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A NEUTRON ACTIVATION ANALYSIS OF THE SILVER COINAGE OF ZAPATA, 1914–1915[1]

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(PLATES XXX-XXXI)

Three types of Mexican silver coins were in circulation in 1910, at the beginning of the revolutionary period:

A. The *peso fuerte* with types of facing eagle/liberty cap and rays (*resplandor*).
.9027 Ⱥ, .0973 CU; 39 mm., 27.07 gm.

B. The redesigned *peso fuerte* introduced in 1910, with types of facing eagle/liberty on horseback.
.9027 Ⱥ, .0973 CU; 39 mm., 27.07 gm.

C. The 50c, 20c, and 10c of a subsidiary silver system introduced in 1905, with types of facing eagle/cap and rays within wreath.
.800 Ⱥ, .200 CU; 30 mm., 12.5 gm. (50c);
22 mm., 5.0 gm. (20c);
18 mm., 2.5 gm. (10c).

The coinage of the large silver pesos fuertes was suspended in March, 1914; they were never struck again. The minor silver denominations, of lower alloy, were produced into September of the same year. Through the rest of 1914 and all of 1915 no silver was struck at México, the mint producing only the bronze 5c, 2c, and 1c. Not until November of 1916 was the coinage of silver resumed (and of gold, which had been suspended since 1910).[2]

As a consequence of the lack of coin, various authorities issued vast quantities of paper currency of irregular circulation and precarious value. Counterfeiting flourished, and even the genuine paper might

[1] A summary version of this paper has appeared in *The Hispanic American Historical Review*, Vol. 52 (Aug. 1972), pp. 456–462.

[2] For details see the *Memoria de la Dirección de la Casa de Moneda*, México, for the fiscal years 1913/1914 through 1916/1917.

be declared invalid overnight for political reasons. Some attempts were made to bring order from chaos by the production of coins locally, many of them imitating the Federal issues from México. These efforts were greatly complicated by the lack of proper assaying and minting facilities, and of sufficient supplies of metal. Such difficulties obtained everywhere and account for the great disparity among the various revolutionary coinages. The coins struck outside México in several areas of the Republic differ from the Federal, and from each other, in both alloy and weight. They exist in a confused variety of types, denominations and modules. Numismatists have arranged and described this material well enough, yet we often do not know all that it means—who issued it, where, under what circumstances.[3]

The silver coinage of Zapata presents such a problem. Zapata began in 1914 to provide $1 and $2 silver coins to the areas under his control. Both denominations were smaller, and contained less silver than the coins of the Republic, but their acceptance was encouraged by the announced presence of an amount of gold in each. The issues of the $2 piece exist in five major varieties:

1. *Obv.*: Facing eagle on *nopal*; above, REPUBLICA MEXICANA; below, DOS PESOS . GRO (*Guerrero*). 1914.
   Rev.: Sun and rays over mountains, of which the central peak is a smoking volcano; around, "REFORMA, LIBERTAD, JUSTICIA Y LEY"; above, ORO: 0,595.
   (9 die pairs: groups L-S 12-PLATE XXX, 12a, 12b, 12c, 12d, 12e, 12f, 12g, 12h)[4]
2. As 1 but 1915.
   (1 die pair: group 13)
3. As 1 but 1915, and on rev. below, Cº Mº (*Campo Morado*).
   (2 die pairs: groups 33, 34-PLATE XXX)

[3] The major works are, Howland Wood, *The Coinage of the Mexican Revolutionists*,[2] *ANSNNM* 38 (New York, 1928); J. Sánchez Garza, *Historical Notes on Coins of the Mexican Revolution, 1913-1917* (México, 1932); and most recently, Carlos Gaytán, *La Revolución mexicana y sus monedas* (México, 1969).

[4] The groups correspond to the varieties in Elwin C. Leslie & Erma C. Stevens, *The Coinage of the Mexican Revolutionist Zapata* ([Cleveland], 1968). The two groups in brackets were not analysed in this study.

4. As 1 but 1915, and on rev. below, SURIANA.
   (1 die pair: group 38-PLATE XXX)
5. *Obv.*: Facing eagle on *nopal*; above, REPUBLICA MEXICANA.
   Rev.: Liberty cap on rays; below, DOS PESOS. C . M . GRO . 1915.
   (1 die pair: group 35-PLATE XXX)

The Zapatista $1 issues are equally varied:

1. *Obv.*: Facing eagle on *nopal*; above, REPUBLICA MEXICANA; below, UN PESO.
   Rev.: Liberty cap and rays within wreath; around, "REFORMA, LIBERTAD, JUSTICIA Y LEY"; above, GRO. / ORO: 0,300; below, 1914.
   (8 die pairs: groups 9-PLATE XXXI, 9a, 9b, 9c, [9d], 9e, 9f, 10)
2. As 1 but 1915.
   (1 die pair: [group 11])
3. *Obv.*: Facing eagle on nopal; above, REPUBLICA MEXICANA: below, 1914 / UN PESO. Cº Mº Gʀᴏ.
   Rev.: Liberty cap and rays above wreath;[5] around, REFORMA LIBERTAD JUSTICIA Y LEY;
   below, ORO: 0,300.
   (1 die pair: group 31-PLATE XXXI)
4. As 1 but 1914, and on obv. below, CAMPO Mº.
   (1 die pair: group 32-PLATE XXXI)
5. As 1 but 1915, and on reverse above, TAXCO.GRO. / G. / ORO: 0,300.
   (4 die pairs: groups 45, 46, 47, 47a)

ANALYSIS

One sees it said that Zapata attempted to issue silver coins as sound as those of the Republic. This at least seems to be the sense of Guerrero when he writes:

[5] In style imitative of the Federal minor silver reverse.

> Se acuñaron entonces las monedas de plata con ley de oro, que se conocieron con el nombre de *pesos zapatistas*, cuyos valores de uno y dos pesos estuvieron en relación con la moneda nacional que circulaba.[6]

But one might have doubted the exchange value of the Zapatista *peso*, since it is considerably smaller than the Federal, weighing hardly more than the Federal 50c piece; and the $2 pieces are similarly undersize. However the coins do bear an indication of added value in the legend which announces that each contains a small quantity of gold. At the time such a legend was unique. During the nineteenth century the fineness of the Mexican silver coinage was indicated by the legend on each piece; so on the peso fuerte through 1909. The gold coins as well had borne an indication of fineness up to 1905. But the peculiarity of the Zapatista coins lay in the fact that never before had a *silver* coin been marked to show its *gold* content, .300 grams and .595 in the $ 1 and $ 2 respectively.[7]

In 1956 Bernardo Eguía Lis undertook a chemical analysis of two examples of each of the Zapatista $ 1 and $ 2 denominations.[8] He proved that the legend—on the $ 1, ORO: 0,300 —had to refer to the net gold content per piece in grams, not (as one might have supposed by the analogy of the legends of the Federal coins) to a 300/1000 gold fineness. But given this, his results were somewhat disconcerting, in that the net gold content of his examples was below the alleged standard in every case.

[6] Gildardo Magaña & Carlos Pérez Guerrero, *Emiliano Zapata y el agrarismo en México*, Vol. 4 (México, 1952), p. 21. The good quality of the coins is variously alleged, e.g. by Baltasar Dromundo, *Emiliano Zapata* (México, 1934), p. 87: ". . . los zapatistas acuñarían monedas de valor acquisitivo no superado más tarde por los carrancistas con sus 'cartones' y billetes 'infalsificables'."

[7] One other Mexican Revolutionary example is known. In 1915, perhaps in imitation of the Zapatista issues, certain coins of Oaxaca were struck with a legend indicating silver and gold content. For the intrinsic value of these coins see below, n. 17.

