Kristiina Johanson

MISSING INTERPRETATIONS: TRACING NATURAL ARTEFACTS IN ESTONIAN ARCHAEOLOGICAL MATERIAL

Abstract
Archaeological collections include hundreds of unworked pebbles and fossils that have been gathered but never interpreted. In retrospect, it is almost impossible to ascertain whether past people have brought the pebbles and fossils deliberately to the sites, considered them significant and used them in any instrumental or non-utilitarian way. Nevertheless, on the basis of the form, appearance and use-wear and in some cases closed find context of the pebbles, possible functions can be discerned. In this article curing and apotropaic uses will be discussed. Written sources and folklore texts, as well as ethnographical material from different parts of the world from various periods, show that pebbles and fossils have been used for different curing and apotropaic tasks, but these kinds of finds are seldom identified among archaeological material. This paper attempts to do so with an Estonian example.

Keywords: archaeological finds, apotropaic stones, curing stones, folklore, fossils, pebbles

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INTRODUCTION

While preparing an article on magical items in Estonian museum collections (Johanson & Jonuks 2018), next to other exciting items, several fossils as well as plain pebbles – round, oblate or irregularly shaped but more or less smooth stones – caught the eye. The same kind of lithic material found in moraine or waterbodies that lack obvious traces of human working is collected from the archaeological contexts of different periods. As a rule, their gathering has neither been explained, nor their possible function suggested. Archaeological finds reach us without the user manual, and when clear interpretation cannot be found, fossils and pebbles without clear use-wear are ignored during excavations or at least have remained undiscussed in find reports and unpublished in articles; they are not included in further analyses, thus leaving their research potential underappreciated (cf., e.g., Gazin-Schwartz 2001; Gilchrist 2008; Thomas 2010; Muhonen 2013; Leeming 2015; Gravel-Miguel et al. 2017).

There are relatively few studies that concentrate on unworked pebbles and cobbles. Manuports have been discussed in publications, but usually as a part of a fieldwork overview (e.g. Indreko 1939; Ringstad 1988) or a find publication (Cahill 2009). A few special publications touch on some specific quality of stones, e.g. the colour of the pebbles of jasper, chalcedony, opal and obsidian found in Icelandic churches (Smith 2016) or discuss the utilitarian meanings of cobbles (e.g. Clarke 2009). More attention has been paid to pebbles that have apparently been modified by people, but whose functions are unclear, such as the Palaeolithic Azilian (Burkitt 1926: 11–3; Jochim 2008) and Iron Age Scottish painted quartzite pebbles

(Ritchie 1972; Arthur et al. 2014) as well as Native American charmstones (e.g. Sharp 2000; Hector et al. 2005 and the references therein). Only in isolated cases have researchers reached an interpretation concerning unworked stones (see Indreko 1939; Bowden & McOmish 1987; Ringstad 1988; Samdal 2000; Gilchrist 2008; Cahill 2009; Thomas 2010; Gravel-Miguel et al. 2017).

The situation seems to be slightly more advanced for fossils, with several thorough discussions published in recent years (Oakley 1965a; 1965b; Meaney 1981; Wyse Jackson & Connolly 2002; Bar-Yosef Mayer et al. 2010; Conneller 2011), but most of these concern distinctive genera, e.g. sea-urchins (McNamara 2011), ammonites (Bassett 1982) or belemnites (Boyadziev 2008). More often, palaeontologists discuss the possible significance of fossils for people in the past (Mayor 2011; Duffin 2013), but these treatments tend to use archaeological finds as an illustration to folkloric beliefs connected to fossils. Generally, it has been noted that archaeologists too often tend to overlook fossils during excavations (Leeming 2015).

In the following, fossils and pebbles from Estonian archaeological sites will be discussed. Firstly, the study describes which pebbles and fossils have been considered worth gathering by the archaeologists, followed by a consideration as to what sorts of stones might have been significant and/or useful for people of the past. In the case of pebbles, different utilitarian uses are likely. For example, burnishing and smoothing tools for pottery or other materials (Valado 2014; Skochina & Kostomarova 2016), potboilers (Skibo et al. 2009; Thomas 2010), ammunition (Thomas 2013; Søvsø 2012: 530–1), grain grinding stones, hammerstones, and gaming pieces (Höltken & Trier 2012: 177) are suggested (see in more detail in Johanson 2018). In the case of fossils, their utilitarian exploitation has rarely been discussed; however, using belemnites as arrowheads (Boyadziev 2008) or toggle fastenings (Guminski & Bugajska 2016: 494), or sea-urchin fossils as toys (Metzger-Krahé 1978: 41) have been suggested. With reference to written and folkloric sources as well as ethnographical parallels, the possible curing and apotropaic functions of fossils and pebbles will be discussed here.

SOURCE MATERIAL

Collected artefacts

The current study includes 587 pebbles from 133 localities, and 285 fossils from 62 different archaeological sites in Estonia (Fig. 1). According to Krumbein phi scale of sedimentology the grain size of pebbles should be 2–64 mm and that of cobbles 64–256 mm. My source material comprises of stones with the diameter of 1–10 cm, but on the average 3–6 cm. For the sake of

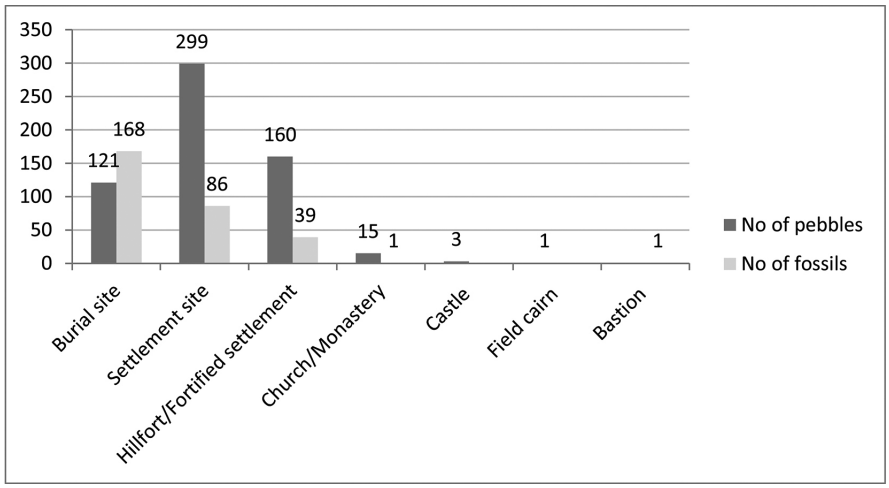

Fig. 1. Number of pebbles and fossils from different site types.

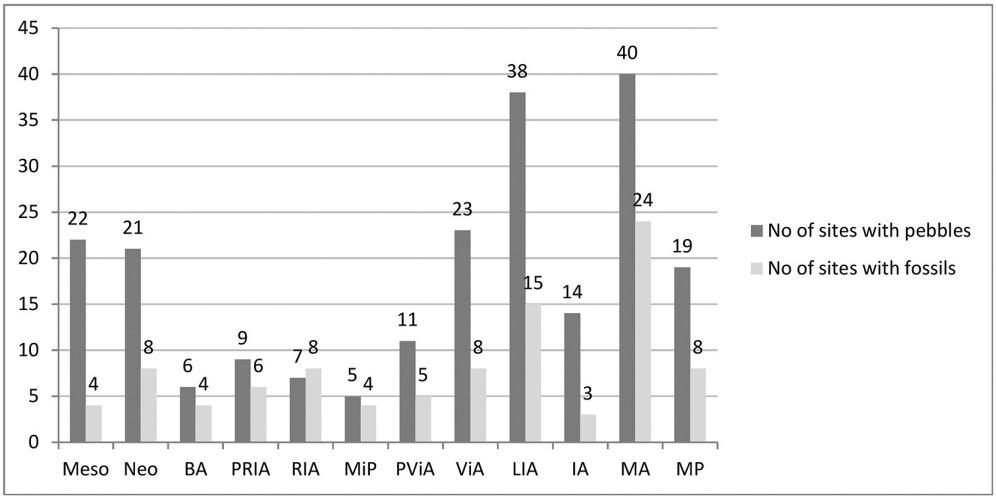

Fig. 2. Number of sites with pebbles and fossils from different periods. Meso – Mesolithic; Neo – Neolithic; BA – Bronze Age; PRIA – Pre-Roman Iron Age; RIA – Roman Iron Age; MiP – Migration Period; PViA – Pre-Viking Age; ViA – Viking Age; LIA – Late Iron Age; IA – Iron Age (i.e. sites with dates covering the whole Iron Age or sites whose specific date within the period is unknown); MA – Middle Ages; MP – modern period.

simplicity, I decided to name all as pebbles, although technically smaller cobbles are among the material too. Unworked stones that would be larger than 10 cm in diameter are rarely taken to archaeological collections, and these are not discussed in the current case.

