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Les deux séries, qui comportent d'autres bustes exceptionnels, ont dû être émises, la première en 302 (4^e consulat de Constance et de Galère et *decennalia* le 1^{er} mars 302), la seconde en 303 (8^e consulat de Dioclétien, 7^e consulat de Maximien, *vicennalia* de Dioclétien et Maximien ¹⁵ le 20 novembre 303).

Bien que la *Virtus Augusti* soit éternelle, les cérémonies du nouvel an ou des *vota* confirment son renouvellement pour une période déterminée ¹⁶. Le bouclier, qui, par ailleurs, évoque le *clipeus votivus*, nous fait admettre que la première série coïncide avec les *vota decennalia* des Césars et la seconde avec les *vota vicennalia* des Augustes.

Le casque radié des deux séries de *folles* semble prouver que les Tétrarques, malgré leur filiation Jovienne et Herculéenne, détiennent toujours de *Sol* pouvoir surnaturel et rôle protecteur ¹⁷.

¹⁵ A. Chastagnol, Les années régnales de Maximien Hercule en Egypte et les fêtes vicennales du 20 novembre 303, dans RN, 1967, éd. en 1968, p. 64.

¹⁶ G. C. Picard, op. cit., p. 467 et 483.

¹⁷ Cf. F. Cumont, *Lux perpetua*, Paris, 1949, p. 292.

DIE-MODULE MEASUREMENTS, AND THE SEQUENCE OF CONSTANTINE'S REFORMED FOLLES ISSUES OF SPRING A. D. 310 AND OF EARLY A. D. 313

Lawrence H. Cope

Recently ¹, I drew attention to the value of the die-module measurement for separating the similar weight-reduced folles, which possess wide and overlapping weight-distributions, into distinct groups from which it is then possible to determine the intended sequence of reductions with greater accuracy and certainty. An initial study was made of the entire long $\frac{T|F}{PTR}$ series of Treveran folles, based on the coins represented in the British Museum Collection ², and it has been since extended to include all the specimens of western-minted folles pertaining to Constantine's two coinage reforms which involved weight-reductions to $\frac{1}{72}$ and $\frac{1}{96}$ libra, respectively ³.

The results, supplemented by some assays of the coinage alloys ⁴, are relevant of the development of Constantine's monetary policies during some of the most

¹ The author, «The sequence of issues in the long T/F series of Constantinian folles minted at Trier, A. D. 309–315», SM 19, 1969, 59–65.

² I am indebted to Mr. R. A. G. Carson for providing opportunities and facilities for studying the pieces in the British Museum Collection, and for numerous discussions on points of detail which emerged during the study of the die-modules.

³ The «solidus-follis» reform of early A. D. 310; and a further reform – involving weight and module diminutions – in late A. D. 312 or early A. D. 313.

⁴ Full assays of the reduced-follis coinage have now been accumulated for over 80 separate pieces, but there are a number of lacunae still to be filled before publication of the complete work is expedient. In the present work reference is made to some of the silver proportions – which all the early folles can be shown to contain.

critical phases in his rise to supreme power, and to the interconnexion of mint-activities in his and other's territories, and to the dating of the principal coin issues and the Constantinian reforms which directly affected the Western and Central mints. Pending the die-measurement of some important rare pieces which are housed in other Collections, the present accumulation of results, and some of the tentative conclusions which might be drawn, are outlined below for the benefit of scholars who may wish to deliberate, verify, or criticise, them.

In the next issue of the *Gazette Numismatique Suisse* (19, 76, 1969, 94—98) Dr. Pierre Bastien published a lengthy and detailed criticism of my previous article. After careful scrutiny of each of his points, however, I find that there is none which would prompt me to make other than minor modifications to the original text. Some matters are certainly debatable, but they cannot be resolved until new evidence is forthcoming; others were not neglected, as Dr. Bastien supposes, but were deliberately avoided as not directly relevant to my specific purposes; yet others are answered either in full or in part in this present work, which was in manuscript form at the time but has now been shaped to deal with the major problems.

P. Bastien has provided us, in the process, with an excellent bibliography of all the important works on the subject of folles weights and dimensions. This is up-to-date — even incorporating works which were in publication at the same time as my own, but of which I was unaware. But the information they contain does not alter the findings which I have made with material of less statistical significance, but of wider provenance and representation, in the British Museum Collection.

Dr. Bastien shows that the principle of die-measurement is by no means new; and that he, and others, have made measurements of die-circles (with various degrees of precision), and have considered their implications in conjunction with weight-statistics. This is undoubtedly true, and his own contribution is outstanding: but I claim that the technique which I use for the measurement of the die-module — which I first described in *NC* 1968, p. 123 — is much more precise and accurate than that of the direct linear measurement of diameter. I locate a transparent gauge, with inscribed concentric circles, over both the obverse and reverse sides of the coin, and record the diameters of the circles which just enclose the beaded or lined extremities of the designs. This technique also allows the estimation of the die-modules of coins which are imperfectly struck, and show only a portion of the die-circle — or even no die-circle in some cases. The measurements are biased towards 0.5 mm larger than those which are centered upon the pearls, but they are more likely to be accurate with respect to the original die-circle from which hot-struck coins have contracted. No matter of great consequence hinges on this difference. I would, however, claim that the sensitivity of my method of measurement enables me to separate some issues which P. Bastien and H. Huvelin⁵ placed in the same group; but this observation is based on the assumption that all their illustrations are reproduced at exactly the same size as the coins.

The really valuable and positive outcome of Dr. Bastien's criticism is the number of matters in which it is becoming clear that there is common agreement upon conclusions reached independently by workers using different methods of approach. Among these the most fundamental are: (i) the recognition of the follis as a true silver denomination; (ii) the identification of some definite fractional-libra coinage weight-standards; and (iii) the development of criteria whereby the existing

⁵ P. Bastien et H. Huvelin, *Trouvaille de folles de la période constantinienne (307–317)*. *Numismatique romaine, Essais, recherches et documents*, V, Wetteren, 1969.

standard works of reference can be used with greater precision, and in better conjunction with each other.

