

## Chemical analysis of the Cadboll Cup and the Watson Mazer

by *Hugh McKerrell*

Two important pieces of Scottish silver, the Watson Mazer and the Cadboll Cup, are without maker's or other marks and both demonstrate features perhaps indicative of reconstruction at different times. They have recently been subjected to chemical analysis in an attempt to clarify their stylistic problems. In order to provide background data against which to compare the results of primary interest, a number of seventeenth-century silver objects, the Galloway Mazer dated to 1569, and a series of Scottish coins of the sixteenth century, were all analysed also.

It was an initial assumption that distinguishing results might derive from minor traces of impurities regularly found in early and late Medieval silver. Previous studies (McKerrell and Stevenson 1972, 195) have shown that elements such as gold, zinc, bismuth and lead, all typically present at the 0.1% level, might be useful. Lead, for example, derives almost totally from the method of manufacture of early silver, that is lead cupellation, and would probably be absent in component parts added to the objects during the last two centuries. Similarly, a general lowering of levels of gold and other minor impurities would be expected in silver of increasingly more recent manufacture. It was not expected that copper, the major alloying element always present, would prove a useful discriminatory parameter, but in fact this element became of the greatest value. Silver emerging from the manufacturing cupellation process contains perhaps only 1% of impurities, usually gold and lead. Fire assay would not (usually) remove these minor traces and they would, for most purposes of a medieval assay office, be included in the apparent silver content. To this silver, in order to effect the Sterling composition, would then be added copper. There would be no copper in the metal from the cupels and it is this additive stage that determines the quality and purity of the finished product. Adding more than the standard quantity of copper was an occasional economic necessity and such debasement has been observed, for example, during certain periods of the reigns of Eadgar and Æthelred in the tenth and eleventh centuries.

The varying standards for silver plate and coinage are well described elsewhere (Jackson 1921 and Burns 1887) and need only a brief summary here. In 1300 a statute of Edward I required all English silver wares to be of the Sterling standard (92.5% silver) and this purity was formally maintained until the 1696 introduction of the Britannia standard (95.8% silver) for wrought plate. In Scotland an enactment of James II in 1457 required a purity of 11 parts pure silver in every 12 of alloy (91.7% silver) for all wrought items. This standard was also formally maintained for some centuries, until in fact the lowering of the Britannia standard back to the Sterling level in 1720. (The introduction of the Britannia standard did not of course affect Scotland as this took place prior to the parliamentary union, but by 1720 Scotland was a part of Great Britain and her existing minimum silver standard was thus raised in that year to the Sterling level.) The formal nature of these purity levels, for Scotland anyway, needs however to be stressed. Thus the 1555 statute of Mary pointed to the great harm being done by some goldsmiths working in wrought silver, with debasement levels down as low as 50% silver. The act re-stated the 1457 requirements of a 91.7% silver content and the necessity for both makers and town marks. The penalty for deliberate fraud was death. Whatever the situation in England (Jackson (1921)

suggests the Sterling standard was maintained for all plate work) there is no doubt that in Scotland during the early to mid sixteenth century, debased silver wares were common. The overall general shortage of silver at this time is evidenced by the 'great' debasement of the English coinage by Henry VIII in 1542. In Scotland issue of good coinage was severely limited

