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METHODOLOGICAL CONSIDERATIONS ON THE ARCHAEOLOGY OF RIGID, REFLEX, COMPOSITE BOWS OF EURASIA IN THE PRE-MONGOL PERIOD

Abstract:

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The main aim of the present paper is to enhance our understanding of bow finds unearthed in burials. General terminological, methodological and source critical problems are concerned in order to define the information value of the two main sources, i.e. rigid bow applications and well-preserved bows.

Key words: bow, bow plate, burial archaeology, methodology, terminology, source criticism, epistemology, documentation, reconstruction

Preface

Around and after the recent millennial, an explicit boom of interest in the ancient 'wonder weapon' is apparent among the descendants of once great steppe empires and warlike 'nations' of old. In some instances, e.g. Hungary, this is dated somewhat earlier, while other nations, like in Central Asia, are still at the start of the process. Mongolia, on the other hand, where a continuous use and manufacturing of the bow in question survived until now, shows less flaming enthusiasm to the case. It seems fairly trivial that by the attraction to the idea of the powerful weapon of the ancestors, the living populace can create identity through triumphant history, maintain and reassure self-confidence. It is not surprising that these nations gained independent statehood rather newly or for the first time in the course of their history. A perfect example is Hungary, where a minor but committed part of the society shows remarkable commitment to the case (Fig. 1). As this recent social phenomenon has been heavily gathering speed, it has not only developed to mass sport activity, but in the meantime created a thriving market of replica weaponry and equipment. As a result, we can already speak of the revival of bowery, horseback archery and archery in general. However, the 'movement' now incorporates some, who do not only wish to recreate but to reconstruct the ancient Magyar bow on scientific grounds. It is also important to note, that though academic concernment to the topic was present from the start, a somewhat grotesque, mostly ignoring relationship has evolved between the two camps. It seems thus inevitable for the academic world and archaeology in particular to answer the demand and undertake the burden of laying the scientific foundation of our knowledge on the bows in question.

The territory of present day Hungary, situated in the very center of the Carpathian Basin in East-Central Europe, consisting mostly of the Pannonian Plain, functioned through centuries as the endpoint of great migrations and as the last western resort for nomadic people. Huns, Avars and Magyars, only to mention those that managed to establish full political authority in the wider region, arrived (with and by their weapons) from time to time and thus contributed to the general ethnogenesis and genetic pool of present day nations in the region. Therefore, the 'nomadic' archaeological material of the Carpathian Basin, especially for the 6th-11th c. A.D., is as unique in quality as in quantity and density, though it mostly consists of burial assemblages, where usually no organic material survives. In male Avar and Magyar period burials due to the typical funerary rite, sets of rigid bow applications are frequently

Fig. 1. Photo cover of *Heti Válasz* (No. IX/42 from 15 October 2009), a weekly newspaper in Hungary, entitled *Escape into protohistory. The return of the pagan world*. Photo courtesy of Heti Válasz Kiadó (www.hetivalasz.hu).

Ryc. 1. Zdjęcie na okładce węgierskiego tygodnika *Heti Válasz* IX/42, z 15.10.2009 r. zatytułowane *Ucieczka w protohistorię. Powrót pogańskiego świata*. Zdjęcie udostępnione dzięki uprzejmości Heti Válasz Kiadó (www.hetivalasz.hu).

discovered. Though the vast East European and Central Asian steppes also provide a great number of bow finds for the first millennium A.D., the general archaeological situation of the Carpathian Basin would render it as a special haven for the research of the 'nomad bow' in the pre-Mongol era. Evidently, this material must be interpreted in the wider context of the archeology of Eurasian bows. Albeit extremely competent experts around the globe have been and are studying the topic of reflex composite bows of Eurasia, no serious attempts have yet been made to incorporate that huge amount of archaeological data into the international research. However, as the most important source critical basics of the research are unfortunately lacking or exist only in comments or short notes, and as the epistemological contributions to the topic (Gaunt 1983; Савин, Семёнов 1995), which have fallen under the present author's attention have yet received no response, the primary aim of the present paper is to propose a unified nomenclature and introduce the sources, methodology and information value of bow finds supplied (mostly) by funerary archaeology. Such a general overview will hopefully point to the possibilities and limitations of the research as well.

Proposal for a unified system of terminology

First of all, the term indicated in the title of the present paper needs some clarification. The author believes on the basis of the archaeological material that the most important invention in bow evolution (or more precisely change) was the development of rigid bow tips (and grips). In addition, this characteristic clearly separates bows of the 1st

millennium A.D. from the so-called Scythian bows, which had obviously no rigid tips – though there are some, who think otherwise (see e.g. Boie, Bader 1995, 29). However, terms, like composite and reflex are unfortunately inadequate to describe archaeological record, since usually, neither manifest in the material unambiguously. The composite nature of the bow find, i.e. following Gaunt's definition: the limb (Gaunt 1983, 42), can only be determined if at least some part of the limb survives, but defining the reflex or deflex of a bow find is also extremely difficult, since it is possible to build deflex bows, which reflect the form of reflex bows both strung and unstrung. Moreover, there is some concrete evidence on the use of such types in the period under discussion (Артемьев, Гайдуков 1992; Ricz, Fabian 1993). Thus, hereby a new term: 'rigid' is introduced as it adequately describes the main characteristic that can be deduced at first glance from the archaeological record – for bow applications of antler or bone are and were stiff, thus the parts (tips and grips), to which they were applied, must have been rigid.

Describing bow parts has a long history: various traditions of Chinese, Korean, Mongolian[1] and English archery terminology are to be noted first, since their usage is more or less continuous up until today. Others, like Persian, Arabic and Byzantine (Greek) nomenclature[2] are known to certain extent from written sources. However, the most relevant Turkic, Khazar, Magyar, etc. words for bow parts unfortunately have not survived. If we take a look at Russian, German, Hungarian and English publications on archaeological material, it seems clear that they tend to be divergent, in some aspects even chaotic. First and foremost, none meet the requirements of modern, appropriately detailed descriptions. German usage for example operates with *Hebelarm*, *Hebelend*, *Hebel*; with *Bogenleisten*, *Bein-* or *Knochenplatten*, *Bogen-*, *End* or *Knochenversteifung* or *-verstärkung*, (*Wurfarm*)*beschläge* and *Bogenplatte* or *-plättchen* for the very same parts (cf. e.g. Werner 1932; 1956; Riesch, Rutschke 2012; Riesch, Rutschke, Stehli 2012), but even English terminology is confused concerning the applications at the tips of the bow: ear-, lever, *siyah*-plates or -laths, sometimes supplemented with indicatives like reinforcement, bone, etc. are generally used[3], while e.g. terms like belly plate and central belly lamination, also indicate some diversity (cf. e.g. the usage of Hall 2006 and Reisinger 2010). Russian definitions on the other hand, seem to be more precise by giving not only the approximate place of the application, like grip or tip, but also define its orientation. A Russian term for describing a bow application thus comprises at least two directions: location and orientation. The phrase e.g. *центральная боковая пластина* or *накладка* (of course further versions are also available) means a plate situated on the side of the grip of the bow. In some cases however, things can get really messy, as e.g. *фронтальные* does not directly mean a certain direction, but it is only an indicative for that the application is not on the sides of the bow[4]. This was recognized most lately by V. V. Gorbunov, who at the classification of Altay material used the *фронтальные – тылные* dichotomy to differentiate between the two positions (Горбунов 2006, Рис. 9-10). The terms *рог* and *рога* can also be confusing, since the tip of the bow in Russian is sometimes called *рог*, meant as horn in anatomical sense, i.e. the tip of the bow, while *рога* denotes both antler and horn as material.

There is also an inherent theoretical problem in English, German and Hungarian usage: the practice of labeling bow applications by their assumed function. As the reinforcing role of rigid bow applications must be considered only as a hypothesis until physical modeling and bending tests do provide hard evidence pro or contra, the explicit use of such terms should be avoided if

[1] On Chinese terminology Gawlikowski and McEwen (1994, 109-110), on Korean, see T. A. Duvernay, N. Y. Duvernay (*Korean Traditional Archery*, 2007 – which was not available for the present research), on Mongolian usage consult Varga (2006, 194-197) with references of Mongolian publications.

[2] On Byzantine terminology see von Fleschenberg (1941-1942) and Kolias (1988, 215-218, 229-238) in general. Arabic or Muslim bow terminology is largely based on archery manuals, date usually from the 14th c. onwards (see e.g. the Kitāb fī 'ilm an-Nussāb – Öztopçu 2002), see Paterson (1966, 69-77) with further literature. The earliest, unfortunately, yet unpublished *furūsiyya*s, dated to the Abbāsid period, might also have data on archery terminology (see al-Sarraf 2002, 149-152).

[3] English terminology was discussed with an outlook on Arabic terms in Coulston (1985, 223-224, Fig. 1).

[4] For Russian terminology see Biro, Lango and Turk (Биро, Ланго, Тюрк 2009, especially 413). The preface of the translator in Hudiakov and Tseveendorj (1993, 71-72) is a typical case for the usual lack of understanding of Russian terminology. The paper written by Ju. S. Hudiakov and D. Ceveendorzh was first published in Russian (in: *Археологические, этнографические и антропологические исследования в Монголии*, Новосибирск 1990, pp. 126-132), then a translation in English appeared in the Journal of the Society of Archer-Antiquaries (Hudiakov, Tseveendorj 1993), then in the Journal of Korean Ancient Historical Society (1995, pp. 593-608). All three papers were republished in the collected studies of D. Czeveendorzh (*Монголын археологийн судалгаа. Эрдэм шинжилгээний өгуулэл, илтгэлийн эмхэтгэл 1983-1992, 1993-1997*, Археологические исследования Монголии II-III. Сборник научных статей и докладов 1983-1992, 1993-1997, ed. Б. Гунчинсурэн, Улаанбаатар 2003, 2004 on pages 302-309, 359-367 and 210-222).

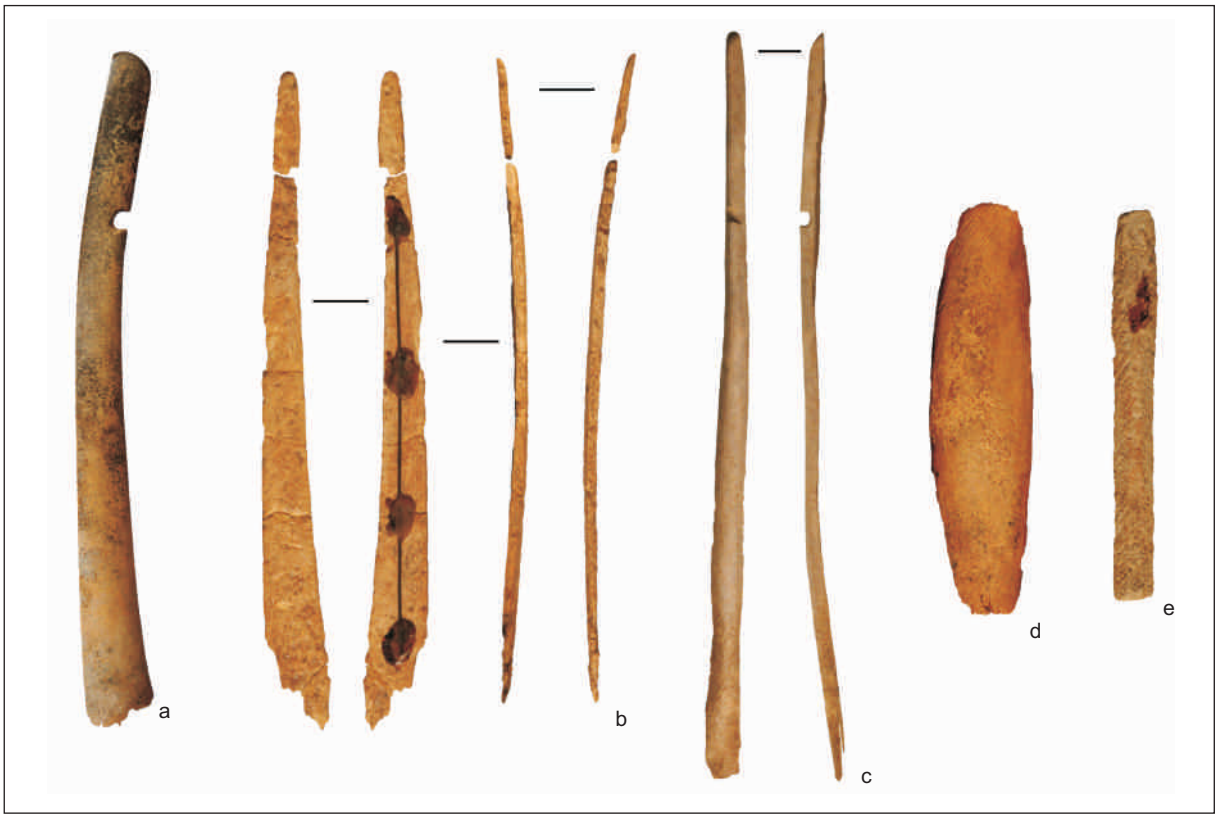

Fig. 2. Terminology of rigid bow applications, portrayed by the type spectrum of 10th c. material from Hungary (without scale): a – lateral tip plate from grave No. 23 at Magyarhomorog-Kónyadomb; b – dorsal tip plate from grave No. 80 at Magyarhomorog-Kónyadomb; c – frontal tip rod from grave No. 63 at Hódmezővásárhely-Nagysziget; d – lateral grip plate from grave No. 10 at Kübekháza-Újtelep; e – dorsal grip rod from grave No. 3 at Rakamaz-Strázsadomb. *Photo by A. Biro*.

