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ARCHAEOLOGICAL RESEARCH AT KAALI METEORITE CRATER

Gigantic craters are rare in the world, they are situated mainly far away from populated areas. Their majority appeared long ago, sometimes even at geological time. An exception is the group of Kaali craters on Saaremaa Island (Estonian SSR), near Kõljala. This place belongs to the former Püha (Holy) parish. As a result of natural scientific research, it has been ascertained that this group of meteorite craters consisting of eight dry craters and one main crater with the so-called "Kaali lake" (Pl. I, *1*) in the middle came into existence some 2,600—2,800 years ago, i. e., in Late Bronze Age. The southern bank of Saaremaa Island was then densely populated; 20 km east of Kaali was Asva, a well-known site of an ancient settlement, and 5 km north of Asva — one more site of Late Bronze Age (Ridala). In the 1930s there was found at Kaali a decorative pin with a disc-shaped head: the pin also belongs to Late Bronze Age. It is highly possible that the main Kaali crater, surrounded by a swell of up to 6 m in height and of a diameter of 110 m and a depth up to 16 m, was an important sacrificing place in the Iron Age. Some authors (Kovalski, Kuznetsova, Yevgenyev, Meri and others) have connected the Kaali meteorite fall with the Greek myth about the death of Phaeton, thus considering that the crater might be "Phaeton's grave".

The Presidium of the Academy of Sciences of the Estonian SSR organized, in 1976, a complex expedition which was assigned the task to carry out comprehensive research of the craters, including archaeological research [1]. An inspection of the place in the spring of 1976 showed that a fortified settlement had existed at the N—E side of the swell surrounding the main crater of Kaali. From inside the settlement was protected by a steep crater swell, and from outside — by a wall built of limestone without a binder (Pl. I, *2*). The cultural layer above the protective wall was found to be up to 3 m thick, thinning at the swell slopes. The first excavations unearthed 135 sq. m. This excavated area was 30—40 cm deep, while rather fragmentary remnants of limestone constructions and a 2 m wide stone-wall surrounding the settlement became visible.

The excavated part yielded 177 items of find material [2] and quite a number of animal bones. The majority of the finds is ceramics (300 pot-fragments all together). Most of the ceramics had a plain surface; it contained sand and disintegrated rock formations. This ceramics seem to come from the first half of the Iron Age. However, in the upper layer there were found pottery fragments which might, as their ornament indicates, come from the Late Bronze Age (the 1st half of the 1st millennium B. C.). These were low bowls, ornamented with a twisted bronze bracelet, or double-conical vessels adorned by means of finger-

[1] The management of the natural scientific research of the craters was assigned to Ago Aaloe, veteran researcher of Kaali craters, senior scientist of the Institute of Geology of the Academy of Sciences of the ESSR. The management of the archaeological research was assigned to the author.

[2] AI 4900, 4915.

tip pressures — they are often met with in the material of Asva and Ridala fortified settlements. From the same time might come some amber pieces, moulds of clay meant for the casting of thin bracelets, a fragment of a crucible for melting bronze, a fragment of a scutch for flax and mill-stones with worn-off brinks. From the upper layer of the settlement there were also found four metal items, all of silver. Three of them (2 spiral-shaped bracelets and a cord-shaped ornamented neck-ring) are evidently deposits, while the fourth (a spiral-shaped finger-ring) was found separately.

These items seem to come from the 2nd quarter of the 1st millennium A. D., and are either sacrificed or cached. This is the first case of finding items of precious metal in the Baltic sites of settlements of the older part of the Early Iron Age. Silver items are also rare in the sites of settlements that belong to the later part of the Iron Age.

The 2nd probe-digging was made in the crater at the foot of the settlement. In 1976 the level of the water being extremely low (20—30 cm deep), it was possible to dig close to the edge of the water. The dimensions of the probe excavation, situated NO—SW were 8×1 m. The depth of the excavation at the NO end was 1.5 m, at the lake end — only 1 m. In the deeper end the excavation unearthed the explosion layer covered by fine limestone gravel sediment. But at the lake side end there were found the water-line and the bank of the ancient lake, the level of which was about 0.5 m deeper than the bottom of the present Kaali Lake. The layers of the sediments of the lake, partly covered by the limestone gravel sediments originating from the time the settlement was constructed, contained much organic material (trunks, branches, leaves, moss, water plants, insects), including fractured animal bones. That year no organic material was extracted. For a ^{14}C analysis, a trunk was taken from the mud on the bank. The age of the trunk turned out to be 940±90 years B. C.

Beside the fortified settlement there have been discovered on the swell of the crater and in front of it, two iron-melting places, both at a distance of 20 m from the ends of the site of the settlement. Slag [3] gathered in the course of the excavation comes from the historic time, but it is also possible that here we have a traditional place where iron was processed at the time when the settlement existed.

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Apart from stationary research at Kaali, antiquities of the SE shore of Saaremaa were brought to light. The Kaali meteorite is supposed to have flown over this place. Digging was carried out on a lesser scope in connection with the inspection of Kahtla.