While having the highest regard for the works of Dr. P. Bastien and his associates, the main points on which I must, reluctantly, disagree, concern the possible methods of coin fabrication and their influence on the determination of the most probable intended libra weight-fractions of the various reduced folles; and the dating of the $\frac{1}{96}$ libra reform. I find myself differing also in my understanding of the effects of this reform at both Ostia and Arelate, and on the inter-relationship of these two mints. On these matters I wish to offer further experimental and numismatic evidence. The numismatic evidence is of particular importance, for, using the wider range of material in the British Museum Collection, I believe that I have established that the Ostian folles issued under Constantine were minted with both $\frac{1}{72}$ and $\frac{1}{96}$ libra weight-standards, with the corresponding larger and smaller die-modules. The same can be shown to be true for the mint of Arelate. Furthermore, it is evident that Maximinus Daza was recognised on both the Roman and Ostian folles of the smaller (19,5 mm) module. Consequently, I conclude that the $\frac{1}{96}$ libra reform took place before May A.D. 313, and not after; and that the mint of Arelate was established at an even earlier date, and some time before Ostia ceased operations. Arguments are advanced in this work for the dating of the $\frac{1}{96}$ libra folles reform to the last days of A.D. 312 or to the first two months of A. D. 313.

Coin fabrication

There are three essential metallurgical criteria for any fabrication route which might be postulated as one used for minting the folles:

- (i) it must be capable of reproducing the identical, fine-grained, homogenised, argentiferous alpha-bronze, internal microstructure (with similar lead-phase distribution), which one finds in the genuine coins ⁶;
- (ii) it should reveal similar melting-loss characteristics;
- (iii) it should lead to a similar statistical weight-distribution to that of the real pieces of coinage being simulated.

Dr. Bastien ⁷ has expressed the view that the route which I have described as a probable one is altogether too long and complicated. In fact, it is the simplest that I can imagine which will result in the identical metallographic structures and weights of reproductions of the folles in their typical alloys. The simpler route suggested by Dr. Bastien is unsatisfactory; in practice it involves rather greater technical difficulties — and these can be demonstrated.

The metallurgical route which I postulated as the simplest and most economical one for the fabrication of the argentiferous bronze folles, at all stages in their size-reductions, has since been examined experimentally, by D. C. C. Potter, at the University of Surrey ⁸. I had suggested the preparation of finished coins, from the raw materials stage, by the following sequence of operations:

⁶ The author, *op. cit.* p. 60.

⁷ The author, «The Argentiferous Bronze Alloys of the Large Tetrarchic Folles of A.D. 294 to 307», *Numismatic Chronicle*, 1968.

⁸ In a final year degree project supervised jointly by Professor M. B. Waldron, Mr. E. G. Cutbush, and the author, during the summer term 1969.

I. Alloy melting — of libra quantities of base metal components and the intended investment of silver.

II. The casting of long strip-lengths; one for each libra melt.

III. Strip-length sub-division, by chopping progressively into halves or thirds (estimating length-division by eye) to produce the desired libra fractions.

IV. The remelting of the roughly rectangular fractions of the alloy into buttons, or sessile drops, of circular shape.

V. Annealing, and partial flattening to form the blank flans.

VI. Coining, by a single blow upon each heated flan, between hard-bronze dies.

By preparing one libra melts of a synthesised large-follis alloy⁹, D. C. C. Potter¹⁰ has reproduced, successfully, both the external form and internal microstructural features of the $\frac{1}{32}$ libra folles, by the proposed route. Furthermore, he has determined the most critical metallurgical stages of the series of processes, and has found means whereby several of the fabrication problems could have been overcome — using only unsophisticated fourth-century techniques. The weight-distributions of the segments, which were prepared by the strip-division technique (without recourse to weighing), were found to resemble those which have been reported for the majority of the large tetrarchic folles¹¹.

The actual weight-distribution of the large «folles» produced from three one libra melts of a typical alloy is shown in the diagram, beneath the weight-distribution of the large Treveran folles whose weights are recorded by P. Bastien and F. Vasselle in their report on the Domqueur Hoard¹². There is a remarkable similarity. The slightly wider spread of D. C. C. Potter's coin weights might be explained as due to the exploratory and inexperienced nature of his minting operations compared with those of the real mint-workers; but the statistical distributions, and the locations of the modes at similar weights beneath the theoretical norm, provide substantial evidence for almost identical oxidation losses which are characteristic of a process involving two melting stages. The achievement of identical microstructures to those of real folles is particularly convincing additional evidence of our having discovered their most probable fabrication route.

Now the weight-distributions of all the statistically-significant batches of weight-reduced folles can be shown to possess similar characteristics to those just mentioned. Thus the $\frac{1}{96}$ libra Treveran folles reported by P. Bastien and H. Huvelin range in weight from 2,2 to 4,4 g, and show a mode in the 3,2 g category; the average weight being, similarly, at about 4% below the theoretical norm. The $\frac{1}{72}$ libra folles range from 2,9 to 5,8 g. There is, therefore, a range of uncertainty of standard when one is judging from weight alone, unaided by die-module measurements; and this also applies to the folles in their earliest stages of reduction. Unfortunately the statistical representation of the so-called first and second folles reductions is weak compared with earlier and later issues. The weight-standards have been based, in these cases, on the rather unreliable average weights of small numbers of samples. Hence the proposition of a most improbable and impractical

⁹ A typical Lugduenese large-follis coinage alloy, having the nominal composition: 6,25% tin; 6,25% lead; 1,37% silver; copper — the remainder.

¹⁰ D. C. C. Potter, «Investigation into the methods of fabrication of early 4th-century Roman bronze coinage», University of Surrey, June 1969.

¹¹ C. H. V. Sutherland, «The Roman Imperial Coinage», vol. VI, 1967.

¹² P. Bastien et F. Vasselle, *Le trésor monétaire de Domqueur (Somme). Etude sur les émissions de bronze de Trèves, Lyon et Londres de la réforme de Dioclétien à 309*, Numismatique romaine, Essais, recherches et documents, II, Wetteren, 1965, p. 15 à 20.

$\frac{1}{41}$ libra standard (by Lafaurie). Even its rationalisation to $\frac{1}{42}$ libra (by Bastien) is difficult to justify either metallurgically or statistically, for the weight-range of the «1st. reduction» folles in the Domqueur Hoard is 6,38 to 8,48 g, which could just as readily match either a $\frac{1}{36}$ or a $\frac{1}{40}$ libra real standard. The «2nd. reduction» folles in the Domqueur Hoard range from 5,59 to 8,32 g. The spread is not very dissimilar, and the sample size is too small for the imagined standards to be positively identified.

