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‘All in a day’s work’? The colourless cylindrical glass cups found at Stonea revisited

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Introduction

A programme of analysis of Romano-British vessel glass has been carried out at the British Museum, and this will be published as part of the forthcoming catalogue (Price forthcoming). The results from Stonea, however, are of such interest that they merit separate publication, as they have significant implications for the ways we study and interpret glass finds. This note has therefore been written for our friends Don and Catherine, in the hope that it will entertain them, in admiration of their distinguished contributions to the study of material culture in the Roman world, and with thanks for the help and encouragement they have given to us over many years.

The Site and the Finds

Stonea Grange, a rural settlement in the Cambridgeshire Fens to the south east of March, was excavated by Tim Potter and Ralph Jackson of the Department of Prehistoric and Romano-British Antiquities in the British Museum between 1980 and 1985. A detailed publication has since appeared (Jackson & Potter 1996, 61-749) and the following paragraphs about the site and finds have been abstracted from it to provide background information.

The settlement, which was established on a ‘greenfield site’ in the late Hadrianic or early Antonine period, around AD 140, was unusual in form, being divided into two sectors by a north-south ditch system (cf. Fig. 2). The west sector contained a large rectangular stone building complex with a tiled roof, hypocausted rooms, mosaic floors, painted wall plaster and glazed windows which was sited in open ground. By contrast, the east sector was laid out in blocks with a basic street grid and was densely occupied, each block containing thatched timber buildings, some with painted wall plaster and glazed

windows, and neat arrangements of wells, latrines and rubbish pits.

In the 2nd century, the settlement appears to have had an official function and may have been an initiative of the Roman state, with military involvement. It has been interpreted as an administrative and market centre on imperially owned land which was not successful, since the monumental building complex was completely demolished in the Severan period, around AD 220. Although part of the population remained and there are indications that after a long period of decline the settlement was again thriving in the 4th century, the post-Severan occupation will not be discussed in this note.

The quantity and variety of 2nd-century finds at Stonea make it exceptional in its regional context. Items of military metalwork were found and the assemblage of coins, which was larger and more diverse than at other Fenland sites, indicated regular use of money. Pottery came primarily from the nearby Nene Valley, although samian and other wares from sources further afield also reached the settlement, including some typically associated with 2nd-century military sites. The presence of olive oil and wine amphorae, and lentils and figs, and the use of flagons and mortaria, show that the inhabitants had Roman-style habits of eating and drinking and perhaps that they received some foodstuffs supplied by the Roman state.

Despite the range of finds, however, the inhabitants do not seem to have been particularly grand. Decorated samian and amphorae were comparatively uncommon and much of the metalwork was functional, while the decorative items such as jewellery were unexceptional in quality. In the later 2nd century fewer examples of most categories of finds were noted and some disappeared completely after the closure and demolition of the stone building complex and the dumping of stored goods into ditches and pits early in the 3rd century.