[8] Bernardo Eguía Lis, "Oro en monedas revolucionarias," in *SocNumMéxico Bol* Jan.-Mar. 1956, pp. 4–6 (= July-Sept. 1962, pp. 143–145).

		weight	% Ⱥ	*grams* Ⱥ	% *Al*	*grams Al*
1914	L-S 33 "Campo Morado"					
$2		24.31	88.41	21.49	2.0	0.486
1915	L-S 12a					
$2		23.40	88.41	20.69	1.7	0.398
1914	L-S 9					
$1		14.27	89.02	12.70	1.8	0.257
1915	L-S 45 "Taxco"					
$1		12.96	82.54	10.70	.3	0.039

These figures, particularly the last, raise real questions about the quality of the Zapatista silver, and so about the sincerity of the whole endeavor.

It seemed useful to us therefore to check these results from a much larger sample. Eguía Lis' investigation could not have proceeded much farther owing to the essential difficulty of chemical analysis: to achieve the proper results the coin must be destroyed. Our analysis by neutron activation depends from an entirely different method which leaves the coin unharmed. It was possible to subject 129 pieces of Zapatista $1 and $2 to analysis, as well as some minor and comparable Federal coins.

The silver content of each coin was determined by two methods.[9] The entire coin was irradiated in the neutron howitzer, yielding an absolute percentage of silver content to an accuracy of ca. ± 1.5–2.0%. In addition a streak sample was irradiated, with a result accurate to about ± 1.0%. In the latter case it was assumed that the coin was composed entirely of silver, copper and gold; in fact slight additional impurities are always present. From these two results a weighted silver result was calculated by averaging the howitzer result plus twice the streak result, to an accuracy of about ± 1.3%.

[9] For a description of the methods, cf. Jere L. Bachrach and Adon A. Gordus, "Studies on the Fineness of Silver Coins," *JESHO* 1968, pp. 298–317; and more fully, Adon A. Gordus, "Neutron Activation Analysis of Coins and Coin-Streaks," E. T. Hall and D. M. Metcalf, eds., *Methods of Chemical and Metallurgical Investigation of Ancient Coinage*, RNS Spec. Publ. 8 (London, 1972) pp. 127–148.

The percentages of copper and of gold were calculated from the streak sample by determination of the ratio of their activation to that of silver. The percentage of error in the copper reading is about ± 0.1%. The three percentages of gold, silver and copper do not necessarily total exactly 100%, because of the method used for averaging the silver data from the two sets of analyses. The total of readings for the entire population produces an average of 99.6% for the three major metals, which indicates that the presence of other elements can be ignored.[10]

The tables include analyses of all 14 varieties of $2 and 13 of the 15 varieties of $1 in this series. (Presumably L-S 9d, which is linked through the obverse die to 9c and Taxco 45–46, would reflect the alloy of its relatives. L-S 11, the anonymous $1 of 1915, would likely resemble the metal of either Atlixtac or Campo Morado.) The results of the individual analyses are grouped according to the die pair from which each coin was struck, and averages are taken for each group. Averages for the cast examples of group 9 are not significant.

Our results confirm those of Eguía Lis. His pesos of groups 9 and 45 were heavier than any of our examples, but the raw gold content was well within our range. The $2 pieces compare to certain of ours, save for the rather low gold of his 12a. The general correlation of his results and ours is close, most importantly in indicating that these particular groups (but not necessarily others) regularly contain less gold than their legends claim. Among the $2 issues, groups 12g and 12h are particularly low in gold, and Campo Morado group 33 and Suriana group 38 are even lower, while the $1 coins of Taxco seem to have abandoned gold altogether.

STANDARD

The analyses not only reveal the real gold content of these issues, but suggest the silver standard. One cannot say why silver content was not stated openly on the coins, but we now know what it probably was from the averages obtained above: 900 thousands fine, a creditable alloy. Note the general consistency of the silver content, which is owing

[10] One very base piece contains gold, silver and copper to a total of 94.34 % (9b, test 1714). Presumably it is contaminated by other elements, particularly lead.

to the careful assaying practices of the Zapatistas, for it cannot have been achieved simply by melting down and restriking older coin. The Federal silver coin in circulation at the beginning of the revolutionary period consisted of pesos fuertes 902.7 thousands fine, and small change 800 thousands fine.[11] The Zapatista silver standard was new, and usually well-controlled. From this figure it is now possible to estimate fairly closely the theoretical weight and intrinsic value of the Zapatista silver coinage:

[11] The tolerance allowed at the México mint in the coinage of silver was 3/1000 in the peso fuerte, 902.7 thousands fine; and 4/1000 in the subsidiary silver, 800 thousands fine. The Zapatista silver coins fall slightly below the legal minimum of the peso fuerte, and far above the maximum of the subsidiary alloy. There is also too little gold in the Federal coins, which contain only infinitesimal quantities, as a residue. By way of example two pieces of the .800 fractional silver system were submitted to the same tests as the Zapatista silver, with the following results:

denomination and date	*grams*	*%Ag*	*%Cu*	*%Au*	*grams Au*
20c 1910	4.89	80.0	20.0	.0142	.00069
50c 1912	12.48	78.4	21.6	.0020	.00025

The minimum percentage of gold content in any of the genuine Zapatista pieces was .27 (group 45, test 2348, Taxco), considerably under what is proper for the coin, yet far above the Federal. Since the gold content of the Taxco pesos is consistently trivial with respect to the content claimed, yet much higher than one finds in the Federal coins, the silver source in their case must have been not earlier coins but an ore with a small but steady proportion of gold which went unrecognized, or at least was not recovered owing to inefficient extraction procedures.

The copper too is a problem. In the peso fuerte the copper: silver ratio is 9.73: 90.27 by weight. Consequently in melting pesos fuertes to produce the 12 grams silver of the Zapatista peso one is left with an overage of copper in the alloy ($9.73 \times 12/90.27 = 1.293$ gm.). To this one would have to add not only the .300 grams pure gold (not coin gold, alloyed with yet more copper in the ratio 90:10), but both another 2.82 grams pure gold per 100 grams of peso fuerte, and 22.7 grams pure silver, in order to arrive at the theoretical alloy of 90 % silver, 7.75% copper, 2.25% gold. In other words both gold and silver Federal coins provide too much copper for the Zapatista alloy.

All this argues that Zapata's silver coins were not produced by the melting of the Federal. Porfirio Palacios says that some at least of the Zapatista metal came directly from the mines, *Emiliano Zapata* (México, 1960), p. 203, "La acuñación se hizo en Atlixtac, Estado de Guerrero, aprovechando el metal de la mina de 'Campo Morado' de la misma jurisdicción."

1) The theoretical gold content of the Zapatista $1 is .300 grams. The Federal gold coinage of 1905–1910, and all subsequent Mexican gold coinage to this day, has been struck on the basis of an imaginary gold peso, 900 thousands fine, weighing .8333 grams. Each gold coin contains .75 grams pure gold for each peso of denomination value: the 10 pesos, weighing 8.333 grams at 900 thousands fine, contains 7.5 grams pure gold, and so on. Therefore the announced gold content of the Zapatista peso, .300 grams pure, would have been worth precisely 40¢.

2) Assuming for the moment that, ideally, the Zapatista peso would contain another 60¢ in value, we must find it in the silver. There are two possibilities, one of which in fact does not make sense.

a) The peso fuerte weighs 27.073 grams, at a silver fineness of 902.7, for a pure silver content of 24.44 grams per peso. The value of 60¢ is therefore represented by 14.66 grams. The silver fineness of the Zapatista peso having been determined as 900 thousands, 14.66 grams would represent 90% of the weight of the coin. The total weight of the Zapatista peso (if full value) should therefore be 16.29 grams, composed of silver, 14.66 grams; gold, .300 grams; and the remainder, copper, 1.33 grams.