Ryc. 2. Nazewnictwo okładzin łuku refleksyjnego, przedstawione na podstawie materiałów pochodzących z X w. z terenu Węgier (bez skali): a – boczna okładzina ramienia łuku z grobu nr 23 w Magyarhomorog-Kónyadomb; b – tylna okładzina ramienia łuku z grobu nr 80 w Magyarhomorog-Kónyadomb; c – przednie nakładki ramion łuku z grobu nr 63 w Hódmezővásárhely-Nagysziget; d – boczna okładzina majdanu łuku z grobu nr 10 w Kübekháza-Újtelep; e – tylna nakładka z grobu nr 3 w Rakamaz-Strázsadomb. *Fot. A. Biro*.

possible. Such tests are a necessity in the case of each different construction type, since it is highly possible that structural changes of the bows during the first millennium must have had impacts on the functions of various bow parts as well. Due to similar difficulties, the material of the application should also be omitted from definitions when no archaeozoological, or any reliable macroscopic analysis is available. Contrary to the common notion, bone and antler are not the same material – there are fundamental differences in their mechanical properties, which ordain and condition these materials for different use and function (MacGregor, Currey 1983; O'Connor 1987). Such analyses are unfortunately rare (see e.g. Choyke, Bartosiewicz 1986; Choyke 1995) compared to their importance, e.g. a tendency of switching from bone to antler material is approximately discernible from the 6th to the 10th-11th c. A.D., at least in the Carpathian Basin.

Keeping in mind the above mentioned difficulties, an objective terminology is proposed and used herein to avoid confusion. First of all, separate elements of the bow will be named as follows: rigid tip, rigid grip, flexible limb and wooden core instead of *siyah*/ear, handle, arm and *кибить*. Directions are given according to the archer, i.e. the so-called belly side facing the archer will be labeled dorsal, while the opposite (the back of the bow) as frontal, and the remaining sides as lateral. These directions are also used to describe and differentiate rigid bow applications. In addition, two main forms of applications are contrasted: those that are rather flat, thin and somewhat long in their own proportions will be named as 'plates' (*пластина* / *Platte*), while the term 'rod' (*накладка* / *Leiste*) will be applied to those that tend to be rather thick or blocky. According to the *Typenspektrum* of the archaeological material, the following terms are proposed for common use (Fig. 2):

– lateral tip plate / концевая боковая пластина / Seitendplatte

– dorsal tip plate / концевая тыльная пластина / Rückendplatte

– frontal tip rod / концевая фронтальная накладка / Frontendleiste

– dorsal tip rod / концевая тыльная накладка / Rückendleiste

– lateral grip plate / центральная боковая пластина / Seitgriffplatte

– dorsal grip rod or plate / центральная тыльная пластина or накладка / Rückgriffplatte or -leiste

– lateral limb plate / плечевая боковая пластина / Seitarmplatte.

Regarding the location of rigid bow applications in graves, disturbed, undisturbed and in situ terms are perfect to express the quality of information that can be derived. However, as disturbance can hit different areas of the grave, and as personal experience indicates that rigid bow applications can turn up undisturbed, in situ in disturbed, even robbed burials, the disturbance of the whole grave does not necessarily applies for the artifact in question. Nevertheless, rigid bow applications are frequently found in obviously undisturbed burials not in the expected order of a bow, whether it be strung or unstrung, but scattered across the grave on locations that would not recall a structural order of a bow. It is imperative thus to define a new term that indicates, whether the applications were found in the order of a bow or not. The expression, 'structural bow order' will be used herein to describe the location of the applications from this perspective. In addition, as there are no unambiguous hints to decide which end of the bow was the upper or lower, these denominations naturally describe only the actual position and not the original relations of bow parts. It is also important to call attention to the common practice in archaeology of claiming the length of a bow in a burial. Namely this data could only be beneficial if the method of measure and the stance of bow are given – as overall length reflects totally different characteristics, if the chord line is meant or if measured on the curve.

Introduction to the observations in source criticism and research methods

As rigid, reflex, composite bows were in use throughout countless cultures and enormous territories of Eurasia, it is imperative to define here the main frames of the present research. The principal interest of this paper lies in the archaeological research of the 'nomadic' bow in the pre-Mongol period, understood here as ca. from the 3rd c. B.C. to the 12th c. A.D., i.e. the 1st millennium in a wider sense. This era embraces the time, when the 'nomadic' bow developed into a new form determined by rigid applications of bone and antler, only to leave them behind at the advent of a new age on the steppes. Such clearly speculative distinctions, like 'nomadic' naturally involves severe disadvantages, since the bow in questions was used by sedentary populations as well. The conventional picture is fairly simple: the nomadic invention and innovation due to its notable military advantages became widespread at least in the border regions of great civilizations. This process is most evident in China and Early Korea, where both military and economical, thus cultural contacts with nomads were more active and permanent than in Europe. In the East, the recurring tides of nomad conquerors, eventually assimilated by the autochthonous population, were also the agents of innovation[5]. Keeping in mind the originally oral nature of nomad culture, the generally dispersed way of life, though of course there are some examples for the contrary, it will not be surprising that we lack a whole bunch of sources, not only in terms of type (material, written, art)[6], but also sources that would relate to the material and production technology of the bow[7]. An attempt will be made in the following to introduce various source types available, produced and processed by archaeology, and to discuss their information value.

On the use of artistic sources

First of all, let's take a quick look at artistic depictions of contemporary bows, as in certain sedentary civilizations and contact zones on the fringes of the 'nomadic world' where the bow in question was used, a great wealth of such sources is available. It also seems clear though that in the absence of a thorough and archery-centered analysis of late antique and early Islamic frescoes of Dura Europos, Qaṣr al-Ḥayr al-Gharbī in Syria[8], Sasanid silver plates and rock reliefs

[5] For general studies on the (history of the) bow type in question, consult e.g. Litvinskij (Литвинский 1966), Medvedev (Медведев 1966), Hazanov (Хазанов 1966), Rausing (1967), McEwen (1978), McEwen, Miller, Bergman (1991), Credland (1994), Grayson (2000) and Riesch (2009).

[6] Artistic representations in nomad cultures regarding realistic scenes or objects tend to be too schematic for such analysis. See for example the mounted archers on the roof tile from the 8th c. A.D. at the Bilge Khagan memorial complex (*Dschingis Khan* 2005, 79) or the engraved figure on the Jargalant harp (Jacobson-Tepfer 2012, Abb. 5).

[7] An overview of Chinese written sources in this respect is given in Gawlikowski and McEwen (1994, 108-116). On Arabic sources discussing similar topics, consult footnote 2 of this paper.

[8] On Dura Europos see e.g. Downey (2006, Fig. 19); on Qaṣr al-Ḥayr, see Schlumberger (1986, Pt. 34).

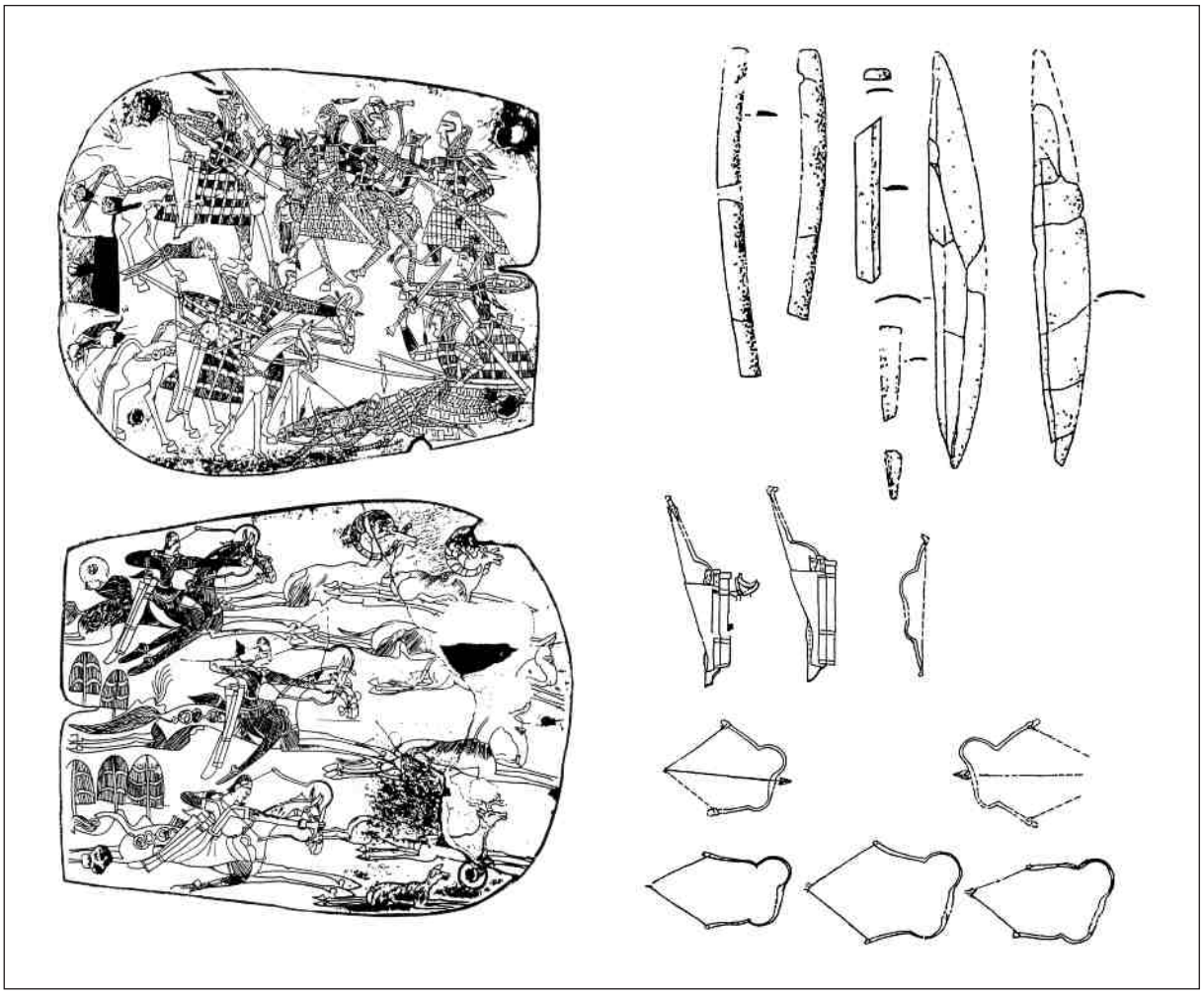

Fig. 3. Rigid bow applications and bow depictions on bone plaques from kurgan No. 2 at Orlat, Uzbekistan (after *Ilyasov, Rusanov 1997/1998, Pl. III-IV and XIII*).

Ryc. 3. Okładziny łuku refleksyjnego i przedstawienia łuku na kościanych plakietach z kurhanu nr 2 w Orlat, Uzbekistan (wg *Ilyasov, Rusanov 1997/1998, Pl. III-IV i XIII*).

depicting mounted hunts[9], the bone plates of Takhti-Sangin in Tajikistan (Litvinsky 2001), yet unexploited vast quantity of contemporary Chinese scenes[10], mural paintings of the Korean Goguryeo tombs[11], just to name a few, an unwary use of pictorial evidence could easily lead to false deductions or assumptions. The case of the engraved bone plates from kurgan No. 2 at Orlat (Kurgantepe), Uzbekistan (Пугаченкова 1989, Рис. 71-72)[12] should make one extremely cautious (Fig. 3). Since the burial at kurgan No. 2 contained bow plates as well (Пугаченкова 1989, рис. 56), the comparison of the two sources might prove fruitful[13]. However, the depicted bows and the physical reality of the buried bow contradict each other on some important points. I would only like to point here to the fact that while lateral tip plates found in the burial are curved to a certain degree,

[9] For an overview of such plates consult Erdmann (1936) or Harper and Meyers (1981), while a specific issue of Sasanid mounted archery was covered lately in Overlaet (1998, 290-297). For a picture of the boar & deer hunt rock reliefs at Taq-i Bustan, see e.g. Chegini and Nikitin (1996, Fig. 15-16) and Otavsky (1998, Abb. 58).

[10] See e.g. the archers on the murals at Bezeklik and Dunhuang (von Le Coq 1925, Fig. 107-108) or the marvelous marble figures from the burial chamber of Yuang Sixu, died in 740 A.D. (*China: Dawn of a Golden age* 2004, 311-312, Fig. 203:a-b).

[11] See e.g. the famous mounted hunt scene in the Muyong-ch'ong (Tomb of the Dancers): *Mural paintings of Koguryo* (1979, 31); most lately Chai-Shin and Tae Ho (2011), or consult the mounted archery contest and other hunt scenes in Tokhung-ri, and Changchon tombs, see *Mural paintings of Koguryo* (1979, 36-38, 59).

[12] A new, more elaborate drawing of the battle plaque was published most recently by M. Mode (2006, Fig. 1 and 3:b) along with a brilliant narrative interpretation. Former drawings can be seen in Ilyasov and Rusanov (1997/1998, Pl. IV).

