Note: This version includes the complete text and tables of the thesis with their original pagination and layout, but does not include any of the graphical figures:

Maps of Geographic Distributions of Artifacts; Geographic Regions Used for Analysis;
Illustrations from Huaman Poma; Illustrations of Artifact Types.

For corresponding maps and illustrations based on an expanded study of over 10,000 artifacts, see

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The Role of Common Metal Objects in the Inka State

by

Bruce Owen

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Timothy Earle, Chairman
Christopher Donnan
James Hill

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Abstract

Copper, bronze, and silver objects could easily have served as symbols of the Inka state, much as Inka style ceramics did. Spatial and temporal distribution patterns in a large sample of late prehistoric Andean metal objects are examined to test the general hypothesis that one or more common metal objects were associated with the Inka state. No evidence is found for any state influence on local metal artifact traditions, other than the introduction of tin bronze. A discussion of the metal objects recovered by the Upper Mantaro Archaeological Research Project shows that access to some common metal objects was related to social status, but that the only changes caused by the Inka conquest were quantitative: an increase in copper production and the extraction of silver from the area by the state. It is suggested that the lack of state influence on local metalworking styles reflects the regional organization of the Inka state.

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Contents

Introduction

When the Spanish arrived in Peru, they were impressed by the enormous quantities of gold and silver attached to the religious institutions and the royalty of the Inka state. They scarcely noticed that the Andean people also produced and used copper and bronze in considerable quantities. In fact, copper or bronze objects are generally more common in late prehistoric archaeological sites than silver artifacts, and far more common than gold.

The historical sources mention gold and silver constantly in their descriptions of temples, gifts, and the wealth and trappings of important people. As Murra (1962) has shown, early accounts also emphasize cloth, a more uniquely Andean wealth or status good. One finds repeated references to precious stones, rare animals, feathers, special woods, foods, and shell.

Yet archaeologists base their interpretations of Inka state presence not on gold, silver, cloth, or any of the other items mentioned in contemporary accounts, but on Inka style ceramics. Inka ceramics are commonly thought to have been signs of individual wealth, prestige, or political position, associating their owner with the power of the Inka state.

Ceramics could serve this purpose because, like cloth, they represented a visible concentration of skilled labor. Ceramic vessels were portable, with high ratios of value to weight and bulk, at least in comparison to other state symbols such as monumental buildings or the staple foods mobilized to finance the state (Earle and D'Altroy, 1982). Inka style ceramics were scarce, which in itself implies value, and their distinctive style made them unmistakable visual symbols of the Inka state from which they derived. Production of, and access to, Inka style ceramics could easily be controlled and limited because it involved specialized craftsmen and spatially restricted resources of clay and pigments.

All the same can be said of copper and bronze objects, and more so. Copper (used here to denote not only pure copper, but also the copper-tin and copper-arsenic alloys called bronze, except where indicated otherwise) is bright, shiny, and highly visible as ornaments worn on the body or implements carried in the hands. Subjectively speaking, copper objects ought to have had an even higher value to weight ratio than ceramic vessels, and they are smaller and less fragile as well. That copper objects are such occasional finds in most archaeological sites in comparison to fine ceramics is direct evidence of their scarcity and presumably of their value.

Copper can be made into virtually any form; like ceramics, copper objects can make clear visual references to a particular style or category of object and the social and political facts associated with that style or category. And, even more than is the case with ceramics, the production and distribution of copper objects can be tightly controlled by virtue of the localized nature of ore deposits, the difficulty and expense of mining and smelting, and the skill required to manufacture metal objects.

Gold and silver were primarily made into elaborate, often unique art objects, while copper and some silver objects tend to be more standardized and certainly more common. The very special gold and silver goods were clearly royal, priestly, or very high status objects that played comparatively little part in the lives of any but the highest of the elite outside Cuzco and perhaps a few other major centers such as Chan Chan. They do not have much to tell us about social and political organization other than that the position of the highest strata of Inka society was exceedingly far above that of the common people and local elites.

Most copper objects and the plainer of the silver artifacts, on the other hand, are much more widely distributed and must have been parts of the daily lives of at least the elite classes of many or most regions of the Inka state. As a gross generalization, these "common" objects are often comparable in rarity to imported Inka style ceramics and Inka-influenced local ceramics (UMARP monograph, in press; Bennett 1939; Uhle collections).

In many parts of the Andes, the addition of tin to copper in order to make tin bronze is exclusively an Inka innovation. In fact, Lechtman (1976) describes tin bronze as an "Imperial alloy", a symbol or manifestation of the Inka state. If the use of tin bronze did in fact spread concurrently with Inka political domination, it would certainly suggest that the Inka state had some significant influence on local copper industries.

The highly suitable qualities of comparatively common copper and silver artifacts for status or symbolic functions, and the archaeologically documented connection of tin bronze to the spread of Inka rule, together suggest that copper objects and some silver objects may have played a role in the Inka state similar to that of Inka style ceramics. Overlooked or taken for granted by early historians just as Inka ceramics were, copper objects could have served as state-associated status markers, visible symbols of Inka presence and imperial favor. Production and distribution of true Inka-style copper objects could have been controlled in much the same way as they were for Inka ceramics, while local craftsmen might have imitated more or less explicitly the Inka style goods. Copper and silver objects could have served as valuables used to finance the state in something like the way that fine textiles did (Murra 1962).

The extent to which comparatively common copper and silver objects functioned as state-associated status goods, and the extent to which the Inka state influenced local metal styles and the organization of production and distribution, provides a measure of the nature of the Inka domination of its subject polities. Together with studies based on ceramics, agriculture, architecture, settlement patterns, and so on, the role of common metal objects in the Inka state can add another line of evidence to our estimation of the degree to which the Inka were involved in the governance of local groups and in the status and prestige relations in those societies. The role of common metal objects also offers another avenue in the evaluation of the relative importance of "staple finance" (Earle and D'Altroy 1982) versus "wealth finance" in the organization of the Inka state (D'Altroy and Earle, 1985). Assessing these fundamental organizational variables is essential both to understanding the Inka state in its own right, and to correctly interpreting the Inka state as an example of an independently developed conquest state in studies of state formation and growth.

Models and Hypotheses

If any common copper and silver objects, or styles of objects, were associated with the state in the sense that Inka style ceramics were, there should be evidence of that association in their spatial and temporal distributions throughout the Inka state. There are four general possibilities for the origins of these hypothetical Inka style metal objects or traits, leading to three distinct spatial and temporal patterns.

First, objects or object traits already prevalent in the Inka heartland could have been physically and/or conceptually distributed throughout the state by the conquering Inka. Second, objects or object traits specifically invented to be state symbols could have been similarly distributed by the Inka. Third, objects or object traits already prevalent in some conquered region with an accomplished metalworking tradition could have been co-opted by the Inka as status or state-associated items. Finally, objects or object traits already common throughout the eventual extent of the Inka empire could have become associated with the state, presumably by virtue of already being status, wealth, or prestige items.

In the first case, the spatial distribution of these objects or traits should cover most or all of the Inka state, subject to the duration and intensity of the Inka presence, with an unspecified degree of concentration in the Inka heartland. Outside this heartland area, the objects or object traits should be rare or absent prior to the Late Horizon, and less rare after Inka conquest. Inside the heartland area, the objects could become either more or less common in the Late Horizon, depending on the nature of their use, associated sumptuary laws, and so on.