The majority of pebbles have a regular round or oval cross-section but a flat longitudinal section; however, there are a few ball-shaped specimens in the samples. The surfaces of the pebbles may be very smooth or slightly rough, and the colours are varied – white, pink, red, bluish grey, brown, or black. The colour is dependant on the rock type, which, in approximately 90 per cent of cases, includes different granites, the most common rock type in Estonian soil. The remainder include sandstones, limestones, amphibolites, gneisses, feldspars, quartzites and goethite, which are all also found country-wide. The studied pebbles all lack or have only very limited and ambiguous use-wear and they have not been ascribed any widely recognised utilitarian function; examples identified as grinding stones, hammerstones, or grain processing stones have not been included in this study.

Surprisingly, pebbles/cobbles lacking or with very limited and ambiguous use-wear have been gathered in hundreds by different archaeologists and from various sites, but rarely interpreted in find lists and only in single cases mentioned in publications. In unpublished find lists, these have mostly been named vaguely as a beautiful, small or round pebble. There are a few cases where the name ascribed to the pebble refers to a tentative interpretation formulated by the archaeologist, but which has not been developed any further as, for example, with suggested curing stones, bewitching stones, snakestones, massaging stones, stones used for pottery making, stones for grinding salt, etc. The only three published cases from Estonia where the pebbles have been discussed in some detail include toadstones by Richard Indreko (1939), thunderstones by Vello Lõugas (1996) and magical stones by Lembit Jaanits (1953).

Fossils located in Estonian archaeological collections belong to various genera, but the most numerous are cephalopods, echinoderms and different types of coral (see in detail in Johanson 2018: Table 1). All the fossils analysed are from local limestone derived from the Ordovician or Silurian bedrock and which have been transported over almost the whole country by glacial ice. No preference for specific genera from particular geological time periods, or types of site can be ascertained from the collections;

instead, it seems that pieces were collected solely because they attracted the collector's attention in some way. Some, such as the fossil crinoid stem fragments (Echinodermata) found at several sites, could have been used as beads; others, such as 24 round and worn bryozoan, *Cyclocrinites* and echinoderm fossils found at the Vaida medieval settlement site, were probably in use as playing pieces. However, several specimens might have attracted attention because of some magical meaning ascribed to them by a particular community and used accordingly. Fossils have usually been recognised as such by archaeologists; however, no provisional interpretation for their appearance at a site has been proposed. It is noteworthy that, although fossils are well-represented in classical and medieval written sources (lapidaries, encyclopaedias), these texts seem not to have influenced the interpretation of fossils by archaeologists in Estonia.

Although pebbles have been gathered from a substantial number of sites, the proportions of pebbles and fossils collected in different time periods is similar for both kinds of source material, i.e. both pebbles and fossils are most numerous in the Late Iron Age and medieval sites, whereas their contribution is the smallest in the case of Bronze Age and Migration Period sites (Fig. 2). This pattern is dependent on the number of excavated sites as a whole, with sites from the Late Iron Age and Middle Ages being the most extensively excavated. Therefore, it is only natural that both fossils as well as pebbles are the most numerous in the sites from these periods. However, some discrepancies can be identified in the data. For example, the number of Stone Age (especially Mesolithic) sites that have yielded pebbles is very high, whereas fossils have not been gathered from these localities as often. The reason for this is apparently the readiness of the archaeologists specialising in the Stone Age to gather all kinds of rocks and minerals as being raw materials of potential benefit to past peoples. Another inconsistency is revealed by the higher number of Roman Iron Age sites that have yielded fossils compared to the number of sites with pebbles. This notion is explained by the fact that the Roman Iron Age sites in the current selection are mostly tarand-graves and it seems that, from burial sites, fossils are more likely to be collected than pebbles (Fig. 3), apparently because in burial (i.e. sacral) contexts fossils are more readily considered as artefacts worth collecting than pebbles. The opposite seems to be true for settlement sites, as the number of dwelling contexts that have yielded pebbles is twice that for burial contexts with pebbles. This pattern might be explained by the (subconscious) perception of archaeologists that pebbles are worth collecting when a utilitarian use can be suggested which is somewhat acceptable in settlement contexts, whereas fossils as unusual finds are more readily gathered regardless of their context, or slightly more likely from

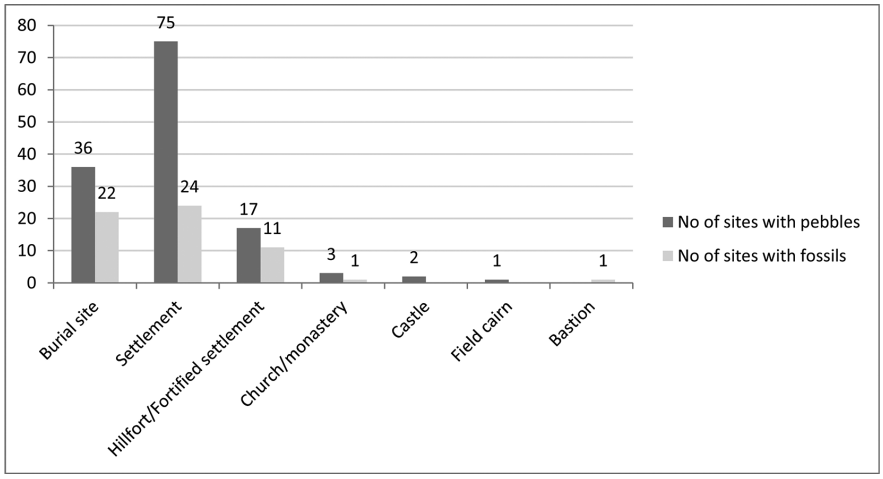

Fig. 3. Number of sites with pebbles and fossils according to different site types.

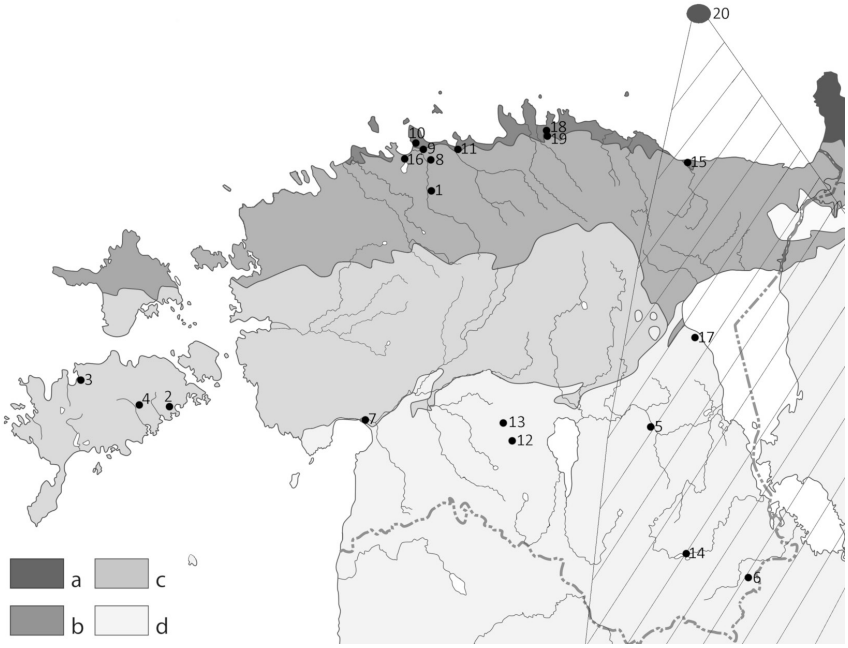

Fig. 4. Estonian geological map; a – Cambrian; b – Ordovician; c – Silurian; d – Devonian. Places mentioned in text; 1) Vaida, 2) Asva, 3) Paatsa, 4) Valjala, 5) Tartu, 6) Uusvada, 7) Pärnu, 8) Saha, 9) Iru, 10) Viimsi, 11) Jägala, 12) Pirmastu, 13) Mustivere, 14) Tamula, 15) Sope, 16) Tallinn Härjapea, 17) Raatvere, 18) Võhma, 19) Uusküla, 20) location and distribution of Suursaari quartz porphyry. Map: K. Roog & K. Johanson.

burial sites. The latter is also obvious when the total number of all gathered pebbles and fossils is taken into account (Fig. 1). In total, 459 pebbles (76% of all pebbles) have been collected from dwelling contexts (settlement sites as well as hillforts), whereas only 121 (20%) are from burial sites. At the same time, 125 fossils (42% of all fossils) have been gathered from dwelling contexts, while 168 (57%) derive from burial sites. Further proof of this suggestion is provided when the calculations are compared to the total number of excavated sites in 1799–1999, 52% of which are dwelling and 48% burial contexts (Konsa et al. 2013).