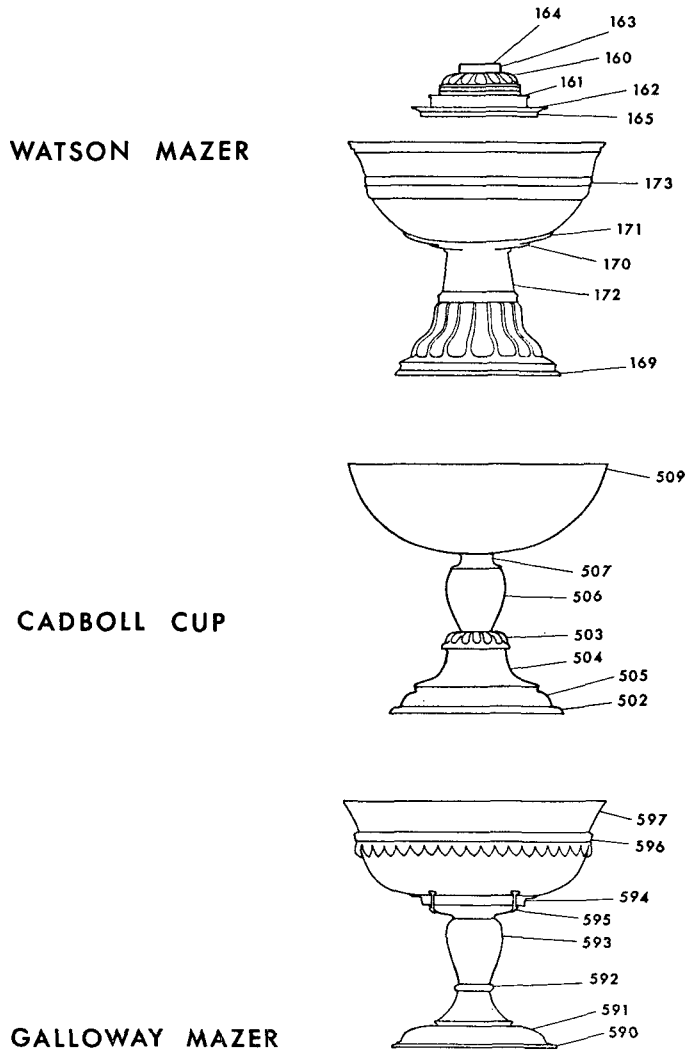


FIG 6 Sampling positions for the Watson Mazer, Cadboll Cup and Galloway Mazer (not to scale)

during the reigns of James IV, James V (when in 1526 the standard was lowered to 83.3%) and Mary during her minority, with an issue in 1555 at 75%. The English debasement lasted until 1560 though by 1552/3 the standard had been greatly improved. For the Scottish coinage the 91.7% standard was restored in 1556, and the minting of much heavier 'dollar'-sized silver began in 1565. The 1555 statute in connection with plate, the removal of the English coinage debasement by 1560 and the general increase in good silver coinage for Scotland, all combine

to suggest that debased silver plate would be a specific analytical feature for Scottish objects of before and around mid sixteenth-century date though, of course, re-use and mixed melting would no doubt be expected to blur the chronological specificity of this feature. However, after 1603, English coin circulated freely in Scotland and there was a general consolidation of standards, so that we might reasonably place debased silver at no later than the latter half of the sixteenth century and this is precise enough for the present purposes.

The first stage of the investigation thus hinged critically upon the validity of these conclusions and a careful selection was made of suitable pieces from the Museum collection to test the thesis. These, as mentioned, included the Galloway Mazer (1569) and a range of ecclesiastical and other objects from throughout the seventeenth century. Whilst it was possible to remove small drilled samples from the Galloway Mazer, and indeed was deemed desirable in view of the unsatisfactory nature of the silver for surface X-ray analysis, this was not considered for the seventeenth-century material in view of the excellent surface polish. Careful comparative work in the Museum laboratory, over a period of years, has shown the good agreement which can be maintained between such surface X-ray analyses and drilled-out specimens subjected to atomic absorption spectrophotometry. These were the analytical methods used here and will not be detailed further. For further discussion see Metcalf and Hall 1972.

There being a number of component parts to the Galloway Mazer, these were all sampled as far as was feasible. Sample locations are illustrated in fig 6 and the resulting analyses listed in Table I. The analyses and descriptions of the seventeenth-century material are listed in Table II.

Examination of these results shows clearly that all the Galloway mazer silver levels, with the exception of the rivets (a likely point of weakness and replacement), are significantly below the Sterling figure, whereas those from the seventeenth-century examples are either closely near to this figure or much higher. Qualitative analysis of about two dozen Scottish silver coins of the sixteenth century was also carried out to check the expected silver levels of around 92%. No debasement was detected.