In the second case, the spatial distribution of these objects or traits should cover most or all of the Inka state, subject to the duration and intensity of the Inka presence, with unspecified degrees and localities of concentration. In all regions, the object or trait should be rare or absent before the Late Horizon, and present or common during the Late Horizon.

In the third case, the spatial distribution of these objects or traits should again cover most or all of the Inka state, subject to the duration and intensity of the Inka presence after the conquest of the originating region, with an unspecified degree of concentration in the region to which the objects or traits are indigenous. Outside the originating region, these objects should be rare or absent prior to the Late Horizon, and less rare after Inka conquest of the originating region. Inside the originating area, the objects could become either more or less common in the Late Horizon, depending on the nature of their use, associated sumptuary laws, and so on.

In the fourth case, the spatial distribution of these objects or traits should still cover most or all of the Inka state, with an unpredictable pattern of concentration. The objects should be present both before and after the Inka conquest of any given region, although the relative abundances may vary unpredictably from region to region and over time.

Table 1 summarizes these models and hypotheses. Although the hypotheses are necessarily vague, they can be at least tentatively falsified. Most importantly, any spatial distribution that is highly concentrated in a subregion of the state would suggest that the object or trait did not have state associations.

Sumptuary laws or other forms of restricted access might reduce the ubiquity of a state-associated object or trait in a region where it was formerly more common, but the same forces should tend to increase the presence of these objects or traits in areas where they were previously rare or unknown by making them more desirable, more available to elites, or even explicitly distributed by the state. Any temporal distribution in which an object or trait became less common in areas outside its primary concentration would suggest that the object did not have state associations.

On the level of assemblages, if the Inka state had a significant effect on local metalworking traditions, temporal changes in metal assemblages in different parts of the Inka region should tend to parallel each other or move from extremes of local diversity in the direction of a common state-wide assemblage. State-associated objects, if any, should tend to appear or proliferate in the Late Horizon in areas where they were previously absent or rare, as discussed above. And on the most subjective possible level, pure Late Horizon assemblages should tend to be similar, sharing certain types or traits, such as the use of tin bronze.

The Data

In order to test these hypotheses, a large number of copper, silver, and (where present) lead objects from many regions of Peru, Ecuador, and Bolivia were examined and entered into a computer data base. The only criteria for selection of these objects was that they come from known geographic proveniences, and that they not include elaborate, unique art objects. Objects from proveniences thought to date to earlier than the Late Intermediate Period were avoided, although many early objects are undoubtedly included. In practice, most or all provenienced objects available in each collection or publication were included except those in high-security storage, on display, or from sites believed to have only Middle Horizon or earlier components.

The data base includes over 3100 records. Each record describes one or more objects according to a typology based on all the museum material, plus information on a number of subsidiary traits, metric data as appropriate, provenience data, and keys into the original notes or publication. The variability of the object types is so great that the metric data promised to be of little importance, and was consequently not collected after the early stages of the project. The important object types are described in Appendix A. Objects were recorded from the Uhle Collection of the Lowie Museum, the Field Museum of Natural History, the American Museum of Natural History, the Machu Picchu Collection of the Yale Peabody Museum, and the excavated metals collection of the Upper Mantaro Archaeological Research Project. Also included are objects described and illustrated in several publications, primarily Baessler (1906) and Antze (1930).

Only 846 of these objects can be placed in known time periods or ranges of periods. 625 are definitely pre-colonial, and of these many are unidentifiable fragments, sheet scrap, and other largely uninformative debris. The coverage of the region controlled by the Inka, though wide, is far from complete, with serious gaps in the northern highlands of Peru, the coast south of Ica, and all of Chile and southern Bolivia. Cuzco itself is not well represented. The sample size for different regions varies widely. There are obvious problems with using museum and published material, ranging from poor documentation to selective acquisition. The assemblages from different regions are not strictly comparable, since they come from largely unspecified but clearly different mixtures of burials, ceremonial contexts, and residential areas.

The lack of temporal control tends to spread out the geographic distributions of object types and traits, by treating occurrences from all time periods as if they were contemporary. For this reason, widespread type or trait distributions suggesting state associations must be taken as tentative. On the other hand, highly localized distributions still carry equal weight against state associations.

The lack of temporal control also tends to introduce extraneous earlier types and traits that may not have been present in significant quantities in the terminal Late Intermediate and the Late Horizon. Since these types and traits are likely to be localized, there is little danger of confusing these early objects with Inka associated goods or styles.

In many Andean regions, copper and silver were commonly alloyed together, resulting in alloys that range from primarily silver with minor quantities of copper to primarily copper with enough silver to allow surface enrichment or to impart hardness or other properties. Without physical analyses, it is virtually impossible to identify the major components or the original surface color of a corroded or cleaned object. Objects with uniform green oxide coats have proved to be mostly silver (Root 1949, table 12, Cat. No. 4931, for example), and objects that appear silver can be partly or primarily copper (Lechtman 1973, note 7). Many objects show traces of metallic surfaces and/or corrosion products of both metals. Apparent metal contents were entered in the data base, but because they are so unreliable and because silver and copper were used to make virtually identical examples of many of the types of common metal objects, no attempt to separate the metals is made in these analyses except in the detailed discussion of the Upper Mantaro material and as noted elsewhere.

This study approaches the data in several distinct ways. Since by far the greatest number of artifacts have only geographic proveniences, attention is paid to the spatial distributions of artifact types and traits, lumping artifacts of known and unknown ages together as though they were all contemporaneous. Next, several smaller assemblages of artifacts that can be placed both in space and time are compared, to test the hypotheses concerning changes over time, the nature of unmixed Inka assemblages, and the spread of tin bronze. In the subsequent section, all of these approaches are combined with historical and other data to consider a number of specific artifact types as potential state-associated goods. Finally, a description of the distributions and contexts of the metal artifacts excavated from residential areas by the Upper Mantaro Archaeological Research Project provides an example of the changes that took place in the use of metals in one particular region as it was subsumed into the Inka state.

Atemporal Spatial Distributions

Occurrences of a large number of metal object types and traits were plotted on maps of the northern and central Inka region to evaluate their distributions in light of the hypothesized patterns. Because of the imperfect areal coverage of the data base and the widely different sample sizes from different regions, all the distribution patterns must be evaluated relative to the overall distribution of the sample (Fig. 1), not simply against a general knowledge of site locations and cultural areas. A small random variation was added to the coordinates of each plotted artifact so that multiple objects from the same site would be distinguishable. A maximum of twenty objects were plotted per provenience, because more than twenty marks blend into a featureless spot on the map. This has the effects of diminishing the apparent degree of concentration in some distributions, and of making the overall sample look like a more uniform representation of the Inka region than it actually is.

Tables 2 and 3 show the actual numbers of the important types recorded for various culture areas. Figure 62 shows the locations of the culture areas used in this study. The tables and maps treat each record in the database as a single occurrence, even though some records include more than one object. In this way, a cache of similar items counts as only one occurrence, rather than swamping the variations in the distribution of single pieces.

Not surprisingly, several comparatively distinct regions appear to vary as cohesive units in the distribution plots, corresponding to the accepted cultural area divisions of the Peruvian coast: the North Coast, Central Coast, and South Coast as defined by Lumbreras (1974). This is not to say that each region has an entirely unique metal assemblage, but simply that often a particular type is represented either at many sites in a region or at very few; distributions often either include or exclude these regions as more or less whole entities. Figure 62 shows the locations of the culture areas used in this study.