[13] Former analyses of the plates unfortunately did not explicate the topic of the bows sufficiently (Пугаченкова 1989, 143-144, Ilyasov, Rusanov 1997/1998, 120).

all engraved bow tips can be considered straight[14]. As the bow plates were not in situ in the grave, and since they are fragmentary, and as only not exactly satisfying pictures were published, we cannot delve here into further discussion. It must be noted however, that on the two Orlat plaques two bow types and shooting styles can be differentiated. On the hunt plaque bows at full draw have tips parallel running, while on the battle plaque the tips form a specific angle with each other. Additionally, on the former, grips are visibly rectangular and twice as long as the palm of the archers, while on the latter, grips are as long as the palms. Note that hunters hold the bow at the joint of the grip and lower limb, while the fighters are gripping it exactly in the middle. The bows of the plaques also show some dissimilarity regarding the asymmetry of the limbs. It is imperative to mention, that while the battle-plaque has completely natural proportions regarding shooting motion and position, the hunt-plaque is the opposite with unnaturally long left hands holding overdrawn bows[15]. Such inclination to lengthen things can also be observed in case of the depicted horse legs. This might point to different 'hands' of the master, or different production chronology, etc. All in all, this unique possibility, when in one and the same archaeological unit a bow representation and a bow itself can be observed and evaluated, posed more questions and problems, than offered answers or solutions. To conclude the lessons of this short example, in each and every case of artistic depictions one must at first weigh the extent of realism, and then proceed to a thorough analysis and comparison with contemporary bow finds.

Understanding objects: attributes and burial phenomena of rigid bow applications

Before we delve into the main topic of this paper, the general chorological and chronological features of rigid bow applications should be introduced shortly, in order to outline the richness and the quantitative frames of the material. In favor of a somewhat perspicuous picture, the vast amount of material will be sketched according to greater regions of Eurasia from the east to west, if possible, following inner chronology in each unit. Only major works and summaries will be quoted, but be advised that lesser contributions could have evaded the author's attention due to major difficulties in the acquisition of Soviet and post-Soviet literature. Chinese papers and works on bow applications and well-preserved bows will be purposely omitted from this overview – as the latter will be discussed in greater length below, and as the former are unknown to the author.

The function and importance of rigid bow applications made of bone or antler was discovered fairly simultaneously at the end of the 1920's by P. S. Rykov and C. Sebestyén Károly[16]. Since then, mostly locally interested surveys and analyses were prepared regarding the topic. The present author is aware only of a single attempt, which challenged a synthesis, rather successfully, and dealt with major changes of the material, however from an evolutionary typological point of view (Hall 2006, especially Fig. 28).

One of the most important areas, concerning e.g. the invention of rigid bow applications, is the territory of present day Mongolia and the Altay region. Here, Xiongnu and Xiongnu influenced material cultures, like Shurmak, Tashtyk or Bulan-Koba, dating from the 3rd c. B.C. to the 2nd-3rd c. A. D. provide a continuously growing number of finds[17]. The rigid bow application material has been analyzed and discussed many times (Hudiakov, Tseveendorj 1993; Boie, Bader 1995)[18]. Ongoing new excavations of undisturbed burials promote this region as one of the most important areas of future bow research. The same area, especially Tuva and the Upper Altay have yielded relevant material – though fewer in number – for later centuries as well, usually divided to Ancient Turkic and post-Turkic (Uyghur or Kimek) periods[19]. Significant diachronic analyses, which discuss the region's bow material from the Xiongnu times to the 10-11th c.

[14] The bow plates are at Pugachenkova (Пугаченкова 1989, рис. 56 and 67; cf. with Ilyasov, Rusanov 1997/1998, pl. XIII) and with her description of the bow-depictions (Пугаченкова 1989, 144 – on рис. 61 a straight lateral tip plate can be seen from Kurgan No. 9 – but its fragmentary state is fairly obvious). Most bow tips on the mounted hunt plaque seem to be curvilinear, but their curvature is focused at the bottom, with which they seem to represent quite unique types.

[15] On a brilliant explanation for depictions of overdrawn bows see Gaunt (1983, 43).

[16] Cf. with the papers of P. Rykov (П. С. Рыков 1925, *Сусловский курганный могильник*, Ученые записки Саратовского государственного университета 4/31925, *idem* 1929, *Археологические разбедки и раскопки в Нижне-Волжском крае, произведенные в 1928 году*, Известия Нижне-Волжского института краеведения 1929/3), published in 1925 and 1929 (as quoted in Werner 1932, endnotes 8-9 and Fettich 1932, footnote 23) and Sebestyén's paper in 1930. The contributions of Rykov were unfortunately not available for the present author.

[17] See e.g. the material from the Egiin gol valley (Төрбат, Амартувшин, Эрденебат 2003; Reisinger 2010).

[18] Most lately see Gorbunov and Tishkin (2006) and Reisinger (2010 - with further literature).

[19] See e.g. the Ancient Turkic burial sites of Kudyrge (Гаврилова 1965, 87-88), Borotal (Кубарев 1985) and Mongun-tayga and Qarahol in Russia (Грач 1960).

were published by D. G. Savinov, Ju. S. Hudiakov and V. V. Gorbunov (Савинов 1981; Худяков 1986; Chudjakov 2006; Горбунов 2006). The next region is the geographically and culturally diverse territory of Western Turkestan (not to confuse with present day Turkmenistan)[20], including steppes and mountains populated by nomads, like the Tien Shan or the Hunger-steppe, but also oasis based civilizations in Khorezm, Sogdiana, etc. As a detailed summary (Litvinsky 1986, 76-81) on bow finds of this region have been published in 1986, it is appropriate to confine the overview here to highlight only the most important issue: rigid bow applications were unearthed in great number in political, economic and cultural centers, fortresses and settlements in the region, like Topraq-qala in Khorezm (Uzbekistan), Penjikent in Sogdiana (Tajikistan), Iakke-parsan and Koj-Krylgan-qala, both in Khorezm (Неразик 1963, рис. 14; *Кой-Крылган-Кала* 1967, 136-137; Распопова 1980, 65-68; *Городище Топрак-Кала...* 1981, 101-105; *Топрак-Кала дворец* 1984, 216-220). The remains of bowyer's workshops in Penjikent and Giaur-qala (Merv, Turkmenistan), Topraq-qala and Qaparas (Uzbekistan)[21] clearly denote the importance of the region, but also make these sites unique in the Eurasian material, as there is only one other workshop find, known to the present author from the 1st millennium A.D. in Eurasian steppe region[22]. The Ancient Turkic material of the region has also been subject to study several times (Табалдиев 1996, 47-50; Borisenko et al. 2006, 109-112). Rigid bow applications of Sasanid Iran are unknown at present[23] – possibly due to the dominant burial rite, though at least in Dailimān, where inhumation prevailed as the major funerary custom, future research might provide related material. If we take a step on the map to the north again to the vast Eastern European steppes, we'll encounter material that is probably as significant as the Central Asian, except that rigid bow applications are lacking here for the period before the Hun invasion[24]. Fortunately, extensive research has been done in this area (see e.g. Савин, Семёнов 1989; 1990; 1991; 1992a), thus it is sufficient to refer only to the latest synthesizes (Anke 1998, 55-65; Измайлов 1998; Савин, Семёнов 1998; Круглов 2005; 2007; Аксенов, Михеев 2009; Mikhailov, Kainov 2011; each with further literature). However, the stratigraphic sequence from the *gorodishche* at Sarkel, Belaia Vezha is worth mentioning, since it provides a clear chronology of different application types for the 10-12th c. – which is a pretty difficult task to accomplish when only burial material is at hand (Флёрова 2000, 101-104, esp. рис. 2). Bow applications from the Caucasus are regrettably mostly unpublished, only general summaries are available for research (Каминский 1982, 1997, 66; Kaminsky 1996, 100-101). Central Europe and the Mediterranean offer a somewhat different picture. Rigid bow applications, primarily lateral tip plates were widespread along the entire length of the European part of the Roman Limes, from Britannia to Dacia (see Werner 1932, 33-35, Coulston 1985; Zanier 1988, 18-23 Anm. 28, Abb. 3; Chiriac 1997; Petculescu 2002, with further literature)[25], but after the Hun invasion[26] they became rare in most of Europe: outside of the Carpathian Basin, only some Germanic burials yielded such material (Riesch 2009, 76-83). However, in Bohemia and Poland bow applications do appear, though in extremely small number in the 10-11th c. as well (Profantová, Lutovský 1992, 11, Obr. 5:1; Dmochowski, Wrzesiński 2004). The material cultures of the Carpathian Basin on the other hand, provide abundant sources: the combined number of Avar and Magyar period burials with rigid bow applications exceeds 600. However, this great wealth of archaeological record has yet not received appropriate attention[27]. The same is true

[20] For the term used herein in a geographical sense and for an introduction to the general issue of geographical terms in Central Asia, see Bregel (2003, 2) and lately Stark (2008, 6-8).

[21] See Belenickij (Беленицкий 1958, 143, Рис. 41) – Penjikent; Usmanova (Усманова 1963, 179-180) – Merv; Tolstov (Толстов 1952, 33-34) – Topraq-qala palace complex (but contrary see *Топрак-Кала дворец* 1984, 216); Gorodiszcze Topraq-qala (*Городище Топрак-Кала* 1981, 101-105) – Topraq-qala fortress. The publication on the workshop unearthed at Qaparas (Поляков С. М. 1979, *Мастерская по обработке рога и кости в крепости Капарас*, [in:] *Этнография и археология Средней Азии*, Москва) is cited at Topraq-qala dvorec (*Топрак-Кала дворец* 1984, endnote 6 on p. 248).

[22] Sarkel, Belaia Vezha: Flërova (Флёрова 2001, 46, 116−125, Рис. 7, 9). On Roman workshops on the Limes, see e.g. Intercisa in Pannonia (Bíró 2009; Vass 2009, 82-83).

[23] On Sasanid bows see Paterson (1969).

[24] Only a few specimens have been found in graves of the Sarmatian era, though they are usually regarded as imports from Central Asia (see e.g. Simonenko 2001, 60-63).

[25] The lateral tip plates got as far as the Arabian Peninsula (Waele 2005).

[26] On Hun bow material in Europe see Werner (1932; 1956), Kalmár (1935), Harmatta (1951), László (1951), most lately Riesch and Rutschke (2012).

[27] As the contributions to this topic are mostly in Hungarian (except Корошец 1959; Fabian 1970; 1984; Ricz 1982-1983; 1983; Ricz, Fabian 1993; Demo 2005; Биро, Ланго, Тюрк 2009), and as a future article is planned to introduce the material and its research history to the international research, citations are omitted here.

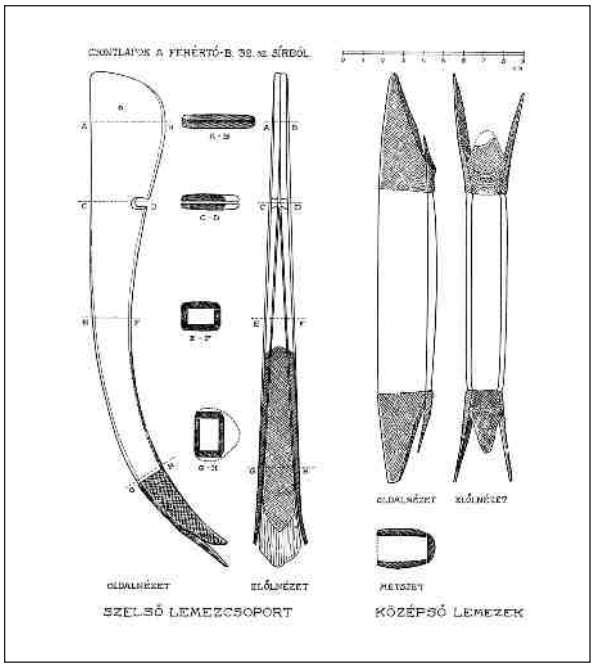

Fig. 4. Typical boxed tip construction of the Avar period – grave No. 32 at Szeged-Fehértó A, Hungary (after *Sebestyén 1930, Fig. 8*).

Ryc. 4. Typowy zestaw okładzin i nakładek z okresu awarskiego – grób nr 32 z Szeged-Fehértó A, Węgry (wg *Sebestyén 1930, Fig. 8*).

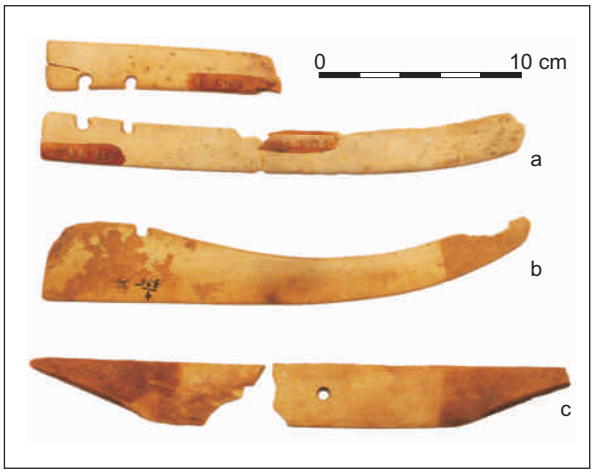

Fig. 5. A selection of extraordinary Avar period bow plates from Hungary: a – double nock on lateral tip plate (Kiskőrös-Rákóczi út 49, grave No. 1); b – drilled lateral grip plate (Budapest, IXth distr., Régi Lóversenytér, grave No. 1); c – lateral tip plate of extreme width (Kiskőrös-Vágóhíd, grave No. 18). *Photo by A. Biro*.