The deductions concerning the period and limits of the sixteenth-century debasement do thus seem well confirmed and we may now proceed to see how this situation applies in the case of the two objects of interest.

The assessment by Mr Stevenson of the stylistic components of the Cadboll Cup places the foot firmly within the Scottish Mazer tradition. This conclusion is confirmed, in detail, by the analyses of the various parts of the foot. Thus fig 6 shows the various sampling positions involved and Table III lists the analytical results (determined by atomic absorption spectrophotometry). All four parts of the foot, it may be noted, are clearly debased and fall well below the Sterling silver level. We could thus, on the basis of these results, place this part of the cup to no later than the latter half of the sixteenth century.

The stem and bowl of the cup are however of better quality than the component parts of the foot and are certainly not the debased metal typical of the Scottish mazer period. This distinction again parallels one drawn by Mr Stevenson where he points to the good comparative similarity of these parts of our cup and those of some continental examples, though we have no comparative continental analyses with which to support it. However, the final assembling of the cup, when the bowl would have been joined to the stem and the latter to the foot, was carried out with debased metal, once again typical of the mid sixteenth century in Scotland. This operation would thus reasonably be placed only within this period and both bowl and stem must derive from certainly no later, and probably one and the same period. The joining together of the various parts would have been carried out in Scotland, using debased metal typical of this period. In the case of what Mr Stevenson calls the cap between the stem and the

TABLE I  
ANALYTICAL RESULTS FOR THE GALLOWAY MAZER

Sampling positions are indicated in fig 6

<i>Lab. Ref.</i>	<i>% Silver</i>	<i>% Copper</i>	<i>% Zinc</i>	<i>% Lead</i>	<i>% Gold</i>
590	87	11	0.2	1.4	0.4
591	85	13	0.1	1.1	0.7
592	80	17	1.1	0.9	1.3
593	83	14	0.6	1.0	1.6
594	83	15	0.3	1.1	0.8
595	92	8	0.2	0.1	0.1
596	86	12	0.5	1.0	0.5
597	75	19	1.1	1.5	3.6

TABLE II  
ANALYTICAL RESULTS FOR SEVENTEENTH-CENTURY SCOTTISH SILVER

<i>Description</i>	<i>% Silver</i>	<i>% Copper</i>	<i>% Zinc</i>	<i>% Lead</i>	<i>% Gold</i>
Greyfriars Cup. Thomas Clyghorne, Edinburgh 1633					
Foot	96	3	0.2	0.1	1.1
Bowl	96	3	0.2	0.2	1.2
Greyfriars Cup. Thomas Clyghorne, Edinburgh, 1633					
Foot	94	5	0.2	0.3	0.5
Bowl	Gilded				
Greyfriars Cup. John Wardlaw, Edinburgh 1644					
Foot	95	4	0.2	0.3	0.4
Bowl	93	6	0.2	0.3	0.3
Greyfriars Cup. John Wardlaw, Edinburgh, 1644					
Foot	93	5	0.3	0.5	0.5
Bowl	95	4	0.2	0.4	0.4
Greyfriars Laver. Probably 1649, renewed 1707					
Body	93	6	0.1	0.5	0.05
Handle	92	7	0.8	0.3	0.2
Greyfriars Basin. Possibly Andre Burrell, 1649	93	7	0.1	0.3	0.04
Ellon Beaker. Walter Melvil, Aberdeen, 1642					
Base	91	8	0.6	0.3	0.3
Body	95	3	1.3	0.2	0.4
Holyrood Sanctus Bell. Zacharias Mellinus, Edinburgh, 1686-7	93	6	0.3	0.6	0.4
Holyrood Chalice. Unmarked. c 1686, ? Scottish					
Foot	91	9	0.3	0.4	0.1
Bowl	91	8	0.1	0.4	0.02
Holyrood Paten. Unmarked. c 1686, ? Scottish	95	5	0.2	0.2	0.1
Holyrood Ciborium. c 1686, ? Scottish					
Bowl	92	7	0.1	0.4	0.05
Lid	92	6	0.3	0.8	0.2
Foot	96	4	0.2	0.2	0.06
Forsyth Paten. ? Zacharias Mellinus, c 1688	92	5	2.1	0.2	0.3

