The Snartemo/Kempston problem
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The Snartemo/Kempston problem

By John Hunter and David Sanderson


This paper deals with analyses made on fragments of glass beakers found at Helgo in Sweden and Spong Hill in Norfolk, England by both energy dispersive x-ray fluorescence and neutron activation. The beaker types considered are of Snartemo and Kempston types, respectively.

Significant differences in the content of minor and trace elements have been discovered which separate the two beaker types and can be interpreted as implying the use of different sands and possibly different de-colourants. It is felt that these discrete compositions imply the use of geologically different raw materials within the same overall tradition of glassmaking. It is not possible to identify specific locations of manufacture for either group, and therefore one cannot dismiss the possibility, however remote, that the Snartemo group is of Scandinavian origin.

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The typologies of early post-roman glass vessels in N. W. Europe have been reasonably well identified on both sides of the North Sea. The British series, first collated over 25 years ago (Harden 1956) has required little amendment since that time, and more recent papers (Harden 1978, 1980) reflect both the general paucity of new material and the likely accuracy of Harden’s earlier study. In part the lack of new British material has been brought about by the shifts of archaeological research objectives towards urban contexts (for example Winchester, Lincoln and York) from which surviving glass is invariably fragmentary and insusceptible to any visual typological analysis. Britain’s corpus of complete glass vessels is largely the product of pagan funeral depositions which in common with the rest of Christian Europe terminated during the seventh century. Beyond that time glass remains are few and apart from the sporadic geographical occurrence of ecclesiastical window glass the only available corpus of material (mid 7th to 9th century) of any contextual value is fragmentary and from the town of Saxon Southampton (Hunter 1980).

In Scandinavia the progress of Christianity was delayed and there was consequently a lengthier tradition of inhumation burials and therefore associated glass in complete form. While the later roman and earlier migration period glasses have been covered on a broad Scandinavian basis, (Ekholm 1958), glasses for example glasses from the Swedish Vendel period (Arwidsson 1942) or those belonging to the later centuries of the millennium in Norway (Hougen 1968). To some extent this fragmentation has been brought about by the presence of quantities of period glasses occurring in specific excavations, such as at Birka (Arbman 1943) constituting a corpus in their own right. Nerman’s work on Gotlandic material (Nerman 1935, 1969) had a similar effect in placing individual vessel types in a closely-defined chronological and geographical context.

However, considering Scandinavia’s uni-
queness in N. W. Europe in yielding a complete typological range of vessel forms from throughout the millennium it is still remarkable that there is no published seriation of types or even updating of existing works. In common with Britain this is likely to be partly a reflection of a trend towards the excavation of settlement sites such as at Helgö, Ribe or Kaupang where the quantities of glass material are in a fragmentary condition and are largely incompatible with the traditional typological approaches as applied to complete vessels. The problem of fragmentary material is a formidable one with an estimated 65% of all Scandinavian glass material being in that state (Hunter 1977).

The main production centres of the previous roman glass industry lay in the Rhine/Seine/Low Countries region and earlier work has suggested continuity into the post-roman era (Chambon and Arbman 1952). As a result it has inevitably been assumed that the glasswares which reached both Britain and Scandinavia were of a common source and that this system of manufacture and distribution continued throughout the millennium. The interpretation is based on distribution figures and general comparability of types and is one which emphasises Scandinavia’s importance as being the only area to exhibit those types used in other parts of Europe after the 7th century. As such Scandinavia’s position in early glass history cannot be overstressed.

The interpretation of this monopoly held by the continental houses becomes less acceptable in the later centuries of the millennium with the general spread of technological development, particularly with regard to ceramics and metallurgy. Archaeological evidence for the growth of glass production (as opposed to glass working) at this time has been confirmed, for example at Szczecin, Poland (Dekowna 1973) and to a more ambiguous extent at Glastonbury England (Radford 1958), although the extent to which any operation was commercial remains another matter entirely. York too, has recently yielded remains of glass manufacturing activity although it appears questionable as to whether this is of Roman or post-roman date (P. V. Addyman pers. com.).