Ryc. 5. Wybór najlepiej zachowanych okładzin łuku pochodzących z terenu Węgier w okresie awarskim: a – podwójne karbowanie na bocznej wierzchniej okładzinie (Kiskőrös-Rákóczi út 49, grób nr 1); b – przewiercona boczna okładzina majdanu (Budapeszt, IX dzielnica, Régi Lóversenytér, grób nr 1); c – boczna wierzchnia okładzina w największej szerokości (Kiskőrös-Vágóhíd, grób nr 18). *Fot. A. Biro*.

for the territory of present day Moldova, where a great deal of 'late nomadic' burial assemblages consisted rigid bow applications, probably datable to the 9-11th c.[28] The last area to mention is present day Bulgaria, where apart from a single burial at Novi Pazar, only stray finds are known (Савин, Семёнов 1991; Йотов 2004, 17-20, Табло I-III).

After this rough sketch let us turn now to the information value of rigid bow applications. First of all, it must be emphasized that rigid bow applications carved from antler or bone are one of the most peculiar artifacts in archaeology as together in a certain set, they belonged to another artifact, the bow itself. Rigid bow plates and rods are therefore primarily parts of complex objects, although they also can be treated independently, since during the manufacturing process the applications were produced separately from other elements of the bow. The axiomatic problems of parts and complex artifacts applies thus well to our material, though in turn, they bring along a series of important theoretical problems, some of which will be discussed below shortly. The question of complex artifacts, the relation between parts and wholes have only recently became a popular topic of archaeological research, yet only in prehistoric, Neolithic studies (Chapman 2000; Chapman, Gaydarska 2007). On the other hand, applied methods and results of these studies might prove useful for future bow research as well, especially if we are to discuss and interpret the high amount of intentionally broken or crushed bow applications in burials. Archaeological interpretation (typology, chorology, chronology, social and cognitive narratives, etc.) should especially keep in mind this problem, since it particularly matters e.g., whether one chooses to typify whole bows or just their rigid applications. It seems though that in the case of bow plate and rod material, we are limited to obtain only inferred information regarding the bow itself, thus it would be appropriate to interpret the applications first and just then move on to more dubious issues.

Our second point is to claim that a huge amount of information is coded in rigid bow applications, which can and should be read. However, as we will see most of this information is bound to speak only of certain, qualitatively limited issues, for bow plates and rods tend to carry concrete information mostly or exclusively on themselves, like their manufacturing technology, size and general form. In fortunate cases however, they can relate to those parts of the bow that they were applied to. This can imply both to the structure of rigid bow parts and to the sequence of

[28] Consult Spinei (2009) for a general summary of late nomadic finds in the region, who offers no evaluation of bow finds.

various stages of the manufacturing process. On the other hand, some data types might prove less interesting, as they provide information on rather individual features of the actual bow. Inherent data is therefore first to be categorized according to the matter it is capable of referring to. However, there is no universal formula for such – different formal types, subtypes and variations of rigid bow applications should be discussed carefully, but individually. As physical attributes can refer to various data types, it is important to note that the situation is complicated further by the nature of the material, i.e. bone and antler, since they easily bear traces of any activity. Certain attributes or phenomena observed on the body of rigid bow applications may be – from our point of view – unintentional and thus indirectly point to past activities. Here, not only simple use-wear traces are meant, but also attributes, which appeared secondarily, e.g. during phases of manufacture. Personal experience indicates that it is possible to identify phenomena, which relate to such activities that were intended to shape the outer surface of the rigid bow part, but the effects of scoring/polishing/shaping, etc. spread onto the applications as well. Inherent information hence might be classified according to its nature: besides functional primary and unintentional secondary data on manufacture, traces of use-wear and a whole range of other data are to be concerned with. As a conclusion of the theoretic section of this paper, it should be emphasized that such data classification, actually attribute analysis, is a task as enormously hard to do as its importance is decisive for the evaluation of the material. Of all discovered attributes, which ones are to be considered relevant, significant, interpretable regarding chronology, typology? Which ones point o separate workshop traditions and which to individual – thus for the whole picture less important – solutions?

However, such attribute analyses require particularly detailed observations and careful comparisons. The above described terminology intentionally based upon a system of directions, is also suitable in describing the main attributes of rigid bow applications. Additionally, applications should be described 'held upwards' to ensure vertical directions (top and bottom). The upward position is obvious in case of tip plates and rods, while it is somewhat impossible to define by grip applications, since they are general bilateral symmetric. To conclude, we can speak of frontal and dorsal edges, outer – usually polished – surface, and inner – scored or scraped – surface, top and bottom sections, etc. Certain smaller, definite, but nonetheless important attributes can only be defined individually or according to a class or type. Publications so far usually lack such comprehensive descriptive information, but photos and drawings are also not abundant – though newer Russian contributions seem to reverse the tendency[29]. Therefore personal examination of the material is a must if one intends to draw serious conclusions regarding the artifact that once bore it (at the end of this paper a detailed description of a full bow plate set consisting of four lateral tip plates is given to provide example for such interpretative descriptions). In ideal burial context and if the aforementioned data is available, bow applications can provide essential information on the structure of rigid bow parts, i.e. grip and tips. Assuming that scored surfaces were prepared in order to improve adhesion, one might deduce that different scored planes – if designed explicit and firm – particularly frontal and dorsal edges, have to do something with the specific position of the applications on the core and with their relation to each other or with the general structure of the bow part. Scored edges also might indicate a sinew or horn cover in specific areas of the rigid bow part. Based on this assumption and of course on the form, vertical and lateral curvature of bow plates, in specific cases, even the reconstruction of the whole rigid part is possible.

Tip plate material from the Avar period of the Carpathian Basin is exceptionally apt for such analysis. Here, lateral, dorsal and frontal bow tip plates literally create a 'box', which defines the bow tip from all sides[30], allowing in turn not only the measurement of its dimensions, but an authentic full reproduction of the bow tip (Fig. 4). Such reproductions also enable the physical laboratory testing of bow tips in order to shed light on their characteristics and behavior under stress. Furthermore in such instances, when the design of the bottom of tip plates is clear and the rate of flare of lateral tip plates can be measured, even specific dimensions of the limb can be deduced, like its starting width. Diverging top sections of lateral grip plate pairs could also provide such information, while the (minimal) width of the grip might be defined with the help of dorsal grip plates or rods. In addition, the form and curvature of the bottom sections of lateral tip plates, and the curve of the dorsal edge of lateral grip plates might give a clue on the form and angle of the profile of limb-tip and limb-grip joints (set back

[29] For appropriately detailed drawings see e.g. Gleboc and Ivanov (Глебов, Иванов 2007, рис. 6-7).
[30] This phenomenon was recognized by Cs. Sebestyén K. as early as the 1930's (Sebestyén 1930, 190-195, 202).

Fig. 6. A well-preserved, but deformed bow from Cagaan Khad, Övörhangay aimag, Mongolia (after *Steppenkrieger 2012, 331*).

Ryc. 6. Dobrze zachowany, choć zdeformowany, łuk z Cagaan Khad, ajmak Övörhangay, Mongolia (wg *Steppenkrieger 2012, 331*).

of the grip)[31]. Moreover, the Avar period bow plate material is so diverse, that a handful of unique attributes and individual solutions, like doubled nocks, drilled lateral grip plates, lateral tip plates with brutal width at top are at hand to discuss and interpret specific questions of construction. (Fig. 5) However, if we are to make one step forward from the reconstruction of rigid bow parts, or if bow plates and rods are useless due to e.g. fragmentation, we must turn the burial context.

Keeping in mind the obviously selective and intentional nature of the burial act (see e.g. Härke 1994; 1997), we arrive at an exceptionally problematic source type. Still, in ideal cases, i.e. undisturbed burials with bow applications found in situ and in order, burial contexts can prove to be extremely useful as well. The analysis of a burial plan, more precisely, the location, position and relation of bow applications to each other requires a careful thought process, but first and foremost, highly detailed documentation prepared during the excavation, composed of descriptions, detail photos and drawings. Unfortunately, neither Mongolian, Soviet, Russian, Ukrainian nor Hungarian publications offer such level of detail (for a nice exception see Reisinger 2010). Avar studies e.g. tend to omit grave plans from cemetery publications[32], which can prevent any immediate analysis based on the published information. Personal experience shows that even published documentation can be false or misleading; therefore it is a necessity to endeavor to utilize the original documentation, which, by the way usually proves to be more detailed than what received publicity. Observations at the site are crucial, and if bypassed, the information is lost forever due to the destructive nature of the excavation (see e.g. Lucas 2001, especially 35-38). Rigid bow applications, especially tip plates, can also be intermixed during general processing and restoration of the finds. In such instances, only careful formal comparison of the applications can lead to success: to determine which plates belonged together. If the tip plates are similar in form, the collation of the length between the nock and upper end of the scored area at the bottom might be of some help, since these should tally with each other in case of plates from the same tip.

Ideally observed and documented undisturbed graves are thus usually invaluable due to their rarity. In each and every instance, the relation and location of bow applications should be individually analyzed, as personal experience shows that there are no identical cases. It is also important to emphasize that the burial context can contribute greatly to the final positions of bow applications. If coffin or some planks were used to separate the dead from the soil, decaying and thus deforming parts of the bow might shift or tilt to certain extent. The gaseous inflation of the corpse could also effect lesser displacements. When the bow was strung and the collapse of the coffin was delayed, the bow under stress could deform significantly, as denoted

[31] It was Cs. Sebestyén K. and J. von Kalmár, who for the first time inferred to these (see Sebestyén 1932, 186, Abb. 6.; Kalmár 1935, 153-154, Abb. 8).

[32] In the case of Kölked-Feketekapu B Avar period cemetery (Hungary) e.g., only a small portion of the grave plans were published (exactly 77 plans and 55 photos from the total number of 662 burials) (see Kiss 2001, 21-189, Abb. 7-52, Taf. 1-22).

Fig. 7. Photo of the *in situ* lateral tip plate pair in grave No. 128 at Hajdúszoboszló-Árkoshalom, Hungary (after *Nepper 2002, 47. kép.*; photo courtesy of Déri Múzeum, Debrecen, Hungary).

Ryc. 7. Zdjęcie bocznej wierzchniej okładziny wykonane *in situ* w grobie nr 128 w Hajdúszoboszló-Árkoshalom, Węgry (wg *Nepper 2002, 47. kép.*; zdjęcie dzięki uprzejmości Déri Múzeum, Debreczyn, Węgry).

e.g. by the intact piece from the 14th-15th c. A.D. crevice burial at Cagaan Khad, Övörhangay aimag, Mongolia (Fig. 6) (*Steppenkrieger* 2012, 330-334) which if decayed in that position no one would assume that the rigid bow applications were laid in the grave with an intact bow. The pressure of soil is also an important factor to count with, as shown by the position of the lateral tip plate pair from the Magyar period grave No. 128 at Hajdúszoboszló-Árkoshalom, Hungary (Fig. 7). Although the grave suffered some disturbance, the plates in question remained in situ, undisturbed by the right *humerus* of the deceased. It is clear from the photo that the lateral tip plates were originally parallel, but soil pressure slowly crushed and pushed the lower sections of both plates to the side as the core decayed, so it would seem that the plates define a hybrid cross section: triangular at the bottom and rectangular at the top. It is fair to conclude this short introduction with a notification, that the position of bow plates in burials not only depends on the status of the bow (unstrung or strung), on intentional breakage but also on a great deal of other factors, like the rate of decay, the presence or absence of coffin, chemical profile of the soil, etc. Hence it is not surprising, that burials, like Qalmaqtöbe in Kirgizstan (Fig. 8), with rigid bow applications found in the expected, strictly appropriate position (i.e. structural bow order), are extremely rare, in contrast to such cases, like burial No. 23 at Magyarhomorog-Kónyadomb, where bow plates only inaccurately reflect the original proportions of the bow (Fig. 9). The above pictured source critical situation is even more distressing as the degree of reflex and symmetry or asymmetry of the limbs can only be observed among strictly ideal circumstances.