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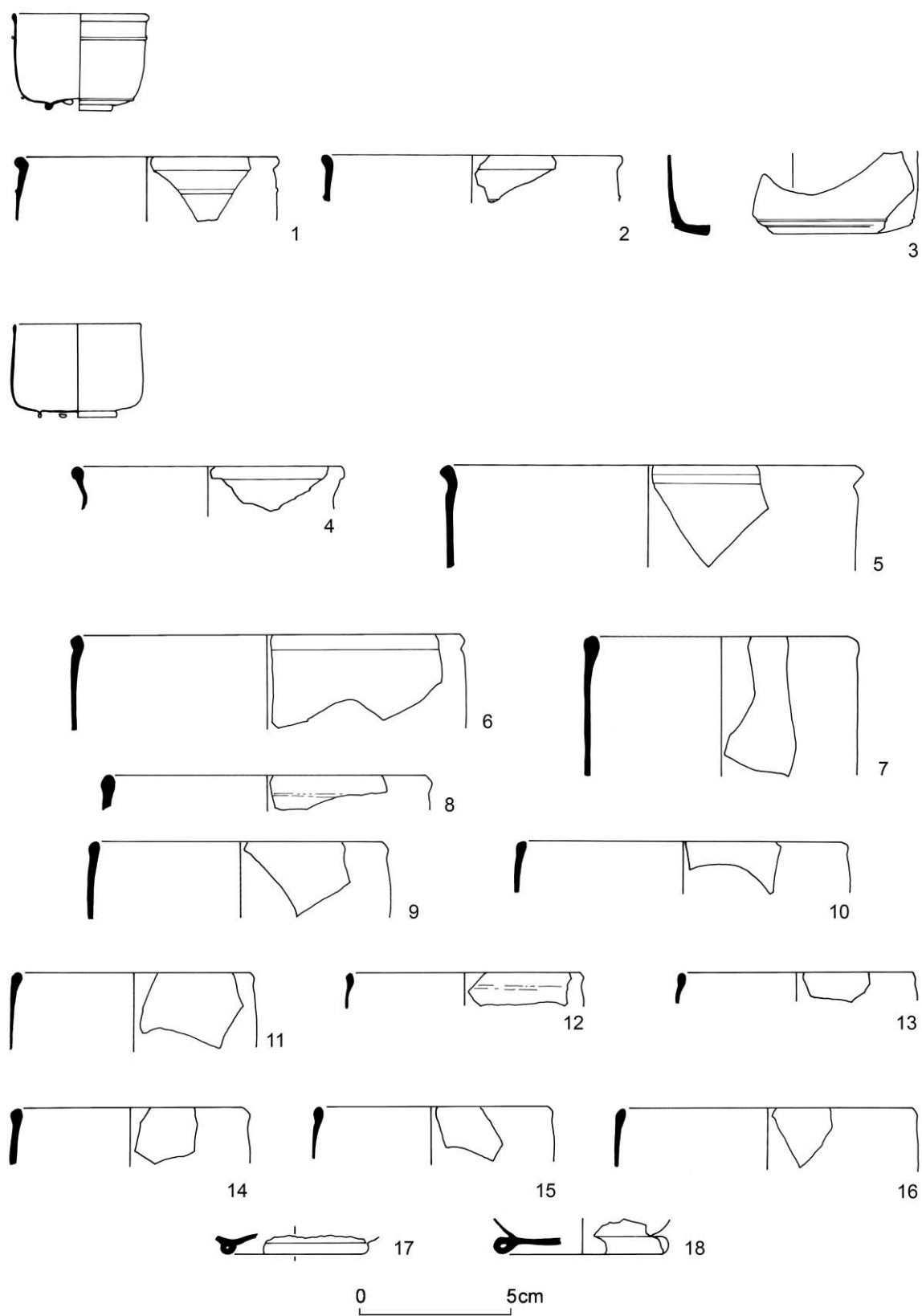


Fig. 1 — Colourless cylindrical cup fragments from Stonea; redrawn by Yvonne Beadnell from Jackson & Potter 1996, figs 126-8.

The Glass

The results of the study of the glass finds in the Stonea publication (Price 1996) supported the evidence provided by other categories of artefacts. A minimum of 58 vessels was identified, of which 42 were interpreted as tablewares, six as household and small storage vessels and ten as larger containers, although the figures for the last two groups are likely to be underestimates. All of the recognisable tablewares were of good quality rather than luxurious, and mostly for serving and consuming liquids, and the large containers were packaging for liquids or semi-liquid commodities. Overall, the vessel forms identify consumers of some affluence but not conspicuous wealth, who had Roman-style drinking habits, chose to use glass vessels and had access to supplies of some of the common forms in circulation, as well as to supplies of foodstuffs in glass containers. In addition, the Mercury bottles may have contained cosmetic or medical preparations brought to the settlement, and a bath-flask hints at a Roman-inspired activity.