Distribution of glass of the pagan period in Britain closely adhers to a pattern indicative of continental import and is in the most part restricted to eastern and south-eastern regions. It bears a close relation to population movement and to the distribution of other continentally derived or inspired artefacts, notably decorated metalwork. This itself should not necessarily preclude manufacture from within the area of distribution, and at a time of relative economic and political stability in which other crafts were known to have developed (for example that of the goldsmith) such a suggestion is by no means improbable. Much the same can be argued for Scandinavia although variation in burial practice at both chronological and regional level has the effect of distorting distribution values. This potential distortion has been observed in a review of Scandinavian trade relations (Bakka 1971) and an evident distribution shift from North Sea trade to a route through the Baltic is likely to be false. Nevertheless it is not possible to dismiss the close correlation at all periods between glass vessels and associated artefacts of known continental import. Nor can the likelihood of a possible manufacturing centre lying within a Scandinavian area of distribution be dismissed immediately.

From roman times onwards until the end of the millennium the composition of glass remained remarkably consistent. Turner’s analyses of glasses over a broader chronological range (1500 B.C. to A.D. 1400) have shown the existence of a wider range of glass types and his work was partially successful in relating compositional type to possible raw materials which included natron as a likely alkali source (Turner 1956). Similar work was carried out by Geilman with particular regard to the analysis of raw materials which included both natron and wood ash (Geilman 1955). Apart from brief and often inaccurate statements in classical literature (for example Pliny) the availability and use of natron is little recorded and even today deposits of this soda-rich evaporite are un-
known outside the eastern Mediterranean, although deposits are known in Africa. Analyses of glasses from both Britain and Scandinavia in the first millennium undertaken by the authors have indicated the possible use of natron at this time as a fundamental constituent (Sanderson and Hunter 1981) and have emphasised the compositional differences between such glasses and those glasses manufactured using other alkali sources such as wood or marine plant ash. 'Natron' glass is characteristically of low magnesium/potassium content and appears almost without exception in N.W. Europe until the end of millennium and the advent of the forest glass houses. Earlier work by the authors investigated the compositions of other possible alkali sources including beech and oak ash and seaweed (fucus serratus) as recorded in mediaeval glassmaking manuals and observed a high degree of compositional variation not only within individual alkali types but also as a result of methods of sample pretreatment (Sanderson and Hunter 1981 a). However, unlike these organic materials whose composition is to a large extent dependent on environmental and soil conditions, geologically derived materials such as natron may be compositionally more consistent and this could account for an overall major element consistency of glasses of this period.

The attribution of natron as the alkali source implicitly assumes a degree of trade contact with the eastern Mediterranean and while this may be an acceptable assumption during the life of the Empire, such contact becomes less credible in the later context of barbarian-consolidated Europe. However in the absence of any other identifiable natron substitute of similar composition the questionable feasibility of continued trade with the East must to a large extent be accepted on the weight of analytical evidence from several hundred different glass items undertaken or collected by the authors.

The range of problems covering manufacture, distribution and trade is considerable in early glass studies and potential solutions may lie in the complementary use of analytical data with the more traditional approaches. One outstanding example of an existing difficulty can be seen in the problematic interpretation of the Snartemo/Kempston groups of vessels whose typological characteristics have been the subject of early discussion (Bjorn 1929, Shetelig 1925). These groups which represent a major exception in generally comparable typologies of vessels between Britain and Scandinavia belong to the tall beaker series of the fifth and sixth centuries. Their interpretation has been comprehensively reviewed in recent years (Evison 1972) and is based on clearly defined typological and distributional differences. The Kempston types (Fig. 1) are tall footless conical beakers of thin glass decorated with narrow horizontal trailing applied below the rim and with vertical looped trails applied to cover the remainder of the body with the loop ends terminating at the base. In comparison the Snartemo types (Fig. 2) are in general less conical and squatter and exhibit feet or small circular standing areas. The decoration is similar but executed using broader trails. In both cases there is considerable variation in the density and width of the trailed zones and the decorative form itself is one widely used on other vessel types of western origin. A major difference between the two, however, is in the substantially thicker vessel walling of the Snartemos. Variation within given types is inevitable with blown vessels but the overall differences between the two types are especially significant considering the similar position taken by each in a seriation mostly common to both Britain and Scandinavia. The difference between the two is not simply one of degance and execution of manufacture, but also one of character. There is for example an obvious discrepancy in proportion. The height to rim diameter of the Kempston type is an approximate ratio of 3:1 as opposed to approximately 2:1 for the Snartemo type.