Well-preserved bow finds – the ultimate source

Contrary to the limited possibilities of rigid bow applications, we do have, on the other hand, more concrete evidence, though in much smaller number, i.e. organic remains of bows in present day Mongolia, Southern Siberia, Innermost Asia, but also in the Ciscaucasus and in the territory of Russian or Western Turkestan. Finds that are of organic material, which would otherwise dissolve in soil, form the group of intact or well-preserved bows. These include both entirely and partially

preserved bow finds. Intact bows of the pre-Mongol period seem to cluster in three or four major areas, where environmental and especially microclimatic conditions permit the survival of perishable organic material. From east to west, the Altay region and Mongolia in general must be mentioned in the first place, where a series of finds discovered in crevice burials (*Felsspaltengräber*) provide abundant information from the 7th c. A.D. onwards. Particular attention must be paid to the wooden 'model' bows of the Altay region and Southern Siberia in the Shurmak-era, ie. ca. 1st-2nd c. A.D. During the early centuries of the first millennium, the local populace of Tuva laid scaled down, but formally identical models or replicas of real weapons (daggers, swords, but first and foremost bows) of wood, sometimes painted[33], into the graves of the deceased[34]. This peculiar funerary custom is most evident at Kokel in West-Tuva, where about twenty burials yielded model bows (see Kenk 1984, 41 in general)[35]. According to one tomb find, presented online by Stephen Selby, model bows were also used in West China probably for the same, yet indefinite reason (Selby, Selby 2002). The next region is the Tarim Basin in Xinjiang, China, where a great number of intact bows were discovered at various abandoned sites and cemeteries in the vast and cold deserts. Most of the Tarim bows are the results of recent motorway-excavations, while others were discovered during the early geographical expeditions of Sven Hedin and Aurel Stein. It is equally interesting, that Tarim bows are usually dated to the 1st half of the millennium – in some instances even somewhat earlier, but with the exception of the 8th-9th c. A.D. finds from the Tibetian fortress of Mazār-Tāgh. Chinese publications on the topic are unfortunately scarce and difficult to obtain, but the high number of intact bows will obviously make the Tarim Basin as one of the most important regions of future research. The third area of interest is Ciscaucasia. Here, bows from the famous site of Moshchevaia Balka[36] have been long known to the research. The regrettably lost bow from Gogops and the only recently published find from Podorvannaia Balka complete the Ciscaucasian circle. In addition to the above mentioned regions, the territory of Western Turkestan and Syria must be noted as well, for both have already provided well-preserved bows though only in smaller number. The famous Yrzi bow from Syria due to its excellent analysis raised the awareness of the research as early as 1937, while relevant material unearthed in Western Turkestan during the extensive Soviet expeditions in the middle of the 20th c. remained almost unknown to the international research. Intact bows were found as far as I am aware, at least in Besh-Tash-Koroo and Qarabulaq, Kyrgyzstan and Topraq-qala, Uzbekistan (Fig. 10). A series of other sites in the region might have had intact bows, like Kayragach, kurgan No. 32[37] but either they remained unpublished or the publications were not available for the present research.

The most important intact bow finds are summarized in Chart No. 1. Insufficiently published or unpublished finds[38] from the above mentioned or other regions of Eurasia could have escaped my attention, while some smaller, least significant fragments, like the stray find from Üyench sum, Khovd aimag, Mongolia (Kőhalmi 1968, 354-356, Fig. 6:14) were intentionally omitted from the present overview.

SITE	DATING	BONE OR ANTLER APPLICATIONS[39]	REFERENCES
Altay region & Mongolia			
Shombuuziin-Belchir tomb No. 12 Khovd aimag, Mongolia	no explicit dating (Xiongnu)	4 lateral tip plates per tip; 2 pairs (!) of lateral grip plates, 1 dorsal grip plate	Reisinger 2010, 46, Fig. 6-7

33 In addition to the Kokel finds, see for example Kyzlasov (Кызласов 1979, рис. 75).
34 For a general overview of model weaponry in graves of the Tashtyk period, see Badeckaia (Бадецкая 1987).
35 For the most intact ones see D'iakonova (Дьяконова 1970a, Табл. IX). Regrettably not all objects were published, but those, which were drawn, are reproduced in Kenk (1984).
36 Note that the Romanization table approved by the Library of Congress was used for the transliteration of Russian place names (available online at: http://www.loc.gov/catdir/cpso/roman.html).
37 Byrkina (Быркина 1970, 124) shortly mentions a "bow" of 1.58 m length, which can also be understood as rigid bow plates found in situ that allowed the measurement of the bow.
38 See e.g. the so-called Yuan bow, of which a photo was posted on the ATARNet in 2006 by S. Selby (http://198.170.107.188/photo/index.php?folder=/Yuan%20Bow/&page=1), or the unpublished bow finds from Ostrov Porechnyĭ, Russia (Hall 2005, 33) and Rim-Gora, Caucasus, Russia (Рунич 1970, 206).
39 Dorsal grip applications will be labeled here as plates, since the difference between the two application types (plates and rods) is rather subjective, and usually can only be decided by personal examination.

Ialoman II, Gorny Altay, Russia	kurgan No. 62	2nd c. B.C. – 1st c. A.D.	2 lateral tip plates per tip; 2 grip plates	Gorbunov, Tishkin 2006, 79, Fig. 2:2,5 and Fig. 8
	kurgan No. 31	4th - 5th c. A.D.	no unambiguous data	Tishkin, Mylnikov 2008, 96, Fig. 3
Kam-Tytugem, Gorny Altay, Russia	"mummified burial"	3th - 5th c. A.D.	2+2 (?) lateral tip plates, 2 lateral grip plates, 1 dorsal grip plate	Худяков, Эбель, Кочеев 1998
Kuray IV, kurgan No. 1. Altay, Russia		probably 7th - 8th c. A.D.	no tip plates 2 lateral grip plates	Евтюхова, Киселев 1941, 110, рис. 50, 52-53
Jargalant, Khovd aimag, Mongolia		7th - 8th c. A.D. (^{14}C dated)	none	Riesch, Rutschke, Stehli 2012, 184-185, Abb. 2; *Steppenkrieger* 2012 248-249, 383
Arcatdel, Bayankhongor aimag, Mongolia		9th - 11th c. A.D. (^{14}C dated)	1 grip plate (?)	*Dschingis Khan* 2005, 83-84
Duguy Cakhir, Bayankhongor aimag, Mongolia		10th - 11th c. A.D.	frontal tip rod[40] (grip-section is absent)	*Steppenkrieger* 2012, 304
Shilüüstey sum, Zavkhan aimag, Mongolia (2 completely intact bows)		10th - 12th c. A.D.	no data	Bemmann, Nomgunsüren 2012, 210-211; *Steppenkrieger* 2012, Abb. 12 on p. 334
Chonot Uul, Khovd aimag, Mongolia		11th - 12th c. A.D. (^{14}C dated)	none (but with a wooden frontal insertion in the nock area)	*Steppenkrieger* 2012, 269-270, 386
Tarim Basin, Xinjiang, China				
Khotan		undated	2 lateral tip plate pairs per tip; 2 lateral and 1 dorsal grip plates	Selby, Selby 2002; Hall 2005, 30, Fig. 2:B, 5, 8:B, 9:B
Niya cemetery No. 1, Tomb M4 (95MN1M4)		3rd c. B.C. (^{14}C dated)	no data (probably 2 lateral tip plates per tip at least)	Hall 2005, 32, Fig. 2:D
the delta of Qum-darya, mass-grave No. 1		ca. 2nd - 3rd c. A.D.	2 lateral tip plates per tip; possibly 2 lateral and 1 dorsal grip plates	Bergman 1939, 121-123, 129, Fig. 30, Pl. 18:10
Miran 2 intact bows		probably 2nd c. B.C. – 4th c. A.D.	no tip plates no visible indication of grip plates due to sinew covering	Hall, Farrell 2008, 90-92, 96-97, Fig. 1-8
Yingpän tombs	M19	Han-Jin (206 B.C. – 439 A.D.)	no data available	Hall 2005, 28, Fig. 3:A
	M30		probably 2 lateral tip plates; no grip applications	Hall 2005, 29, Fig. 2:A, 9:A
Niya 1959 (59MNM001) also known as the Minfeng bow		Eastern Han (25-220 A.D.)	no data	Bóna 1991, 236, Abb. 6; Gawlikowski, McEwen 1994, Fig. 16; Hall 2005, 30, 32, Fig. 2:C; Riesch, Rutschke 2012, Abb. 6
Niya cemetery No. 1	Tomb M1	end of the 2th – 3rd A.D. (^{14}C dated)	no data	
	Tomb M3		no data on tip plates; unknown number of grip plates	
	Tomb M8		no data	
Mazār-Tāgh, refuse heap below the fort 2 bow tips from 1908; 1 bow tip from 1913		8th - 9th c. A.D.	none	Stein 1921, Vol. 3: 1288, 1292, Vol. 4: Pl. LI; 1928, Vol. 1: 92, 94, Vol. 3: Pl. VI; Hall, Farrell 2008, 95-96, Fig. 21-23
Ciscaucasus, Russia				
Gogops 1865 (also known as the Maykop bow)[41]		late-Alanic (no explicit dating, probably 8th-10th c. A.D.)	only 1 lateral tip plate remained; probably without grip plates	Arendt 1934, Abb. 25; Савин, Семенов 1992b; Hall 2005, 33, Fig. 4:A, 8:C, 9:D
Podorvannaia Balka, Nizhniy Arkhyz, burial excavated in 1989		8th-9th c. A.D.	2 lateral, 1 dorsal, 1 V-shaped frontal tip plates per tip; 2 lateral grip plates	Тихонов, Хафизова n.d.[42]

[40] Though the description of the object is unfortunately ambiguous and although no cross-section is given, a detail photo of the tip on p. 304, proves that the Duguy Cakhir bow had similar tip-construction as a rare Magyar bow type (known from Hódmezővásárhely-Nagysziget burial No. 63; Jánosszállás, Gróf Árpád földje burial No. 2 in Hungary and Alba Iulia-Staţia de Salvare, burial No. M.3/S.IX in Romania). For the type see Nagy and Révész (1986) or Izmajlov (Измайлов 1998, 247-249).

[41] The Gogops bow was for long thought to originate also from Moshchevaia Balka (see e.g. Ierusalimskaja 1996, 107 and footnote 196). However, A. M. Savin and A. I. Semenov unambiguously proved that the bow was found near the river Gogops (Савин, Семенов 1992b, 202) and is identical to the Maykop bow, published by V. V. Arendt in 1934.

[42] There is another paper, which discusses the Arkhyz bow (Н. А. Тихонов, Е. Н. Хафизова 2006, *Сложносоставной лук из Нижне-Архызского городища*, [in:] *Первая абхазская международная археологическая конференция*, Сухум, pp. 328-330 as cited in Тихонов-Хафизова n.d., footnote 4), but it was unfortunately unavailable for the present study.

Moshchevaia Balka[43] 1974 probably from the so-called 'Senmurv-burial' (Hermitage, St. Petersburg)	8th-10th c. A.D. (Roth 1999, 526-528)	no tip plates 2 lateral grip plates	Милованов, Иерусалимская 1976; Ierusalimskaja 1996, 107-109, 223, Abb. 133-134; Hall 2005, Fig. 4:B, 8:D
Moshchevaia Balka 1978 (КГИАМЗ, Krasnodar)	no explicit dating, probably 8th-10th c. A.D.	2 lateral, 1 dorsal tip plates per tip; 2 lateral grip plates	Каминский 1982, 48-50, Рис. 1:1-9; Hall 2005, 34, Fig 7, 9:C
Zmey, catacomb graves Nos. 3, 14 and 15[44]	10th-12th c. A.D.	no data, but probably without any plates	Кузнецов 1961, 71, 87, 92, 112, 114
Western Turkestan			
Topraq-qala, Khorezm, Uzbekistan at least 4 intact bows[45]	3th c. A.D.	2 lateral tip plates per tip; 2 lateral, 1 dorsal grip plates	Толстов 1952, 34-35, Рис. 22; *Топрак-Кала дворец* 1984, 216, 218, 220, рис. 88
Qarabulaq, Kirgizstan 4 specimens[46]	2nd-4th c. A.D.	2 lateral tip plates per tip; 2 grip plates	Баруздин 1961, 61-62, Рис. 11
Besh-Tash-Koroo II. burial, Kyrgyzstan	7th-8th c. A.D.	no tip plates; 2 lateral, 1 dorsal grip plates	Табалдиев 1996, 47-48, рис. 10:2-3
Euphrates-valley, Syria			
Yrzi/Baghouz, opposite of al Bukamal	late 2nd c. B.C. – 3rd c. A.D.	2 lateral tip plates per tip; no grip plates	Brown 1937
Egypt			
Belmesa	undated	only 2 in situ lateral tip plates remained from the bow	Coulston 1985, 233-234, Fig. 15-18

Chart 1. Intact bow finds of the Ist millennium A.D. in Eurasia. *Compiled by A. Biro*.

Zestawienie 1. Znaleziska łuków z I tysiąclecia n.e. na obszarze Eurazji. *Oprac. A. Biro*.

After the short tour around the sites that yielded well-preserved bows, it is also important to discuss the main source critical features of the material. The interest for such finds is attested by two archaeologically based reproductions-reconstructions, which have been published most lately (Riesch, Rutschke 2012; Riesch, Rutschke, Stehli 2012)[47], but bowyers around the globe also have prepared and are making other, yet unpublished replicas. On the other hand, the prospects of reconstruction are not only a question of capable skilled craftsmen and 'authentic' material, but must also rest on the full understanding of the archaeological material. As the ultimate aim of bow-research is of course scientific reconstruction, a short summary of the possibilities and limitations of knowledge on intact bows is inevitable. First of all, it is imperative to call attention to the fact, that well-preserved artifacts are the only hard evidence on technology, construction and the organic, dissolving material of bows. As intact finds are immensely essential to the understanding of pre-Mongol period rigid, reflex, composite bows, it is decisively necessary to document and analyze these finds from each and every possible perspective. Before we turn to the ends and means of such a research, a rough overview of the available information must be given, and the topic of recognition must be touched upon as well.