Principles of gathering

It seems reasonable to conclude that past field archaeologists did not gather all the pebbles and fossils which they encountered during their excavations. The personal decision-making process in the field is influenced by several conscious and subconscious (inner) factors which become intertwined. The subconscious agents include the valid intellectual climate which supports or rejects the significance of natural finds, but also the cognitive approach regarded as being universal to human perception and which stipulates that finds that look conspicuous or remarkable on the outside have to be meaningful. The academic background of the researchers involved can be regarded, at least partly, as a subconscious agent since being familiar with or interested in (local) folklore or ethnography might lead a researcher to see additional meanings to natural finds. For example, Richard Indreko probably leaned on his knowledge of toadstones in well-published German folklore when interpreting a few regularly shaped red granite pebbles with a diameter of 6 cm, and smooth, perhaps water-polished

surfaces from the Bronze and Iron Age fortified settlement in Asva (Indreko 1939: 30) (Fig. 5: 1–2). Toadstone was a highly prized gem during the Middle Ages in western Europe, and used in cases of snakebite, against poisoning and several internal diseases. According to legend, toadstones grew in the heads of toads and had to be obtained from a living animal. Many surviving examples of toadstones can be identified as the fossilised teeth of a Late Jurassic fish, *Lepidotus maximus,* found all over north-west Europe (Duffin 2008: 34–43; 2010: 3–4). Although the toad is known in Estonian folklore as the embodiment of the Devil, as in the example of German Christian culture (Valk 1994), toadstones do not seem to be represented in local folklore.

Aita Kustin, when identifying some putative snakestones from the material obtained from the Late Iron Age Paatsa and Valjala hillforts (Kustin 1963a; 1963b) (Fig. 5: 3–4), apparently relied on Finnish folklore; during Soviet times, Finnish archaeological literature was more freely available and finds of possible magical snakestones in Finnish Viking Age graves have been discussed by Ella Kivikoski (1965: 31). The snake's court stone or *käärmeenkäräjäkivet*, pebbles that are believed to have been carried along by snakes, are known in Finnish folklore (Stark 2015; Hukantaival 2018a). Snakes are well-known magical creatures in Estonia (e.g. Eisen 1926; Fabricius 2010), but snakestones are unfamiliar in Estonian folklore. The latter notion is surprising since records of serpent stones or adder stones are known across much of the world, and their appearance and medical uses have been discussed in lapidaries since classical times through the medieval to the modern period (Pymm 2016). Although several therapeutic properties were ascribed to serpent stones, they were highly valued as having magical powers and being generally protective against witchcraft.

Fig. 5. Pebbles from the Bronze and Iron Age site of Asva (1–2; Archaeological Research Collection of Tallinn University AI 3658:602) and from Valjala Iron Age hillfort (3–4; AI 4300:304, 305), both on the Saaremaa Island. The Asva finds were named toadstones by the excavating archaeologist, whereas the Valjala pebbles were called snakestones. Photos: K. Johanson.

Fig. 6. Curing and apotropaic pebbles from the collection of Estonian National Museum; 1) bewitching stone (ERM A 371:14), 2) thunderstone (ERM 6748), 3) thunderstone, pyrite pebble (ERM 6944), 4) ear stone, bryozoan (ERM A 502:124), 5) ear stone, chain coral (ERM A 452:4). Photos: Estonian National Museum.

Vello Lõugas discussed the presence of thunderstones among the archaeological finds of burial sites and hillforts (Lõugas 1996: 116–7). In contrast to Indreko and Kustin, he

Fig. 7. Pebbles from the medieval settlement site of Uusvada, south Estonia (Archaeological Collections of the University of Tartu TÜ 116:352, 353, 1130). Photos: K. Johanson.

was very likely influenced by Estonian folklore since, unlike snake- and toadstones, thunderstones are well represented in local traditions. A few thunderstones (pyrite balls, granite pebbles) are also represented among the folk medicine collection in the Estonian National Museum (Fig. 6: 2–3). Foreign influences might also have affected Lõugas since belief in thunderstones or thunderbolts is considered to be a universal phenomenon (see more in Carelli 1997; Muhonen 2006; Johanson 2009). In addition to round pebbles, different types of fossil, such as sea-urchins, belemnites and fossilised sharks' teeth, as well as ancient stone tools have been regarded as thunderstones (Adams 1938; Bassett 1982). According to Estonian folklore records, the most common way to use thunderstones for curing is to rub swellings with the stone. Sometimes, debris scraped from the stone was given to cure many sudden-onset diseases, such as stroke (Est. rabandus) in both people and animals, as well as a toothache. In the case of a toothache, the stone was heated and the steam produced was inhaled or the debris released from the stone surface was swallowed. Soaking a hot thunderstone in water and washing the ears with the water was supposed to help against earache.

Ethnographic and folkloric knowledge of curing pebbles (e.g. Zurov 2017) inspired Heiki Valk, who described the grandmother of one of his informants as a woman who knew the art of curing and treating illnesses with round, pigeon-egg-shaped pebbles (Valk 2005: 3). With this observation, Valk indirectly explained why he gathered pebbles during his archaeological excavations. For example, fieldwork at the medieval settlement site at Uusvada, near where the grandmother referred to above lived, yielded three small smooth pebbles (Fig. 7).

The conscious factors that have influenced researchers' choices in gathering natural finds include the knowledge of ecological circumstances. For example, in fossil-rich areas (in Estonia, areas where Silurian and Ordovician limestones form the bedrock; moraine fossils are also more common there than in other areas) archaeologists are less likely to collect fossils, as these do not feel remarkable enough, and it is difficult to decide whether or not the fossils have been brought to the site on purpose. The feeling that widespread phenomena cannot be anything special is thus also ascribed to the communities being studied (see also Leeming 2015: 19). The conscious choice to collect natural artefacts seems to be influenced by an indicative find context. For example, pebbles tend to be collected from cemeteries when found in close proximity to burials (see also below) or which, on the basis of the interpretation of accompanying finds (e.g. net-sinkers, grain grinding stones), have probably been ascribed a similar function.

However, the reasons for gathering a certain pebble or a fossil have hardly ever been discussed by the researchers; also, more specific contexts of natural finds have seldom been debated in find reports. For example, several smooth water-polished pebbles have been gathered from Paatsa, Valjala and Asva, but only a few were ascribed an interpretative folkloric name. Also, Lõugas gathered many pebbles from different sites and discussed the possibility of contemporary belief in thunderstones, but he did not associate any particular pebble from a specific context with that belief.

Thus, depending on the personal qualities and professional training of the individual researcher, an archaeologist's tendency to collect things that they cannot interpret and/or connect to human activities, is different. Also, there are additional variables that are dependent on the specific excavation situation. For example, during research-related excavations, archaeologists tend to collect more non-artefacts than during

rescue excavations. The reasons for this might include the constraints of stricter time-limits in rescue excavations, but more importantly, there is the archaeologists' personal and more profound interest in the site during the research-related excavation. Also, natural finds are more readily collected when other (more eloquent) finds are scarce.

DISCUSSION

Idea of magical agency

What are these natural artefacts in archaeological collections? What could their contemporary meaning have been? Sonja Hukantaival has suggested that the interpretation of the signs of everyday customs and beliefs is based on the combination of object and context and supported by analogies of known practices in later periods (Hukantaival 2018b: 83). Despite the possibility of over-interpretation (Nurmi 2011: 149), this is a good starting point. Past people have knowingly collected both large and small pebbles, fossils and samples of minerals since the Palaeolithic; also, it has been suggested that they were perceived as apotropaic charms this early (e.g. Conneller 2011; see references in Johanson 2018). However, more specifically, we can speak of using pebbles and fossils as curing or apotropaic items on the basis of Greek and Roman records. The most widely known are the notes of Pliny the Elder propagated through several other classical works, and incorporated into both medieval and early modern lapidaries. From these texts and illustrations, we know about the use of predominantly precious and semiprecious stones, as well as minerals as curing or protective magical amulets (see e.g. Duffin 2013). The curing and apotropaic agency ascribed to stones is connected to the main principles of a magical worldview, e.g. the law of similarity and the law of contact, as explained by James Frazer (1990). Examples can be found in different contexts; for example, according to the law of similarity, hematite helped against bleeding because of its red colour, and bufonites or the toadstone helped against poisonings, since toads produce toxins under their skin. According to the principle of contact magic, the skin diseases believed to have been caused by underground forces (abscesses, swellings, scabs) could be relieved when a stone picked up from the ground was rubbed against the sore place and then returned to the ground. Ascribing this agency to otherwise lifeless objects no doubt fed on counterintuitive ideas (e.g. Pyysiäinen 2002: 122) as well as universal cognitive perceptions connected to nature as a whole. Accordingly, pebbles with holes or of conspicuous colour or size had to be something special; unique in nature, their characters had to refer to a special power that humans could use for their good (cf. witch's eye on the trees, Siamese twin animals, etc.).