The glass assemblage was dated by reference to similar material from other Romano-British sites and the evidence of other finds at Stonea to a period of approximately a hundred years from the first quarter of the 2nd century to the first quarter of the 3rd century. Two groups of tablewares were identified, although a precise chronology for the use of the glass was difficult to ascertain as few of the fragments came from deposits dated to this period.

The earlier group included cylindrical bowls and conical jugs (Price 1996, 379-82, 398-9 nos 4-7b, fig 125, and 386-90, 401 nos 37-40, 45-8 fig 129-30; cf. Price & Cottam 1998, 78-80, 152-7) already known in the third quarter of the 1st century, as well as colourless wheel-cut drinking vessels with cracked-off rims (Price 1996, 382-6, 399 nos 8-12h, figs 125-6; cf. Price & Cottam 1998, 88-9, 91-2) which appeared at the end of the 1st and early 2nd century. These forms disappeared from circulation in the third quarter of the 2nd century at most Romano-British sites, and they must have been obsolete (or greatly treasured) by the time the earliest of the Stonea finds were deposited in the Severan dumping.

The later group, which included cylindrical cups with fire-rounded rims and jugs with pulled-out pouring spouts (Price 1996, 386, 399-400, figs 126-8; cf. Price & Cottam 1998, 99-103, 159-61, 179-81) were introduced in the third quarter of the 2nd century and may have been made until around the middle of the 3rd century. At Stonea, a fragment from a colourless cup with trails was found in a late 2nd century pit and another from a blue-green cup came from silt possibly deposited at this time, while the remainder were from 3rd-4th century and later features; none was recorded in the Severan dumping deposits.

The patterns of distribution of the two groups within the settlement are distinctly different, which may have contributed to their differential survival and to the discrepancies in their dates of deposition. Many of the earlier

group came from the ditches, gullies and wells in the vicinity of the large stone building complex in the west sector, while most of the second group came from gullies and pits in the east sector, the finds being concentrated in the eastern blocks. This may point to the groups serving different users or functions, or to a change in status or in the pattern of occupation within the settlement in the later 2nd century which caused a movement of glass use from the public building complex to the timber buildings in the east sector.

Nearly all the vessels are represented by a single fragment, but within the earlier group a substantial part of the vessel has survived in four instances, three of which came from the Severan dumping. This seems to indicate that careful collection of broken vessel fragments was normal practice at the settlement, which in turn implies either that the inhabitants had links with a glass workshop in the Nene Valley or elsewhere and collected the glass for recycling there or that the glass was to be re-worked at Stonea itself, although no evidence for such activity has been found. Such organisation of collection may have been suspended when more important events, such as the closure and demolition of part of the settlement, took priority, and this might explain why glass in the Severan dumping deposits was not retrieved for recycling. A similar phenomenon has been noted in closure and abandonment phases of military sites (Price & Cottam 1998, 8), as at Usk and Inchtuthil.

The colourless cylindrical cups with fire-rounded rims

As mentioned above, the tablewares were dominated by jugs (ten examples) and cups (22 examples), and seventeen of the cups were cylindrical with fire-rounded rims (two blue-green, fifteen colourless), making them the commonest glass tableware form at Stonea (Fig. 1). Two variants occurred, with trailed decoration (nos 1-3a; four fragments from a minimum of two vessels) and without decoration (nos 4-16; sixteen fragments from a minimum of thirteen vessels). Two base fragments (nos 17-18) were also found, although these do not certainly belong to the cups.