Although most of the listed finds are considered to be published, detailed information along with sufficient illustrations were released only in some instances. Older reports, especially former Soviet publications, tend to be particularly laconic or outdated. Appropriately detailed description and evaluation is rare, though one might judge or label different contributions many ways according to various questions asked. However, it is fair to acknowledge that only the descriptions of Belmesa, Yrzi, Jargalant, Podorvannaia Balka and Moshchevaia Balka 1974 finds are as accurate as the importance of the finds would require. The bows of Topraq-qala and Moshchevaia Balka 1978 are too generally depicted, while the rest have only brief, simplified descriptions. Moreover, the evaluation of the Gogops bow rests exclusively

43 Three additional bow fragments from the site in the collection of Hermitage remain unpublished (Ierusalimskaja 1996, 107, 223), but as the author of the quoted catalog indicates, further bow fragments are also kept in the collection of Kurdzhinovo.
44 To my knowledge the Zmey finds remain unpublished, only short descriptions with the length and width of the bow fragments were given by V. A. Kuznecov.
45 No separate data is available – only general descriptions.
46 No separate data is available – only general descriptions.
47 The latter one is a reconstruction of a bow of which only the plate set has survived, but the authors emphatically utilized information provided by more or less contemporary intact bows during their work.

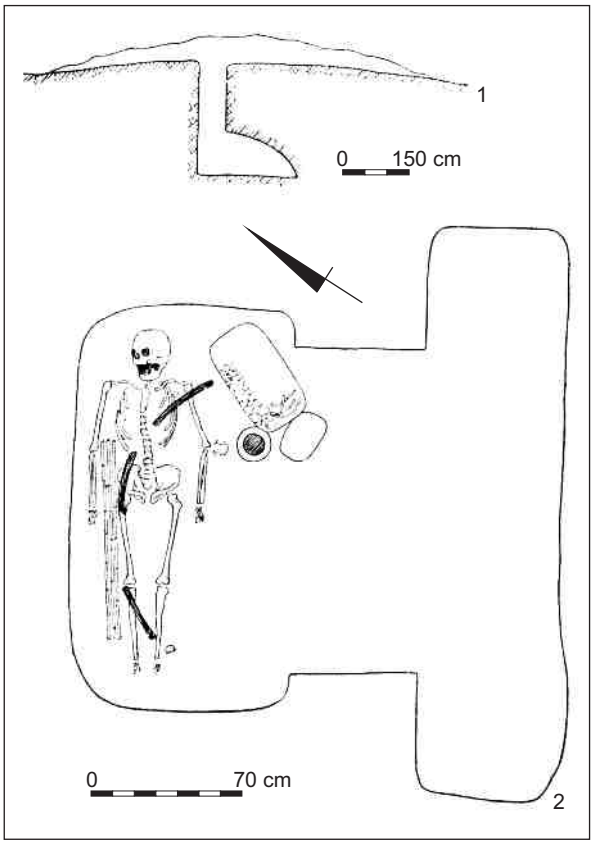

Fig. 8. Rigid bow applications in ideal positions as seen on the grave plan of burial No. 1 at Qalmaqtöbe, Kirgizstan (after *Кибиров 1959, Puc. 28*).

Ryc. 8. Aplikacje łuku refleksyjnego w ich właściwej pozycji na planie grobu z pochówku nr 1 w Qalmaqtöbe, Kirgistan (wg *Кибиров 1959, Puc. 28*).

on only one survived drawing. If we now take a look at published illustrations, a similar picture emerges. Truly useful drawings that depict not only the artifact but its cross-sections at several points are fortunately much frequently met, like Khotan, Yingpän M30, Qum-darya, Yrzi, Belmesa, Besh-Tash-Koroo, Gogops, Podorvannaia Balka and Moshchevaia Balka 1974, 1978[48]. However, interpreted drawings on the construction of the finds are rather limited to a few (Yrzi, Qarabulaq and Topraq-qala). The possible lack of appropriate documentation both in terms of quantity and quality is especially regrettable in those cases, when the finds have been lost, like Gogops, dismembered like Qum-darya, or decayed, like Podorvannaia Balka. The general state of preservation of bow finds is a principal issue of future research. As new, scientifically based analyzing methods and technologies, like DNA profiling are gaining more and more ground in modern archaeology, the role of intact finds will eventually increase greatly for bow-research.

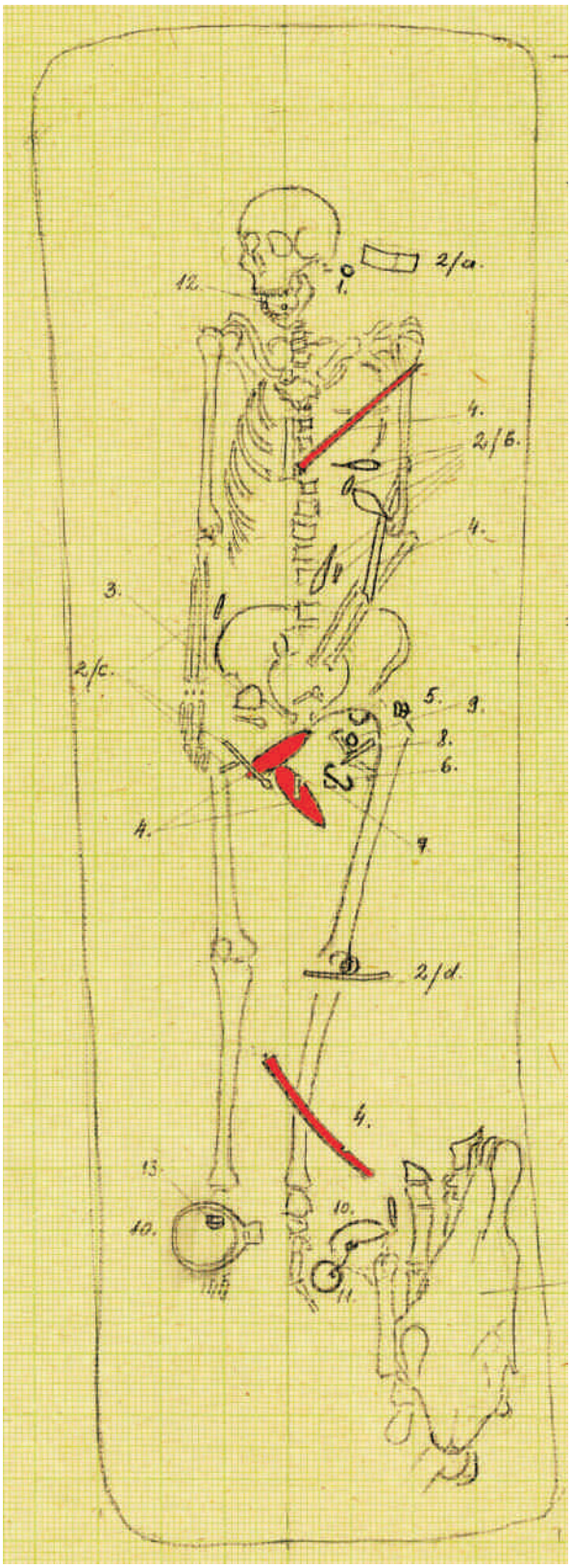

Fig. 9. Grave plan of burial No. 23 at Magyarhomorog-Kónyadomb, Hungary. Courtesy of L. Kovács.

Ryc. 9. Plan grobu nr 23 w Magyarhomorog-Kónyadomb, Węgry. Dzięki uprzejmości L. Kovácsa.

[48] A. Hall has reproduced most of the above mentioned cross-sections in a comparative way (Hall 2005, Fig. 8-9).

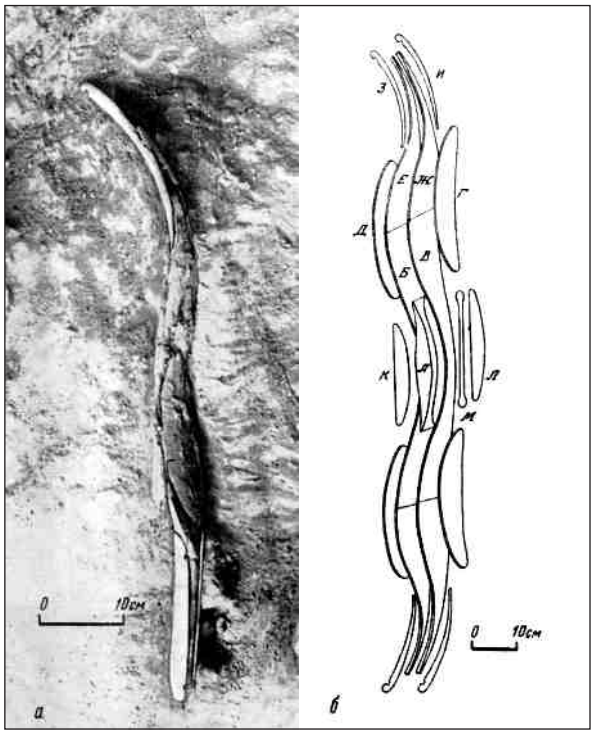

Fig. 10. Photo and structural interpretation of an intact Topraq-qala (Uzbekistan) bow (after *Топрак-Кала дворец 1984, Рис. 88*).

Ryc. 10. Zdjęcie oraz strukturalna interpretacja w pełni zachowanego łuku z Topraq-qala (Uzbekistan) (wg *Топрак-Кала дворец 1984, Рис. 88*).

However, even the most important and common, non-destructive survey technologies, like CT-scans and X-ray photos are rarely used. Although the bows from Jargalant, Chonoot-Uul and Khotan have been examined using such modern research techniques[49], but the results were published only in the case of the Khotan find. Dendrological studies are a bit more frequent, we are informed of the wooden material of Jargalant, Chonoot-Uul, Topraq-qala, Moshchevaia and Podorvannaia Balka, Mazār-Tāgh and Yrzi. Most of the analyses are however unpublished; only the results are given[50], while in some cases, like Mazār-Tāgh, dendrological definitions were not made by professionals, thus might not be correct at all. The horn material was analyzed only in two cases: Yrzi (definition without naming the method used) (Brown 1937, 2) and Jargalant, where DNA profiling method was applied – though unsuccessfully (*Steppenkrieger* 2012, 383). Unprofessional substance-definitions are also prevalent in the case of other organic materials, like sinew and wrapping.

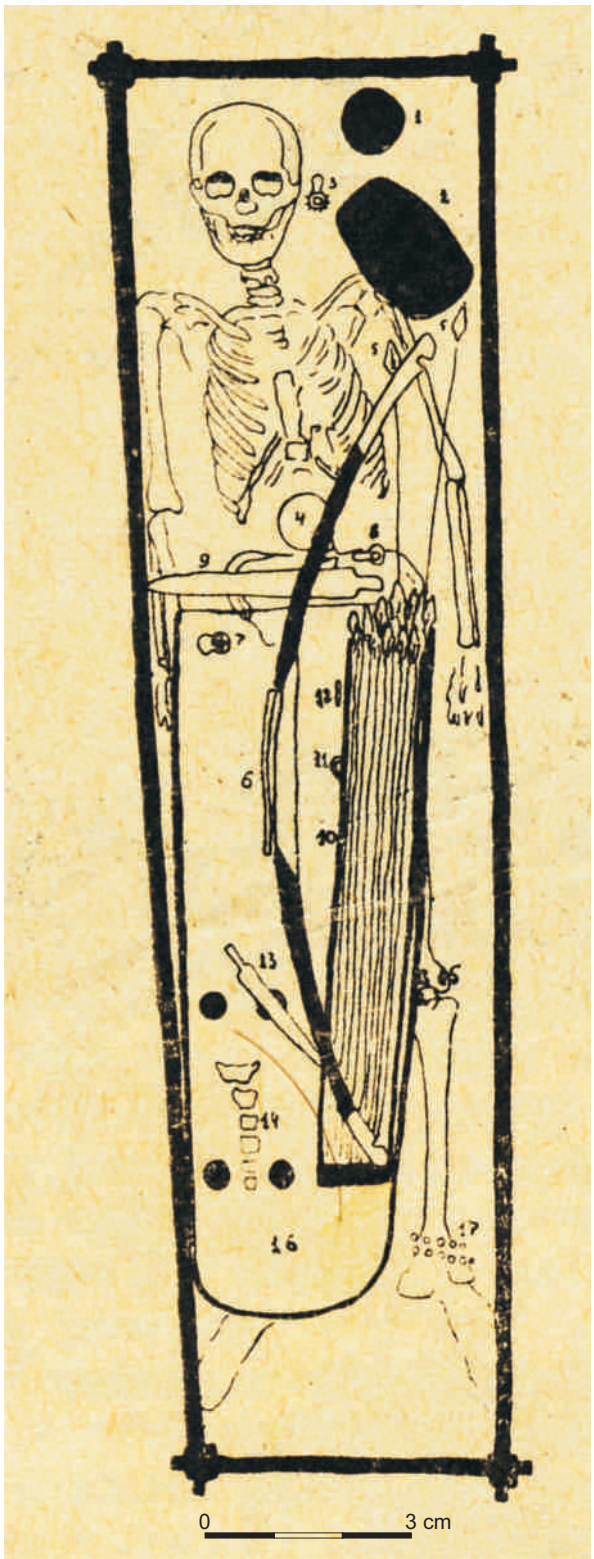

Fig. 11. Plan of the grave in the 7th building at Aqtöbe II fort, Kazakhstan (after *Максимова et al. 1968, Рис. 31*).