Written and folkloric sources

Written sources from Estonian medieval and modern periods have minimal records on curing with portable stones. The records in written sources describing the 'superstitious' practices of Estonians mostly deplore social events, like gatherings at sacred boulders, springs and trees as well as offerings made at these sacred sites. Everyday magic is poorly reflected in chronicles and later visitation protocols; perhaps it was not considered dangerous or peculiar enough for the church officials or nothing was known about these private domestic practices. Everyday curing and apotropaic magical practices were seldom reflected in court trials either, since benign magic was hardly a cause for accusations (cf. Hukantaival 2016: 69). Thus, these two aspects might be the reasons why the folk records that were written down in the 2nd half of the 19th and the beginning of the 20th century give only partial descriptions of the same practices (e.g. keeping snakes as pets, making offerings to trees, springs and boulders, using salt and consecrated items for witchcraft and curing, etc.) as those included in the medieval and modern period written sources. It is doubtful that pebbles, silver scraped from coins, animal claws or simple everyday tools were not used in curing practices before the 19th century. Furthermore, the veneration of thunder is mentioned in most of the medieval and modern period sources (e.g. Sild 1937; Gutslaff 1992; Fabricius 2010), but the use of thunderstones or -bolts as curing or apotropaic objects is almost exclusively indicated by the folklore texts from the 19th–20th century. The only exception is a record by Forselius in

the 17th century of Estonians striking their heads with a stone during the first thunder of the year to avoid headaches (Forselius 1915[1685]: 31). Nothing specific was mentioned of the stone, but it is likely that it was a valued thunderstone. However, using fossils and small smooth pebbles for curing and apotropaic practices is described in Estonian folklore texts (Johanson & Jonuks 2018), and several examples of pebbles and fossils originally used for this purpose are preserved in the medicine and witchcraft collection of the Estonian National Museum (Johanson & Jonuks 2018: Fig. 4) (Fig. 6).

Thus, the folklore and written sources demonstrate that pebbles and fossils were regarded as peculiar or special, and were frequently used for magical practices. However, these records are hardly straightforward. For example, in Estonian records, thunderstones can refer to prehistoric stone items, round vari-coloured pebbles, pyrite balls or even true meteoritic fragments. In the case of ear stones, fossils of corals and bryozoans seem to have been preferred (Fig. 6: 4–5), but smooth pebbles were used to cure an earache as well. According to several European sources (see Pymm 2016), snakestones can refer to pebbles of different colours, fossils or even man-made beads. There might have been some unwritten traditions that prescribed the perception of particular fossils and pebbles in a certain way, with written documentation probably adding specific names to these and influencing the distribution of these traditions. Nevertheless, a strong possibility exists that, for the majority of people, pebbles and fossils that attracted their attention were ascribed a general magical meaning. People used them in apotropaic or curing practices when they felt it right and necessary, by regarding a suitable quality (smoothness, colour, shape, etc.) as an essential feature. This notion is specifically referred to by the various identities attributed to snakestones and thunderstones. Therefore, the names attributed to pebbles and fossils in written or folklore texts should not be overestimated.

To some extent, the geological conditions of a given location seem to determine the choice of a particular stone, but even knowing this does not narrow the circle of possible curing stones down. Sometimes, legends and magical potential became attached to particular fossils which were common in a particular area, e.g. ammonites in Whitby region in England (Bassett 1982). Similarly, beliefs attached to belemnites appear in places when they are more easily found (Skeat 1912: 62–3). At the same time, the requisite stone should not be too easy to find, as expressed in Estonian folklore records concerning thunderstones and earstones. Thus, making suggestions on the basis of written and folklore sources about what pebbles or fossils found in archaeological contexts might have been considered significant by past people, is an unrewarding task. Also, as demonstrated above, the first choice is always made by the archaeologist in the field.

Nevertheless, considering the above discussion, it is likely that many of the pebbles and fossils present in the archaeological material might have participated in magical curing or apotropaic practices. Although in the majority of cases we have to be satisfied with more or less speculative conclusions, there are examples for which the closed find context, the use-wear present on the object or its distant provenance allows the suggestion that the items were brought to the site and regarded as being significant by the people of the past. A few of the more conspicuous cases will be considered below.

Fossils in archaeological collections

Although several studies have tried to associate specific genera of fossils with particular curing and apotropaic stones (i.e. snakestones, thunderstones) known from the written sources and folklore texts (e.g. Pymm 2016), the more specific conclusions mostly remain speculative and only in single cases is a more specific interpretation justified. A case in point is the potential finds of thunderbolts from Tartu hillfort. According to Estonian folklore records, valuable thunderbolts have included stone hearts, which refer to different limestone fossils, predominantly cephalopods preserved in local Silurian and Ordovician limestones, but which are taxonomically related to the Jurassic and Cretaceous belemnites. A cephalopod fossil (TM A 15:1000) which has been broken into three pieces, but was 13 cm long when intact, was collected from the Late Iron Age or early medieval layer. As the pieces were found together, the fossil had to be intact

Fig. 8. Partly ground Subulites gigas *snail fossil from Tartu Medieval hillfort, east Estonia (Tartu City Museum TM A 16:563). Photo: T. Jonuks.*

when it reached the occupation layer. The find context referred to an ordinary occupation layer and the fossil itself does not show any traces of modification.

Also, a gastropod fossil, *Subulites gigas,* was found from the late prehistoric context of the Tartu hillfort; one side of the fossil shows heavy traces of grinding (Fig. 8). There is a possibility that the wear-traces on the side of the fossil are ice scratches produced at the time when the fossil was still locked in limestone, whereas the fossil might have been accidentally brought to the site with limestone slabs (Meidla, pers. comm.). However, the prehistoric hillfort was made of timber and limestone was not used for building. Therefore, it is more likely that the fossil reached the settlement site as a manuport. Abrasion by ice might be responsible for some of the scratches on the fossil; however, one of the sides has been ground down to give an almost polished appearance, leaving the surface of this side of the fossil slightly convex, which might be the result of deliberate human action. The two described fossils, as well as the finds of a few Neolithic artefacts from Tartu hillfort – a stone axe (TM A 14:402) and a flint arrowhead (TM A 16:304) – attest that the thunderbolt-legend was very likely known at the time in Late Iron Age and medieval Tartu, and the deliberate grinding of the gastropod fossil might have been to file potent and curing debris from it. The introduction of thunderbolt-belief to the Estonian area is difficult to date, and the few post-medieval sources available provide no references. However, it is reasonable to suggest that the belief, which spread through parts of Europe from the beginning of the 1st millennium AD (see e.g. Merrifield 1987: 10), reached Estonian territory together with intensified trading and contacts in the Viking Age. The presence of numerous Stone Age edged tools from Late Iron Age settlement contexts seems to add credit to this hypothesis (see Johanson 2018).

Two beautiful orthoceridan cephalopod fossils from the town of Pärnu, one of which is a coiled nautiloid (Fig. 9: 3), might be regarded as apotropaic instruments. Unfortunately, no find context for the fossils is provided, but we are dealing with archaeological finds, so they could be of medieval or modern period date. Estonian nautiloid fossils are taxonomically related to fossil ammonites with similar coiled shells, which are perhaps the most well-known fossils in the world. Ammonites have similarly been used in curing and apotropaic practices. They were known to man since early Greek times when they were associated with the coiled horns of the ram and regarded as being sacred (Bassett 1982: 3). Ammonites have been used as valuable charms in different parts of the world (see Pymm 2016), but they have, perhaps, been most common in Great Britain where they were

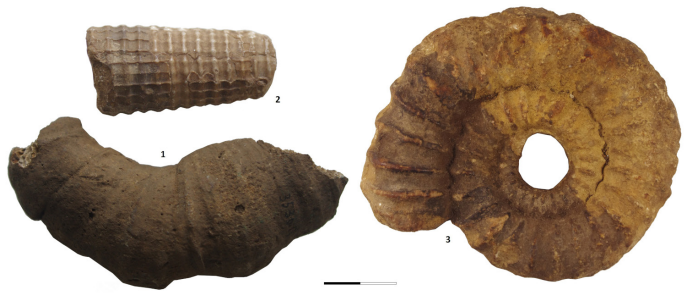

Fig. 9. Fossils from archaeological sites; 1) rugose coral from Saha cemetery (AI 3536:11), 2) cephalopod fossil from Saha cemetery (AI 3536:12), 3) nautiloid from Pärnu (Pärnu Museum). Photos: K. Johanson & T. Jonuks.

Fig. 10. Gastropod fossils from archaeological sites; 1) Viimsi I tarand-grave (AI 5914:105), 2) Iru settlement site (AI 3429:926). Photos: T. Jonuks.

associated with serpents and called snakestones (see also Skeat 1912). In some parts, they were known as crampstones or associated with fairies (Bassett 1982: 4; Pymm 2016). Although ammonites were used in folk medicine, for example curing cramps in cows, they were mostly credited with magical effects or religious significance, e.g. generating prophetic or heavenly dreams. The coiled nautiloid from Pärnu has a hole in the middle. The inner part might have been weathered out by natural processes, but the edges of the hole leave the impression that this part of the shell was removed deliberately. The find might have been valued merely as a peculiar natural item, while the hole implies that it could have been used as a charm that could be hung from a string or thread.

A cephalopod fossil has been found together with a rugose coral from the Late Iron Age cemetery near the Saha chapel (Fig. 9: 1–2), founded at the beginning of the Middle Ages. The fossils are found in the Late Ordovician limestones further to the south, and their natural northward movement would be unlikely (Meidla, pers. comm.). The reason for this is that glacial ice movement was southwards during the Ice Age, which means that fossils broken eroded by the ice from the Silurian and Ordovician bedrock in Estonia cannot have moved northwards unless by later, post-glacial rivers. However, the latter case is not suggested here as the two fossils were found together some distance away from any rivers, leaving human transport as the most plausible option. Even if the fossils' specific find place or connection to any actual graves had not been recorded, they might have been interpreted as grave goods and perhaps considered to be magical, apotropaic means of protecting the dead. Similarly, fossils from Iron Age and medieval burial sites have been interpreted as charms (Meaney 1981; Samdal 2000; Gilchrist 2008). During the 19th century, people had visited the chapel to seek cures for their ears (Winkler 1900: 13). Thus, it is plausible that the fossils had participated in some magical curing procedure and were left at the cemetery afterwards, perhaps after a contact magical procedure.