Another cohesive group of distributions comprises a general south and central highlands assemblage, including the Upper Mantaro Archaeological Research Project material from around Jauja, the Cuzco material, and the Machu Picchu material. These highland areas have obviously different metal assemblages, but they share many similarities as well. The southern Titicaca area, Bandelier's material from the Illimani region of central Bolivia, and his collections from the Pelechuco-Charassani area in northern Bolivia east of Titicaca hold together as a single region in some distributions and show distinctly different patterns in others. Finally, some objects and traits are primarily Ecuadorian. One unusual burial, on La Plata Island off the coast of Ecuador, contained Cuzco Inka ceramics and copper objects typical of the distant highlands assemblage.

However, the most general and consistent pattern in the artifact distributions is a clear division into coastal assemblages (North Coast to the Ica valley) and highlands assemblages (from the Jauja region, through Machu Picchu, Cuzco, and southern Titicaca, to the flanks of Illimani in Bolivia). Because of the poor representation of coastal material south of the Ica valley and of highlands material north of the Upper Mantaro area, this division could also be construed as a northwest versus southeast distinction. Lechtman (1979) simply divides Andean metalworking traditions into "North Andes" and "South Andes" categories.

On the coast, there is a clear concentration of all forms of metal vessels, earspools, rings, limespoons, beads, sheet metal bangles other than disks, and spindle whorls (Fig. 2-8). All of the highly varied forms of tweezers are strongly concentrated on the coast, although occasional examples of some types are encountered in the highlands (Fig. 9-11). Although the sample size is small, copper star mace heads appear to be found mostly on the coast (Fig. 12). Objects that appear to have enriched silver surfaces on material with a significant copper content are heavily concentrated on the coast (Fig. 13). As noted above, visual inspection is likely to be inaccurate in estimating metal contents. However, this visual assessment is supported by some physical evidence. Silver surface enrichment is documented by physical testing of coastal material (Lechtman 1973), while extensive SEM/EDS analysis of the Upper Mantaro Archaeological Research Project's metals collection has not identified a single example of silver surface enrichment from that highland region.

The highlands, on the other hand, have a complete monopoly on copper and lead bolas, strong concentrations of needles with pierced eyes (as opposed to looped eyes), T-shaped axes, and semi-lunate tupus, as well as a moderately strong concentration of copper conical "bells" (Fig. 14-19). Some types and traits are even more severely restricted to just the southern Titicaca and northern Bolivia areas, including several types of cast tupus, forged tupus with lobes or steps on the neck below the head, and forged tupus with strongly downturned corners on the heads (Fig. 20-23). Interestingly, most highlands objects other than bolas have a few representatives in the Central Coast collections. It is tempting to suggest that this reflects a real interaction between the Lima area and the highlands, perhaps associated with pilgrimages to Pachacamac or other central coastal centers, but the pattern could also simply result from the unusually large sample size from the Central Coast.

Within these general areas, of course, there are still significant differences in artifact distributions. Some objects are found more commonly at certain sites than others, despite the general regional pattern.

Finally, some object types have localized distributions that do not fit neatly into either the general coastal or highlands patterns. One type of axially symmetrical tupu and a particular variety of tweezers are found only around Lima (Fig. 24, 25). A number of object types including the well-known massive copper digging points and very thin sheet "leaves" usually found in burial caches are seen only on the North Coast (Fig. 26, 27). Sheet strips or wires ending in forged hooks, clearly designed to link together to form a hoop, appear only in the Chincha valley (Fig. 28). Certain earspool types are very locally distributed (Fig. 29, 30). Copper architectural "cramps" and a certain type of cast figurine are found only at or around Tiahuanaco, possibly dating to Middle Horizon times (Fig. 31, 32). A distinctive copper sheet ornament with repousse dots and four holes, probably for mounting as a headress ornament (Fig. 123), is found solely on the Island of Titicaca in what appear to be large offering deposits (Bandelier 1910).

Lead is found virtually exclusively in the Jauja region, in the Lima area, and occasionally south of Titicaca, probably as much due to the location of lead-silver ores as to cultural differences (Fig. 33). Heavy copper axes with large holes in the haft portion are restricted to Ecuador (Fig. 34). And sheet copper "money tumis" (Masuda et al 1985) are found in an odd distribution including the north-central North Coast, a few examples in the Lima region, and other examples in northern Bolivia (Fig. 35). The Lima area objects could easily represent exchange with the northern region, although the gap between the northern and central coast occurrences demands some explanation. Despite their overall similarity, the Bolivian "money tumis" are somewhat different in form from the North Coast ones, and the geographic separation suggests that the Bolivian "money tumis" are probably unrelated, or very indirectly related, to the North Coast phenomena. The Bolivian examples look more like usable tools than the large, stylized North Coast versions.

Interestingly, there do not seem to be any objects or traits that are strongly concentrated in the Cuzco and Machu Picchu area, nor many in the Jauja region with the exception of lead objects. The Inka heartland, if these sites can be taken as representative of it, appears to participate in metal traditions centered in other regions, without being the focal point of its own tradition. This impression could well be due, however, to the small sample size from Cuzco itself; the Field Museum has numerous copper objects said to be from Cuzco that are different from any used in this study, but which were not recorded due to time constraints.

Some object categories do have the broad distributions with regional concentrations hypothesized to result from Inka state associations, such as sheet disks, tweezers in general, tupus in general, tumis, axes in general, fine chisels, and needles in general (Fig. 36-42). General manufacturing techniques, such as the use of sheet metal and casting, and metalworking debris such as sheet scrap, casting waste, and cast "ingots" are also widespread (Fig. 43-45).

However, most of these wide distributions conceal major variability within them. For example, the distribution of all tweezers appears to show a modest but distinct representation of tweezers in the highlands as well as the coast. But as mentioned above, the distributions of individual tweezer types--and the forms vary radically--show that each type is strongly concentrated on the coast, with only a very small number of examples in the highlands (Fig. 9, 10, 11). A state-associated type ought to be comparatively homogeneous; it seems unlikely that the Inka would have co-opted a clearly long-standing coastal category of object as a state item and then imported or imitated it in such markedly different forms. This pattern of isolated examples of very different subtypes suggests casual exchange of objects or ideas, rather than state-associated distribution or restricted access. The same argument holds for the many varieties of tupus and the two major categories of needle types (Fig. 16, 24, 46-48).

The overall impression given by the geographic distributions of metal artifact types and traits is one of considerable inhomogeneity. Few of the distributions cover most of the Inka region, as demanded by the models of state-associated objects. Clearly, the Inka did not have a large-scale, statewide influence on local metalworking traditions, at least at the level of object types and features. If the Inka did affect local production or styles of metalworking, the changes must have been limited to a few particular object types, comparatively rare objects, or to organizational details that did not affect the nature of the final products. There was no massive restructuring of metalworking in the Late Horizon, nor was there large-scale exchange or distribution of Inka-style metal objects. The Inka influence was lighter than that. After detailed physical analyses of the metal objects from the Ica and Chincha valleys, Root (1949) came to the same conclusion about that region: "Inca workmen apparently stayed in their mountains, and the craftsmen of the coast continued much as before..."