It is for these reasons that in my previous work I purposely avoided reference to any of the five numbered folles weight-reductions. I do not believe that five reductions have been established. There is uncertainty of the real standards which should be placed between those of $\frac{1}{32}$ and $\frac{1}{48}$ libra. I would accept the probability of an interposed $\frac{1}{36}$ libra standard — on metallurgical and statistical grounds; but in view of the uncertainties which prevail I favour describing the weight-reduced folles by their die-modules and fractional-libra identifications rather than by a sequential number which may have to be changed; thus, for clarity and precision, we should use the term «22 mm, $\frac{1}{72}$ libra» rather than «4th. reduction». This will be of special value for separating the $\frac{1}{48}$ libra folles of different modules, and will allow any revisions of the numberings to be made, in the light of future research, with the minimum of confusion.

Die-Modules

If the demonstrably feasible minting techniques which I suggested, and which D. C. C. Potter has investigated, were in fact the ones used by the Romans for fabricating the folles of all dimensions, it becomes evident that — without any final weight-check before issue — the weights of a proportion of even newly-minted pieces (which nominally fall adjacent in the observed sequence) would have tended to overlap and to be inseparable into their proper groups except on the basis of the sensitivity of the eye to measurable differences in die-module. Although weight-statistics for the folles are still of interest, and of considerable importance, the point now established is that we cannot hope, thereby, to differentiate the various weight-reduced folles on the basis of resultant weight alone. The die-module is certainly the more precise and reliable parameter to use, in conjunction with the observed weight; and it has the practical advantage that (unlike coin weight) it has persisted as long as the coin, virtually uninfluenced by wear, and that even on mis-struck, badly shapen, or exceptionally light pieces, there is often sufficient of the border visible to allow its reasonably accurate enclosure within a concentric-circle measuring gauge.

The die-modules of the large tetrarchic folles (of $\frac{1}{32}$ libra), minted to early A. D. 307, are found to vary, somewhat, between 25 mm and 27 mm — according to the mints and dates of origin of the coins. Next, the principal weight-reduced folles of the Western and Central mints, of spring A. D. 307 to the beginning of A. D. 310 — whose weights correspond with an eventual reduction to $\frac{1}{48}$ libra — are mainly of c. 25 mm module; but in the east the contemporaneous issues to the same weight-standard tend to be slightly smaller, c. 24 mm¹³. Constantine's «solidus-follis» reform of mid A. D. 310 (which was unparalleled elsewhere in the Em-

¹³ This small difference could reflect variations in linear measurement standards throughout the empire. As with weights, there was a universal system but apparently no fixed Imperial standard against which local standards were carefully compared for precision.

pire) brought a further die-reduction (to c. 22 mm) coincident with a weight-reduction to $\frac{1}{72}$ libra. His next independent reform, of late-312 or early-313, involved the association of a further weight-reduction (to $\frac{1}{96}$ libra) with a reduction in die-module to 19–20 mm ¹⁴.

The rebellious and independent Maxentius, controlling all the Italian mints, having followed the universal change to a $\frac{1}{48}$ libra weight standard in A.D. 307, maintained this (and his alloy fineness standard) ¹⁵ until his defeat by Constantine in October 312. The less well-kept weight-standards of the Maxentian mints after A.D. 310 might now be explained as partly or wholly due to his adoption, at both Rome and Ostia, of the more highly-leaded alloys favoured earlier by the moneyers of Carthage ¹⁶. These alloys would have suffered greater melting and volatilisation losses in the alloy and flan preparation stages. Maxentius' reduced-follis coinage dies varied slightly, between 23 and 25 mm, but they appear to have been well-maintained, to October 312, at c. 24 mm, despite the die-reductions which the legitimate imperial rulers had made earlier ¹⁷ in the territories which bordered his own.

Galerius, the Senior Augustus at the time, appears to have strongly resisted following Constantine's coinage innovations in his own dominions. He minted, consistently, $\frac{1}{48}$ libra folles to the date of his death (5 May 311); these are of 23,5 to 25 mm module. It was left to Licinius, his successor in Pannonia, to effect the inevitable reduction (to 22–23 mm), at the mints of Siscia, Heraclea and Thessalonica, at least a full year after Constantine had taken this step in the west.

Maximinus Daza, who had effected his own reform (to 21–22 mm) at Antioch and Alexandria — possibly in early 311 — soon established his diminished folles at the Balkan mints of Cyzicus and Nicomedia which he swiftly included in his

¹⁴ There is some slight evidence for a reduction also in the fineness standard of these issues — to 3 scrupula of silver per libra — but some coin assays could be influenced by the segregation of the substantial proportions of lead found in some of the argentiferous bronze alloys of this period, and by an associated segregation of the silver. I have one exceptional coin which assayed 1,08 % silver in one half, and 1,42 % in the other; the difference is just sufficient to confuse the precise identification of the intended standard as one of 4 scrupula per libra, or of 3 scrupula per libra.

¹⁵ A most consistently-maintained standard of 4 scrupula of silver per libra of coinage alloy: see L.H. Cope and H.N. Billingham, *Bulletin of the Historical Metallurgy Group*, Aug. 1969; also evidenced by more recent (unpublished) assays performed for Dr. A. Jeločnik, Narodni Muzej, Ljubljana.

¹⁶ In my paper in NC 1968 I associated the folles coinage of the Gallic mints — particularly of Lugdunum — with a preference for more highly-leaded alloys than in use elsewhere at that time. More recently I have obtained an analysis of a Carthaginian follis of Maxentius (RIC VI, Carthage 60) which indicates a preference, at Carthage, for very highly-leaded alloys, c. 12 % Pb. The later coinage of Rome and Ostia, produced by the transferred mint personnel, shows a continuation of these more highly-leaded compositions. These then spread to all the western mints (including conservative London) long before the termination of the Sol coinage and the re-appearance of superior coining alloys containing less lead.

It has always been uncertain whether Maxentius removed the mint-personnel from Ticinum and Aquileia before those cities were captured by Constantine in the autumn of A.D. 312. Some of my recent analyses of Maxentian folles — in the Latin-officinae series minted at Ostia — show remarkable resemblances to alloys minted earlier at the northern Italian mints: they are much less leaded than either the earliest Greek-marked or the later Constantinian folles. The metallurgical evidence is in favour of Ostia having been founded from Carthage via the mint of Rome. Then, at the beginning of A.D. 310, there appears to have been a transfer of additional mint-personnel from Ticinum and Aquileia — perhaps coincident with the change in Ostian mint-markings.