Among the gastropods, a small Bellerophontid fossil with a diameter of 2 cm has been found from the Iru settlement site, which was occupied from the Late Bronze Age until the Viking Age. The specimen has been pierced in the middle, either deliberately or accidentally (Fig. 10: 2). The surface of the fossil has been polished and fine grooves are present on the side opposite the most weighty part of the specimen. The use wear suggests that the item was probably once worn, perhaps as an amulet on a string or a strap of leather. However, the find context does not suggest any special treatment. It could have been a house amulet, similar to sponge fossils in Anglo-Saxon settlements, regarded as the most usual type of 'holed stones' (Meaney 1981: 116). In British folklore, holed stones were generally valued as hagstones (Toms 1932), keeping away nightmares as part of a belief that extends back to the Anglo-Saxon Period in the middle of the 1st millennium AD (Meaney 1981: 116). A similar gastropod fossil (Fig. 10: 1) with a pierced hole has been found from the Viimsi I Roman Iron Age tarand-grave infill. The roughened surface of this specimen suggests that it has been exposed to weather conditions resulting in the removal of all traces of potential use wear. However, wearing the specimen as an amulet or a bead might have been possible, since one of the most significant collections of limestone pebbles with natural holes, interpreted as beads, have been found from the same grave (Lang 1993).

Fossils that look similar to living organisms, such as gastropods or trilobites, might have been perceived as spirit animals emerging from their stony covering; this has been suggested

for some Palaeolithic and Mesolithic examples (e.g. Glørstad et al. 2004: 106; Conneller 2011: 95–7). During the Stone Age, the uncovering of petrified animals from the raw material during flint working probably added to this belief in the transformative power of a rock. It is very likely that a similar belief continued to some extent until fossils were identified as once-living organisms in the 17th–18th century. A few examples of flint flakes with fossils inside have been found from some Stone Age sites in Estonia (e.g. Ihaste Mesolithic settlement site in central Estonia) but the presence of fossils in flint finds has not been the subject of a special study. Next to the gastropod fossils in Iru and Viimsi, beliefs in lithified animals might have been expressed in the case of *Pararaphistoma qualteriata*, a fossil gastropod found from the multi-period site of Jägala Jõesuu hillfort, as well as several trilobite fossils, one from the Iron Age and medieval Mustivere settlement site and the other from the medieval cemetery in Pirmastu (see more in Johanson 2018: 101).

Pebbles in archaeological collections

Although of 587 pebbles I connected 273 as being potentially used for curing and apotropaic practices, it is impossible to associate these with a particular belief as could be done, but with notable reservations, in the case of fossils. Iron Age, medieval and modern period lapidaries are full of descriptions of different minerals and rocks and cryptopalaeontological studies have tried to associate contemporary names with suitable geological candidate materials, but in individual archaeological cases the effort is still problematic. Moreover, the distribution and impact of lapidaries in Estonia is difficult to ascertain. The spread of ideas, to some extent, can be imagined and may be reflected in the 19th- and 20th-century folklore records; it is unlikely, however, that they had any significant impact on the local inhabitants in the medieval and modern period. In the cases discussed below, a generally apotropaic function is suggested.

The pebbles with moderately polished surfaces are of glaciofluvial origin, rounded and smoothed by Ice Age rivers, and can be collected from the moraine. Pebbles with very smooth or even polished surfaces, on the other hand, are more likely to have been found in existing waterbodies and could, therefore, have been brought to the site. Smooth round and oblate stones are common in some parts of the coast, but they can also be found in inland waterbodies and moraine. In the latter environments they would have to have been searched for intentionally, so it can be suggested that regularly shaped round and oblate pebbles with polished surfaces were brought to the sites from (nearby) waterbodies (Kirs, pers. comm.) for particular uses. Two flat pebbles with water-polished surfaces had been placed on the breast of the subject in burial no 7, dated to 4170–3370 calBC (Tõrv 2016: 179), at Tamula Stone Age cemetery (Fig. 11: 1–2). Further unusual associated grave goods (wing bones of the crane, animal teeth, bird figurines) of this burial of a 6–10-year old child have been discussed elsewhere, with the suggestion that the child had been a ritual specialist while alive (Jonuks 2009: 126). Also, the burial contained four pieces of amber which, it has been proposed, may indicate that the deceased suffered from some severe conditions during their lifetime (Ots 2006: 125). The burials at Tamula were excavated in peat, and although no particular geological studies have been conducted there, the presence of organic material (logs, birch bark) in some burials suggests that the bodies were buried directly in the peat layer. This means that the two pebbles resting on the remains of

Fig. 11. Pebbles found from burial sites; 1, 2) Tamula, south Estonia, Late Mesolithic burial (AI 3960:272, 273), 3) Raatvere, east Estonia, Late Iron Age burial (AI 5295:98). Photos: K. Johanson.

the child could not have been an accidental association but suggestive of their deliberate placement on the body. In addition, one of the pebbles has slightly lustrous surfaces, possibly a consequence of being carried in a pouch. All the grave-goods imply that the child might have needed extra protection in the Otherworld, probably because of his/her means of death, and the two accompanying pebbles were meant to assist him/her on the journey.

Another remarkable example is provided by 41 small, mostly smooth granite pebbles found under the shoulder of a Neolithic Corded Ware culture burial (no 2) in Sope which, according to the excavator, had been placed under the shoulder as a single deliberate act, since the pure sand around the skeleton contained no stones at all (Indreko 1933) (Fig. 12). Here, too, some special meaning of the pebbles to the deceased or the grievers is suggested.

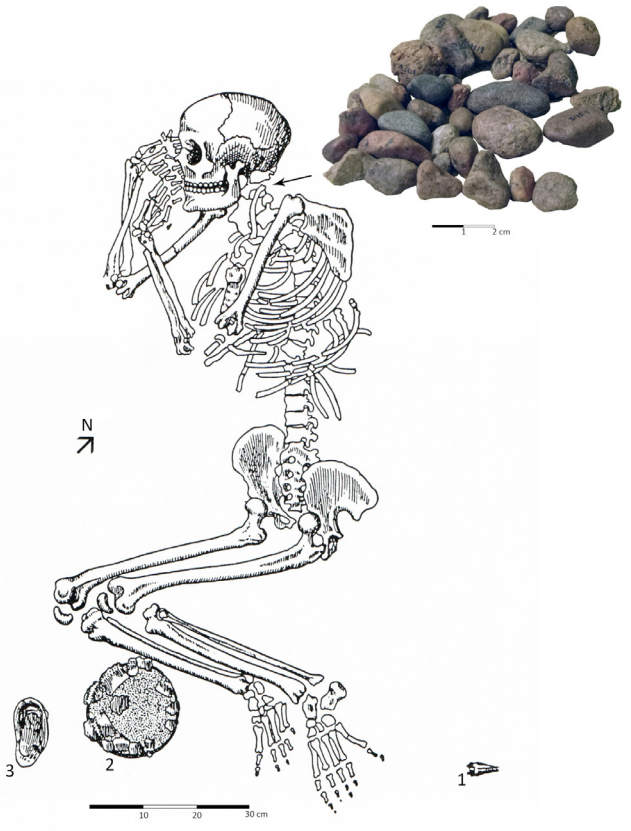

Fig. 12. Late Neolithic female burial of Sope, north-east Estonia; other grave goods (AI 3175): 1) bone awl, 2) Corded Ware clay vessel, 3) freshwater pearl mussel Margaritifera margaritifera*. Drawing: K. Johanson, after Indreko 1933.*

The placing of natural round pebbles into graves as part of the Stone Age burial ritual has parallels from Finland, where Stone Age graves often contain pebbles. The presence of some of the pebbles might be connected with the need to raise certain parts of the body in the grave (Ahola 2015: 27, 32; cf. Nilsson-Stutz 2003: 335), but this function can be excluded if the pebbles are placed onto the surface of the body, as in Kukkarkoski 11 (Ahola 2015: 32) or Jönsas, where the wealthiest graves contained more than 200 pebbles forming a heavy stone cover over the burial feature (Ahola, pers. comm.). According to Ahola, these smooth pebbles are foreign to the natural soil of Jönsas. Thus, these must have been purposefully chosen and used in ritual contexts by the Stone Age people. This interpretation is supported further by two anthropomorphic pebbles found from Finnish rock art localities which are believed to be connected with Sámi *sieidi* sites; it seems that the Sámi worshipped portable pebbles that functioned as the foci of worship at a wider sacred site (Lahelma 2006: 19). Ahola apparently sees the pebbles in these Stone Age sites as representing part of the same belief system as the worshipping of portable stones.