Changes Over Time

In six regions covered by this survey, it has been possible to date some metal artifacts to pre-colonial time periods. Only identifiable objects, not unidentifiable fragments, are included in this discussion. The most securely dated are the metal objects excavated by the Upper Mantaro Archaeological Research Project from residential contexts in primarily single-component Late Intermediate or Late Horizon sites. Of the 223 UMARP objects, 114 are identifiable objects from good, dated pre-colonial contexts.

Using Menzel's (1976) seriation of Chincha and Ica ceramics, 133 objects from burials in that region were dated to pre-colonial times. Unfortunately, Menzel dates only a fraction of the Uhle collection grave lots. Menzel's dates tend to be more recent than Kroeber and Strong's (1924a,b), which Root used in his analysis of the Chincha and Ica metals. Menzel does not date many of the lots examined by Root, especially the ones he felt were early. All of Root's "Late Ica II" objects are Late Horizon, according to Menzel; almost half of his "Late Chincha I" objects are Late Intermediate-Late Horizon; most of his "Late Chincha II" objects are Late Horizon-Early Colonial; and his "Inca" material includes many objects dated by Menzel as either Late Horizon-Early Colonial or Early Colonial.

Fifty-eight metal objects from burials in the Lambayeque Valley, excavated by Bennett (1939) were roughly dated according to his analysis of the associated ceramics.

Fifty-five metal objects from Bandelier's excavations in the

Pelechuco-Charassani area of Bolivia, east of Titicaca, were dated according to Chapin's (1961) reanalysis of the ceramics now housed at the American Museum of Natural History. However, because all but seven of the datable objects from this region were assigned to the Late Horizon, this material is not very useful for looking at change over time.

All the metals from Machu Picchu are assumed to be Late Horizon pieces, as are the metal objects found in the La Plata Island burial excavated by Dorsey (1892).

Table 4 summarizes the dated assemblages from areas with pre-Inka material by general period (pre-Late Horizon versus Late Horizon), region, and type, showing both the total counts of objects and the percentage of the assemblage that they comprise. Objects amounting to less than one percent of any assemblage are lumped as "minor others".

As discussed above, major Inka influence on or involvement in local metalworking industries should tend to cause changes in the Late Horizon that make local metal assemblages vary in parallel or become more similar to each other, and state-associated types, if any, should become more common in the Late Horizon outside of their originating region.

The dated Lambayeque material includes 34 pre-Late Horizon objects, and 23 Late Horizon objects. These are extremely small samples by which to characterize entire assemblages, especially since they represent a very small number of grave lots from several different sites, but they are all that is available. In the Late Horizon, there appear to be reductions in the relative importance of copper "money tumis", heavy copper digging points, metal vessels, and the tied-up bundles of very thin copper "leaves" found in burial caches. There seems to be a corresponding increase in tweezers, with just possibly significant appearances of rings and a form of folded, repousse sheet silver plaque. The remaining changes, involving only one or two objects, cannot be considered significant. Even the ones mentioned are highly tentative. The general trend appears to be one which reduces the role of uniquely North Coast objects and metal vessels, while maintaining a smattering of other widespread coastal types.

The Chincha and Ica material, on the other hand, show a different set of changes in the Late Horizon. With 38 pre-Late Horizon objects and 95 objects dated to the Late Horizon, there appear to be declines in the relative frequency of sheet metal disks and metal vessels. Tweezers rise in importance somewhat, as do bangles and earspools. Sheet metal sheathing nailed over wooden objects appears in the Late Horizon, but the percentage is probably deceptively high, since one such object can produce a large number of sheathing material fragments that may be recorded as separate occurrences depending on the conditions of excavation and cataloging. A few other object types, including copper star mace heads and conical sheet metal "plume holders" appear in the Late Horizon assemblage in small percentages. Both of these types could be argued to be considerably older than the Late Horizon, however. The decline in metal vessels parallels that seen in the Lambayeque assemblages, as does the rise in tweezers. This suggests a pattern, albeit a weak one, of change in the Late Horizon parallel to that seen on the North Coast. The direction of this change, however is not towards the highlands assemblages. If anything, more of the explicitly local, coastal types are present in the Late Horizon Chincha-Ica assemblage than in the pre-Late Horizon collection.

The metal objects from the Upper Mantaro area used here comprise 45 pre-Late Horizon artifacts (terminal Late Intermediate Period, in this case), of which all but 18 are silver sheet disks, and 69 Late Horizon pieces. Some 24 additional well-provenienced fragments are ignored here as typologically unidentifiable. This unusually well-documented excavated collection is more fully discussed in a later section.

The most striking changes in the Upper Mantaro assemblage do not relate directly to object types, but to the metals used. Silver drops from 43% of the assemblage in the Late Intermediate to 14% in the Late Horizon, while copper consequently rises from 35% to 77% of the dated material. In addition, copper becomes about three times more ubiquitous in the Late Horizon, while silver becomes distinctly scarcer. There was evidently a copper production boom in the Late Horizon.

The largest change in the type composition of the assemblage is a significant drop in sheet disks, all of which are made of silver in the Late Intermediate. In the Late Horizon, copper disks appear, but not in sufficient numbers to compensate for the loss of silver in circulation. Several pieces of evidence discussed in the Upper Mantaro section of this study suggest that silver was being taken out of circulation in the Late Horizon, even as silver production was probably rising. The silver was presumably transferred to the Inka state.

Other changes in the Upper Mantaro material include relative increases in tupus and needles in the Late Horizon, although these trends are largely due to the real decline in disks. Although the percentage of bolas remains about the same, the Late Intermediate bolas are all lead, while the Late Horizon bolas include two cast tin bronze examples virtually identical to the one from Machu Picchu sectioned and illustrated by Mathewson (1915). Finally, the Late Horizon tweezers are of a virtually unique type, so different from those seen elsewhere that it is not certain that they in fact served the same purpose. Unlike virtually all other Andean tweezers, which terminate in comparatively broad edges, these come to long, narrow points. If these objects are taken to be tweezers, there could be a parallel change in the Upper Mantaro area, the Lambayeque valley, and the Chincha-Ica area in which tweezers become more common in all these regions. The samples are very small and the types ambiguous, so this conclusion should be taken as tentative at best. Clearly, the Inka conquest brought about major changes in the metals used in the Upper Mantaro area, with repercussions in the types of objects made from them. However, these changes appear to be unlike the temporal trends in the other regions studied, and they do not bring the Upper Mantaro area any closer to a state-wide pattern of metal artifacts.

The Pelechuco-Charassani material includes too few pre-Late Horizon pieces to allow any secure conclusions. However, every one of the 7 early objects is a tupu, and 83% of the Late Horizon objects are tupus. No significant change is indicated, but neither is a change ruled out.

The temporal data, such as they are, do not indicate that any uniform set of changes occurred in local metalworking traditions when they were incorporated into the Inka state. There is a suggestion that tweezers became more common in several areas in the Late Horizon, but the items referred to as tweezers differ markedly from region to region, and the trend itself is not numerically convincing. Otherwise, no emerging state-associated type is indicated. There is a slight tendency for the Lambayeque assemblage to approach the composition of the overall undated coastal assemblage in the Late Horizon by downplaying some of its more unusual types, but neither it nor the Chincha-Ica material gets much closer to the highlands assemblages. The Chincha-Ica assemblage, if anything, differs from the highlands material more rather than less in the Late Horizon. Like the spatial distribution data, the temporal data provides no support for any widespread or uniform Inka influence on local metal industries.