¹⁷ Constantine, in A.D. 310; Licinius in mid-311; and Maximinus Daza (possibly in early 311).

extended sphere of influence following the death of Galerius. But his re-adoption of the Galerian CMH symbol¹⁸ on his commonest Cyzicene GENIO AVGVSTI folles, of c. mid 311—313, suggests his clear intention to uphold them as $\frac{1}{48}$ libra pieces even though they were to be subject to further slight die-diminution (to 20—21 mm) during 312 and early 313. The earliest reduced folles of Daza appear to have been made to a 3 scrupula per libra silver standard¹⁹ — lower than the contemporaneous 4 or 5 scrupula standards of Constantine, Maxentius and Galerius — and the continuation of this low standard may have enabled Daza, for a time, to maintain his $\frac{1}{48}$ libra weight standard, in the face of reductions in the rest of the Empire, without the investment of too much bullion. But, in any event, both Constantine and Licinius were then committed to their own coinage policies — in which there was undoubtedly some measure of agreement, since the folles from the Licinian mints, of c. 312, are also of Constantine's 22 mm module, and of $\frac{1}{72}$ libra weight, without any inscriptional pretence of their being heavier. The concord of Constantine and Licinius in monetary matters at this time is seen by the speed with which Licinius adopted the Constantinian folles reduction²⁰ to a die-module of 19—20 mm, at Siscia, in the early part of 313, before his almost immediate conflict with Maximinus Daza.

The economic scene of A. D. 310—313 is very much one of Constantine setting the pace, with ideas and workable monetary innovations, and with the initiative to put them into practice; and of the other rulers — with the possible exception of Licinius at a particular stage in early A. D. 313 — resisting inevitable change, in the prevailing inflationary circumstances, as long as their pride, military powers, or economic circumstances allowed. It is to Constantine's own mints, therefore, that it is most profitable to turn in order to follow the fundamental and emergent pattern of development of the reduced-weight follis coinage in the second decade of the fourth century A. D. The coin dimensions of the issues of Trier from late A. D. 309 to A. D. 313 have been already considered in some detail, and the basic pattern of reform determined. The issues of the other western mints now deserve similar examination.

Mint of Londinium

For the mint of London, Dr. Sutherland lists (in RIC VI) the first issue of SOLI INVICTO COMITI together with other types bearing the identical $\frac{1}{\text{PLN}}$ mark, bracketing these with a weight-range of 7,5—5,0 g and dating them c. autumn 307 to early 310. Thus one might be led to infer²¹ that the Sol coinage commenced

¹⁸ The CMH symbol was introduced by Galerius on Nicomedian folles in late A. D. 307. Its exact meaning is uncertain, but it matches pieces which I judge to have been minted at $\frac{1}{48}$ libra, and so I incline to Dr. J. P. C. Kent's view that its Greek epigraphy could simply mean «a standard of 48». I am still seeking one of these pieces, for destructive analysis, to determine the fineness standard adopted — since Maximinus Daza had previously used a lower standard than Galerius.

¹⁹ For typical analyses of Antiochene and Alexandrian coins see L. H. Cope and H. N. Billingham, *Bulletin of the Historical Metallurgy Group*, vol 2, Pt 1, 1968 (Item Nos. 5 and 6 in Table II).

²⁰ The IOVI CONSERVATORI (thunderbolt) issues, RIC VI, Siscia 229–231.

²¹ Despite earlier detailed and valid evidence produced by R. A. G. Carson and J. P. C. Kent, «Constantinian Hoards and other Studies in the Later Roman Bronze Coinage», *Numismatic Chronicle*, 1956, pp. 91, «... that the variety of types with mark PLN gave way to the single type *Soli Invicto Comiti* just before the end of this mark».

earlier at London than at Trier, and that it belonged there to the earlier $\frac{1}{48}$ libra folles series and not to the new $\frac{1}{72}$ libra issues connected at Trier with the solidus-follis reform. The die-modules of the two Sol pieces in the British Museum are, however, of c. 22 mm — compared with the larger (c. 24 mm) module for representative specimens of four of the other six reverse types bearing the PLN mark. It is clearly evident that the first Sol coinage had the same dimensions at London as at Trier, and that it can be accorded a similar date — later than the larger $\frac{1}{\text{PLN}}$ pieces. It belongs, also, to the $\frac{1}{72}$ libra weight standard²² matching the weights quoted in RIC VI for the subsequent $\frac{\text{T}|\text{F}}{\text{PLN}}$ series of c. mid-310. Two assays of the latter coinage²³ compare almost exactly with one of the much earlier G. P. R. issues²⁴ of London, and these indicate that the solidus-follis reform originally involved no deliberate change in alloy fineness standards at London, but only in weight and module. The new $\frac{1}{72}$ libra follis was still a «silver» piece, although containing only 5 scrupula of silver per libra²⁵.

Constantine's next reform (to c. 20 mm module) occurred in the course of the $\frac{*|\text{PLN}}{\text{PLN}}$ mark²⁶ of late 312—313 at London — the last mark here to be shared by Maximinus Daza. Of the nine reverses listed in RIC VI the majority are found to possess a 22 mm module, but the SOLI INVICTO COMITI, GENIO POP ROM, and MARTI CONSERVATORI types are also found with the module of c. 20 mm, which pertains also to the next $\left(\frac{\text{S}|\text{F}}{\text{PLN}}\right)$ series which continued to at least July 315²⁷. The $\frac{*|\text{PLN}}{\text{PLN}}$ series comprises, therefore, two consecutive issues — with different weight-standards; these equate, respectively, with the second and third $\frac{\text{T}|\text{F}}{\text{PTR}}$ issues of Trier.

Mint of Lugdunum

At Lyon the solidus-follis reform issues of c. 309—313 are clearly those which commence with the $\frac{\text{F}|\text{T}}{\text{PLC}}$ mark. A step-change down from the 25,5 mm of the preceding $\frac{\text{CI}|\text{HS}}{\text{PLC}}$ issues, to 22 mm for the three standard reverse types minted for Constantine only, is clearly defined. Although this scarce issue appears to «reflect

²² P. Bastien has also drawn attention to this (GNS Aug. 1967, p. 105, footnote 13).