One may object that there is no reason to suppose that the Zapatista pesos, or any of the Revolutionary coinages, were intended to be of full value. Certainly they would not have been in this case, for of the 45 $1 pieces tested above, only one weighs as much as 16 grams (group 31, test 2286), and that is of low silver fineness; the average of the lot is not even 13 grams. On the basis of the silver content of the peso fuerte, the Zapatista peso is considerably under value.

b) The subsidiary silver introduced in 1905 was struck to an alloy 800 thousands fine. The 50¢ piece weighed 12.5 grams total, containing 10 grams pure silver. The value of 60¢ is therefore represented by 12 grams pure silver. If 12 grams represented 90% of the weight of the Zapatista peso, the total weight of the coin would have been 13.33 grams, composed of 12 grams silver, .300 grams gold, and 1.033 grams copper.

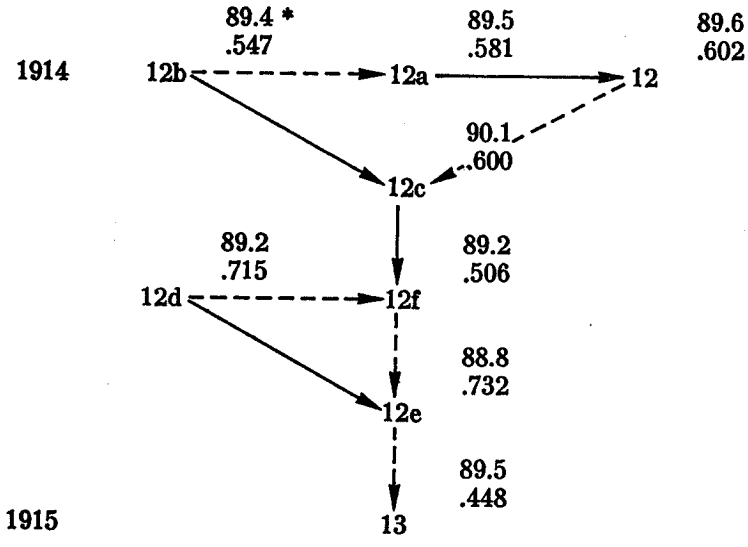
Calculation b) is much nearer the mark, for in this case the average weight of our peso specimens is only .64 grams under the standard—more than one would want to see at an established mint, but part of the loss is owing to our working with worn coins. We take it therefore as

virtually certain that the Zapatista peso was defined a as silver coin 900 thousands fine, weighing 13.33 grams, composed of 12 grams silver, .300 grams gold, and 1.033 grams copper. The silver would have had an equivalent value of 60¢, the gold of 40¢, so that intrinsically the Zapatista peso was as sound as the peso in Federal subsidiary silver, a tribute to the capacity, and to the honesty, of the Zapatistas. Note too the nice exactitude of the theoretical weight. To check whether any Zapatista peso was up to weight, you had only to weigh it in a balance against just two pieces, a good Federal $10 gold coin at 8.33 grams, and a 5 gram weight.

The theoretical basis of the $2 piece is proportionately the same, save that the gold content is announced as .595 grams rather than the expected .600. There is no explanation for this oddity; possibly some official scruple dictated the change at the beginning of the series because of a slight failure in the alloy. The difference between .595 and .600 grams, on the analogy of the Mexican Federal gold coin, is tiny—2/3 of one centavo. The theoretical gold content of the $2 piece is therefore equivalent to 79.33¢ of the gold peso. If we assume a theoretical weight of 26.67 grams for the coin, double that of the $1, the 90% silver fineness produces a pure silver content of 24 grams, equivalent to $1.20, with copper making up the remaining 2.072 grams. The total intrinsic value of a $2 piece weighing 26.67 grams was $1.99 1/3. Again the average of the specimens tested falls rather below the suggested normal weight. At least some of the difference arises from weight lost by wear in circulation, but a larger difficulty seems to have been that control of weight was not careful, for the individual weights are fairly widely scattered and a few specimens are very heavy indeed.

DIES

To discover the application of this theory in practice it is first necessary to determine the structure of the coinage by arranging the groups by mint and order of issue; only then can one ascertain to what extent the variations in alloy are random or part of a deliberate structure. The 2 pieces include a good die-linked series for eight of the 10 anonymous groups.



Most striking is the picture of the gold content which emerges from this arrangement. While the net amount of gold per piece varies rather considerably, the average is high with reference to the claimed .595 grams, and contrary to all expectation, tends to rise through the 1914 issues. Aside from group 12f, each group tests somewhat higher in gold content than the average of those which precede, with a fall occurring in 1915.

The two other anonymous $2 groups of 1914, 12g and 12h, of lower average gold content, are not linked into this larger series, but there is evidence in the method of die manufacture for a late rather than an early date. The uniformity in style of all the anonymous, Campo Morado and Suriana $2 dies leaves no doubt that they were cut by a single engraver. As he worked he renewed his punches from time to time. Thus the letter C in REPUBLICA MEXICANA, JUSTICIA and Cº Mº has three forms in the $2 series of 1914–1915:

		obv. die		*rev. die*	
1914	flat base C	No. 1:	12b/12c/12f	No. 1:	12b/12a
	narrow oval C	No. 2:	12a/12	No. 2:	12/12c
				No. 3:	12d/12e/12f/13
	thick top C	No. 3:	12d/12e	No. 4:	12g
		No. 4:	12g	No. 5:	12h
		No. 5:	12h		
1915	thick top C	No. 6:	13	No. 6:	13
		No. 7:	33	No. 7:	33 "Campo Morado"
		No. 8:	34/38	No. 8:	34 "Campo Morado"
				No. 9:	38 "Suriana"

These three forms follow closely the development of the $2 die linkage outlined above, with the addition here of the non die-linked 1915 Campo Morado and Suriana issues. Although the order of die production is not necessarily the same as the order of die use in the coinage, the important point is that the dies of groups 12g and 12h are cut with the third form, the thick top C. They were therefore the last dies cut in 1914, and the coins struck from them were probably produced late in the year.

The $1 issues unfortunately are not so easily handled, primarily because so little die linkage occurs. Letter forms are of some assistance in determining the order of die production; the letters C and O are particularly distinctive.

		obv.	*rev.*	
1914	large closed C	9b/MO–11	9b	round O
	large open C	9a	9a	
		9	9/9d	
		31 "Campo Morado"	31	oval O
		9c/9d/45/46	9e	
	skew closed C	9e	9c	
		10	10/32	
		32 "Campo Morado"	11	
1915	skew closed C	9f	9f[12]	square oval O
		11		

[12] Perhaps some reworking in the die. The C was originally skew closed, but the O is round.

new font:

square closed C	47/47a	45	"Taxco" square O
		46	"Taxco"
		47	"Taxco"
		47a	"Taxco"

The position of the Campo Morado dies is evidence that dies were being cut for more than one mint at once. However the Taxco reverses, and obverse 47/47a were not cut at the same time as the other dies, nor by the same engraver. The obverse eagle has fuller, more rounded wings than on the earlier dies; the reverse rays are thicker. Curiously the wreath of the last three reverse dies is composed of two laurel branches, rather than the customary oak and laurel. A new font with selfconsciously-squared letters and rather fancy R's and S's was used for the circumferential legends. This font is not found on any other signed coins of Taxco, but was used for the dies of the last $2 issue of Campo Morado (group 35, see below), as well as the 1915 Campo Morado 50¢ bronze (L-S 27–30e).