As well as the Stonea fragments, Fig. 1 includes an illustration of a complete example of each variant, from which it can be seen that these cups had a more or less vertical rim with a thick fire-rounded edge, a straight or slightly convex side, a strong change of angle to the lower body, and a flat or slightly concave base. Undecorated cups generally had a double base-ring with a tubular outer ring and a small thick trailed ring near the centre of the base, and trailed cups had a similar base or two narrow trailed rings. They ranged widely in size, though the rim diameter of most were between 80-110 mm. The undecorated form is the commonest form of drinking vessel of any period in Britain before the 4th century and examples, often in very large numbers, are found in virtually every settlement occupied between the third quarter of the 2nd

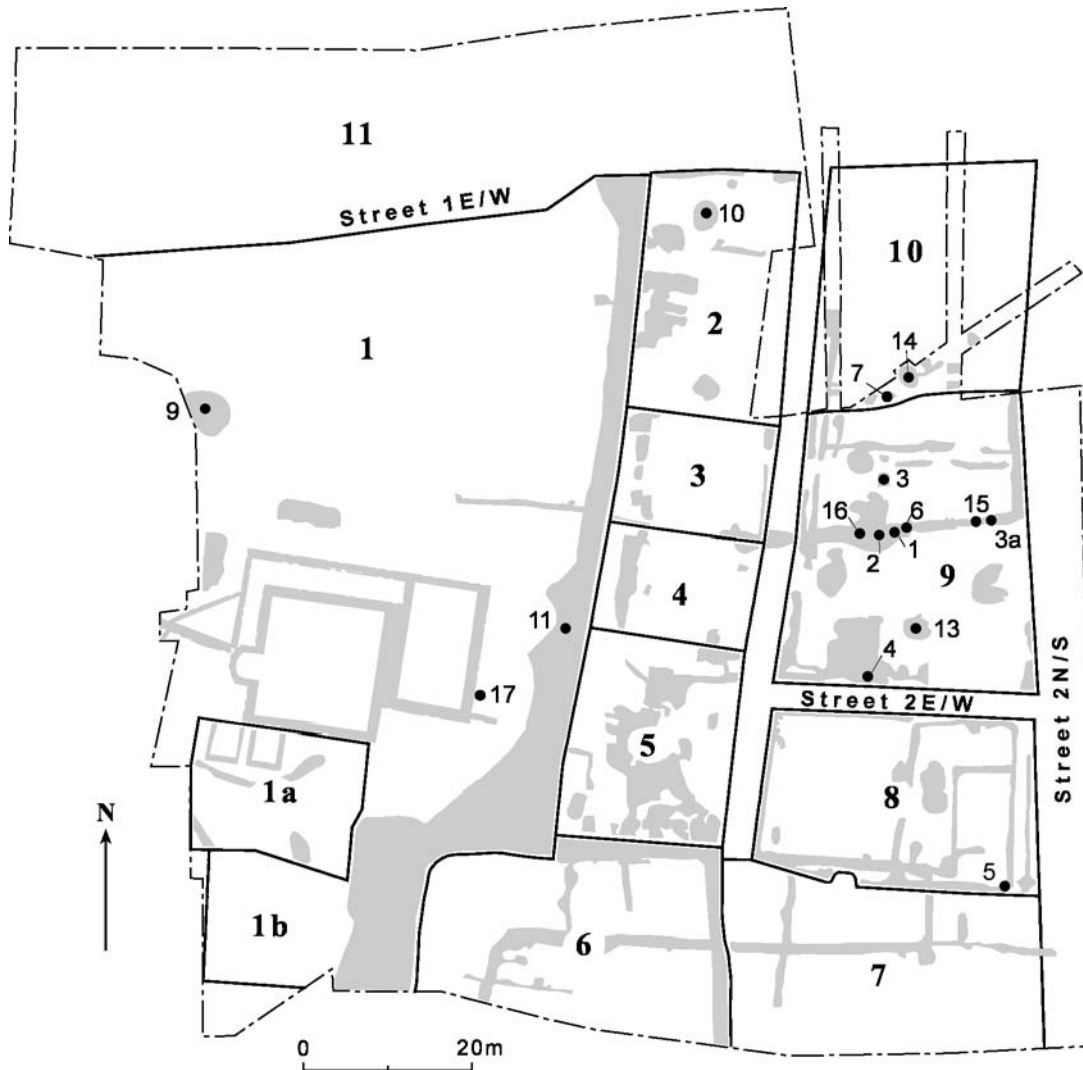


Fig. 2 — Distribution of the colourless cylindrical cups within the settlement at Stonea; redrawn by Yvonne Beadnell from Jackson & Potter 1996, fig. 24.