²³ 1,74 ‰ and 1,76 ‰ silver; for *Soli Invicto Comiti*, $\frac{\text{T}|\text{F}}{\text{PLN}}$

²⁴ 1,84 ‰ silver; for RIC VI, London 90.

²⁵ The assays of some Treveran folles, however, indicate that the alloy standard at Trier might have been 4 scrupula silver per libra; this became the eventual standard, at all the western mints, for the $\frac{1}{72}$ libra follis (of 22 mm die-module).

²⁶ The preceding $\frac{|\text{PLN}}{\text{PLN}}$ mark, of c. mid 310 to late 312, comprises issues which are all of the 22 mm die-module.

²⁷ Since it includes the type of *Adventus Aug N*, which refers to Constantine's entry into Rome in July 315 (see Carson and Kent, 1956, p. 94); although in RIC VII the terminal date of this entire series is given as A. D. 314.

the break with Daza», before a supposed temporary closure of Lyon, the real break must have occurred much later at the Italian mints in Constantine's possession; and this characteristic lack of recognition of Daza at Lyon has, in fact, led to the inclusion of some earlier $\frac{T|F}{PLG}$ folles in a «late 314—315» group in RIC VII. At Lyon the historical division between RIC VI and VII introduces distortions to the dates of the issues, but recognition of the coin modules involved allows corrections to the reference sequence to be made. The $\frac{S|F}{PLG}$ SOLI INVICTO COMITI coinage with which RIC VII commences, is of 22 mm module. Instead of being dated to the later part of 313—314 it should now be placed much earlier in 313 (or even in 312), despite the almost inexplicable absence of Daza from the obverse inscriptions. Indeed, the subsequent $\frac{T|F}{PLG}$ series is also found to contain some 22 mm module issues ²⁸ which are appropriate to an earlier date than Professor Bruun suggests for this series. It is clear now that the 19 mm reform was effected in the course of this $\frac{T|F}{PLG}$ mark ²⁹, and therefore the two consecutive coinages in this Lugdenese series correspond with the second and third $\frac{T|F}{PTR}$ series possessing the same pair of identical die-modules.

Mints of Ticinum and Aquileia

Ticinum and Aquileia, in that order, were the northern Italian cities (whose mints Maxentius may have ceased to use for some time) which were captured by Constantine in his strategic manœuvres early in his campaign against Maxentius in the autumn of A. D. 312. It is evident that Constantine brought them both into immediate production, mainly to meet his current needs of the contemporaneous 22 mm module, $\frac{1}{72}$ libra, folles. In contrast with his practice at Lyon, and perhaps in deference to local sentiment in Italy at the time, Constantine struck a proportion of this initial coinage for Daza as well as for himself and Licinius. The scarcity of the early Aquilean pieces, and the apparent absence of 19 mm module coins ³⁰ suggest a very short period of issue — probably only while Constantine closed his attack upon Rome. But at Ticinum a clear step-change to c. 19 mm for the rare second $\frac{|}{PT}$ issues without Daza's inscriptions, and the continuance of the identical module for the subsequent $\frac{*|}{PT}$ and $\frac{|*}{PT}$ issues, reflect Constantine's continued use of Ticinum — perhaps because of its convenient proximity to the political events to be centralised in Milan early in A. D. 313.

²⁸ The types VIRT CONSTANTINI AVG, and some of SOLI INVICTO COMITI have been found — the latter in both 22 and 19,5 mm modules.

²⁹ Detected, so far, for the types of SOLI INVICTO COMITI and MARTI CONSERVATORI.

³⁰ There is, however, one 20,5 mm *Genio Augusti* coin in the British Museum Collection. It is difficult to determine whether this should be placed in the group with c. 22 mm die-module or in the c. 19 mm group.

Mint of Roma

Some of the complexity of the coinage of Rome, from 312 to 313, and the transition from RIC VI to RIC VII, can be simplified by a study of the sequence of die-modules. Following the Maxentian $\frac{\text{REP}}{\text{REP}}$ issues — which show a tendency for a diminution of module (from 24 to 22,5 mm) without any positive evidence of deliberate reduction in weight standard — Dr. Sutherland lists the $\frac{\text{RP}}{\text{RP}}$ series of Constantinian folles as earlier than the $\frac{*}{\text{RP}}$ issues, mainly on the basis of the simpler mark being the earlier. But we are then faced with having to explain a contraction in both the obverse variety and in the number of reverses for the «starred» issue at a time when Constantine's opportunities for personal propaganda, in Rome, were at their best. Even more difficult to understand is the apparent decrease in output when the need for hard cash was actually increasing; and the reason for a return to the $\frac{\text{RP}}{\text{RP}}$ mark for the subsequent *Soli Invicto Comiti* issues of smaller module. Constantine's increasing dominance, and his diminishing regard of Maximinus Daza, as revealed by the coinage, is more consistent with the placing of an emergency issue with $\frac{*}{\text{RP}}$ at an earlier date than the $\frac{\text{RP}}{\text{RP}}$ issues of greater variety. The reduction of module to 19 mm for the Sol type then becomes a natural development during the course of the $\frac{\text{RP}}{\text{RP}}$ mark. In this context Professor Bruun³¹ has previously noted the different sizes of the $\frac{\text{RP}}{\text{RP}}$ issues, when undertaking a «rough classification of the modules». I find the larger of these to be of 22 mm, and the smaller (corresponding with reverse images of Sol, and of Sol with captive) to be of 18 to 19 mm die-module. I suggest, therefore, that this is a case in which it is reasonable to disregard the usual rule for associating a more complex mark with a later date of issue.

An important omission from both RIC VI and RIC VII is the $\frac{\text{R}^* \text{P}}{\text{R}^* \text{P}}$ *Liberator Orbis* issue (in the names of Constantine and Licinius) previously listed by Dr. Kent³² and represented by two pieces, for Constantine, in the British Museum. These have die-modules of 19,5 and 20/20,5 mm, and so they belong properly to the coinage issued after Constantine's reform of late 312 or early 313: the theme is indeed, quite appropriate to the events and the political and religious outcome of the Congress of Milan in Feb. A.D. 313 — a freedom from past Maxentian tyranny, and the declaration of a new freedom from religious persecution. A revised list of the sequence of issues from the mint of Rome can now be constructed, as follows:

³¹ RIC VII, p. 284.