Comparison of Unmixed Late Horizon Assemblages

An alternative approach to the temporal data involves comparing the Late Horizon assemblages from different regions with each other, rather than with the earlier material from the same regions. If there was any state-wide influence on local metals traditions, it should show up as some commonality between the Late Horizon assemblages. These data, which are partially the same as those used in the previous section, are presented in Table 5. Again, the numbers are quite small, but two additional assemblages are included, one from Machu Picchu and the other from a grave with several fine Cuzco style Inka ceramic vessels found on La Plata Island, off the central Ecuadorian coast.

These assemblages fall into three distinct categories. The highlands category is typified by the large Machu Picchu assemblage, with the Upper Mantaro, Pelechuco-Charassani, and La Plata Island collections all comprised of subsets of the assemblage found at Machu Picchu. Here again the "types" involved include some extremely variable categories such as tweezers in general and tupus in general. Most of the tupus from the Pelechuco-Charassani area, for example, are completely different from any tupus found at Machu Picchu, and some of the Machu Picchu tupus are types generally restricted to the southern Titicaca area. The cohesiveness of this set of assemblages is in part a matter of the low resolution of the comparison.

The Lambayeque Late Horizon assemblage and the Chincha-Ica Late Horizon assemblage are completely different from each other and from the highlands Late Horizon assemblages. They share only a single artifact type with the other assemblages, the broad category of tweezers in general. The Chincha-Ica assemblage shares sheet disks with highlands assemblages, but the coastal assemblage disk category includes disks that are convex and have multiple holes, while the highland disks are exclusively flat and have a single hole. The small sample size may exaggerate the differences in these assemblages by tending to suppress the occasional occurrences in one assemblage of types common in the other. However, the atemporal spatial distribution maps indicate that most of the types found in these Late Horizon assemblages are in fact types that have clear north or south coast concentrations. Clearly, the Lambayeque, Chincha-Ica, and highlands assemblages have virtually no overlap in the Late Horizon, and can in no way be said to be similar to each other at the level of object types.

Among the highlands Late Horizon assemblages, the presence, absence, and proportions of types varies considerably. The patterns within this group are probably partially due to the different sample sizes, so that the largest sample has the most different types and the smaller samples have subsets of those. Context is probably also a factor. The Upper Mantaro assemblage may be relatively heavier in needles because it represents residential debris rather than burial goods. The Machu Picchu material is from both types of contexts but is weighted towards burials. The other dated material is primarily from graves.

The hypothesis of Inka involvement in metal production or use requires nothing more than "some sort of commonality" between Late Horizon assemblages. The data cannot provide support for even that weak a prediction; the Late Horizon assemblages are very different from each other in almost all respects, and the hypothesized role of metals in the Inka state is not validated.

The Tin Bronze Horizon

One of the best reasons for suspecting that the Inka had some concrete impact on local metalworking traditions is the apparently sudden, universal spread of tin bronze in the Late Horizon. Lechtman (1976) has called tin bronze a "standard of the Inca hegemony...one of the symbols of state power disseminated throughout Tawantinsuyu by the Inca".

An alloy per se, without being made into some characteristic object or treated in a distinct style, is a subtle symbol. It is not clear whether the common Inka bronze alloys, which contain just a few percent of tin, would have been distinctly different in color from ordinary copper or arsenic bronze. A person may have been hard put to distinguish supposedly symbolic tin bronze objects from pieces made of plain copper or arsenic bronze. Probably the only way to detect low-tin bronze is to observe its hardness in the course of use, but the bulk of the bronze objects are tupus, needles, and other items that would never be subjected to cutting or other tasks requiring hardness.

On the other hand, adding tin lowers the melting point of the metal, and it improves the metal's working and casting properties. Metalworkers may have adopted it as much for its advantages during manufacturing as for the physical or symbolic qualities it gave the final product (Mathewson 1915; Nordenskiold 1921). Lechtman (1979) is correct that tin and arsenic have about the same effect on copper. However, arsenic was apparently derived from the original ore (Lechtman 1976), so its quantity could not be controlled or increased. Tin, on the other hand, could be added to any melted copper or bronze to further improve its qualities. That is exactly what happened in the Upper Mantaro region, where many Late Horizon tin bronzes are clearly nothing more than the same arsenic bronze used in the Late Intermediate, with tin added (see Appendix B). But regardless of tin's symbolic, practical, or other functions, the tin bronze horizon certainly indicates that the Inka state had at least an economic impact on local metalworkers by making tin available to them.

This is not the place to review all the evidence for the tin bronze horizon, but the change does seem to have occurred in at least two of the areas studied here. In the Chincha-Ica area, tin appears in some copper objects only during and after the Late Horizon, regardless of whether Kroeber and Strong's (1924a,b) or Menzel's (1976) chronology is used. With Menzel's chronology, however, there is only a single pre-Late Horizon copper piece among those Root examined, plus one Late Intermediate-Late Horizon piece that also contains no tin. Interestingly, fewer than half of the Late Horizon copper objects contain tin according to Menzel's dating, and a still smaller fraction are tin bronze using Kroeber and Strong's chronology.

All of the Machu Picchu copper objects analyzed by Mathewson (1915) contain tin. Almost all of the copper artifacts from what are probably Inka ceremonial offerings on the Island of Titicaca, collected by Bandelier (1910) and analyzed by Wissler (Mead 1915), contain tin. Without comparable pre-Late Horizon material, however, it is dangerous to rely too heavily on these examples. And in fact, all of the presumably pre-Late Horizon material from Tiahuanaco, except for the famous "cramps" said to have held architectural stones together, also contain tin (Mead 1915). Tin bronze probably already had a long history in Bolivia, where tin is mined, when the Inka acquired the Titicaca region and areas south and east of it.

Physical analyses described in the section on the UMARP material have shown that tin was not used in the Yanamarca Valley prior to the Late Horizon, but that it was added to most or all copper objects after the Inka conquest.

In addition, the Upper Mantaro analyses suggest that bulk copper circulated as chunks of pure copper, and that the tin was probably not added until the time of the casting of an object or forging blank. Tin may have circulated in pure, metallic form, or as pieces of very high tin bronze intended for alloying with pure copper (see the UMARP section for details).

In either case, tin must have come from the important deposits in Bolivia, and its availability throughout the Andes does not seem to have been significant until Inka times. Since the historical sources agree that the Inka strongly restricted most travel, it seems likely that the state was involved at least passively in the distribution of tin.

Particular Artifact Types

Treating the metal objects as assemblages and sets of distributions has failed to produce evidence of significant Inka involvement in or influence on local metalworking industries. Inka influence could have been too subtle for these techniques to detect, perhaps involving only one or a few specific object types or traits, possibly less common ones. Are there specific metal objects or traits that fulfill the hypothesized spatial and temporal expectations of state-associated objects?

A number of the copper objects from Machu Picchu, described and illustrated both by Bingham (1930) and Mathewson (1915), tend to be thought of as "typical" Inka objects. The attractive copper limespoons with long-beaked birds cast onto the head are one example; yet their spatial distribution (Fig. 49) shows these objects to be clearly concentrated on the coast, especially the Central Coast. The two cited examples from Machu Picchu are the only instances of this type in the highlands.

