Korta meddelanden

A Late Neolithic glass scraper from Berthåga churchyard near Uppsala, Sweden

In the area surrounding Berthåga chapel and churchyard, about 3.5 km west of Uppsala city centre, are eleven registered ancient monuments: graves, burnt stone mounds, and other settlement sites. Due to a planned expansion of the churchyard, a special investigation of the site was carried out in May 1995 by archaeologists of the National Heritage Board, Department of Archaeological Excavations, Uppsala (Fagerlund 1995). During the first days of work, a rounded lump of glass, about fist-sized, was found and was discarded as being apparently recent material. The subsequent find of a glass scraper initiated an intensive search for the glass lump, but to no avail.

In May 1997, a preliminary survey of the area was carried out, resulting in the recovery of fifteen glass pieces, classified as flakes and chips. Other finds included tools and flakes of flint and quartzite (Fagerlund 1999).

The glass scraper

The scraper (fig 1) has a maximum length of 4.6 cm, maximum width 12.5 cm, thickness 7 cm, and a weight of 17 g. The glass is dark yellowish green , transparent and appears to be homogeneous. A tiny stringer of translucent greyish white glass occurs near the surface. Much of the item is covered with a dull, yellowish grey coating, apparently an alteration crust. The knapping technique used to make the scraper is identical to the one used for flint and quartzite tools at the site and is typical for the Late Neolithic and Early Bronze Age (K. Thorsberg, quoted by Fagerlund 1999), c. 2350–1500 BC. The scraper was retouched with a high precision pressure technique typical for the period in question.

Age of the glass

A Late Neolithic to Early Bronze Age glass scraper recovered in Sweden would be a truly remarkable find. Determining the age of the glass was thus of paramount importance. Gamma ray spectrometry carried out on the scraper at the Studsvik research reactor by J. Chyssler revealed the presence of uranium-thorium decay series elements.

Fig.1. The glass scraper from Berthåga churchyard.

Further gamma spectrometric measurements were carried out by P. Ros, Department of Radiophysics, University of Lund. Flakes taken from the scraper were dissolved in HF/HNO_3, followed by extraction, ion exchange chromatography, electrodeposition, radon bubbling (for ^{226}Ra) and alpha spectrometry (for other isotopes). The following results were obtained: ^{238}U 0.82, ^{234}U 0.82, ^{230}Th 1.1, ^{226}Ra 2.9, and ^{210}Pb 3.1 mBq, after correction for a blank sample. The results indicate near-equilibrium conditions for uranium and thorium as well as an excess of radium. As the starting composition with respect to radioelements remains unknown, no precise age determination can be made. However, the glass has to be at least several hundred years old.

Chemical composition

Analyses of a splinter from the back of the scraper with the electron microprobe at the Insti-

Weight-%	Berthåga glass scraper Mean	Std. Dev.	1	2	3	4	5
SiO_2	54.85	0.60	55.86	56.34	55.23	73.80	79.30
TiO_2	0.15	0.02	0.22	0.05	0.53		0.80
Al_2O_3	6.14	0.08	2.50	6.41	10.04	13.70	11.20
FeO tot.	1.16	0.04	0.82	0.15	7.94	2.30	2.37
MnO	0.70	0.03	1.28	0.71	0.42		0.11
MgO	3.21	0.03	4.06	2.62	2.91	0.12	1.30
CaO	21.66	0.23	23.69	20.48	14.48	1.00	1.92
Na_2O	2.79	0.09	2.58	1.72	1.84	4.80	0.51
K_2O	5.36	0.06	5.10	4.24	4.79	4.00	3.00
P_2O_5	2.22	0.12	3.34	3.92	1.80		
Cl	0.46	0.03	0.40				
Total	98.70		99.85	96.64	99.98	99.72	100.51

1 Medieval potash-lime-glass, average of 30 analyses (Wedepohl 1993)
2 Greenish window glass, Hessen, manufactured AD 1090 (Bezborodov 1975:XI)
3 Light glass, Roman and/or Medieval, Pavia (B. Messinga, pers. comm. 1999)
4 Obsidian, Iceland (Barnes & Barnes 1960)
5 Tektite, average moldavite (Barnes & Barnes 1960)

Table 1. Chemical composition of the Berthåga glass scraper (electron microprobe analyses; average of 8 analyses, except for Cl: 4 analyses) and five comparative glass compositions. — Den kemiska sammansättningen hos Berthågaskrapan och fem jämförelsematerial från olika tider och platser.

tute of Earth Sciences, University of Uppsala, showed the glass to be very homogeneous as is indicated by the low standard deviations (table 1). The principal chemical characteristics are: relatively low silica contents, high calcium contents, moderately high potassium and sodium contents, and about half a percent of chlorine.

This composition clearly excludes natural glasses. Both obsidian and tektites (analyses 4 and 5, table 1) have significantly higher silica contents and calcium contents of less than a tenth of the one found in the Berthåga scraper. The same differences apply even more accentuated for desert glass or fulgurites (often, almost pure quartz glass). Thus it is concluded that the Berthåga glass was man-made, most likely from a mixture of sand, plant ash, and lime. In order to explain the chlorine contents, the plant ash would have been derived not only from wood but also grasses (e.g. wheat) or ferns (see analyses of plant ashes in Bezborodov 1975).

The homogeneous composition as well as the absence of any major air bubbles suggest that a skilled craftsman manufactured the glass.

Discussion

The glass scraper from Berthåga churchyard has been dated to the Late Neolithic or Early Bronze Age, both by the techniques used and by the archaeological context. Glass tools recovered at Stone Age sites are very rare indeed. At the Palaeolithic site at Willendorf, Austria, green glass was found that turned out to be natural tektite glass (Bezborodov 1975), a material formed by meteorite impacts and used occasionally throughout the Mesolithic. Obsidian has been used for tool production since the Lower Palaeolithic (Bezborodov 1975). However, there seem to be no certified occurrences of man-made glass from the Stone Age.

Glass has been produced since the 18th century BC; the first recipe for glassmaking was found in the library of Assurbanipal (Bezborodov 1975). However, all ancient and Roman glasses are soda glasses (Bezborodov 1975, Wedepohl 1993), typically containing about 65-70% silica, 6% calcium and 16% sodium. Consequently, the hypothesis of the Berthåga glass as import goods, e.g. from the eastern Mediterranean, can be ruled out.

Medieval glasses have high calcium contents, and some of the compositions show distinct similarities to the Berthåga glass (analyses 1 and 2, table 1). Could the glass scraper represent a lump of Medieval glass, knapped into a scraper by some practical joker? Probably not. The knapping took place some time ago, as the alteration crust covering much of the object takes time to develop. Pressure flaking and retouching techniques, on the other hand, were only reconstructed by archaeologists fairly recently.

If the Berthåga scraper does not represent an import from the Mediterranean, and is not a recent fake made of Medieval glass, we are left only with the option of prehistoric glass production. The glass would then represent a discovery of the process, independent of the glass production in the eastern Mediterranean. Abundant chips and flakes of glass at the site indicate that the scraper (and other glass tools?) was made at Berthåga. Whether or not the glass was a local product, or if the material was imported from elsewhere (much like the flint that probably derives from southern Scandinavia) must remain an open question.

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