³² J. P. C. Kent, «The Pattern of Bronze Coinage under Constantine I», NC, 1957.

A. *Issues for all three rulers:*

- | | | |
|--|---|-----------------------|
| i) $\frac{* }{\text{RP}}$ and $\frac{ *}{\text{RP}}$ issues | } | with 22 mm die-module |
| ii) $\frac{ }{\text{RP}}$ first series | | |
| iii) $\frac{ }{\text{RP}}$ second series — with 19 mm die-module | | |

B. *Issues for Constantine and Licinius only:*

- | | | |
|--|---|-----------------------|
| iv) $\frac{ }{\text{R}^* \text{P}}$ (<i>Liberator Orbis</i>) | } | with 19 mm die-module |
| v) $\frac{\text{R} \text{F}}{\text{RP}}$ (<i>Marti Conservatori</i> and <i>Soli Invicto Comiti</i>) | | |
| vi) $\frac{\text{R} \text{F}}{\text{R}^* \text{P}}$ (<i>Marti Conservatori</i> and <i>Soli Invicto Comiti</i>) | | |

If this is the correct sequence, then Constantine made the final decision to cease recognition of Maximinus Daza, while at Rome, after the folles size-reform to 19 mm and $\frac{1}{96}$ libra. This event could have been right at the end of A. D. 312, or at the very beginning of A. D. 313, and might have coincided with his own acceptance from the Senate of the title of Maximus Augustus — to which he was not, in seniority, really entitled.

Mint of Ostia

Constantine's Ostian folles all bear the same $\frac{|}{\text{MOSTP-Q}}$ mint mark, and are almost impossible to separate chronologically except by module. The larger (22 mm module) is represented by only two *Genio Pop Rom* types in the British Museum Collection: the majority of the existing coins are of a smaller (c. 20 mm) module — for which Daza is well represented with both the *Soli Invicto Comiti* and *SPQR Optimo Principi* types. The obvious dearth of the larger-sized Ostian pieces, contrasted with the comparative abundance of similar ones from Rome, leads me to conclude that (with Ticinum, Aquileia and Rome in his possession, and with Ticinum and Rome certainly minting for him) it was not necessary for Constantine to commission the mint of Ostia immediately after its capture. There can be little doubt that, in November 312, Constantine had a surplus of minting capacity in Italy — upon all of which he had no need to draw, even when he required a greater abundance of coinage for the heavy military and civil expenditure which he incurred in Rome in December 312 and January 313. It seems reasonable to argue that, once Italy was in his possession, Constantine quickly reconsidered the locations of his mint-cities in the light of his immediate and future plans for military dispositions and military and civil commitments. Thus Ostian minting activity (after Constantine's victory) could have suffered a temporary suspense, pending eventual decisions to close Aquileia, to open Arles, and to translate all the mint-

workers of Ostia to Arles when its temporary services had met the short-term winter needs for hard cash. That the Ostian issues «extended well into 313»³³, is open to much doubt³⁴.

Mint of Arelate

Professor Bruun³⁵ has very clearly established the case for the transfer of the mint-personnel of Ostia to Arles: it is only the timing which is uncertain. R. A. G. Carson and J. P. C. Kent³⁶ thought it unlikely that Arles replaced Ostia before mid-314, on account of the time previously taken for the move from Carthage to Ostia and on the evidence of a consular bust (surely Cos III for early 313 in this case, but also found on a later coin datable to [Cos IV] A.D. 315) for the type *Utilitas Publica*³⁷ which they associated with the opening of the mint at Arles. Professor Bruun however, argued for the establishment of Arles no later than the early summer of A.D. 313. He noted the link between the earlier *SPQR Optimo Principi* issues of Ostia and those of Arles, and offered the possible explanation that Ostia was not transferred at once in its entirety, but gradually³⁸. This idea — that Arles was really founded before Ostia closed — is supported by the evidence of longer imperial legends in the first issues, and by the evidence that the gold issues give no indication of direct continuation from Ostia; they need not do so if Arles were really a separate earlier foundation.

Arles is another Constantinian mint where the complete absence of Maximinus Daza from the coinage is no real justification for all of it to be dated later than May 313. The new factor of great significance, arising from the die-module measurements, is that the first PARL issues listed in RIC VII are of the larger (c. 21,5 mm) module which Constantine minted in Italy in the Autumn of A.D. 312. The lack of recognition of Daza has led to these pieces being, hitherto, dated post-May 313 — whereas the themes of two of the types (*SPQR Optimo Principi*, and *Recuperatori Urb Suae*), as well as their modules, do point appropriately to an earlier date. The precedent observed at Lyons, for Constantine's deliberate neglect of Daza on earlier folles produced well within his own original territory, suggests that his recognition of Daza on the coins of the acquired Italian mints had more of the nature of an appeasing policy than of genuine desire.

Another important point is that the last issues of Ostia are of the same module as later issues of Arles, but of distinctly smaller module than the first issues of Arles. This seems to be the final convincing proof that Arles commenced minting well before Ostia had ceased. The die-modules and the relevant types indicate that Constantine might have opened Arles, about December 312, even before deciding to make temporary use of Ostia — with every intention of transferring all the

³³ RIC VII, p. 399.

³⁴ I support Professor Bruun's observation (RIC VII, footnote 5, p. 227) that Ostia may well have been closed by Constantine when he decided to leave Italy for Gaul in March A.D. 313 — since the need for its continuance after that date would have greatly diminished, with Ticinum and Rome operating and with Arles becoming firmly established.

³⁵ Patrick M. Bruun, «The Constantinian Coinage of Arelate», Helsinki, 1953.

³⁶ R. A. G. Carson and J. P. C. Kent, op. cit. p. 117.

³⁷ This type also has a module of c. 20 mm: but it must be of later date than the first issues (of c. 21,5 mm module) listed in RIC VII. The imagery is that of Moneta being received at her destination: this would refer better to the completion of transfer rather than the beginning.

³⁸ Patrick M. Bruun, op. cit. (1953) p. 17.

Ostian mint personnel³⁹ when his immediate local cash needs had been met. Laffranchi's⁴⁰ association of the (final) transfer with the special issues of *Providentiae Augg* and *Utilitas Publica* at Arles is quite in accord with the die-modules for these second PARL issues, which were extant in the Spring of 313.