These specific differences are emphasised by distribution patterns. The Kempston types have been listed by Evison who identified examples from England, Germany, Belgium, France, Holland and Czechoslovakia (Evison
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The Snartemo types (Rademacher 1942) have been listed most recently by Bakka and lie within Belgium, Holland, Germany and Czechoslovakia but with the great majority being within Scandinavia (Bakka 1971). While the two distributions show a degree of commonality on the continent, there are no examples of the Snartemo type in England, and, with one exception, no Kempston types in Scandinavia. The exception is a fine example discovered in occupation debris in Dankirke, Denmark (Thorvildsen 1972). The clear distribution difference between English and Scandinavian versions has been held to indicate a specific manufacturing and marketing tactic by which thicker tougher wares were produced specifically for export to Scandinavia. This has recently been reaffirmed by Bakka but no satisfactory explanation has ever been offered as to why no other vessels type received similar treatment or followed a similar distribution pattern.

The distribution of both types is based mostly on complete or near complete items and may be supplemented by including some of the less dubious pieces from cremation burials and more recent fragments from settlement sites. Important items are those from the excavations at Helgö, Sweden and the pagan cemetery at Spong Hill, Norfolk, England. Both these sites supplied the material analysed below. Although the glasses were in a fragmentary condition there was no doubt that they belonged to Snartemo.
Fig. 3. Oxide weight percentages and parts per million (PPM) concentrations for elements analysed. — Viktprocentersandelar avseende metalloxider samt PPM-halter i analyserna.

<table>
<thead>
<tr>
<th>Element</th>
<th>SNARTEM (Helgö)</th>
<th>KEMPSTON (Spong Hill)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Oxide Wt %</td>
<td></td>
</tr>
<tr>
<td>Na₂O</td>
<td>19.8</td>
<td>19.8</td>
</tr>
<tr>
<td>MgO</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Al₂O₃</td>
<td>3.6</td>
<td>3.1</td>
</tr>
<tr>
<td>SiO₂</td>
<td>63.2</td>
<td>63.3</td>
</tr>
<tr>
<td>K₂O</td>
<td>0.5</td>
<td>0.7</td>
</tr>
<tr>
<td>CaO</td>
<td>6.0</td>
<td>6.6</td>
</tr>
<tr>
<td>TiO₂</td>
<td>0.97</td>
<td>0.57</td>
</tr>
<tr>
<td>MnO</td>
<td>3.40</td>
<td>3.35</td>
</tr>
<tr>
<td>Fe₂O₃</td>
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<td>1.72</td>
</tr>
<tr>
<td>CuO</td>
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<td>0.01</td>
</tr>
<tr>
<td>ZnO</td>
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<td>0.01</td>
</tr>
<tr>
<td>PbO</td>
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<td>0.005</td>
</tr>
<tr>
<td>SrO</td>
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<td>0.060</td>
</tr>
<tr>
<td>PPM</td>
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<tr>
<td></td>
<td>Cs</td>
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<td></td>
<td>Hf</td>
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<td></td>
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<td></td>
<td>Sb</td>
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<tr>
<td></td>
<td>Cr</td>
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<tr>
<td></td>
<td>Ce</td>
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<td></td>
<td>Eu</td>
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<tr>
<td></td>
<td>La</td>
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</tr>
<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>Pa</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>Np</td>
<td>(0.3)</td>
</tr>
</tbody>
</table>

Figures in brackets represent minimum detectable levels.

and Kempston vessel types respectively.

Samples of each were selected and analysed by both energy dispersive x-ray fluorescence analysis and neutron activation analysis. The subsequent data showing oxide weight percentage and parts per million (ppm) concentrations for the two methods respectively are presented in Fig. 3. As far as major elements are concerned all the glasses are of the soda-lime-silica type and with the possible exception of Spong Hill No. 1911 all are of the type whose composition is consistent with the use of natron as an alkali raw material. The exception has a higher potassium content than might be expected but not the higher magnesium content that would associate it with glasses made with the ashes of marine or woodland plants. It varies significantly from the rest of the Spong Hill group in the concentrations of several elements and this may reflect alternative production circumstances at a level not fully seen from the samples here. This apart, there is no significant difference between the two groups in terms of the general type of alkali raw materials used for their manufacture.