In summary of the results of the first year's research it must be said that the excavations of the fortified settlement discovered on the bank of the main crater promise to yield stabler footholds than have been available hitherto for determining the upper time limit of the Kaali meteorite fall. The rich organic sediment conserved in the lake will make it possible to reconstruct the nature of Saaremaa after the fall of the meteorite during several thousand years running, as well as the different phases of the construction of the settlement, and, by that medium, to obtain an absolute chronology. It has been decided to continue the research at Kaali.

[3] AI 4927.

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KAALI METEORIIDIKRAATRI ARHEOLOOGILINE UURIMINE

Resümee

1976. aasta kevadel moodustati ENSV TA presiidiumi eestvõttel Kaali meteoriidikraatrite uurimiseks Saaremaal kompleksekspeditsioon, mille programmis on ka ulatuslikud arheoloogilised uurimistööd kraatrite juures ja ümbruskonnas 5—10 aasta jooksul.

135 m² suuruse kaevandiga tehti peakraatrit (tahv. I, *1*) ümbritseva ringvalli kirdelõigus kindlaks väljastpoolt vastu kraatri valli rajatud linnusasula, mida piiras poolkaares kuivmüürina laotud kivitara (tahv. I, *2*). Linnusasula ülemistes kihtides leidus peamiselt rauaaja vanema poole keraamikat, sekka ka hilispronksiaja savinõukilde ning samast ajast pärinevaid valamisvormide ja tiiglite katkeid, jahvekive, merevaigutükke, luuesemete katkeid ja loomaluid. Ohvri- või peitleiuks tuleb nähtavasti pidada asula ülemisest kihist leitud metallesemeid — hõbedast kaelavõru ja kaht käevõru ning spiraalsõrmust. Võimalik, et need leiud on seostatavad vanasti Püha järve nime kandnud Kaali järve kui muistse ohvripaiga austamisega.

Kraatris veepiirile rajatud proovikaevandis satuti pronksiaegse järve kaldajoonele, mis on praegusest minimaalsest veetasemest umbes ½ m sügavamal ning sisaldab ohtralt orgaanilist ainet — puutüvesid, oksi, lehti, rohtu, sammalt ja isegi putukaid. Järvesetteid katavad ülalt linnusasulast kraatrisse valgunud setted, mis on ehitusjärkudega samaaegsed ning sisaldavad purustatud luude ja savinõude tükke. Kraatri kagukaldal avastati rauasulatus- ja -töötlemiskoht (varem oli rauasulatuskoht leitud kraatri põhjaserva taga).

Kaali meteoriidi langemise trassil ja kraatri ümbruses selgitati välja kümmekond uut kinnismuistist, mis on dateeritavad ajaarvamiseelsesse aega või üldisemalt rauaaja vanemasse poolde.

В. ЛЫУГАС

АРХЕОЛОГИЧЕСКОЕ ИССЛЕДОВАНИЕ КААЛИСКОГО МЕТЕОРИТНОГО КРАТЕРА

Резюме

Для изучения Каалиских метеоритных кратеров на о. Сааремаа весной 1976 г. по инициативе Президиума АН ЭССР была организована комплексная экспедиция, программа которой предусматривала и обширное археологическое исследование кратеров и их окрестностей.

Раскопками у главного кратера (табл. I, *1*) перед северо-восточной частью вала на площади 135 м² были раскрыты остатки укрепленного поселения, пристроенного полукругом к валу и защищенного с внешней стороны каменной оградкой (табл. I, *2*). Верхние слои укрепленного поселения содержали в основном керамику эпохи раннего железа, но изредка попадались черепки позднебронзового характера и синхронные с ними фрагменты глиняных форм для литья бронзовых предметов, тигли, костяные изделия, куски янтаря, терочники, а также кости животных.

Жертвоприношением или кладом следует считать обнаруженные в верхних слоях поселения металлические предметы — шейную гривну, два браслета, спиральный перстень — все из серебра. Возможно, эти находки связаны с почитанием Каалиского озера (раньше Святое озеро) как места жертвоприношения.

Пробный раскоп, произведенный в кратере около границы воды, позволил определить берег озера в эпоху бронзы, который располагался примерно на 1/2 м ниже современного минимального уровня воды. Прибрежные отложения древнего озера содержат много органических остатков — стволы деревьев, ветки, листья, траву, мох и даже насекомых. Озерные отложения покрыты смытыми сверху отложениями, которые синхронны строительным периодам поселения и содержат расколотые кости и мелкие черепки.

Кроме ранее известного места выплавки железа за северным валом кратера, на юго-западном берегу его обнаружено еще одно такое место.

На трассе падения Каалиского метеорита и в окрестностях Каали инспекциями выявлено около десятка новых археологических памятников, датируемых эпохой раннего железа.

Работы по комплексному изучению Каалиских кратеров предусмотрены на 5—10 лет.