Mint of Siscia

Although it was outside Constantine's direct influence in early A. D. 313, the mint of Siscia provides evidence of the Constantinian (19 mm) reform, in the course of the $\frac{|A-\text{E}|}{\text{SIS}}$ mark, being approved and executed by Licinius. This reduction in die-module (from c. 23 to c. 20 mm) accompanies the shortening of the reverse legend from *Iovi Conservatori Augg NN* to *Iovi Conservatori*⁴¹ and the exclusion of Maximinus Daza's inscriptions; but an even more significant indication of Licinius' changed behaviour, pending his formal agreements with Constantine, is the exclusion of Daza from what must be considered to be the earlier (22 mm module) Victory and Globe issues⁴² with the full-length inscriptions.

Mints of Heraclea and Thessalonica

There is no reduction, however, at Heraclea, to a 20 mm module, before the capture of the mint by Maximinus Daza in April 313 — nor at Licinius' other mint of Thessalonica. One might conclude that Licinius, during his short time in Illyricum following the meeting with Constantine in Milan, was unable to effect the proposed changes in minting practices at his mints beyond Siscia before Maximinus Daza moved his forces against him.

The evidence of the coinage appears to be that, even before their Milan conference, both Constantine and Licinius had already ended their formal recognition of Maximinus on their folles, and that Constantine had also faced the necessity of reducing the folles' dimensions, and of a reorganisation of his mints. It is possible that the adoption of a universal follis (of 19 mm module and $\frac{1}{96}$ libra weight standard, and with a common fineness standard of 4 scrupula of silver per libra) was mooted and agreed at the Conference of Milan; but Licinius, having introduced it at Siscia, was prevented from altering the practices at his more eastern mints by the urgent necessity to move his forces against Maximinus Daza's invading army. After the defeat of Daza, when he and Constantine alone shared the empire, Licinius, with all the acquired riches of the eastern world, tends to have thence preserved the status quo with respect to the follis dimensions at all his mints except Siscia,

³⁹ Arles and Ostia both worked in four *officinae*. Bearing in mind that Maxentius had condensed his Italian mint-activities into the two principal mints of Rome and Ostia there could have been a sufficient number of trained mint-workers available for Constantine to divide them simply between both Ostia and Arles, to operate four *officinae* at each on an output basis which gradually shifted the main production to Arles. There is considerable compositional similarity between the alloys of the later issues of Arles and Ostia; this is very strong evidence for the mint personnel having taken their preferred minting practices and metallurgical «know-how» with them.

⁴⁰ L. Laffranchi, *Rev. Belge de Num.* (1921).

⁴¹ RIC VI, Siscia 229–231.

⁴² RIC VII, Siscia 3 and 4.

and to have become increasingly independent of Constantine in monetary matters⁴³ until the final clash. Then Constantine's overwhelming victory, in A. D. 324, brought once more a monopoly in Imperial rule, and a new universal coinage into being⁴⁴.

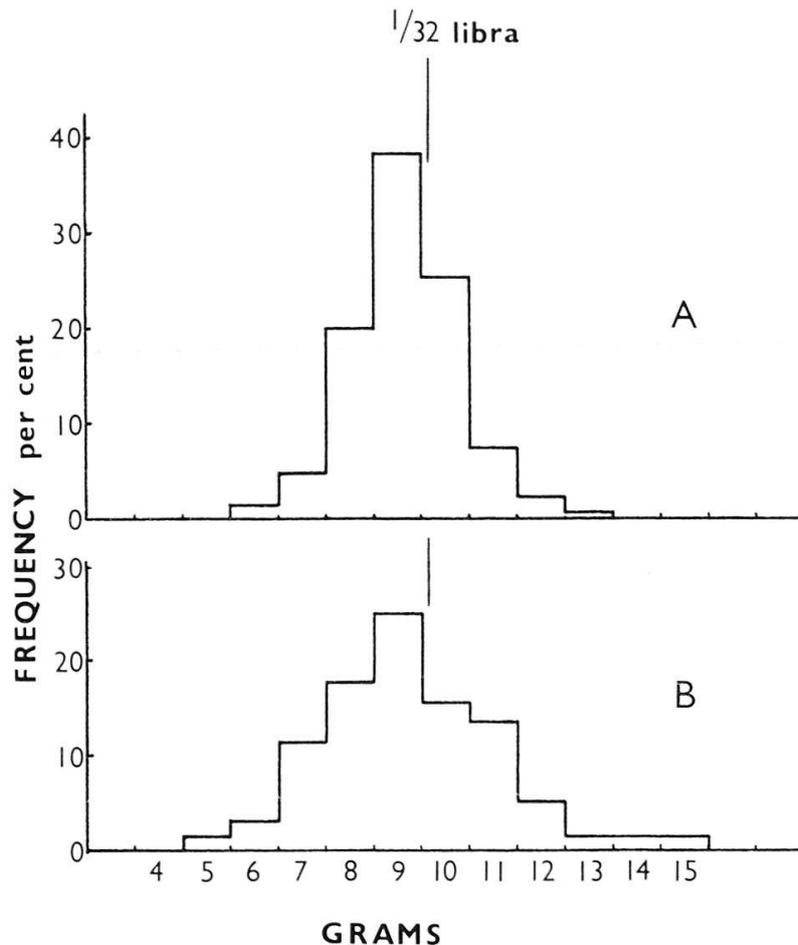
The historical developments

The events of the autumn and winter of A. D. 312—313 had a profound influence on the development of the Constantinian coinage and on the subsequent coinage of the Empire. Both Constantine and Licinius appear to have excluded Maximinus Daza from their coinages — in the mints which lay within their own unassailable territories — long before the reduction in follis die-module to c. 19 mm. This latter reform was clearly initiated and established, by Constantine, at the western and central mints to meet his own monetary needs; but the policy was endorsed and partly effected by Licinius when the two rulers were in short-lived concord. For a time, the Italian folles of reduced module continued to honour Maximinus Daza; but the alliance of Constantine and Licinius at Milan in February A. D. 313 appears to have strengthened their resolve to cease a formal minting practice which Constantine had continued as a matter of policy in conquered territory — but which neither Constantine nor Licinius had supported in spirit. The absence of Daza from the coinage does not, therefore, correspond with a precise chronological date-line for the coinage of all mints. The initial break could have come as early as Constantine's discovery of Maxentius' compact with Maximinus shortly after his capture of Rome at the end of October 312; but the evidence for a coinage size-reduction before the break with Maximinus places the final withdrawal of recognition later — but not necessarily later than the meeting of Constantine and Licinius in February 313. The heavy financial commitments in December 312 and January 313 provide good reason for placing the $\frac{1}{96}$ libra follis reduction before the Milan conference — possibly late in 312, before the main expenditure in Rome was incurred and the actual pieces were needed for payments. Neither Constantine nor Licinius had to wait for the events of May 313 before taking the common step of ceasing to recognise their rival on their coinages; and Constantine's ready arrogation of the title «Maximus Augustus» is indicative of his real sentiments in the matter.