However, when the minor and trace elements are examined important differences between the two groups of glass emerge and these can be interpreted as implying the use of different sands and possibly different decolourants. There are significant differences in the contents of titanium, potassium, manganese, strontium, antimony and cerium, any one of which could be used to distinguish between the groups without ambiguity. There are also overall differences in iron and

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lanthanum. Given the present state of knowledge of raw materials for glassmaking it is not possible to ascertain whether these elements entered the glass from the alkali, the sand, from decolouring additives, or indeed as contaminants from the melting process or from some other activity taking place in the vicinity. If natron is indeed the alkali source, which seems the most probable explanation in view of the evidence outlined above, then it is likely that the high titanium and iron contents of the Snartemo vessels represent the use of a different source of sand from that used to manufacture the Kempston fragments. It should be mentioned here that the titanium contents of the Snartemo fragments are higher than for any other glass examined by the authors from British contexts of the 1st millennium A.D.

The interpretation of the manganese and antimony contents is more difficult. It has been suggested (Sayre 1963) that antimony and/or manganese were deliberately added to early glasses in order to decolour the iron introduced through the sand, although objections have been raised on technological grounds (Newton 1980). The successful operation of these elements as decolourants depends both on the full homogeneisation during melting and on careful control of the oxidation-reduction conditions in the furnace. Newton suggests instead that these elements may have found their way into glass as impurities in raw materials which have yet to be identified. In this respect it should be pointed out that both groups of glass exhibited light tints (stronger in the case of the Snartemos) which seem to indicate that any attempts to use manganese or antimony as decolourants were not successful. It is not possible to say whether this represents a failed attempt at decolouring or merely the presence of impurities in the raw materials. The antimony content of both groups, is in any case too low to be seriously considered in this respect, although its origins in the Kempston cones in concentrations 100 times greater than in the Snartemos is problematic.

Similar problems of interpretation apply to the trace elements, information about which is not yet commonly available in the literature on early glass. Fig. 4, however, illustrates one of the several pairs of elements that may be used to discriminate between the two glass groups discussed here.

In summary the samples examined can be shown to have discrete compositions and although there are outstanding difficulties in making definite assignments of raw materials to them, it is felt that they imply the use of geologically different raw materials within the same overall tradition of glassmaking. It can therefore be argued when the archaeological evidence is taken into account that these two vessel types while having certain visual features in common, could be the products of two distinct glassmaking centres. Perhaps they represent the products of different houses whose distribution area, rather than being selected (i.e. by sending thicker tougher vessels to Scandinavia) was imposed by geographical position and existing alignment of trade movement. It is not possible to identify specific locations of manufacture for either group, and therefore one
cannot dismiss the possibility, however remote, that the Snartemo group is of Scandinavian origin. Further analytical work is being undertaken on other vessel types from this period (notably claw and funnel beakers) and it may therefore be possible to associate other vessel types with one or other of these two groups of samples on analytical grounds.

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References

Arwidsson, G. 1942. Vendelstile, Email und Glas.
Problemet Snartemo/Kempston


Prov har gjorts på fragment av Snartemobägare från Helgö i Sverige och av Kempstonbägare från Spong Hill i Norfolk, England. Analys gjordes medelst röntgenfluorescens och neutronaktivering. Resultatet härav visas i fig. 3.

Speciellt intressant är att man härigenom kunde fastställa signifikanta skillnader beträffande förekomsten av biämnen och spårämnen som titan, kalium, mangan, strontium, antimon och cerium, vilka kunde utnyttjas för att skilja grupperna åt (fig. 4.). Man skulle kunna tolka detta som beroende på att man använt olika sandarter och möjligen också olika sorters afvägningsmedel. Tolkningarna är komplicerade men resultatet tyder på att man använt råvaror av geologiskt sett olika ursprung men ändå arbetat inom samma hävdvunna tillverkningstradition.


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