Ryc. 11. Plan grobu z budynku 7 w forcie Aqtöbe II, Kazachstan (wg *Максимова et al. 1968, Рис. 31*).

[49] For a short description of the results on Jargalant and Chonoot-Uul, see Steppenkrieger (2012, 383, 386), for Khotan, consult Selby and Selby (2002).
[50] Further on this topic, see Riesch and Rutschke (2012, 85, endnote 25).

In turn, deficient information might lead to false supposition on intact bow finds, like in the case of the burial in the 7th building at Aqtöbe II fort in Kazakhstan (Fig. 11). As the grave was published in a quite rare book in 1968, original data (Максимова et al. 1968, 75, рис. 31) on the find is hard to acquire. However, the burial was republished by I. Bóna in 1991 (Bóna 1991, 235 and Abb. 3 on p. 14) by reproducing the grave-plan with minor modifications[51] and giving a description of the tomb, thereby it received greater reputation along with similar finds discussed by Bóna (see e.g. Riesch, Rutschke 2012, 78). Due to the high level of detail – but of course, also due to the undisturbed nature of the burial – the place and position of the bow plates are unambiguously clear on the grave-plan. Thus, one can easily deduce the size of the bow and its asymmetry. On the other hand, as the limbs are firmly marked as wide, black stripes, connecting white bow plates, the form, curve, length and width of the limbs of the unstrung Aqtöbe bow are clearly shown. Unfortunately, the plan is amusingly delusive; since the authors of the 1968 book explicitly state that *деревянные части истлели* i.e. the wooden parts had been vanished (Максимова et al. 1968, 75). The Aqtöbe II find thus properly demonstrates the importance of authentic documentation. The already mentioned model bows from the Altay, especially Tuva, pose other problems of recognition. In the cemetery of Kokel, bow plates and model bows were also found, but never in the same burial[52]. Model bows are usually defined by their small size, painting, simple structure – carved from a single wood, and the lack of additional layers, like sinew and horn. However, most of the burials yielded only fragments, so it cannot be unambiguously excluded, that some are the remains of real, functional weapons. Such a differentiation would otherwise require more detailed descriptions than currently available. However at least in the case of burial No. 26/XXXVII this is more than probable, witnessed by the rivets in the wooden artifact (Вайнштейн 1970, Рис. 70)[53].

Closing remarks

Let us turn now to the information value of intact bow finds as a conclusion. We have seen that artistic depictions are prone to abstraction and unrealism. Rigid bow applications however are capable of delivering useful but qualitatively limited information on their own, though only in certain, ideal cases and by meticulously detailed personal examination. Intact finds are thus quite important for the research of past bows, since they provide information on particular details that would be otherwise lost, even if survived only considerably deformed. Technology, i.e. construction technology is the first to mention, as this – if the number of finds do increase greatly in future – helps not only to isolate and define specific traditions of bow making, but is the main key to approach the question of invention and evolution of the rigid, reflex composite bows of Eurasia. Such structural details range from the construction of the separate parts of the bow (cross-section, layering, etc. of the tips, limbs and grip), but also include the general assembly of these parts, i.e. the construction of (possible) joints at the grip and/or at the bottom of the tips, and of course the angles formed by the pieces. By contrast, the dimensions of the bow and its separate parts (length, width and thickness), the absence or presence of bone or antler applications and last but not least the organic material rather seem to represent only momentary situations, determined by available materials, the choice and demand of the 'customer', possibilities and skill of the bowyer. It thus seems fair to anticipate for future research that intentional solutions for structure and construction during manufacture are the most important issues concerning archaeological classification, typology, chronology and overall evaluation of the finds.

It is also compelling to draw a general, though certainly inaccurate and sketchy picture of the chorological and chronological nature of the sources. It seems clear, that the 'hot spots' of intact bows and rigid bow applications unfortunately do not overlap in most cases. While at present rigid bow application material is primarily concentrated in 3rd c. B.C. – 2nd c. A.D. (Xiongnu) Altay and Mongolia, 6th-8th c. (Old Turkic) Southern Siberia, Altay and Tien-Shan, 6th-11th c. (Avar and Magyar) Carpathian Basin and the (Khazar, Bulgar, etc.) Eastern European steppe-region, well-preserved bows are confined mostly to 3rd c. B.C. – 4th c. A.D. Xianjiang, 7th-11th c. Altay and Mongolia, and to 8th-10th c. Ciscaucasus[54]. As the two types

[51] The two plans show no difference in respect of the bow.

[52] See Vaynsteyn and D'iakonova (Вайнштейн, Дьяконова 1966, 258-277) for graves excavated in the 1950's. (Kurgans 9 and 68 yielded both wooden fragments of model (?) bows and bow plates, but these kurgans were destroyed, or at least heavily disturbed – *ibidem*, 268-269, 276-277) For graves excavated in the 1960's, see Vaynsteyn (Вайнштейн 1970) and D'iakonova (Дьяконова 1970a; 1970b).

[53] S. I. Vaynsteyn claimed the object to be a model bow on page 78.

[54] Though the – at present, from our point of view – lesser known region of so-called Western Turkestan might prove otherwise,

of concrete evidence literally bypass each other in time and space, their typological comparison is limited to intact bow finds rigged with rigid applications. However, the question, to what extent does or does not correspond intact and plate finds to each other, is an essential one, and cannot be answered easily. It should also be taken into account, that three of the 'hot spots' (Xinjiang, Ciscaucasus and the cited sites in Western Turkestan), which provided numerous intact finds cannot be considered as part of the nomad world, which is originally associated with the invention and innovation of the bow type in question. But they are rather peripheral contact zones on the margins of the nomad world, with continuous sedentary civilizations. The cemetery of Kokel with its model – thus most likely fashioned after the original – bows might contribute to the question. All recognizable Kokel models have straight tips and pointed tip-limb joints, which tallies well with the lateral tip plates found in the same cemetery. The straightness of these tip plates was already noticed by several authors, claiming it as the main, but unique attribute of Kokel type bows[55]. Nevertheless in some instances we find lateral tip plates curved along their entire length in the same material as well (see e.g. burials 26/III/1-2 and 26/XXVI)[56], which are not attested on model bows. The relation between angles of straight tips with curved bottom and tip-limb angles preserved by model bows would also deserve a specific study. All in all, like by the case of the comparison of Orlat depictions and plates, the case of Kokel models and bow plates is also a cautionary sign, not to draw premature conclusions based solely on unilateral and therefore deficient data.

Acknowledgements

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Appendix – description of the bow plate set of the Magyar period burial No. 38 at Szeged-Algyő, Hungary (Figs. 12-14)[57]

1) Lateral tip plate without protrusion at the head section (i.e. type definition)

Full, intact length 27.9 cm. Max. width at bottom 2.32 cm, in the middle 1.75 cm, min. width 1.75 cm. Width below and above the nock 1.88 cm, in the nock 1.3 cm. Width of the top section 1.88-1.45 cm. Nock height at the aperture 0.58 cm, depth 0.5 cm. Length of top section (above nock) ca. 5.2 cm. Thickness of frontal edge 0.1-0.15 cm. Thickness of the plate at bottom 0.05 cm, in the middle section 0.3 cm, at the point 0.18 cm. Height of the cross-section at the bottom 0.52 cm, in the middle section 0.5-0.4 cm, at the top section 0.4-0.3 cm. Weight 21.76 g.

Carved from antler. Totally intact specimen, only small, insignificant damages are observable on the dorsal edge. The nock opens to the right. The plate is somewhat twisted – probably mostly due to deformation in the grave. The form of the point is asymmetric, slightly slanting towards the frontal edge. The form of the bottom is symmetrically rounded. Frontal and dorsal edges are both curved at their full length (the top section above nock is probably straight). Cross-section of the plate is convex-concave, which loses height (thus pall) both at bottom and top. Frontal edge is obliquely cut inwards and sparsely scored at the middle section and above the nock for ca. 2.2 cm length. The angle of the cut plane and the outer surface is ca. 95°. Dorsal edge is unscored and a bit rounded. The nock is somewhat downwards drawn, and it is almost of a semicircle shape. Upper and lower inner walls of the nock are vertical, the back wall is sloped with inconclusive wear traces, which are perpendicular to the axis of the plate (which probably hints to a tied string). The outer surface is intact, polished and smooth, with faint traces left by the slasher tool. The bottom is scored up to a height of ca. 4 cm with diagonal,

but here future bow research has huge tasks to accomplish first: international discussion and evaluation of local material and well-documented new finds are necessary.

[55] Cf. with types 2 and 3 in Iu. S. Khudiakov's classification (Худяков 1986, 65-68), see also Boie and Bader (1995, 29) and Hall (2006, 66 and Fig. 28).

[56] See Vaynsteyn (Вайнштейн 1970, рис. 12:19-22 and рис. 52:1-2,6-7; cf. with Khudiakov's type 1 – Худяков 1986, 64-65). The Kokel grave 26/XXVI is extremely interesting, since here a full set of lateral tip plates were unearthed, of which only one was curved and the others straight.

[57] Until now, the present author has not yet received information about the burial context (location of the bow plates in the grave), thus the full evaluation of the whole bow is omitted here.

Fig. 12. Bow plate set of Magyar period burial No. 38 at Szeged-Algyő, Hungary. *Photo by A. Biro*.

Ryc. 12. Okładziny łuku ze starowęgierskiego pochówku nr 38 w Szeged-Algyő, Węgry. *Fot. A. Biro*.

orderly incisions. The whole inner surface is scored with lengthy incisions.

2) Lateral tip plate without protrusion at the head section (i.e. type definition)

Full, intact length 27.8 cm. Max. width at bottom 2.2 cm, in the middle 1.9 cm, min. width 1.8 cm. Width below the nock 1.8 cm, above the nock 1.85 cm, in the nock 1.3 cm. Width of the top section 1.85-1.45 cm. Nock height at the aperture 0.59 cm, depth 0.48 cm. Length of top section (above nock) ca. 5.05 cm. Thickness of the plate at bottom 0.07 cm, in the middle section 0.3 cm, at the point 0.13 cm. Height of the cross-section at the bottom 0.59 cm, in the middle section 0.45 cm, at the top section 0.4-0.25 cm. Weight 18.31 g.

Carved from antler. Totally intact specimen, only small, insignificant damages are observable on the dorsal edge and the point. The plate is broken into two fitting pieces. The nock opens to the left. The plate is slightly twisted – probably mostly due to deformation in the grave. The form of the point is asymmetric, slightly slanting towards the frontal edge. The form of the bottom is cut, straight; the angle with the dorsal edge is ca. 75°. Frontal and dorsal edges are both slightly curved at their full length. Cross-section of the plate is convex-concave, which loses height (thus pall) at the top. Both frontal and dorsal edges are unscored and a bit rounded. The nock is somewhat downwards drawn, and it is almost of a semicircle shape. Upper and lower inner walls of the nock are vertical, the back wall is slightly sloped with inconclusive wear traces, which are also seem to be drawn downwards. The outer surface is intact, polished and smooth, with faint traces left by the slasher tool. The bottom is scored up to a height of ca. 4.5 cm with diagonal, orderly incisions. The whole inner surface is scored with lengthy incisions.

Collation of lateral tip plates Nos. 1-2, and the proposed tip construction

It is obvious, that the two lateral tip plates are a pair and were once on the same tip, as their proportions and form tally, although smaller discrepancies are also observable (e.g. in the wear traces of the nocks). The lengths between their nock and upper ends of the scored areas at the bottom tally with each other. The plates are