The precise order and timing of the closure of Aquileia, the foundation of Arles, and the phased transfer of the mint-personnel of Ostia can all be explained by a consideration of the die-module measurements of contemporaneous pieces and similar types. The detailed construction of events, given above, does not appear to me to contain any objectional numismatic or historical features. A revised sequence for the Constantinian coinage of this period, which bridges the reform from $\frac{1}{72}$ to $\frac{1}{96}$ libra folles pieces and links the reference works (RIC volumes VI and VII), is proposed and given in the Appendix as a basis for refinements.

⁴³ Constantine's reform, c. A. D. 318, which involved the introduction of the *Victoriae Laetae Princ Rep*, and *Virtus Exercit* issues, of superior fineness, has no direct parallel with Licinius, but Licinius did increase the fineness of some of his *Iovi Conservatori Augg* issues at roughly the same time. (Assays to be published.) Furthermore, Licinius never adopted the gold solidus: instead he continued to mint the aurei which were currently in favour in the Balkan and eastern dominions which were not influenced by Constantine's reforms in the west. Their fairly simple weight ratios, however, would have facilitated universal exchange beyond the different rulers' territorial borders.

⁴⁴ The «solidus-siliqua-follis» system, in which the small folles still retained their «silver» denomination characteristics. A few assays accumulated to date indicate a fineness standard of 4 scrupula per libra for the *Providentiae* issues of post-A. D. 324.



A. Weight-distribution of the large Treveran folles found in the Domqueur Hoard. (Compiled from data recorded by P. Bastien and F. Vasselle, 1965.)

B. Weight-distribution of synthesised folles prepared by D. C. C. Potter according to the fabrication route postulated by the author (University of Surrey, 1969).

Résumé

L'auteur développe ses précédentes études (GNS 19. 1969, 59) de la série des *folles* de Trèves (fin 312 au début 313), en y comparant les émissions contemporaines des autres ateliers occidentaux, conservées au British Museum. Il expose derechef l'intérêt d'une exacte mensuration des coins pour le classement en différentes émissions de séries par ailleurs identiques.

Il répond aux observations si pertinentes faites par le Dr. P. Bastien à la suite de sa première étude (GNS 10. 1969, 94) et apporte de nouveaux arguments en faveur de sa thèse relative au mode de fabrication des *folles* de poids réduit.

L'auteur apporte un grand nombre d'informations historiques et numismatiques à l'appui de sa datation des *folles* frappés à $\frac{1}{96}$ de livre et la fixe entre la fin de 312 et le début de 313. Un autre point important est la démonstration que l'auteur apporte à l'appui de la thèse que l'atelier d'Arles a été ouvert vers la fin de l'an 312 pour la frappe des pièces à $\frac{1}{72}$ de livre, bien avant la fermeture de l'atelier d'Ostie et avant la réforme ramenant les *folles* à $\frac{1}{96}$ de livre dans ces deux ateliers. Un tableau de toutes les frappes constantiniennes dans les ateliers occidentaux, plus

Siscia, distingue celles émises à $1/72$ de celles à $1/96$ de livre, dont le passage de l'une à l'autre a dû survenir en février 313. Il est intéressant de rappeler que Licinius participa à la réforme et qu'il l'appliqua à Siscia avant que de se déplacer vers l'Est pour combattre Maximinus Daza. Les folles conservés au British Museum, d'un diamètre de 19 mm ($1/96$ de livre) frappés à Rome et à Ostie, semblent indiquer que la réforme y fut faite déjà avant.

Notes of the synopsis (folder):

(i) ? symbolises probable location of these issues, pending die-module measurements being made on coins not represented in the British Museum Collection.

(ii) Figures in parentheses () represent silver assays obtained by the author – expressed as a percentage of the coin alloy.

(iii) I place the unmarked issues in the Treveran series; while maintaining the possibility of their production by itinerant mint-workers accompanying Constantine in Italy in late 312 ad early 313.

SELTENE SCHWEIZER KLEINMÜNZEN *

Edwin Tobler

Wer sich mit schweizerischen Kleinmünzen befaßt, kann immer wieder freudige Überraschungen erleben. Den gröberen Sorten gegenüber, sei es in Gold oder Silber, ist die Zahl der Kleinmünztypen bedeutend größer, dennoch wurden sie bis in letzter Zeit von vielen Sammlern als Stiefkinder behandelt. So ist es auch nicht verwunderlich, daß in der Literatur in dieser Hinsicht noch manche Lücke besteht, während in den meisten Museen verborgene Schätze an Kleinmünzen liegen, und hie und da auch im Handel unbekanntere Stücke auftauchen.

Geldgeschichtlich sind diese Gepräge aber mindestens so wichtig und ebenso interessant wie die größeren Nominalen. Es waren ja hauptsächlich die Kleinmünzen, die im täglichen Gebrauch als Zahlungsmittel Verwendung fanden, die wertvolleren Münzen dienten in erster Linie dem Großhandel und waren weitgehend ausländischen Ursprungs. Natürlich zirkulierte auch fremdes Kleingeld in der Schweiz, jedoch nicht in dem Ausmaß und der Vielfalt wie bei den größeren Nominalen. In künstlerischer Hinsicht allerdings boten die gröberen Sorten, besonders die Taler, den Stempelschneidern weit mehr Entfaltungsmöglichkeiten. Dennoch finden wir aber auch bei den Kleinmünzen außerordentlich schöne Gepräge, und wir staunen, wie mancher Stempelschneider es verstand, auch auf kleinstem Raum feine und wirkungsvolle Münzbilder hervorzubringen.

Deshalb möchten wir nun den Leser mit einigen unedierten Kleinmünzen bekannt machen und zugleich einige seltene Stücke abbilden, die wohl schon beschrieben, aber unseres Wissens noch nie in photographischer Wiedergabe gezeigt wurden.

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