MINTS

The problem of identifying the silver mints of Zapata has been complicated by the statement of Sánchez Garza, that "dies reading Atlixtac, Campo Morado and Taxco were indiscriminately used in all those places, hence it is utterly impossible to distinguish the issues of the State of Guerrero."[13] This seems inherently unlikely, and it is not clear whether his information derived from independent sources, or was merely an attempt to explain the die linkage which the coins themselves reveal. It is true that some bronze coins of the three mints in question were struck from a common obverse die (e.g. L-S 14a, 15, 26, 44), as were others struck from another obverse at Atlixtac, Taxco and "Guerrero" (L-S 4, 16–17a, 41–43). But dies can be transferred from one mint to another, and in any case Sanchez Garza can only have been speaking of the bronze coinage. There are no silver "dies reading Atlixtac," and the neutron activation analysis of the silver specimens shows significant

[13] *Historical Notes*, p. 22.

difference in metallic content to be associated with different die pairs. The $1 and $2 issues which bear a common mint name, or which are die-linked within the anonymous series, are each of individualistic alloy and cannot all have been produced at a common time and place.

In attributing the anonymous $2 issues, we should note first that groups 12g and 12h are not die-linked with the rest of the anonymous $2 series, from which they also differ noticeably in alloy. Their average weight is low, as are both the net silver and gold contents. In addition they are not die-linked to each other, and differ from each other in that 12h shows a high copper content and erratic individual weights. One must conclude that the dies of groups 12g and 12h were used under circumstances entirely different from those of the other Zapatista $2 dies, and from each other. They must have been used at two mints other than that of the large die-linked anonymous series, an hypothesis which is supported by comparison of their alloy with that of the silver coins struck the following year, 1915, from mint-marked dies. Group 12g differs from the die-linked anonymous $2 pieces in its rather high copper percentage, somewhat low net gold content, and low average weight. These are precisely the characteristics of group 33, probably the earlier of the two 1915 Campo Morado groups.

	grams	% *Ag*	% *Cu*	% *Au*	*grams Au*
1914 12g	23.41	89.2	9.2	1.77	.410
1915 33 "Campo Morado"	23.97	88.2	9.2	1.67	.398

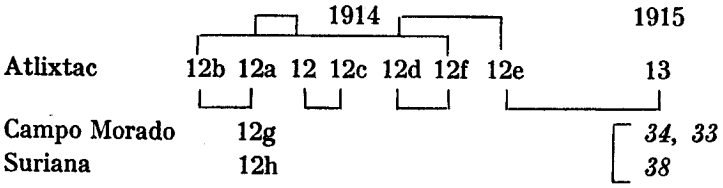
We know no 1914 $2 pieces from Campo Morado, even though the $1 was struck there in 1914 and the $2 in 1915 (groups 33 and 34). It must be that in addition the $2 pieces of group 12g were struck at Campo Morado in 1914, although the dies did not bear the mint name.

Group 12h is very odd. The silver content ranges over a disappointing scale of 81.8–76.3%, with the lowest average of any of the groups; the copper content is very high indeed; the gold is relatively low. Planchet weight is very poorly controlled. These are characteristics as well of the rare Suriana 1915 $2. We were able to analyse only two specimens of the Suriana issue which provided us with a bizarre weight range of 29.70 and 22.68 grams (the heavier being the more worn), the second lowest average silver content, an average copper content exceeded only by group 12h, and a low gold content.

	grams	% *Ag*	% *Cu*	% *Au*	*grams Au*
1914 12h	19.83	78.7	18.9	2.08	.409
1915 38 "Suriana"	26.19	82.8	14.4	1.25	.334

While the two groups are dissimilar in degree, they present the same general profile, so that it is a not unreasonable supposition that they issued from the same mint.

The anonymous $2 pieces of 1914, therefore, should be attributed to not one but three different mints, probably the same as the three mints which struck the denomination in 1915. The first of these, and the most active in 1914, might for convenience be identified as Atlixtac, considered by Sánchez Garza as the major Zapatista mint;[14] the other 1914 groups were struck at Campo Morado and (probably) Suriana. The $2 issues therefore are to be distributed as follows:



The Atlixtac issues are entirely die linked. Those of the other mints are not, but an obverse die is shared between Campo Morado group 34 and Suriana group 38. Mint names occur only on the groups italicized above, not on any of the 1914 issues, or at Atlixtac in 1915.

As in the case of the $2 issues, there are notable differences among the various $1 groups with respect to metallic content. Group 9c, alone among the anonymous $1 issues, is high in silver but low in both copper and gold. The only other examples of this alloy in the Zapatista silver are the 1915 mint-marked issues of Taxco (groups 45–47a). Since the obverse die of 9c was continued with Taxco groups 45 and 46, all must have been struck there. This is the first evidence that the Taxco mint was operating as early as 1914; only coins dated 1915 actually bear the city name.

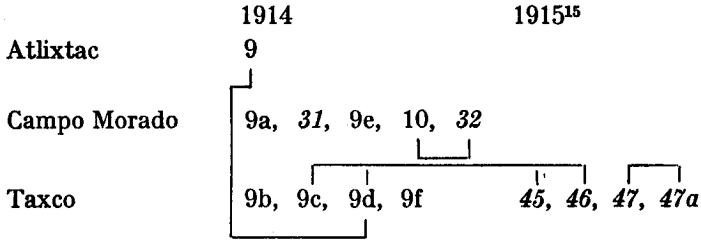
Groups 9b and 9f are more difficult. Their gold content is very low, comparable to the Taxco groups. But their silver is low as well, save

[14] *Historical Notes*, p. 22.

for one piece of group 9f, and their copper consequently high. One might wish to attribute both groups to Taxco, representing early endeavors of that mint before the silver content of the $1 was stabilized at the official 90% level.

It is also likely that several of the anonymous $1 issues of 1914 were struck at Campo Morado. Groups 9a, 9e and 10 average high in gold when compared with Taxco, but still well under the promised .300 grams and under all the other anonymous issues of non-Taxcan composition. The proportions of silver and of copper are far more erratic than those of the Taxco or anonymous issues, but similar to the examples of Campo Morado. These details, together with the fact that the obverse die of group 9e was used in 1915 to strike signed 50¢ copper at Campo Morado (L-S 27ax, b, c) make it fairly certain that these silver groups are to be attributed to that mint. Group 9 averages highest of any in both silver and gold content, well above the signed pesos of both Taxco and Campo Morado, and must therefore have been struck at a third mint, presumably at Atlixtac, along with the die-linked anonymous $2 groups.

A suggested distribution of the $1 issues is as follows:



The issues designated by italics are the only ones which actually bear the mint name.

Three other Zapatista silver issues were produced in 1915. None bears any indication of gold or silver content.

(1) 50¢ pieces were struck at Taxco (L-S 43), of which one specimen was tested: 8.88 gm.; 92.8% Ag (8.24 gm.); 5.8 % Cu (.52 gm.); .57 % Au (.051 gm.)—test 2169. The silver is exceptionally good. The quantity of gold—high for a coin which should contain none—shows that the gold of the Taxco $1 coins was indeed residual.

[15] L-S 11 cannot be attributed until an analysis is available.

The piece was probably intended to be of full value. We do not know the standard weight; our example, at 8.88 grams, weighs less than any in Leslie-Stevens, who give a range of 8.95–10.85 grams. Even this light piece contains 8.24 grams pure silver, equivalent to 41.2¢ at .800 fine; and .051 grams gold, equivalent to 6.75¢, for a total of about 48¢. The heavier specimens would actually have been worth more in metal than their face value.