Much the same is true of the triangular-shaped bronze tweezers from Machu Picchu. Bingham's (1930) illustration is a bit misleading; in fact there is only one classical triangular-shaped tweezer from Machu Picchu, plus a blank that is clearly ready to be made into one. Two other illustrated tweezers are actually rounder in shape and have thin, convex valves as opposed to thick, tapering flat ones. Whether their owners perceived them as the same or different items is impossible to say, but the two varieties can almost always be unambiguously separated both in this assemblage and on the coast. Finally, one of Bingham's illustrations (e) is definitely a side view of another (probably a), although this is not explained in the caption. The two illustrated examples, plus one additional piece from Cuzco, are the only occurrences of these triangular tweezers in the highlands (Fig. 11). These same three tweezers are also the only highlands occurrences of a characteristic step or groove in the thickness of the tweezers' neck. This trait is found on both triangular and teardrop-shaped tweezers on the coast (Fig. 50).

Very few of the heavy T-shaped axe heads of the type collected by Bingham at Machu Picchu and along the Urubamba are known from other proveniences, although many unprovenienced examples are found in various collections. It is hard to say what the distribution of these objects was in either space or time, but they appear to be rare outside the highlands (Fig. 17). The only datable examples are those from Machu Picchu itself. The available data neither support nor reject T-shaped axes as state-associated types.

Only somewhat clearer is the case of the copper conical, hollow "bells", or "earrings", as Bingham called them. These artifacts appear to have a primarily highlands distribution, centering on the southern Titicaca region, with a few examples at Machu Picchu, a half-dozen others on the coast and in central Ecuador, and three in the Inka burial on La Plata Island (Fig. 19). As with the T-shaped axes, this distribution could represent the minor dissemination of a basically highlands or southern Titicaca type by the Inka state, or it could be interpreted as too concentrated in the southern Titicaca region and too faint elsewhere to imply state associations.

The only datable examples of these conical "bells" are from Machu Picchu and La Plata Island, neither of which has a pre-Late Horizon component for comparison. The La Plata Island occurrence is particularly interesting, because not only the ceramics, but also all the metal objects, are exactly like objects found at Machu Picchu. Both the ceramics and the metal artifacts must have been brought to Ecuador from the Inka heartland. Does this association and long distance travel suggest that the conical "bells" and the accompanying semi-lunate tupus are state-associated items in the same sense as the ceramics with which they were buried? Or are they just Cuzco-area objects brought along for functional or general decorative reasons rather than explicitly state-symbolic purposes? Again, the data can neither confirm nor deny any state associations with this copper artifact type.

Bingham found and illustrated a number of large copper disks (36 to 77 millimeters in diameter), each with a pierced tab on the edge. These objects are strongly concentrated in the highlands, with only one example found anywhere on the coast (Fig. 51). Poma illustrates warriors wearing these disks on their chests, suspended by a cord through the pierced tab (Fig. 67, 68). In one case, the warriors are explicitly not Inkas, but the mythical precursor race of Auca runa (warlike people) (Fig. 69); in another, both Inka troops and a Can~ari opponent wear the disks (Fig. 70). The only dated examples are those from Machu Picchu and a single Late Horizon example from the Upper Mantaro. The restricted spatial distribution and Poma's illustrations of non-Inkas wearing them suggests that these objects did not have a strong association with the state.

In contrast, the historical sources repeatedly agree that piercing the ears to wear large earspools was an Inka prerogative, granted occasionally to favored vassals or ethnic groups (Cobo 1983:208, 245; Garcilaso 1961;6, 12, 13, 139, 188; Poma 1978:34). Many of Poma's illustrations show the Inka wearing earspools (Fig. 71-76); there may not be a single picture of an Inka ruler without them. Nobles are also shown wearing earspools (Fig. 77), and they even retain them when ignominiously stripped and killed (Fig. 78). Yet the archaeological distribution of silver and copper earspools is limited to the coast (Fig. 3), with only one possible exception. Most of the recorded earspools come from Chincha, Ica, and the Vicus area; unlike most coastal artifacts, earspools are poorly represented on the Central Coast.

Of course, the illustrations do not show what material the Inka-associated earspools were made from. If only gold, highly elaborated silver, or expensively inlaid earspools were worthy of use in the highlands, then the criteria used to select objects for this study would have excluded them. Alternatively, they may have been too valuable and too easily gathered by non-archaeologists since the conquest to have survived. Or Poma's illustrations may have a coastal bias, although the general textual agreement argues against that explanation.

Earspools do become more common in the Ica-Chincha Late Horizon assemblage, but they are not seen to proliferate in any of the other dated assemblages. As discussed above, the change in relative frequency of a state-associated object within its originating region could go either way, depending on the nature of the association and the rules applied to it; the temporal data from the Chincha-Ica region neither support nor reject a state association for earspools.

Moreover, the general category of earspools can be divided into three subcategories with even more restricted distributions. One variety, with the tubular section flaring out to the full diameter of the faceplate, is found only in the Vicus area; another, with a short, large diameter tubular section, is concentrated in the Chincha valley; and the last, with a long, narrow tubular section, is found mostly in the Ica valley and the Vicus area (Fig. 29, 30, 52).

The highly restricted spatial distribution of archaeological earspools in general, the even more regional distribution of particular varieties, and their failure to spread outside the originating region in the Late Horizon would be grounds for rejecting earspools as state-associated objects, were it not for the textual and pictorial evidence to the contrary. One hopes that this conflict can be explained without denying the validity of the metals data base or the hypothesized spatial and temporal distributions of state-associated objects, but a convincing explanation remains elusive and earspools have to be treated as a problematic category.

There is a similar conflict with copper star-shaped mace heads. Poma (1978) illustrates many of the Inkas (Fig. 71-76 and others not shown) and the head messenger (hatun chaski) (Fig. 79) as holding star-headed maces, although there do not seem to be textual references to these weapons as indicators of rank or state affiliation. Yet the spatial distribution of copper star-shaped mace heads is primarily coastal, with only three highlands examples known (Fig. 12). Like the cone bell distribution, this pattern is ambiguous. Especially with the small number of pieces plotted, it is difficult to say whether this distribution represents a coastal type co-opted by the Inka state, or a coastal object without state associations. Again, the archaeological data hint at a coastal bias in Poma's drawings. On the other hand, star-shaped mace heads made of stone are common in highlands museums. The Upper Mantaro Archaeological Research Project recovered several from various periods and social status contexts, and Rivet and Verneau (1912) illustrate numerous examples found at sites from Ecuador to Tiahuanaco. The present data do not permit any secure conclusion about copper star-shaped mace heads.

The spatial distribution of tumis makes them prime candidates to be Inka state-associated objects (Fig. 39). Broadly distributed but somewhat concentrated in the highlands, tumis are found throughout the entire region of this study except Ecuador. The pattern is almost exactly what is hypothesized for an originally highlands object type that is physically or conceptually disseminated by the Inka throughout their territory. Unfortunately, the only well-dated pre-colonial examples are from Machu Picchu and the Pelechuco-Charassani Late Horizon assemblage, neither of which offers a usable pre-Late Horizon assemblage for comparison. Two tumis from the Upper Mantaro region date to early colonial times, but none were found in good Late Horizon or Late Intermediate contexts. Numerous hafted tumis have been found, and many were clearly sharpened and used as cutting tools, often rather roughly. One might doubt that an apparently utilitarian artifact would have carried status or political associations.