TABLE III  
ANALYTICAL RESULTS FOR THE CADBOLL CUP  
Sampling positions are indicated in fig 6

<i>Lab. Ref.</i>	<i>% Silver</i>	<i>% Copper</i>	<i>% Zinc</i>	<i>% Lead</i>
502	78	20	0.3	0.9
505	82	16	0.7	0.7
504	87	11	0.6	0.7
503	76	19	3.3	0.9
506	91	8	0.3	0.6
507	80	18	0.8	0.7
509	93	6	0.1	0.8

foot, the alloy used was significantly different in zinc content from the foot metal and is perhaps a pointer to a slightly different manufacturing time or workshop origin between these parts.

The traces of lead and gold entirely preclude a modern origin for any of the major parts of the Cup. A rivet inside the foot, joining this to the stem, and an obviously weak point, does however seem to be of fairly modern metal, containing 8% of copper but no detectable traces of gold, zinc, or lead.

The situation with regard to the analyses of the Watson Mazer is set nicely into perspective by the foregoing. Again, the sampling positions are indicated in fig 6 and Table IV lists the analytical results obtained by atomic absorption spectrophotometry and arc spectrography.

TABLE IV  
ANALYTICAL RESULTS FOR THE WATSON MAZER  
Sampling positions are indicated in fig 6

<i>Lab. Ref.</i>	<i>% Silver</i>	<i>% Copper</i>	<i>% Zinc</i>	<i>% Gold</i>	<i>% Lead</i>
173	81	16	0.2	3*	0.3
169	85	15	0.2	0.2	0.3
172	82	16	0.4	2	0.3
170	85	14	0.8	—	0.3
163	87	13	0.2	0.2	0.3
160	74	16	0.7	10*	0.3
161	85	15	0.4	0.2	0.3
171	90	9	0.2	1	0.1
162	90	10	0.4	0.2	0.1
165	92	8	0.2	0.2	0.1
164	94	4	0.4	2	0.05

\* Probably deriving from surface gilding

There can be little doubt, from these results, that the main component parts of the mazer, the foot, bowl metal and print mount, are very similarly debased metal and compare with that likely to be typical of the latter half of the sixteenth century. These and the other related silver analyses are illustrated in fig 7, where the distinctions already noted may be seen. The decorative stylistic clash between foot and bowl is in no way paralleled by the analyses. They suggest, instead, a fairly close contemporaneity between both these parts. This particular situation obtains also with the Cadboll Cup where, in spite of decorative and stylistic differences, there can be demonstrated to be no severe chronological distinctions between the various component pieces. In fact, an impression is gained of a perhaps somewhat casual procedure in assembling the parts of both the Cadboll Cup and the Watson Mazer.

Further demonstration of the contemporaneity of the Watson Mazer with the Cadboll Cup and other Scottish standing mazers, is afforded by the similarity between the decorative bosses on the flange joining the foot to the stem on the Cadboll Cup and those on the print mount of the Watson Mazer. These latter relate to the more elongated versions on the mazer foot and there is, as Mr Stevenson stresses, an overall connective element in most of the early Scottish mazers. The decorative bowl-rim features of the Watson Mazer also clearly relate to similar work on other Scottish mazers of the sixteenth century.