This analysis is important in suggesting that the Taxco $1 issues were struck from metal intended for a 50¢ issue. The 50¢ piece was apparently of full value, but the pesos could not have been, given their module, because of the low proportion of gold.[16]

(2) A rare silver 50¢ piece (L-S 27ax) was struck at Campo Morado in a series of common 50¢ bronzes. No example was tested.

(3) A redesigned $2 struck at Campo Morado (group 35, PLATE XXX) was the proper end of the Zapatista silver coinage in 1915. Its legends are cut from the same font of squared letters as that used to produce the reverse dies of the Taxco pesos. Its types imitate the old peso fuerte with Liberty cap, but the weight is lower even than the earlier Zapatista $2. Perhaps more important, the coin bears no legend indicating the content of either gold or silver. The alloy approaches that of Taxco in the weakness of the gold; the silver is high enough, actually slightly higher than that of the earlier $2 pieces of the same mint. But the coin has lost an appreciable amount of value, largely because of the 30% drop in weight from the standard, coupled with an almost 50% drop in net gold content. The average of the three analyses produces a pure silver content of 16.89 grams, and .218 grams pure gold equivalent to 84.6¢ and 28.1¢ respectively, for a total of $1.127 intrinsic value in a $2 coin. For whatever reason the original Zapatista formula of a silver coin equivalent in metal value to circulating value could no longer be sustained, but neither does the coin claim an unrealistic content.

The year 1915 saw otherwise the production of a mass of Zapatista bronze. No bronze at all had been struck at these mints during 1914, but in 1915, as silver coinage was dropped, the bronze was undertaken

[16] A change of plans may also be indicated in that of the two 50c strikes at Taxco in 1915 (L-S 43–44), the bronze is certainly later than the silver, for the reverse die common to both develops an edge break at 3–4 o'clock on the bronze.

with vigor, and some of the issues, from 2¢ to 50¢, remain the commonest of the Zapatista coins. The decision in 1915 to coin in the baser metal is best illustrated in the use of three $1 obverse dies, the legend UN PESO being erased, to coin 50¢ bronze at the Campo Morado mint (L–S 27-28a). Even this coinage was suspended before the year was out. There remain only rare and sporadic issues. A peso of Guerrero type but struck in Morelos appeared in 1916, from the obverse die used for group 9b in 1914 (L-S MO-11).

CONCLUSIONS

(1) Zapatista silver coinage was organized far more carefully than has hitherto been recognized. At least four mints were established to strike in 1914 and 1915: Atlixtac, Campo Morado, Suriana and Taxco. Although the majority of the die pairs bear no mint name, it is possible, through the criteria of die linkage, variation in letter punch, and particularly metallic analysis, to discover unsuspected activity in the latter three mints in 1914.

(2) Zapatista die production was efficiently centralized. All the $1 and $2 dies of 1914 and 1915 (save those of groups 35, 47, 47a, and the obverses of groups 45 and 46) were cut by the same hand, without respect to the mint at which they were to be used. The earliest dies were anonymous, perhaps because no need was felt to distinguish among coins which had been centrally authorized, even if struck at different mints. Why the mint names were subsequently introduced is uncertain, but they may well reflect the fact which analysis has substantiated, that there were rather significant intrinsic differences in the products of the different mints.

(3) The weight of the $1 was theoretically ca. 13.33 grams, that of the $2, ca. 26.66 grams. The unusual alloy, in which silver was mixed not only with the customary copper but with a stated amount of gold, was devised to maintain the silver coins at a value equivalent to that of the minor Federal silver 50¢, 20¢ and 10¢. The Zapatista piece did represent a debasement of the coinage from the level of the peso fuerte, but not from the level of the fractional silver which had been struck at México since 1905. The gold content of the Zapatista pieces was crucial; without it they would have been worth intrinsically only about

60% of their face value at exchange with the Federal coins. But if value was their concern, why did the Zapatistas not choose the obvious alternative, to strike full value silver pesos? Perhaps silver was not as richly available as they would have liked. Or perhaps they judged that any peso irregularly issued would be suspect no matter how plausible its silver content, so that to render it as widely acceptable as possible they created a bimetallic peso in which 40% of its face value was pure gold.[17]

(4) The analyses show that a silver fineness of 900 thousands was aimed at, different from and incommensurate with those of the Republican coinage. There is more variation between individual examples than normal mint usage allows, which is hardly surprising under the circumstances. But the average is high and steady, aside from Suriana, proving a general concern to produce a silver coinage of honorable content.

(5) The gold content is another matter. The 1914 Atlixtac $2 issues, claiming to contain .595 grams gold, are impressively generous, averaging .626 grams with an extreme individual example of .801 grams.[18] More-

[17] Compare the 1915 issues of Oaxaca with indication of gold. They fall into two groups, 1) reading AG 0.902, AU 0.010 on $2 and $5 (Wood 147–149), and 2) 0.175 ORO without mention of silver on $5, $10 and $20 (Wood 143–146). The weight of all the coins with respect to denomination is so much less than that of the Republican and the Zapatista issues that there is no relation at all between intrinsic and circulating value. The heaviest $2 piece known (Gaytán OAX 69 TER, p. 199), weighing 6.58 grams, produces 5.935 grams pure silver and .0658 grams pure gold, worth respectively 29.68¢ (in relation to the 800 thousands fine subsidiary silver of the Republic) and 8.77¢, for a total intrinsic value of only 38.45¢. The $5 piece would have been valued proportionately.

The second series, of higher net gold content, is hardly any better because the weights of the denominations have been drastically reduced. The heaviest specimen of the $5 piece known to Wood weighed 3.79 grams. A gold fineness of 175 thousands produces a pure gold content of .6633 grams gold, worth 88.5¢. (It is unlikely that the legend means "0.175 *grams* gold" since it occurs unaltered on all three denominations; if it does the fine gold value of each piece would have been only 23.3¢). No silver content is announced. Even assuming, what is highly unlikely, that all the remaining metal of the coin is silver, the $5 piece of 3.79 grams would still contain only 3.1267 grams pure silver, valued at 15.6¢. The $5 coin of this issue was therefore worth at a maximum just over $1.04. The legends announcing gold and silver content on the coins of Oaxaca might have made them more attractive, but this is a far cry from the coins of Zapata which were at least in theory as sound intrinsically as the Federal.

[18] This $2 piece, test 2121 of group 12e, contains 21.92 grams silver, equivalent

over the percentage of gold, and consequently the net gold content rises continuously through the 1914 issues, with the exception of group 12f, to an average of .732 grams in group 12e, or some 23% above the standard. There could hardly be better evidence of the seriousness with which the announcement of gold content was intended. The alloy of the Atlixtac $1 is not so promising, nor is the metal of the Campo Morado $1 and $2. The $2 pieces struck at Suriana in 1915 contain an average of only .334 grams gold, or some 44% under the standard; while group 12h, attributed provisionally to Suriana in 1914, averages lower than any other group of the year at .409 grams.

But it is in the Taxco $1 issues that we discover not a weakness in the gold content but a disregard for it. The maximum in eight specimens of group 45 is only .099 grams, with an average of .059. The examples of the other signed groups, 46–47a, fall below even this average. This can only have been deliberate policy, for the silver content of the peso was carefully calibrated at Taxco. It is likely that this tiny gold content was a residue left over in the regular processes of refining, and that the coiners did not intend that there be any gold in the coin, much less the .300 grams which the legend of the $1 claimed.[19]

(6) Although cast issues are met with elsewhere in the Mexican revolutionary coinage, Zapatista silver is struck. A few cast examples of Zapatista $2 and $1 silver are known, of which four were subjected to our analysis. The $2 piece was cast from an original struck specimen of group 12d, the three $1 pieces from those of group 9.