Specific significance must have been ascribed to pebbles of Suursaari quartz porphyry which can be found naturally only in the eastern part of Estonia (Tuuling & Kirs 2013: 149) (Fig. 4). One of the pebbles was found at Narva Joaorg, a multi-period site in the north-eastern part of Estonia, while the other three (AI 5937 II:1045, 554; 6004 III:126) come from the medieval and modern period settlement of Härjapea, presently in the centre of Tallinn in north-west Estonia (Lavi 1992) (Fig. 13). The latter pebbles have clearly been brought to the site intention-

ally from a collection point 200 km away, while ice transport in this direction is impossible. The three deep black coloured pebbles are each 2–3 cm in diameter with a very smooth surface. The context of the finds in the occupation layer, together with pottery and glass shards, pipe fragments, etc. does not allow a more specific function to be proposed, but two possibilities can be suggested. In medieval and modern period archaeological contexts, round clay balls and sometimes also pebbles have frequently been interpreted as marbles (e.g. Höltken & Trier 2012: 177; Søvsø 2012: 530–1; Veeckman 2012: 74).

The Härjapea pebbles are of naturally oblong shape and thus not suitable for marble rolling, but obviously they could have been used in some other pastime as gaming pieces. The black colour of the pebbles, not very common among local Estonian rocks, might have been important for the inhabitants. According to Estonian folklore texts, black pebbles form one type of thunderstones used in curing and apotropaic practices. Also, raven stones (Est. kaarnakivi) are described as consisting of small and black pebbles (Eisen 1926: 313). According to Kreutzwald (1856: 628–9), raven stones were believed to cure erysipelas, swellings, eye inflammations, toothache and many other diseases. A black, though significantly larger (with the diameter of 11 cm) smooth pebble is stored in the folk medicine collection of the Estonian National Museum as a raven stone and has a history of topical use in the treatment of skin conditions. Elsewhere in Europe small, smooth, lens-shaped black stones with diameters around 3 cm were sometimes regarded as serpent stones or adder stones in written sources from the medieval and modern periods. These pebbles, believed to have been obtained from the head of a snake, were used to prevent and cure snake bites by pressing the stone against the wound (Pymm 2016 and the references therein). Thus, there is a strong possibility that the three pebbles were highly valued and brought to the site from a significant distance. From oral tradition, we can speculate that their purpose might have been some form of (apotropaic) magic or healing practice.

Fig. 13. Quartz porphyry pebbles from the medieval and modern period settlement site of Härjapea, present-day Tallinn, north Estonia (AI 5937 II:554, 945). Photo: K. Johanson.

An 11th-century burial of a smith in Raatvere yielded a small smooth limestone ball (Fig. 11: 3) with a diameter of only 1.7 cm. It was found together with a silver coin and a fragment of a leather belt from the thigh area of the skeleton. The location of the finds refers to the possibility that the coin and the ball were carried together in a pouch. The perfect ball-shape of the stone is not natural, and the piece of limestone must have been modified into a ball. Perhaps it was a marble, but these are generally found in settlement sites, not accompanying a burial. Thus, its interpretation as an amulet is perhaps more likely.

An analogue might be drawn with white quartz pebbles, which were placed in graves from Neolithic times to the Middle Ages (e.g. Evans 1897; Kermode & Herdman 1904: 34; Meaney 1981: 88–90; Ringstad 1988; Daniell 1997; Samdal 2000; Gilchrist 2008; Arthur et al. 2014). In these cases, they have been interpreted as amulets against witchcraft and illnesses (Ringstad 1988: 339), and symbols of the sun, life and re-birth (Carlie 1999: 55–7; Arthur et al. 2014: 6 and the references therein), or water and regeneration (Gilchrist 2008: 151). The latter interpretations rest upon the translucency of quartz and its ability to reflect light, which is present in quartz flakes but not in crusted pebbles. This preference for white stones (i.e. quartzite) is not followed in Estonian examples, however. Quartz is a common mineral in Estonian soil, so if quartz pebbles were chosen preferentially, their percentage contribution would be expected to be much higher among the collected pebbles. There are some indications of the significance of quartz as a material; for example, the Roman Period tarand-graves of Võhma and Uusküla, where deliberate breaking of quartzite pebbles on graves has been suggested (Lang 2000: 160)

as taking place in connection to some (burial) ritual. Whether or not the Raatvere ball was connected with beliefs attributed to quartz pebbles, is uncertain, but carrying it in a pouch with a coin suggests its value to the owner.

CONCLUSION

I tend to agree with Timo Muhonen (2013: 133) that 'even though archaeological studies involving religion and ritual are currently numerous … in archaeology there are still wide currents that partly unintentionally foster the idea of material culture as above all utilitarian and associate only 'anomalous' things with rituals', but without reflecting on the ritual behaviour in detail. The similarly conventional treatment of archaeology as the interpretation of the actions of past people should be added, whereas interest has been 'narrowly confined to objects which show human action' (Leeming 2015: 17; see also Samdal 2000: 7). In other words, many researchers cling to the 'safe' dichotomous viewpoint that only finds with traces of working or use-wear pertain to archaeology (see also Gilchrist 2008). In addition, the dominant view stipulates that artefacts have been made and used only for one function or several similar functions (see also Samdal 2000: 11; Johanson & Jonuks 2018), and alternative possibilities are not considered. However, items used in a utilitarian way can be done so without macroscopic or even microscopic traces of use-wear. A perfect example is provided by the pebbles used experimentally for polishing and smoothing pottery which, depending on the hardness of the rock, might not show any traces of usage even after long-term employment (see more in Johanson 2018). As proved by ethnographic curing stones, several practices, such as pressing onto skin inflammations, leave no visible traces on the stone. Moreover, the same things have frequently been used both in utilitarian ways as well as ritually, and often the ritual items do not look unusual or anomalous (see discussion on Native American charmstones in Hector et al. 2005). In other words, one should be aware of the actualising of the special agency of non-special items in a ritualised context (see Muhonen 2013: 129; Hukantaival 2016: 198). Also, different practices may result in similar use-wear. Thus, pebbles with fire-cracked surfaces may apply to potboilers used to heat water for regular cooking, but might perhaps imply the heating of a curing stone to produce therapeutical steam or water (Thomas 2010 and the references therein). Finally, some random traces of use-wear on pebbles (e.g. lines in different directions) might have been left from intentional and conscious use (e.g. as a charm or a peculiar curing application).

All this means that during archaeological excavations selecting the pebbles and fossils that might have been significant or used by people as apotropaic or curing means is a complicated process. Also, we do not know what the archaeological find context should be for a pebble or a fossil used in everyday magical and curing practices. Until now, these 'natural finds' have been gathered without any clear idea of such possibilities, so in find lists we find only information concerning the layer and/or square and depth. According to this information, pebbles and fossils have often been found from occupation layers together with potsherds and other everyday artefacts. Unfortunately, in most cases, this fact says little about the significance of the finds for the past communities. At the same time, no field archaeologist gathers unworked pebbles because they have a *potential* (my emphasis) significance for people of the past (Muhonen 2013: 133).

Whilst we cannot gather all existing pebbles and fossils that appear in archaeological sites, and we cannot interpret those that have been gathered, we can say that the lack of evident traces of production or use does not mean that the pebble was 'plain' or the fossil 'natural' and for this reason not worthy of precise documentation or collection. In the same way, the pebble with traces of use-wear might not have been any more significant for the users than the unworked ones. The same idea is emphasised by the much-referred to thoughts of Joanna Brück that the categories 'ritual' or 'practical' have been created by us and, being artificial, are thus essentially flawed for archaeological periods (Brück 1999: 337). In trying to revise our opinions, the adjectives 'plain' and 'meaningful' are similarly flawed, and we should proceed from the logic of the practitioners. Here, the dichotomy of research opinion is clearly indicated: worked stone = something significant, unworked stone = plain,

insignificant. When we take away this safe dichotomy, we are left with academic confusion in which everything is possible and any interpretation might be true.

In order to clarify this confusion, the emic viewpoint is sometimes used. However, the emic viewpoint is difficult to apply when dealing with archaeological material, especially when we are talking about 'natural artefacts' with unclear or many different functions, even in cases when written sources exist. Thus, we are still left with hundreds of finds of which were regarded as being worth collecting by the archaeologists, but thorough discussion has been attempted in only a handful of cases. Probably, the bulk of these finds, by their very nature, only permit speculative interpretation, a situation which we as archaeologists are usually afraid of. We are unaware as to whether the archaeological pebbles and fossils discussed above were actually used, considered significant or in many cases even whether they were actively brought to the site at all. However, if we do not acknowledge the possibility, we will not be able to see the behaviour.

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REFERENCES

Personal communication

Ahola, M., archaeologist, Department of Cultures, University of Helsinki, e-mail to the author, 16 November 2015.

Kirs, J., geologist, Institute of Ecology and Earth Sciences, University of Tartu, communication with the author, 14 December 2016.

Meidla, T., geologist, Institute of Ecology and Earth Sciences, University of Tartu, communication with the author, 2 November 2017.

Unpublished sources

Hector, S.M., Foster, D.G., Pollack, L.C., Fenenga, G.L. & Whatford, J.C. 2005. A charmstone discovery in the Redwood Forests of Mendocino County, California. Research report, California Department of Forestry and Fire Protection.