Unlike the widely distributed category of tweezers, the variation within the general category of tumis is comparatively minor. This study uses a narrow definition of "tumi" that excludes the clearly different Chimu "tumis" and objects depicted on Moche vessels that are often called "tumis". Within the category of tumis as defined in Appendix A, some have handles that end in loops, a few end in cast animal heads or figures of animals or people, and some just thin down to a point. The handles vary in section from fairly flat rectangular sections to ovoid and round sections. The blades vary slightly in curvature and the ratio of length to width. But there is no question that all these objects were essentially the same thing, more or less elaborated. The variable traits are not regional. On the contrary, the distributions of tumis with plain, looped, flat sectioned, rectangular sectioned, and rounded sectioned handles are all virtually identical to the distribution of tumis in general (Fig. 53-57). The same is true for tumis with a particular, distinctive treatment of the join between the handle and the blade (Fig. 58). These uniformly widespread patterns of variation within a single type, in contrast to the patchy distributions of other metal objects and traits, suggest some sort of pan-Andean phenomenon that might be difficult to explain without recourse to associations with the Inka state or an earlier large scale interaction system.

Tupus initially appear to be good candidates for objects with Inka state associations. Tupus are found throughout the Inka region, although they are far more common in the highlands, especially in the Titicaca area (Fig. 38), than on the coast. This pattern is similar to that of tumis (Fig. 39), but in this case the considerable variation within the category of tupus demands that subtypes be considered separately. For example, a number of tupu types and traits are found exclusively in the southern Titicaca area, such as tupus with lobes or steps on the neck below the head, tupus with a particular, distinct treatment of the join between the head and the neck, tupus cast in flat, two-piece molds representing llama heads or other designs, and miniature tupus apparently cast by the lost wax method in various distinctive patterns (Fig. 20, 22, 46, 59). As mentioned earlier, several very different cast tupu types are sharply restricted to the Pelechuco-Charassani and Illimani area; tupus with strongly downturned, rounded corners are mostly found in the southern Titicaca area, although a few occur in other widely scattered places; and a category of axially symmetrical tupus occur only on the Central Coast (Fig. 21, 23, 24).

The only tupu types with sufficiently widespread distributions to be potential state-associated objects are plain, flat, round headed tupus and plain, flat, half-round headed tupus referred to as semilunate. The round headed tupus are substantially more common, with a distribution concentrated in the highlands, especially the southern Titicaca area, a moderate representation on the Central Coast, and a thin but definite distribution elsewhere on the coast (Fig. 60). The only surprise is that there is but a single example in the large Chincha-Ica collection. This is very close to the distribution predicted for a highlands type spread by association with the Inka state.

But unlike the situation with the tumis, there is clear archaeological evidence that this type of copper tupu was already comparatively widespread by the Middle Horizon. Theresa and John Topic excavated some 37 copper tupus from several separate proveniences in the "mausoleum" on Cerro Amaru near Marca Huamachuco, of which 20 to 35 appear to be the plain, round headed type. (Topic and Topic, 1984; xeroxed field notes). The mausoleum contained a few ceramics assigned to Huari Epoch 1B, and twelve radiocarbon dates for the structure range from 330 AD +/- 105 to 680 AD +/- 80, plus an anomalously early date of 10 BC +/- 70. Far to the south, Isbell excavated a number of plain round headed copper tupus from Middle Horizon graves at Conchopata (Isbell n.d.). That tupus in general are a very old concept is demonstrated by the gold examples in Chavin style illustrated by Lothrop (1941), although they are quite different from any seen in this collection. Given these well dated early examples, attributing the spatial distribution of any tupu type, and especially of the plain round headed variety, to Inka influence would not be very convincing.

Semilunate tupus are primarily a highlands type, less concentrated in the southern Titicaca area than the plain round headed variety, with some examples on the Central Coast and nine others in the Inka burial on La Plata Island (Fig. 18). This distribution does not fit the predicted one for state-associated objects very well, with the total absence of the type on both the north and south coasts. On the other hand, the same arguments concerning the conical "bells" in the La Plata burial apply to these semilunate tupus. This clear-cut association with Inka state ceramics in a comparatively remote location may suggest that these tupus had some state symbolic function similar to that of the ceramics. Alternatively, they might just be Cuzco area objects that traveled with the owner of the vessels without necessarily serving explicitly state-associated functions.

Historical and ethnographic sources indicate clearly in words and pictures that tupus were primarily or exclusively worn by women, as they apparently are today in the southern Andes (Fig. 80-83, plus others not shown; Poma 1978:33, 46, 81; Bandelier 1910:74-5, quoting Cobo; Bandelier n.d.b:31-33; Murra 1962:719). Unfortunately, the sexes of the individuals buried with tupus at Cerro Amaru could not be determined due to poor preservation, and Isbell does not specify the sexes of the Conchopata burials. Assuming that tupus are a traditionally female accessory, one doubts whether they would have served as state-associated goods in the male dominated polity of the Inka.

None of the suggested object types was clearly associated with the Inka state. Most can be ruled out as state symbolic or wealth items, but the data on a few are ambiguous. Tumis, in particular, cannot be ruled out, but neither can they be confirmed as having Inka state associations.

The Changing Role of Metals in the Upper Mantaro Area

The metal objects excavated by the Upper Mantaro Archaeological Research Project (UMARP) provide a uniquely detailed example of the changing role of metals in one particular region as that area was subsumed into the Inka state. The Upper Mantaro appears to have been relatively unimportant as a metal production and consumption region compared to the much more productive areas around Lake Titicaca and on the north coast, but the patterns there still suggest what sorts of changes took place when metal-producing regions were acquired by the Inka state.

UMARP focused on the Yanamarca Valley, a small valley opening onto the northern end of the Mantaro Valley just above Jauja, in the central highlands of Peru. The Yanamarca is a rich agricultural zone which in the terminal Late Intermediate period (locally called "Wanka II") was dotted with fortified habitation sites located on defensible hilltops. When the Inka conquered the local Wanka people, they moved most of the population from these defensible sites into unfortified towns at lower elevations, closer to the best farmland for growing maize. The Wanka II and Wanka III (Late Horizon) periods were both very short, on the order of 70 years duration.

Both the Wanka II and the Wanka III sites are composed of circular stone structures, organized as "patio groups" of two to eight structures facing into a common patio space. The patio is often further delimited by walls connecting the structures into a closed ring with only one or two entrances. These patio groups are taken to represent the living places of discrete economic units, probably extended families. At many of the sites, the walls of many structures and patios are still standing up to two meters tall, so that the patio groups can easily be distinguished without excavation. These patio groups were classified prior to excavation into a "commoner" category and an "elite" category, based on the quality of the stonework, the location and size of the patio group, and the density of Inka sherds surface-collected in the area. The pre-excavation judgments of status were upheld in almost every case by the relative concentrations of fine ceramics, metals, shell, quartz crystals, dietary differences inferred from bone and botanical remains, and so on (Earle, et al 1980 and in press).

Altogether, UMARP excavated 38 commoner and elite patios at nine different sites, finding 224 non-ferrous metal objects. After a detailed study of the ceramics, bone (pig bones indicate post-contact occupation), and other artifacts, those excavation loci that appeared to represent undisturbed, single-period occupation deposits from the Wanka II and Wanka III periods were selected for analysis. Burial contexts were excluded in order to best represent the conditions prevailing among the living. There are 1780 of these loci with good contexts, containing the 138 metal objects upon which the rest of this summary is based.