The silver content of the $2 is rather low—82.7% as against 89.2% for the struck group. It contains twice the copper percentage of the struck pieces and almost no gold at all—0.50 grams as against .715 grams for the struck group. It is impossible that this coin was cast from the same metal used to produce the struck pieces; it can only have been manufactured elsewhere and at a later date. There is no indication that the

to $1.096 at .800 fine, and .801 grams gold, equivalent to $1.068; for a total intrinsic value of $2.164.

[19] By way of comparison, two cast Revolutionary silver pesos from Sinaloa, having no connection with the Zapatista coins and claiming no gold content, tested out at 0.614 and 0.622% gold, more than the average of any of the signed Taxco groups, and double the actual gold content in grams of the Taxco coins since the northern pesos are as large as the peso fuerte.

casting was official; on the contrary, the gold content is so low that even the Taxco coiners might have blushed.

Similarly, the silver fineness of the three $1 pieces is not despicable, but their weight is somewhat low so that the gross silver content averages almost 20% below that of the struck specimens of group 9. The copper content is high in two of the three examples, and their average gold content only about 1/4 of that of the struck specimens. Most striking of all is the fact that the three cast coins differ so markedly from each other, particularly in the copper content. Although each was cast from an example of group 9, they are in effect three different issues. The only possible conclusion is that they are cast counterfeits deriving from separate sources.

(7) Our results vindicate those historians who have argued that Zapata's coinage was essentially honorable. The large variations between individual specimens demonstrate the difficulties involved in producing a standard coinage at make-shift mints: the weights vary too widely, the bimetallic fineness was not maintained at Suriana, nor the gold at Taxco. But the majority of the coins are struck near the theoretical standard, one which reveals a serious attempt to produce coin as good as the Federal fractional silver. What the Zapatistas bought, they paid for in good coin. The political and social importance of this attitude cannot be overestimated.

(8) Finally, a glance at context. No one seems to have correlated Zapata's silver coinage with the nature of the community within which it was to be used. Guerrero was the least likely area for such a coinage, since it was on the whole the most backward and depressed of all the Mexican states. For example, 1) In 1919 Guerrero ranked 27th among 31 states and territories in percentage of population living in communities of more than 2500 inhabitants.[20] Such a dispersed rural economy, for the majority a subsistence economy, has no need of coins of high denomination or indeed frequently of coins at all. 2) In 1910, at the outbreak of the Revolution, Guerrero had the highest rate of illiteracy of any Mexican state or territory—over 90%.[21] It ranked third from

[20] James W. Wilkie, *The Mexican Revolution: Federal Expenditure and Social Change since 1910* (Berkeley, 1967), p. 218.

[21] Wilkie, pp. 208, 212.

the bottom among the states and territories in the number of schools proportionate to population, and seventh from the bottom in proportion of the population attending school.[22] Literacy and extent of education is a general indication of the proportion of the population capable of carrying on business dealings of any complexity beyond single transaction sales and purchases. 3) Tax revenues were extremely low. In fiscal 1909/1910 Guerrero produced 32¢ per capita in Federal excise taxes, the least produced by any state. In state taxes the revenue of $1.08 per capita was the smallest of any state save Oaxaca.[23] 4) Capital was very short. The one state-chartered bank, the Banco de Guerrero at Iguala, was capitalized in 1906 at $500,000, the smallest of all but one of the 26 state-chartered banks. Even this money was conservatively put to use; half of it was not called until 1909/1910. Of the monies available to the bank in 1910 some 38% was let out on collateral loans, the third highest percentage of all the state-chartered banks; conversely, only 11% was owing from "Debtors and Debit Balances," the lowest percentage of any of the banks. That is to say, even the tiny capital available to the Banco de Guerrero was lodged with people of some property, those who were able to provide physical backing for their loans. The very high percentages obtaining elsewhere for "Debtors and Debit Balances"—up to 72% of assets at the Banco de Coahuila—of course represent overdrafts as well as signature loans, and so signify money available to some extent to the same propertied elements. But it was the policy of the Banco de Guerrero, and had been since its founding, to limit lending to those who had already attained some financial stability, so that those for whom capital accumulation was difficult found it equally difficult to borrow.[24]

These statistics argue a level of poverty in Guerrero such that wide use of a high denomination silver coinage was not practical. Yet the Zapatista $1 and $2 issues are by far the commonest of all Mexican Revolutionary silver; the $2 piece is the largest denomination struck during the Revolution outside Oaxaca. Of course they circulated else-

[22] These figures are derived or calculated from *The Mexican Year Book, 1911*, p. 7, and *1922–24*, tables to p. 355.

[23] Calculated from *Year Book, 1911*, pp. 7, 50–92.

[24] Statistics calculated from *Year Book, 1911*, pp. 132–144.

where, notably in Morelos, whose economy was considerably more advanced than that of Guerrero. But the campaigns of both Revolutionary and Federal troops in Morelos in the course of 1914 devastated the state, and economic conditions were hardly any better at the time than in neighboring Guerrero. In any case the coins were produced under the Zapatista state government in Guerrero, which had been installed after the fall of Chilpancingo to the revolutionaries in late March 1914. Whether they circulated there or more widely, their high value suggests that they were ultimately intended not for the populace in general but for the commercially adept in the few larger centers. Their legends virtually say as much: the indication of gold content may sooth the skeptical recipient, but the gold has ultimately no practical significance unless it can be recovered. While few would be competent to smelt the Zapata silver, it can be done with the appropriate equipment. But it is not worth doing except as these coins are taken in some quantity. Ultimately therefore the metallic value of the coins was recuperable not even by the few who were able to use them in commerce, but the fewer who were able to accumulate them by saving.

The types and legends of Zapata's silver coins may be interpreted variously as expressions of Revolutionary fervor, but the coins as objects of exchange could have been continuously useful only for a stable and sophisticated fraction of the population. In type these $1 and $2 pieces are already traditional. The Zapatista thematic aside, the coins read *República Mexicana* and bear the type of eagle on *nopal* which had distinguished the Federal coinage from the beginning of the Republic. The reverse type of the $1, the Liberty cap on rays, is a Federal type of equal antiquity. In all this the historical continuity of the coins, both superficial and intrinsic, and the conventional honesty of the men responsible for them, were emphasized.[25] The coins thus provide striking

[25] *Cf.* what is said of General Salgado, the Zapatista Governor of Guerrero, "Obtuvo la aprobación para emitir billetes a condición que fueran canjeados cuanto antes por moneda de plata, para lo cual ya había formado su plan. El canje, *para honra del movimiento suriano* y de la administración guerrerense, fué hecho en su totalidad poco tempo después, redimiéndose en plata y oro la deuda que momentáneamente contrajo el Gobierno Provisional del Estado" (Magaña & Guerrero, *Emiliano Zapata*, p. 21, italics added). At least part of the exchange would have been accomplished with the Zapatista silver coinage.

confirmation of a recently published socialist thesis which argues that philosophically the Zapatistas were essentially bourgeois Liberals:

> The Zapatistas were not anti-bourgeois . . . in the sense that they wished to destroy bourgeois property relationships—surely the only test of a genuine anti-bourgeois attitude. It was feudal, not bourgeois, social relationships which the men of the South sought to destroy. The *zapatista* proposals which mentioned the interests of the working class looked to the *improvement* of the worker's conditions *within* the framework of capitalist property relationships by such means as guaranteeing workers the right to organize and to strike, providing for shorter hours of labor, and so forth. In short . . . although the *zapatistas* sought to protect and promote the interests of small proprietors, they also envisioned that bourgeois property relationships would continue to prevail in industry, commerce and finance.[26]