Indreko, R. 1933. Aruanne kaevamistest Lüganuse khk. Püssi vld. Sope kl. Metsavälja tl. maal 9–13. VII.1933. Research report, University of Tartu.

Jaanits, L. 1953. Neoliitilised ja varase metalliaja asulad Emajõe suudmealal. PhD thesis, Archaeology, University of Tartu.

Kustin, A. 1963a. Aruanne Valjala maalinna arheoloogilistest kaevamistest 1962.a. Research report, Tallinn University.

Kustin, A. 1963b. Aruanne Paatsa linnuse kaevamisest 1963.a. Research report, Tallinn University.

Lavi, A. 1992. Vahearuanne Tallinn-Härjapea asulakoha kaevamistest 1991.a. (Pleekmäe ala). Research report, National Heritage Board, Tallinn.

Ots, M. 2006. Merevaigud Baltimaade kivi- ja pronksiaja muististes. MA thesis, Archaeology, University of Tartu.

Samdal, M. 2000. Amuletter. Gjenstander med amulettkarakter i vestnorske graver i tidsrommet 350–1000 e.Kr. BA thesis, Archaeology, University of Bergen.

Valk, H. 2005. Arheoloogilisi andmeid Uusvadast 2005. Research report, University of Tartu.

Internet sources

Konsa, M., Sikk, K. & Tvauri, A. 2013. Arheoloogilised kaevamised Eestis 1799–1999. Võrguteavik. Tartu: TÜ ajaloo ja arheoloogia instituut. <http://www.arheo.ut.ee/kaevamiste-nimekiri>

Thomas, M.S. 2013. Reassessing slingstones. Unpublished manuscript. <https://www.researchgate.net/publication/264974746_Reassessing_slingstones>

Literature

Adams, F.D. 1938. *The Birth and Development of the Geological Sciences*. Baltimore: Williams & Wilkins.

Ahola, M. 2015. Tracing Neolithic funerary practices from Finnish ochre graves – a case study from Kukkarkoski Comb Ware burial ground. *Thanatos* 4 (2): 23–41.

Arthur, R., Murray, J. & Ritchie, A. 2014. *Painting the Stones Black: Solving the Mystery of the Painted Quartz Pebbles.* Archaeology Reports Online 12.

Bar-Yosef Mayer, D.E., Gümüş, B.A. & İslamoğlu, Y. 2010. Fossil hunting in the Neolithic: shells from the Taurus Mountains at Çatalhöyük, Turkey. *Geoarchaeology: An International Journal* 25 (3): 375–92.

Bassett, M.G. 1982. *'Formed stones', Folklore and Fossils*. Cardiff: National Museum of Wales.

Bowden, M. & McOmish, D. 1987. The required barrier. *Scottish Archaeological Review* 4: 76–84.

Boyadziev, K. 2008. Real arrows or 'darts from heaven'? Some ideas on the interpretation of belemnites from Neolithic and Chalcolithic sites in Bulgaria. In R.I. Kostov, B. Gaydarska & M. Gurova (eds.) *Geoarchaeology and Archaeomineralogy:* 289–90. Sofia: Ivan Rilski.

Brück, J. 1999. Ritual and rationality: some problems of interpretation in European archaeology. *European Journal of Archaeology* 2 (3): 313–44.

Burkitt, M.C. 1926. *Our Early Ancestors. An Introductory Study of Mesolithic, Neolithic and Copper Age Cultures in Europe and Adjacent Regions*. Cambridge: University Press.

Cahill, M. 2009. Tinkering with torcs: an unusual Bronze Age hoard from Kilsallagh, Co. Longford. In N. Finlay, S. McCartan, N. Milner & C. Wickham-Jones (eds.) *From Bann Flakes to Bushmills: Papers in Honour of Professor Peter Woodman*: 3–11. Prehistoric Society Research Paper 1.

Carelli. P. 1997. Thunder and lightning, magical miracles. On the popular myth of thunderbolts and the presence of Stone Age artefacts in medieval deposits. In H. Andersson, P. Carelli & L. Ersgård (eds.) *Visions of the Past: Trends and Traditions in Swedish Medieval Archaeology:* 393–417. Stockholm: Central Board of National Antiquities.

Carlie, A. 1999. 'Sacred white stones'. On traditions of building white stones into graves. *Lund Archaeological Review* 5: 41–58.

Clarke, A. 2009. Craft specialisation in the Mesolithic of northern Britain: the evidence from the coarse stone tools. In N. Finlay, S. McCartan, N. Milner & C. Wickham-Jones (eds.) *From Bann Flakes to Bushmills: Papers in Honour of Professor Peter Woodman:* 14–21. Prehistoric Society Research Paper 1.

Conneller, C. 2011. *An Archaeology of Materials: Substantial Transformations in Early Prehistoric Europe.* Oxford: Routledge.

Daniell, C. 1997. *Death and Burial in Medieval England, 1066–1550*. London: Routledge.

Duffin, C. 2008. *Fossils as Drugs: Pharmaceutical Palaeontology.* Ferrantia 54.

Duffin, C. 2010. The toadstone – a rather unlikely gem. *Jewellery History Today* 8 (Spring): 3–4.

Duffin, C. 2013. Lithotherapeutical research sources from antiquity to the mid-eighteenth century. In C.J. Duffin, R.T.J. Moody & C. Gardner-Thorpe (eds.) *A History of Geology and Medicine*: 7–43. Geological Society, Special Publications 375.

Eisen, M.J. 1926. *Eesti vana usk*. Tartu: Eesti Kirjanduse Selts.

Evans, J. 1897. *The Ancient Stone Implements, Weapons and Ornaments, of Great Britain*. London: Longmans.

Fabricius, D. 2010. *Dionysius Fabriciuse, Viljandi kiriku praosti Liivimaa ajaloo lühiülevaade neljas osas aastast tuhat ükssada viiskümmend kaheksa kuni aastani 1610***.** Tartu: Johannes Esto Ühing.

Forselius, J.G. 1915[1685]. *Eestlaste ebausu kombed, viisid ja harjumised*. *Trükki toimetanud J. Jõgewer.* Jurjev: Eesti Kirjandus.

Frazer, J.G. 1990. *The Golden Bough*. London: Macmillan.

Gazin-Schwartz, A. 2001. Archaeology and folklore of material culture, ritual, and every-

day life. *International Journal of Historical Archaeology* 5 (4): 263–80.
Gilchrist, R. 2008. Magic for the dead? The archaeology of magic in later Medieval burials. *Medieval Archaeology* 52: 119–59.
Glørstad, H., Nakrem, H.A. & Tørhaug, V. 2004. Nature in society: reflections over a Mesolithic sculpture of a fossilised shell. *Norwegian Archaeological Review* 37 (2): 95–110.
Gravel-Miguel C., Riel-Salvatore, J., Maggi, R., Martino, G. & Barton, C.M. 2017. The breaking of ochred pebble tools as part of funerary ritual in Arene Candide Epigravettian cemetery. *Cambridge Archaeological Journal* 27 (2): 331–50.
Guminski, W. & Bugajska, K. 2016. Exceptions as a rule. Unusual Mesolithic cemetery and other graves at Dudka and Szczepanki, Masuria, NE-Poland. In J.M. Grünberg, B. Gramsch, L. Larsson, J. Orschiedt & H. Meller (eds.) *Mesolithic Burials – Rites, Symbols and Social Organisation of Early Postglacial Communities: International Conference Halle (Saale), Germany, 18th–21st September 2013*: 465–510. Halle (Saale): Landesamt für Denkmalpflege un Archäologie Sachsen-Anhalt.
Gutslaff. J. 1992. Palve Pikrile. In A. Saareste & A.R. Cederberg (eds.) *Valik Eesti kirjakeele vanimaid mälestisi a. 1524–1739:* 98–100. Akadeemilise Emakeele Seltsi Toimetised 16.
Höltken, T. & Trier, M. 2012. Kindheit und Jugend, Ausbildung und Freizeit – im Spiegel der Kölner Funde. In M. Gläser (ed.) *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum VIII: Kindheit und Jugend, Ausbildung und Freizeit*: 173–86. Lübeck: Verlag Schmidt-Römhild.
Hukantaival, S. 2016. '*For a Witch Cannot Cross Such a Threshold!' Building Concealment Traditions in Finland c. 1200–1950.* Archaeologica Medii Aevi Finlandiae XXIII.
Hukantaival, S. 2018a. The materiality of Finnish folk magic – objects in the collections of the National Museum in Helsinki. *Material Religion: The Journal of Objects, Art and Belief* 14 (2): 183–98.
Hukantaival, S. 2018b. The goat and the cathedral – archaeology of folk religion in medieval Turku. *Mirator* 19 (1): 67–83.
Indreko, R. 1939. Asva linnus-asula. In H. Moora (ed.) *Muistse Eesti linnused:* 17–52. Tartu: Õpetatud Eesti Selts.
Jochim, M.A. 2008. The Mesolithic of the Upper Danube and Upper Rhine. In G. Bailey & P. Spikins (eds.) *Mesolithic Europe*: 203–20. Cambridge: Cambridge University Press.
Johanson, K. 2009. The changing meaning of 'thunderbolts'. *Folklore: Electronic Journal of Folklore* 42: 129–74.
Johanson, K. 2018. *Missing Interpretations. Natural and Residual Finds in Estonian Archaeological Collections*. Dissertationes Archaeologiae Universitatis Tartuensis 8.
Johanson, K. & Jonuks, T. 2018. Are we afraid of magic? Magical artefacts in Estonian museums. *Material Religion: The Journal of Objects, Art and Belief* 14 (2): 199–217.
Jonuks, T. 2009. *Eesti muinasusund*. Dissertationes Archaeologiae Universitatis Tartuensis 2.
Kermode, P.M.C. & Herdman, W.A. 1904. *Illustrated Notes on Manks Antiquities*. Liverpool.
Kivikoski, E. 1965. Magisches Fundgut aus Finnischer Eisenzeit. *Suomen Museo* 72 (1965): 22–36.
Kreutzwald, F.R. 1856. Wie Man den Stein des Raben (kaana-kivi) sich verschaffen kann. In F.G. von Bunge (ed.) *Das Inland: Eine Wochenschrift für Liv-, Esth- und Curländische Geschichte, Geographie, Statistik und Litteratur* 39: 628–9.
Lahelma, A. 2006. Excavating art: a 'ritual deposit' associated with the rock painting of Valkeisaari, eastern Finland. *Fennoscandia archaelogica* 23: 3–23.
Lang, V. 1993. *Kaks tarandkalmet Viimsis, Jõelähtme kihelkonnas*. Töid arheoloogia alalt 2.
Lang, V. 2000. *Keskusest ääremaaks. Viljelusmajandusliku asustuse kujunemine ja areng Vihasoo-Palmse piirkonnas Virumaal*. Muinasaja teadus 7.
Leeming. P. 2015. 'Also found … (not illustrated)…': The curious case of the missing magical fossils. In C. Houlbrook & N. Armitage (eds.) *The Materiality of Magic: An Artefactual Investigation into Ritual Practices and Popular Beliefs*: 15–22. Oxford: Oxbow.