century and the second quarter of the 3rd century. Thus, the presence of these vessels is a strong indication that glass was being used in some quantity at Stonea in the late 2nd century, despite other evidence that finds were diminishing in quantity.

The majority of the finds were deposited in the eastern part of the east sector (Fig. 2). Nine of the fifteen securely located rim or body fragments were found in Block 9 in pits and gullies associated with the timber domestic buildings, two were found close by at the south end of Block 10 and one came from the south east of Block 8. Only two were noted in the vicinity of the monumental stone building in the west sector, and the two base fragments were also found there. Although this pattern of deposition does not guarantee that drinking from these vessels took place primarily in the domestic buildings rather than the public

buildings, that this was the case must be a strong possibility.

All but one of the cups are represented by a single rim/body fragment, which may point to their use at a time when recycling was taking place. As has been mentioned above, one fragment was found in a context dated to the late 2nd century, but the form is absent from the Severan dumping deposits.

As part of a research plan to monitor patterns of importation and local production of glass in Roman Britain and to learn more about the composition of the glasses used to form the vessels, several groups of glass from Stonea were selected for analysis, and some results of the work on the colourless cylindrical cup fragments are presented in the following sections of this note.

	Cylindrical cups		Standard RM01	
	M (19)	SD	M (14)	SD
Na ₂ O	16.06	0.11	13.39	0.20
MgO	0.42	0.04	4.14	0.05
Al ₂ O ₃	2.21	0.06	0.64	0.06
SiO ₂	71.94	0.20	72.21	0.27
P ₂ O ₅	0.06	0.05	-	-
SO ₃	0.15	0.05	0.38	0.10
Cl	1.11	0.03	-	-
K ₂ O	0.56	0.05	0.30	0.03
CaO	6.95	0.07	8.68	0.10
TiO ₂	0.06	0.04	-	-
MnO	0.20	0.04	-	-
FeO	0.28	0.05	-	-
Sb ₂ O ₃	<0.30	-	-	-

Table 1 — Composition of colourless cylindrical cups from Stonea by EDXA. Values by weight per cent. M...mean, SD...standard deviation, parentheses indicate number of analyses.

Analysis, results and interpretation

Small fragments were removed from the vessels, mounted in epoxy resin and polished using diamond pastes. They were coated with a thin layer of carbon and analysed by energy dispersive X-ray analysis (EDXA; Oxford Instruments ISIS system with a germanium detector) in a scanning electron microscope (JEOL JSM 840). Details of the technique are given by Freestone *et al.* (2000).

The mean composition of nineteen cylindrical cup fragments, with standard deviations, is presented in Table 1. Also given for comparison are the results of repeated analyses of a glass standard, RM01, using the same analy-

tical system (after Freestone *et al.* 2000). It is observed that the Stonea glasses are all soda-lime-silica glasses of the Roman type, with the low concentrations of potash (K₂O) and magnesia (MgO) that are typical of the period. The colours of the glasses are “natural” and the concentrations of colourant elements are low. The 0.2% manganese oxide (MnO) is unlikely to be natural, but this level is quite low, and may be due to the admixture of glasses richer in these components during an earlier recycling stage.

Of particular note is the very tight grouping of the cups. This is demonstrated in Fig. 3, which compares the soda and lime contents of the Stonea cups with those of 97 colourless cylindrical cups from a range of Romano-British sites (Baxter *et al.* 2005). It is observed that the Stonea glasses are very tightly clustered, relative to the distribution of vessels of a single type from a wide range of sites.