Specimen	L-S no.	UM[27] Test no.	wt.	% Ag	wt.Ag	%CU	wt.CU	% Au	wt.Au
$2 1914	12	2137	29.24	89.2	26.08	7.9	2.31	2.28	.667
		2296	28.14	91.3	25.69	6.3	1.77	2.60	.732
		2277	27.42	90.2	24.73	8.1	2.22	2.24	.614
		2295	27.38	89.0	24.37	8.8	2.41	2.25	.616
		2688	26.57	88.2	23.43	8.3	2.21	2.29	.608
		2135	24.36	89.6	21.83	7.4	1.80	2.19	.533
		2136	24.03	89.8	21.58	7.6	1.83	2.18	.524
		2139	22.93	89.5	20.52	8.8	2.02	2.40	.550
		2138	22.74	89.4	20.33	7.8	1.77	2.53	.575
Avg.[28]			25.87	89.6	23.17	7.9	2.04	2.33	.602

[26] Robert P. Millon, *Zapata: The Ideology of a Peasant Revolutionary* (New York, 1969), p. 100.

[27] These analyses were made possible through the generosity of a number of numismatists who lent their specimens for examination: Arthur Blaze Jr., Roy E. Daniels, Elwin C. Leslie, Pat Pace, Mrs. Erma Stevens, Verne R. Walrafen, and The American Numismatic Society.

[28] The average silver content of all $2 issues save 12h is 89.0%

Specimen	L-S no.	UM[27] Test no.	wt.	% $A\!\!\!/$	wt. $A\!\!\!/$	%CU	wt.CU	% $A/$	wt. $A/$
	12a	2297	27.18	88.8	24.14	8.6	2.34	2.05	.557
		2298	25.03	90.9	22.76	6.2	1.55	2.21	.553
		2141	25.01	89.6	22.41	7.6	1.90	2.10	.525
		2280	24.58	88.2	21.68	10.3	2.53	2.41	.592
		2140	24.14	89.3	21.56	8.1	1.96	2.14	.517
		2142	24.10	90.4	21.79	7.0	1.69	3.08	.742
Avg.			25.01	89.5	22.39	8.0	2.00	2.33	.581
	12b	2143	27.28	90.5	24.69	7.0	1.91	2.18	.595
		2344	25.96	89.0	23.10	8.0	2.08	2.13	.553
		2145	25.38	87.0	22.08	9.4	2.39	2.12	.538
		2299	25.14	91.1	23.10	6.3	1.58	2.32	.583
		2300	24.94	90.0	22.45	7.9	1.97	2.15	.536
		2278	23.95	89.3	21.39	7.6	1.82	2.25	.539
		2144	23.77	89.2	21.20	8.6	2.04	2.04	.485
Avg.			25.20	89.4	22.57	7.8	1.97	2.17	.547
	12c	2129	25.83	88.0	22.73	8.6	2.22	2.42	.625
		1717	25.65	91.6	23.50	6.0	1.54	2.45	.628
		2301	24.29	89.3	21.69	7.9	1.92	2.35	.571
		2130	21.44	91.5	19.62	6.1	1.31	2.69	.577
Avg.			24.30	90.1	21.89	7.2	1.75	2.48	.600
	12d	2125	25.95	88.6	22.99	8.6	2.23	2.98	.773
		2302	25.43	90.2	22.94	7.1	1.81	3.13	.796
		2303	24.86	87.6	21.78	9.1	2.26	3.13	.778
		2128	24.76	89.9	22.26	7.0	1.73	2.76	.683
		2127	24.67	89.2	22.01	6.9	1.70	3.11	.767
		2123	24.63	89.4	22.02	7.1	1.75	2.94	.724
		2124	24.35	89.6	21.82	7.0	1.70	2.46	.599
		2126	23.58	89.1	21.01	7.3	1.72	2.53	.597
Avg.			24.78	89.2	22.10	7.5	1.86	2.88	.715
	12e	2120	25.96	89.0	23.10	7.5	1.95	3.05	.792
		2146	24.88	88.8	22.09	7.5	1.87	3.02	.751
		2121	24.80	88.4	21.92	7.5	1.86	3.32	.801
		2147	24.79	91.8	22.76	6.1	1.51	2.14	.531
		2306	24.62	89.2	21.96	7.4	1.82	2.89	.712
		2307	24.49	86.0	21.06	11.5	2.82	3.18	.779

Specimen	L-S no.	UM[27] Test no.	wt.	% Ag	wt. Ag	%CU	wt.CU	% Au	wt. Au
		2122	23.02	88.5	20.37	7.5	1.73	3.17	.730
		2308	23.01	87.9	20.23	8.0	1.84	3.35	.771
		2279	22.22	89.2	19.82	7.7	1.71	3.23	.718
Avg.			24.20	88.8	21.48	7.9	1.90	3.03	.732
	12f	2805	25.91	90.7	23.50	7.2	1.87	2.06	.534
		2149	24.87	88.4	21.99	9.6	2.39	2.07	.515
		2304	24.46	89.4	21.87	8.6	2.10	2.06	.504
		2305	24.35	88.4	21.53	9.0	2.19	1.93	.470
Avg.			29.90	89.2	22.22	8.6	2.14	2.03	.506
	12g	2343	26.50	91.2	24.17	7.9	2.09	.69	.183
		2310	26.14	89.4	23.37	8.1	2.12	2.17	.567
		2150	24.23	88.1	21.35	11.0	2.67	1.79	.434
		2309	23.26	87.7	20.40	11.2	2.61	1.67	.388
		2154	22.43	89.8	20.14	8.3	1.86	1.79	.401
		2152	22.41	89.5	20.06	9.3	2.08	1.83	.410
		2151	22.32	88.5	19.75	9.7	2.17	2.17	.484
		2283	22.07	88.3	19.49	10.3	2.27	1.86	.411
		2153	21.32	90.5	19.29	7.2	1.54	1.92	.409
Avg.			23.41	89.2	20.89	9.2	2.16	1.77	.410
	12h	2160	27.91	76.4	21.32	21.6	6.03	1.64	.458
		2157	25.26	79.1	19.98	17.7	4.47	2.41	.609
		2159	22.61	76.5	17.30	21.7	4.91	1.65	.373
		2282	22.02	77.6	17.09	20.1	4.43	1.74	.383
		1719	21.06	81.2	17.10	15.5	3.26	2.74	.577
		2158	18.59	78.5	14.59	19.9	3.70	1.70	.316
		2284	17.46	76.3	13.32	21.0	3.67	2.55	.445
		2285	17.41	78.4	13.65	18.5	3.22	2.52	.439
		2156	17.40	79.8	13.89	17.3	3.01	2.44	.425
		2155	17.04	80.0	13.63	18.4	3.14	1.82	.310
		2161	16.91	78.6	13.29	18.7	3.16	1.70	.287
		1718	14.25	81.8	11.66	16.3	2.32	2.00	.285
Avg.			19.83	78.7	15.57	18.9	3.78	2.08	.409
1915	13	2702	26.31	88.1	23.18	8.4	2.21	1.69	.445
		2133	25.86	90.1	23.30	6.4	1.66	1.79	.463
		2700	25.40	89.7	22.78	8.6	2.18	1.82	.462