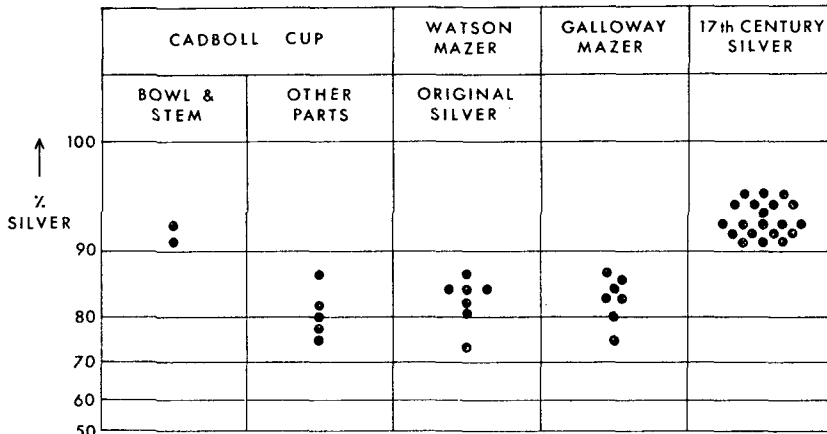


FIG 7 Silver analyses

Visual inspection shows that, initially, the Watson Mazer foot was joined to the wooden bowl by the usual riveting procedure through part 170 (fig 6). Wear or damage has led, however, to a widening of the wooden bowl's central hole with parallel extensions of the upper foot width through part 171, and of the print mount through parts 162 and 165. There is a good analytical comparison between these three parts and they are significantly less debased than the initial, earlier major components. This re-assembly of the mazer would be unlikely, on the basis of these results, to have taken place during the sixteenth century. However, equally clearly, the metal used is not in any way modern silver. With the exception then of these later parts there is nothing to suggest a date outwith the late sixteenth century for any part of the mazer.

A totally different approach to the dating of these two pieces, and one leading to similar conclusions, is illustrated in fig 8. This relates the maximum bowl diameters of date marked mazers (after How 1934, 394) as well as foot diameters, to the date of manufacture. In so far as one can attempt to relate any change in fashion to some mathematical function of time, we can conclude from fig 8 that some valid relationship does seem to exist. This being so, and without pursuing the exercise to any too narrow conclusions, we may suggest that both the Cadboll Cup and the Watson Mazer are broadly contemporaneous and would seem to be, moreover, early on in the Scottish mazer series, i.e. possibly manufactured somewhere around the middle of the sixteenth century. These possibilities are, to a certain extent, supported by the similar bold decorative bosses, already mentioned, on both objects; an indication perhaps of some close contemporaneity. Also, through these same bosses, with their connective link to a number of the other Scottish mazers, and assuming the logic of a progression from the bolder,

perhaps cruder, versions to the softer and much more decorative examples (for example on the Craigievar Mazer) we can perhaps, again, see a chronological priority for both the Cadboll Cup and the Watson Mazer.

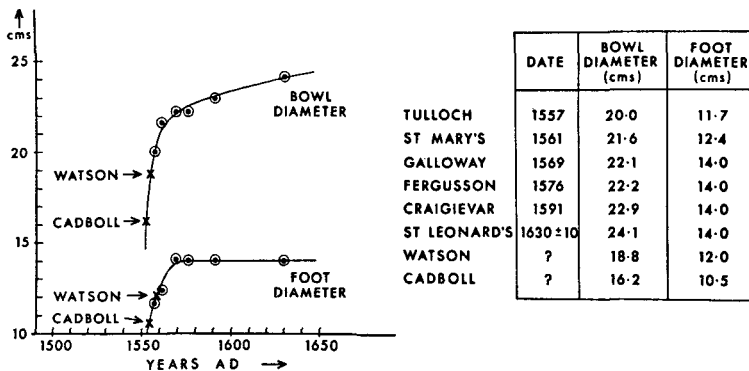


FIG 8 Dimensional changes for Scottish standing mazers

In summary, there seems no reason, from the work here described, to place the main construction of either the Cadboll Cup or the Watson Mazer outwith the latter half of the sixteenth century. Indeed, there is some evidence to suggest a more specific date towards the middle of that century. In the case of the Watson Mazer it would seem that there has been a single more recent reconstructive operation, possibly during the century following initial construction. This involved only small widening additions of silver and did not influence or change any aspect of the original sixteenth-century design.

#### ACKNOWLEDGMENTS

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