Lõugas, V. 1996. *Kaali kraatriväljal Phaethonit otsimas*. Tallinn: Eesti Entsüklopeediakirjastus.

Mayor, A. 2011. *The First Fossil Hunters. Dinosaurs, Mammoths, and Myth in Greek and Roman Times.* Princeton: Princeton University Press.

McNamara, K. 2011. *The Star-Crossed Stone. The Secret Life, Myths, and History of a Fascinating Fossil*. Chicago: University of Chicago Press.

Meaney, A. 1981. *Anglo-Saxon Amulets and Curing Stones*. Bristish Archaeological Reports, British Series 96.

Merrifield, R. 1987. *The Archaeology of Ritual and Magic*. London: B.T. Batsford.

Metzger-Krahé, F. 1978. *Das archäologische Fundmaterial III der Ausgrabung Haithabu*. Berichte über die Ausgrabungen in Haithabu 12.

Muhonen, T. 2006. Kolme ajallista näkökulmaa ukonvaajoihin. Kivikauden kiviesineet myöhempien aikojen kuriositeetteina. *Kuriositeettikabi.net* 3.

Muhonen, T. 2013. A hard matter: stones in Finnish-Karelian folk belief. In A. Kannike & P. Laviolette (eds.) *Things in Culture, Culture in Things*: 114–38. Tartu: University of Tartu Press.

Nilsson-Stutz, L. 2003. *Embodied Rituals and Ritualized Bodies. Tracing Ritual Practices in Late Mesolithic Burials.* Acta Archaeologica Lundensia Series in 8º 46.

Nurmi, R. 2011. *Development of Urban Mind – Object Biographical Approach. The Case Study of Tornio Town, Northern Finland*. Oulu: University of Oulu.

Oakley, K. 1965a. Folklore of Fossils. Part I. *Antiquity* 39: 9–16.

Oakley, K. 1965b. Folklore of Fossils. Part II. *Antiquity* 39: 117–25.

Pymm, R. 2016. 'Serpent stones': myth and medical application. In C.J. Duffin, C. Gardner-Thorpe & R.T.J. Moody (eds.) *Geology and Medicine: Historical Connections.* Geological Society, Special Publications 452.

Pyysiäinen, I. 2002. Religion and the counter-intuitive. In I. Pyysiäinen & V. Anttonen (eds.) *Current Approaches in the Cognitive Science of Religion*: 110–32. New York: Continuum.

Ringstad, B. 1988. Steiner brukt som amuletter i forhistorisk tid – et eksempel fra Kvåle i Sogndal. In S. Indrelid, S. Kaland & B. Solberg (eds.) *Festskrift til Anders Hagen*: 325–41. Arkeologiske Skrifter fra Historiske Museum 4.

Ritchie, A. 1972. Painted pebbles in early Scotland. *Proceedings of the Society of Antiquaries of Scotland* 104: 297–301.

Sharp, J. 2000. Charmstones: a summary of the ethnographic record. *Proceedings of the Society for California Archaeology* 13: 233–43.

Sild, O. 1937. *Kirikuvisitatsioonid eestlaste maal vanemast ajast kuni olevikuni*. Acta et Commentationes Universitatis Tartuensis B Humaniora 40 (4).

Skeat, W.W. 1912. 'Snakestones' and stone thunderbolts as subjects for systematic investigation. *Folklore* 23: 45–80.

Skibo, J.M., Malaine, M.E. & Drake, E.C. 2009. Stone boiling, fire-cracked rock, and nut oil: exploring the origins of pottery making on Grand Island. *The Wisconsin Archaeologist* 90 (1–2): 47–64.

Skochina, S.N. & Kostomarova, Y.V. 2016. The function of pebble-tools from Late Bronze Age sites in the Tobol forest-steppe: an experimental traceological analysis. *Archaeology, Ethnology and Anthropology of Eurasia* 44 (1): 72–81.

Smith, K.P. 2016. The colour of belief: objects of jasper, opal, chalcedony, and obsidian from the Reykholt churches. In G. Sveinbjarnardóttir (ed.) *Reykholt: The Church Excavations*: 230–42. Publications of the National Museum of Iceland 41.

Søvsø, M. 2012. The archaeological traces of childhood and youth, play and games in medieval Ribe. In M. Gläser (ed.) *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum VIII: Kindheit und Jugend, Ausbildung und Freizeit*: 525–38. Lübeck: Verlag Schmidt-Römhild.

Stark, L. 2015. Magic and witchcraft in their everyday context. Childhood memories from the nineteenth-century Finnish countryside. In A.B. Amundsen, A. Ohvrik & A. Gudmundsdottir (eds.) *Special Issue: Magic and Texts*: 125–46. ARV: Nordic Yearbook of Folklore 70.

Thomas, M.S. 2010. Potboilers reheated. *Proceedings of the Prehistoric Society* 76: 357–66.

Toms, H.S. 1932. An early bead necklace found at Higham, Kent. *Rochester Naturalist* 1932 (May): 1–8.

Tõrv, M. 2016. *Persistent Practices. A Multi-Disciplinary Study of Hunter-Gatherer Mortuary Remains from c. 6500–2600 cal BC, Estonia*. Dissertationes Archaeologiae Universitatis Tartuensis 5.

Tuuling, I. & Kirs, J. 2013. Eesti on rändkivide maa. *Eesti Loodus* 3: 20–7.

Valado, M. 2014. Identifying lightly used polishing stones: experiments and implications. In Y.M. Rowand & J.R. Ebeling (eds.) *New Approaches to Old Stones: Recent Studies of Ground Stone Artifacts*: 173–81. London: Oakville.

Valk, Ü. 1994. On the connections between Estonian folk religion and Christian demonology. *Mitteilungen für Anthropologies und Religionsgeschichte* 8: 191–209.

Veeckman, J. 2012. Archaeological evidence concerning childhood, education and recreation in medieval and post medieval Antwerp. In M. Gläser (ed.) *Lübecker Kolloquium zur Stadtarchäologie im Hanseraum VIII: Kindheit und Jugend, Ausbildung und Freizeit*: 69–80. Lübeck: Verlag Schmidt-Römhild.

Winkler, R. 1900. Ueber Kirchen und Capellen Ehstlands in Geschichte und Sage: Vortrag gehalten am 11. Mai 1894 in der Ehstländischen literärischen Gesellschaft. *Beiträge zur Kunde Ehst-, Liv- und Kurlands* 5 (1): 1–38.

Wyse-Jackson, P. & Connolly, M. 2002. Fossils as Neolithic funeral adornments in County Kerry, south-west Ireland. *Geology Today* 18 (4): 139–43.

Zurov, L. 2017. Petseri maakonna setu ja vene talupoegade ristiusueelsetest iganditest ja religioossetest uskumustest. Kivide, allikate ja puude austamisest. In T. Benfoughal, O. Fišman & H. Valk (eds.) *Inimese Muuseumi ekspeditsioonid Eestisse: Boris Vilde ja Leonid Zurov Setomaal (1937–1938)*: 251–319. Seto Instituudi Toimetised 2.