Specimen	L-S no.	UM[27] Test no.	wt.	% Ag	wt. Ag	%CU	wt.CU	% Al	wt. Al
		2701	24.65	84.8	20.90	13.3	3.28	1.43	.352
		2134	24.43	91.0	22.23	7.1	1.73	1.93	.471
		2311	24.32	93.2	22.67	5.2	1.26	2.04	.496
Avg.			25.16	89.5	22.51	8.2	2.05	1.78	.448
	33	2165	25.25	87.6	22.12	9.4	2.37	1.63	.412
		2166	24.80	84.8	21.03	13.1	3.25	1.82	.451
		2314	24.37	87.5	21.32	7.8	1.90	1.66	.405
Campo		2698[29]	24.33	90.1	21.92	7.3	1.78	1.65	.401
Morado		2313	24.14	89.0	21.48	9.2	2.22	1.23	.297
		2164	23.70	91.2	21.61	8.5	2.01	1.15	.273
		2699	23.00	86.4	19.87	9.9	2.28	2.24	.515
		2346	22.13	89.3	19.76	8.4	1.86	1.95	.432
Avg.			23.97	88.2	21.14	9.2	2.21	1.67	.398
Campo	34	2697	29.44	84.5	24.88	11.5	3.39	1.77	.521
Morado		2927	28.72	87.2	25.04	11.3	3.24	1.52	.437
Avg.			29.08	85.9	24.96	11.4	3.32	1.65	.479
Suriana	38	2696	29.70	80.7	23.97	15.7	4.66	1.43	.425
		2695	22.68	84.9	19.26	13.1	2.97	1.07	.243
Avg.			26.19	82.8	21.62	14.4	3.82	1.25	.334
Campo	35	2694	20.09	89.0	17.88	8.1	1.63	1.80	.362
Morado		2167	19.16	91.6	17.55	6.2	1.19	.98	.188
		2168	16.60	91.8	15.24	7.5	1.25	.62	.103
Avg.			18.62	90.8	16.89	7.3	1.36	1.13	.218
	12d cast	2281	27.40	82.7	22.66	15.5	4.25	.18	.050
$1 1914	9	2686	13.78	92.7	12.77	4.7	.65	2.31	.318
		2288	13.17	89.1	11.73	8.4	1.11	2.72	.358

[29] This example, in the collection of the ANS, bears an inscription engraved by hand upon the reverse, GRAL. / E. ZAPATA (PLATE XXXI) his personal pocket piece?

Specimen	L-S no.	UM[27] Test no.	wt.	% Ag	wt. Ag	%CU	wt.CU	% Au	wt. Au
		2291	12.81	91.1	11.67	7.4	.95	1.92	.246
		2131	12.78	94.5	12.08	3.1	.40	2.67	.341
Avg.[30]			13.14	91.9	12.06	5.9	.78	2.41	.316
	9a	2292	13.78	89.3	12.31	8.3	1.14	2.16	.298
		2920	13.23	87.3	11.55	10.9	1.44	1.83	.242
		2921	12.59	89.3	11.24	8.9	1.12	1.82	.229
Avg.			13.20	88.6	11.70	9.4	1.23	1.94	.256
	9b	1714	12.68	58.3	7.39	35.4	4.49	.64	.081
	9c	2982	14.58	89.8	13.09	9.5	1.39	.65	.095
		2983	14.17	89.9	12.74	9.6	1.36	.54	.076
		2984	13.46	88.3	11.89	11.2	1.51	.54	.073
		2922	13.06	91.6	11.96	7.9	1.03	.48	.063
		1716	12.23	94.3	11.53	5.6	.68	.70	.086
Avg.			13.50	90.8	12.24	8.8	1.19	.58	.079
	9e	2692	13.95	91.3	12.74	7.1	.99	1.88	.262
		2345	13.02	90.6	11.80	8.6	1.12	1.61	.210
		2689	12.62	79.2	10.00	19.5	2.46	2.70	.341
		2693	12.57	82.5	10.37	15.3	1.92	1.77	.222
		2132	12.17	87.2	10.61	9.7	1.18	1.91	.232
		2293	11.15	85.4	9.52	12.7	1.42	1.79	.200
Avg.			12.58	86.0	10.84	12.2	1.52	1.94	.245
	9f	1715	12.62	91.9	11·60	5.7	.72	1.01	.127
		2923	11.94	84.7	10·11	15.1	1.80	.29	.035
		2289	11.24	64.8	7·28	32.8	3.69	.54	.061
		2342	10.45	71.0	7·42	27.8	2.91	.68	.071
Avg.			11.56	78.1	9.10	20.4	2.28	.63	.074

[30] The average silver content of all $1 pieces, save for groups 9b and 9f which are not consistent with the rest, is 88.8%.

Specimen	L-S no.	UM[27] Test no.	wt.	% Ag	wt. Ag	%CU	wt.CU	% Au	wt. Au
	10	2290	14.49	89.7	13.00	7.8	1.13	1.88	.272
		2294	12.94	90.9	11.76	7.5	.97	1.83	.237
		2924	12.67	91.3	11.57	7.2	.91	1.53	.194
Avg.			13.37	90.6	12.11	7.5	1.00	1.75	.234
Campo Morado	31	2286	16.51	75.9	12.53	20.9	3.45	1.78	.294
		2925	15.57	81.2	12.64	17.3	2.69	1.42	.221
Avg.			16.04	78.6	12.59	19.1	3.07	1.60	.258
Campo Morado	32	2287	14.38	87.4	12.57	11.1	1.60	1.75	.252
		2340	14.23	88.8	12.64	8.2	1.17	1.87	.266
		2163	13.29	91.3	12.13	6.6	.88	1.62	.215
		2312	12.40	90.0	11.16	8.6	1.07	1.68	.208
		2162	10.43	91.3	9.52	7.3	.76	1.66	.173
Avg.			12.95	89.8	11.60	8.4	1.10	1.72	.223
1915 Taxco	45	2347	15.22	89.7	13.65	8.4	1.28	.59	.090
		1713	12.63	90.2	11.39	9.5	1.20	.38	.048
		2171	12.53	90.3	11.31	8.6	1.08	.45	.056
		2690	12.45	89.2	11.11	10.8	1.34	.38	.047
		2172	12.30	88.2	10.85	10.7	1.32	.43	.053
		2687	12.16	90.7	11.03	9.5	1.16	.40	.049
		2170	11.67	89.3	10.42	10.6	1.24	.85	.099
		2348	11.50	91.1	10.48	8.9	1.02	.27	.031
Avg.			12.56	89.8	11.28	9.6	1.21	.47	.059
Taxco	46	2929	11.65	88.0	10.25	11.6	1.35	.32	.037
Taxco	47	2931	12.20	90.7	11.07	9.1	1.11	.28	.034
Taxco	47a	2930	11.48	86.4	9.92	13.3	1.53	.33	.038
	9 cast	2691	11.74	87.0	10.21	12.6	1.48	.22	.026
		1811	11.60	72.3	8.39	25.9	3.00	1.01	.117
		2341	11.03	92.0	10.15	6.9	.76	.63	.069

SILVER COINAGE OF ZAPATA


L-S 12


L-S 34

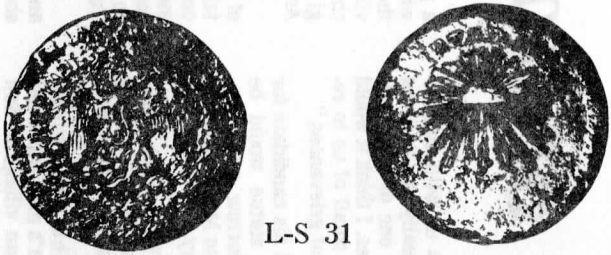

L-S 38


L-S 35

SILVER COINAGE OF ZAPATA

L-S 9

L-S 32



L-S 31

L-S 33