At first sight, the marked clustering of this group might not appear surprising. According to conventional models of production, glass workshops would have used different, local, raw materials and their products should be separable according to chemical composition. This scenario would seem to suggest that the Stonea cups were the product of a single workshop. However, it is now widely (although not universally) believed that Roman glass was made in large primary installations, probably located in the eastern Mediterranean, and that the raw glass so produced was broken up into lumps and distributed across the empire for re-working (e.g. Foy & Nenna 2001; 2003). If so, then workshops over a very large area may have received glass from a single primary production centre, while a single fabrication workshop could receive glass from more than one primary centre (Freestone *et al.* 2002). Such a mode of production does not obviously lead

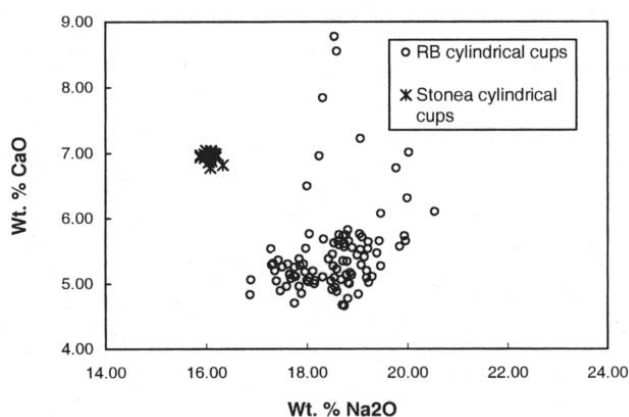


Fig. 3 — Comparison of Stonea cylindrical cup compositions with those of cylindrical cups from sixteen Romano-British sites, data of Baxter *et al.* (2005).

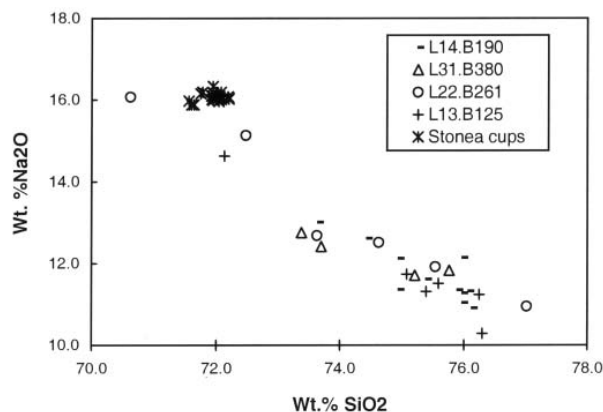


Fig. 4 — Compositions of Stonea cylindrical cups compared with the compositions of glass from four furnaces at Beth Eli'ezer, Israel.

to form-composition associations. Indeed, the key programme that has endeavoured to demonstrate correlations between form and composition has demonstrated that differences are typically tenuous (Baxter *et al.* 1995; 2005). By comparison, the tight grouping shown by the present vessels, particularly in terms of the major glass-making components soda, lime and silica, is quite remarkable.

An alternative explanation for the tight compositional grouping of the cups might be that they were produced in a single workshop over a period of time using a supply of glass from a single primary factory or furnace. Unfortunately, the putative Roman primary glassmaking sites have not yet been discovered but this possibility can be tested using data from Levantine primary glassmaking sites dating to the later 1st millennium AD (Freestone *et al.* 2000; Tal *et al.* 2004). Figure 4 compares glass compositions from four separate primary furnaces at a single glassmaking site, Beth Eli'ezer, near Hadera, in Israel with those of the Stonea cylindrical cups. It is observed that the spread of compositions produced in a single tank furnace is significantly greater than that of the Stonea cups and that the spread of compositions for the whole site is very large. The Stonea cups therefore do not represent the repeated use of glass from a single primary production site or furnace.