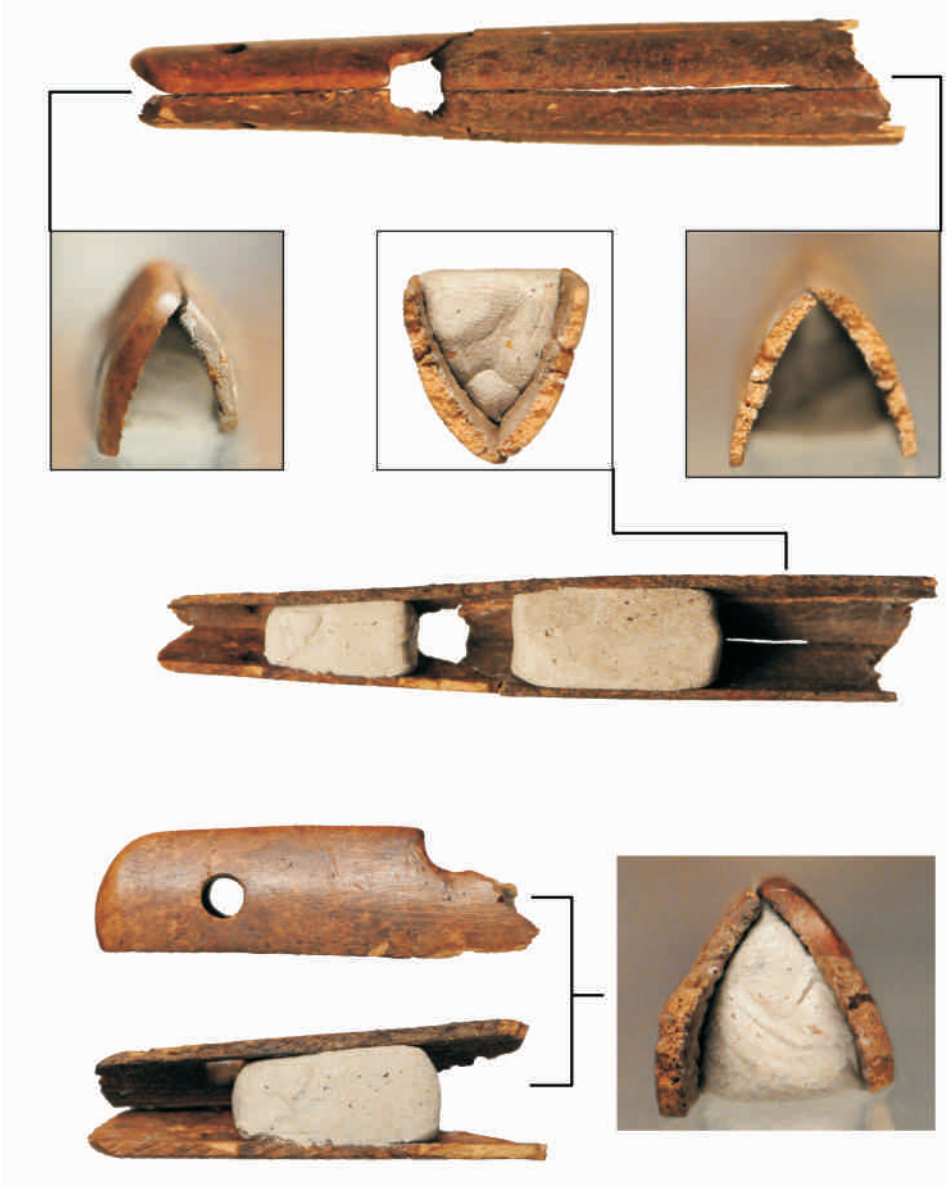

Fig. 13. Interpretative photo documentation of the bow plate set of Magyar period burial No. 38 at Szeged-Algyő, Hungary. *Photo by A. Biro*.

Ryc. 13. Rekonstrukcja fotograficzna ułożenia okładzin łuku umieszczonych w starowęgierskim pochówku nr 38 w Szeged-Algyő, Węgry. *Fot. A. Biro*.

unusually big. The tip construction can be only ambiguously assumed, as the edges of both plates are mostly uncut and unscored. According to the cut & scored edge section of plate No. 1, we might assume that the frontal edge of plate No. 2 abuts on the other. As both plates are deformed, twisted a bit, a strict collation cannot be made. However, in their present state the plates would form an asymmetrical, hybrid tip construction with a top section of a uniquely ovoid cross-section and an isosceles cross section at the middle and bottom section. In this state, the bottom of the plates has a max. inner flare of 4-5 cm. Although there's no clue for the pertinence of this position, the measurements of the core are given. The main angle of the core in this case would be 35-45° at the reconstructed section with a base of 1.3 cm and height of 1.75 cm. The whole tip on the same spot has 1.3 cm width and 1.85 cm height. According to the curvature of the (rounded) dorsal edges, the dorsal surface of the tip must have been slightly convex.

3) Lateral tip plate without protrusion at the head section (i.e. type definition)

Full, intact length 23.6 cm. Max. width at bottom 2.2 cm, in the middle 1.9 cm, min. width 1.7 cm. Width below the nock 1.65 cm, above

Fig. 14. Detailed and interpretative photo documentation of the bow plate set of Magyar period burial No. 38 at Szeged-Algyő, Hungary. *Photo by A. Biro*.

Ryc. 14. Szczegółowa dokumentacja i interpretacja fotograficzna ułożenia okładzin łuku umieszczonych w starowęgierskim pochówku nr 38 w Szeged-Algyő, Węgry. *Fot. A. Biro*.

the nock 1.5 cm, in the nock 1 cm. Width of the top section 1.5-1.05 cm. Nock height at the aperture 0.75 cm, depth 0.55 cm. Length of top section (above nock) ca. 3.3 cm. The drilled hole is 0.47× 0.5 cm. Thickness of the frontal edge 0.15-0.2 cm, dorsal edge 0.2-0.08 cm. Thickness of the plate at bottom 0.1 cm, in the middle section and at the point 0.2 cm. Height of the cross-section in the middle section 0.45 cm, at the top section 0.35-0.3 cm. Weight 10.25 g.

Carved from antler. Almost intact specimen, though small sections have broken off of the frontal and dorsal edges at the bottom, and around the drilled hole. The plate is broken into seven fitting pieces. The nock opens to the right. The form of the point is asymmetric, slightly slanting towards the frontal edge. A drilled hole is situated from 1.2 cm distance from the point and 0.3 cm from the dorsal edge. The hole is ovoid in form, its diameter slightly increases towards the inner surface, but there are no use-wear traces on the rim on either surface. As no traces of corrosion are present, the hole must have not served for an iron nail or rivet. The form of the bottom was probably cut and straight; the angle with the dorsal edge could have been ca. 120-135°. The frontal edge was probably curved at its full length, while the dorsal edge is straight and breaks at a point in an angle of ca. 13°. This point is ca. 2.5 cm distance from the nock downwards. Cross-section of the plate is slightly convex-concave. The frontal edge is obliquely cut inwards and densely scored with diagonal incisions at its full length. The angle of the cut plane and the outer surface is ca. 90°, on the top section 75°. The dorsal edge is also obliquely cut inwards and densely scored at its full length. The thickness of the dorsal edge drops off at the middle section. The angle of the cut plane and the outer surface is ca. 80-90°. The nock is unusually big and perpendicular to the axis of the plate, with a somewhat amorphous form. Upper and lower inner walls of the nock are vertical, the back wall is slightly sloped but no wear traces are observable as the plate is not washed. The outer surface is intact, polished and smooth. The bottom is scored up to a height of ca. 2.5 cm with diagonal, orderly incisions. The whole inner surface is scored with lengthy incisions.

4) Lateral tip plate without protrusion at the head section (i.e. type definition)

Full, intact length 24.1 cm. Max. width at bottom 2.58 cm, in the middle 2 cm, min. width 1.8 cm. Width above the nock 1.61 cm, in the nock 1.07 cm. Width of the top section 1.61-1.45 cm. Nock height at the aperture 0.6 cm, depth 0.5 cm. Length of top section (above nock) ca. 3.2 cm. Diameter of the drilled hole is 0.45 cm. Thickness of the dorsal edge 0.12-0.18 cm. Thickness of the plate at bottom 0.08 cm, in the middle section 0,23 cm, at the point 0.22 cm. Height of the cross-section in the middle section 0.48 cm, at the top section 0.35 cm. Weight 12.51 g.

Carved from antler. Almost intact specimen, though small sections have broken off of the frontal and dorsal edges. The plate is broken into six fitting pieces. The nock opens to the left. The form of the point is asymmetric, slightly slanting towards the frontal edge with more explicitly rounded corners. A drilled hole is situated from 1.35 cm distance from the point and 0.4 cm from the dorsal edge. The hole has a form of a circle, its diameter slightly increases towards the outer surface, but there are no use-wear traces on the rim on either surface. As no traces of corrosion are present, the hole must have not served for an iron nail or rivet. The form of the bottom is asymmetrically rounded. Frontal edge was probably curved at its full length, while the dorsal edge is straight and breaks at a point in an angle of ca. 10-11°. This point is ca. 2 cm distance from the nock downwards. Cross-section of the plate is slightly convex-concave. The frontal edge is uncut, unscored and a bit rounded at its full length. The dorsal edge is obliquely cut inwards and densely scored with diagonal incisions at most of its length. The angle of the cut plane and the outer surface is ca. 90-95°. At a 5.5 cm long bottom section the dorsal edge turns to a tapering, uncut, unscored design. The nock is narrow and small compared to the other plate, and drawn downwards. Its form somehow is still a semicircle. The start of both upper and lower inner walls of the nock are vertical, which turns to a sloped design with the back wall. On the latter and in the lower corner explicit traces of wear are observable, though its angle with the main axis cannot be determined. The outer surface is intact, polished and smooth. The bottom is scored up to a height of ca. 2.7 cm with diagonal, orderly incisions. The whole inner surface is scored with lengthy incisions.

Collation of lateral tip plates No. 3-4, and the proposed tip construction

It is obvious, that the two lateral tip plates are a pair and were once on the same tip, as their proportions and form tally, although important discrepancies are also observable (e.g. in the size and form of the nocks). The lengths between their nock and upper ends of the scored areas at the bottom tally with each other. It is imperative to note that the breakage lines on the plates also tally with

each other, which will be of great importance during the analysis of the burial context. However, the tip construction can be reconstructed with great certainty. As dorsal edges of both plates are cut inwards, it is probable that their planes were at least parallel. The odd design of the frontal edges points to further deductions: as the rounded and unscored frontal edge of plate No.4 perfectly fits onto the inwards cut & scored plane of the frontal edge of plate No. 3. In this position the planes of the dorsal edges are parallel. Thus, the cross-section of the tip in this case is an isosceles triangle, where the equal sides are a bit convex. The main angle is ca. 45-55° at the reconstructed sections with a base of 1 and 0.8 cm and height of 1.3 and 1.15 cm. The whole tip on the same spot has 1.45-1.25 cm in width and 1.5-1.4 cm in height, while these measurements below the nock are 1.4 cm and 1.6 cm, and 1.8 cm and 1.7 cm for the whole tip respectively. As due to the excessive fragmentation of the plates concrete measurement cannot be given, but the flare at the bottom could have been max. 2.7 cm. The reconstruction is further approved by the position of the drilled holes, which only tally with each other in this case. From the increasing diameters of the holes it is possible to deduce that they were drilled when the plates were already on the tip.

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UWAGI METODOLOGICZNE DOTYCZĄCE ARCHEOLOGII ŁUKU ZŁOŻONEGO, REFLEKSYJNEGO I KOMPOZYTOWEGO NA TERENIE EURAZJI W OKRESIE PRZEDMONGOLSKIM

Streszczenie

Głównym celem niniejszego artykułu jest wzbogacenie naszej wiedzy, dotyczącej znalezisk łuków w pochówkach z I tysiąclecia n.e. na terenie Eurazji. W celu określenia wartości informacji niezbędnych przy analizie dwóch głównych dostępnych rodzajów źródeł, tj. aplikacji łuku złożonego i jego zachowanych w całości egzemplarzy, pod uwagę wzięto główne problemy dotyczące terminologii, metodologii oraz krytyki źródeł. Podjęto próbę sprecyzowania terminologicznego elementów zachowanych łuków, w kontekście ogólnie przyjętego nazewnictwa, odnoszącego się do tego typu zabytków. Jako że struktura ramion łuku (złożona lub prosta) oraz kształt łuku (refleksyjny lub defleksyjny) nie mogą być jednoznacznie określone na podstawie danych archeologicznych, zasadnym wydaje się wprowadzenie określenia „złożony", które właściwie opisuje główne cechy charakterystyczne dla źródeł archeologicznych. Stąd też, biorąc pod uwagę zróżnicowaną terminologię używaną dla aplikacji łuku złożonego w różnych językach (rosyjskim, angielskim, niemieckim, czy węgierskim), podjęto próbę jej ujednolicenia w spójny system, podkreślający pewne powiązania teoretycznych problemów funkcji (wzmocnienie a dekoracja lub budowa łuku) i materiału (kość lub poroże). Zaproponowano obiektywną terminologię, która oprócz głównej charakterystyki formalnej aplikacji (okładzina lub nakładka) dotyczy również ich umiejscowienia (majdan lub ramię) i pozycji (przednia, tylna lub boczna). Wyjaśnienie problemów związanych z krytyką źródeł oraz metodami badawczymi wymagało

również podjęcia się analizy źródeł ikonograficznych. Aby ukazać ich abstrakcyjność, wykorzystano znaleziska z Kurgantepe (Uzbekistan), gdzie w jednym grobie odkryte zostały relikty łuku i jego przedstawienia. Szeroko omawianymi są też rodzaj, jakość i ogólna *wartość* informacji (wytwórczość, budowa, funkcja, ślady używania, itp.) pochodzących ze źródeł archeologicznych. Podkreślone zostało, że aplikacje łuku złożonego były niegdyś częścią skomplikowanego i złożonego urządzenia mechanicznego, co rodzi epistemologiczne pytanie, czy powyższe aplikacje mogą być rozumiane i interpretowane oddzielnie czy też wyłącznie jako część większej całości, jaką jest łuk. Ocena i klasyfikacja aplikacji bądź jedynie samego łuku ma bowiem w tym kontekście fundamentalne znaczenie. Celem tego teoretycznego omówienia jest przedstawienie ścisłej metodologicznej podstawy, pomocnej przy dalszej analizie materiału archeologicznego występującego w grobach z terenu Eurazji. Dla pokazania jak ważną rolę dla badań odgrywają znaleziska dobrze zachowanych łuków, opracowana została lista wszystkich znalezisk łuku złożonego z okresu przedmongolskiego. Zawarto w niej dane chronologiczne dotyczące zachowanych w całości łuków, a także informacje dotyczące okoliczności ich odkrycia, kontekstu archeologicznego znalezisk czy stanu ich zachowania.

Tłumaczył Piotr Zelny