Our preferred and, we believe, the only realistic interpretation of the Stonea compositions is that the assemblage of colourless cups represents a single batch, or melting pot, of glass. If lumps of raw glass, or vessel cullet, are broken up, mixed and melted in a pot, then the resultant melt will tend to homogenise any original heterogeneities in the mix, a process which can be accelerated by stirring the glass. Each batch of glass has the potential to have a unique composition, depending on the combination of compositions of raw glass and cullet that is melted. If the pot of molten glass is well mixed, every vessel made from it is likely to have an identical composition. This is precisely what is observed in the Stonea assemblage. In addition to the mean compositions of the cylindrical cups and the standard, Table 1 also includes the standard deviations, a measure of the spread of the data around the mean. It is seen that the standard deviations for the Stonea vessels are comparable to those obtained on repeated analysis of standard RM01. Thus the cylindrical cups are all identical within experimental error and appear to represent the same material. This is most readily explained as a single batch of glass.

Discussion

The significance of these results is profound, as it is possible to reconsider issues such as procurement, availability, usage and chronology when the Stonea colourless cups are seen in terms of a batch. As explained, a batch is seen as a unique melting event, in one pot or small rectangular melting chamber. This group of vessels is thus likely

to have been blown by a craftsman in a single cycle of production in a very short period, possibly in one day. In turn, this implies that the group of glass cups found at Stonea was obtained either by purchase of the products of a recently-made batch from a market or glass house, or that the glass was blown on-site by a peripatetic glass-blower, specifically to order. In either case, it appears that the number of purchases or acquisitions of glass made by, or for, the occupants may have been relatively small in number and significantly less than the *prima facie* impression given by the number of glass vessels found on the site.

The idea that a substantial settlement such as Stonea obtained its glass in just a few batches between the second quarter of the 2nd century and the first quarter of the 3rd century has considerable implications for the role of glass there and may throw light on the nature of occupation in the settlement. Glass vessels may not have been as commonly used, or may have been less obtainable, than could have been expected. Why were these vessels purchased? Do they represent a specific order for a specific event or are they the 'family china' (or 'corporate entertainment') set, to be used again and again over a long period? Alternatively, they might be a hint that the settlement was occupied intermittently rather than continuously and that the colourless cylindrical cups, and the colourless jug with a pouring spout (Price 1996, 386, 390, 400 n° 31, fig. 128) which comes from the same batch, represent an episode of occupation.

The recognition that the glass on a site was acquired in specific batches may also give us insights into how glass was used. Were special sets including different forms blown to order, or were groups of glass tablewares such as cups, jugs and bowls put together from stock? Reason suggests that if matching glass was required, the sets would have been blown from a single pot whenever possible, so that their colours matched precisely, and we are now in a position to test such ideas.

What we can see in each batch of glass is an archaeological event, a single acquisition. The ability to recognise such glassmaking events should lead to refinement of the chronologies of specific glass types as the *terminus ante quem* of all of a particular batch is determined by the earliest dated example. If two products of a single batch appear in contexts of very different date, the later one must be an heirloom if it has continued in use, or it can be shown to be residual. Thus, the evidence of the colourless cylindrical cups and the jug with pouring spout shows that they arrived and were used at Stonea in the late 2nd century; they were not brought by or for the personnel who demolished the stone building in the early 3rd century.

Batches have not been commonly identified in studies of the composition of early glass. This may however, be a function of context. In a fairly isolated and short-lived official settlement such as Stonea, the number of glass batches used is likely to have been comparatively limited

and thus easier to discern analytically than in the public and residential buildings in a town. Nonetheless, the recognition of batch uniqueness has the potential to determine the minimum of batches/pots of glass used to produce the vessels, objects and window glass found in urban as well as rural sites, and could in due course lead to much greater accuracy in calculating minimum numbers. In the shorter term, we are optimistic that further analysis of glass finds from other Romano-British rural and military settlements will extend and develop our understanding of the production, supply and consumption of glass.

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