Most of the distribution data is expressed in terms of "ubiquity", or the fraction of all the loci that contained one or more artifacts of the type under discussion. Using ubiquity rather than artifact density per volume or some similar measure counteracts the effect of finding a cache or set of artifacts in one place, or a single very large artifact, which might otherwise overshadow the broader patterns of distribution. Because ubiquity measures the absolute amount present rather than a proportion of the assemblage, it is not subject to many of the problems of percentage data, either. The loci vary in size, but a typical locus is a single natural level of a 1.5 meter square excavation unit, usually between two and 15 centimeters thick.

To the north, west, and east of the Yanamarca are shallow deposits of oxide and sulfide ores of copper and silver, as well as galena (lead ore) with silver impurities, many of which have been mined in modern times and probably were exploited in the past. Some native silver may have been present, but there was probably never much native copper.

The UMARP Metals Assemblage

The Upper Mantaro metals assemblage is mostly copper (60% by count), with some silver (30%), a little lead, and a single piece of gold. There is not a single example of silver or gold surface enrichment in the assemblage, including the pieces from mixed and late contexts that are not otherwise discussed here. Silver surface enrichment on copper-rich objects, in contrast, is very common on the coast.

The most common type of artifact is a thin sheet disk with a single hole, usually of silver. A few copper examples have loops of thread preserved through their holes, suggesting that they were used in ways similar to disks found on the coast, sewn onto various textile goods. The size distribution of the disks is clearly bimodal, with a small 15 mm diameter size and a large 23 mm size. Most of the silver is found in the form of disks; the three identifiable silver objects that are not disks are all tupus.

The other fourteen tupus in the sample are copper. Both the copper and the silver tupus are mostly of the forged variety with flat, round heads, occasionally with additional ornamental details. Two copper tupus are cast in the round, and one Wanka II silver tupu is huge, some 304 mm long and 135 mm across at the head. The UMARP tupus tend to be small relative to those from the Machu Picchu area and the Titicaca area, which have the two most comparable metals assemblages. Excepting the giant silver example, the UMARP tupus all fall in the bottom ends of the distributions of shaft length and shaft diameter of tupus from the other two highlands regions. The heads are too stylistically variable to be useful for this type of comparison, and there are too few complete objects for mass to be a useful yardstick.

Needles are present in both the northern, looped-eye style and the southern, pierced-eye form. This area is the only one studied that has an appreciable mix of both needle forms. All the needles are copper. As in other areas, the needles vary widely in length (5 to 16 cm) and shaft diameter (1.5 to 3.6 mm), and from blunt to very sharp. Several needles had traces of twine in their eyes.

Fragments of copper shafts that could be from either needles or tupus are the second most commonly found metal artifact. Unidentifiable bits of sheet copper are also frequent.

The four very similar copper tweezers are of a unique type almost never seen outside the UMARP area. Rather than coming to broad, curving edges, they taper to a small point. Three have geometric designs traced on both surfaces. The only other metal objects in the assemblage that are decorated in this way are three otherwise non-descript bits of copper sheet strip. The UMARP tweezers all fall at the lower ends of the ranges of lengths, widths, and masses of tweezers found in other parts of the Andes.

Bola weights, originally attached to cords and thrown at the legs of hunted animals, were made from both copper and lead. The lead weights appear to have been formed when cold, with a crude hole all the way through, and are unlike any others in this study. The copper examples are just like the rather elaborately cast bolas from Machu Picchu. Other lead objects include bits of lead that were melted into repair holes on either side of a break in a ceramic vessel and trailed across the break to join the pieces together, and an oval bung-hole plug that once stopped up a neatly ground hole in a large ceramic vessel.

In spite of their wide distribution throughout the Andes, only two tumis were excavated in the Upper Mantaro region. One was from the Late Horizon, and the other was from a patio with a post-contact occupation. The Late Horizon example has identifiable coca leaves preserved in the corrosion on the blade, and, like the tupus, it is at the bottom end of the size range of tumis from the rest of the Andes.

The assemblage includes a smattering of single examples of artifact types found elsewhere, but the only remaining category with any number of examples is the broad category of manufacturing debris. The UMARP material includes numerous bits of scrap copper sheet, some with clear scoring marks and breaks, some roughly snipped into odd shapes, and some folded up into compact packets, as well as solid, irregular chunks of copper that appear to be excess metal melted for casting or ingots. No direct evidence of metal smelting or object manufacture was found, but this debris suggests that copper was worked, if not produced, somewhere nearby.

The UMARP assemblage is clearly a subset and a local variant of the overall highlands metals assemblage, with an unusual type of tweezer and none of the more common varieties, no examples of cone "bells" or spherical bells, and several unique lead bola weights. Silver disks, rare in other highlands assemblages, are the largest single category of metal artifact in this area. Needles are also unusually well-represented, but that may be due to the residential context of the excavations. Most of the other samples derive at least in part from burials, where needles may be underrepresented. This is the only assemblage that features a mix of both pierced-eye needles and looped-eye needles, suggesting some contact or exchange with the regions both to the northwest and to the south in the highlands, which is hardly surprising. Tupus, as well as a few of the less numerous types not discussed above, are small compared to analogous objects from elsewhere in the Andes. Possibly the raw metals were scarcer or more valuable in the Yanamarca than in other parts of the Andes. This difference might also be due to the more ordinary residential contexts of the objects, in contrast to the burials of important people, ceremonial centers, and offering deposits from which many of the other objects come.

Status Differences in Access to Metals

Not surprisingly, the elites in Wanka society apparently had access to substantially more metal goods than did the common people. Table 6 shows the ubiquities of silver, copper, and lead objects in commoner and elite patios in both Wanka II and Wanka III times. The elites generally had four to five times as much silver as the commoners, two to two and one half times as much copper, and a bit more lead. These figures confirm that among these metals (gold is too rare to discuss here), silver had the strongest associations with social status or wealth, followed by copper, with lead only slightly related to status.

The Wanka elites also had special access to certain types of metal artifacts, above and beyond their control of metals in general (Table 7). All four tweezers and all four ornaments to be worn came from elite patios. Tupus, both of silver and of copper, are much more strongly concentrated in elite patios than are silver and copper objects in general. Tweezers, tupus, and various items of jewelry, then, appear to have been special prerogatives of the elite.

Copper needles, on the other hand, are distributed almost equally between commoners and elites, in spite of the general concentration of metals with the elites (Table 7). Copper needles were apparently utilitarian objects without status connotations.

However, the needles in elite patios tend to be smaller in diameter than those in commoner patios. The size distributions overlap considerably, but the four needles with the largest shaft diameters are all from commoner patios, the smallest diameter needle is from an elite patio, and the mean, median, and modal diameters of elite needles are all smaller than those of needles from commoner patios. Needles from elite patios average 2.3 mm in diameter, while needles from commoner patios average 2.7 mm in diameter. This difference suggests that copper needles may have been used for making finer textile products in elite patios than in commoner patios.

Metal production debris, including sheet scrap and casting waste or ingots, and ores of copper, silver, and lead, are only slightly concentrated in elite patios. Although the elite had special access to certain finished metal goods, apparently they did not have a strong hold on the byproducts of metal manufacturing. This discrepancy could suggest that the elites did not control the metal manufacturing process, or that these byproducts were not highly valued and hence were readily circulated among the common people.

Changes in the Late Horizon

Before the Inka conquered the Yanamarca, the Wanka metals assemblage consisted mostly of silver disks sewn onto clothing, with some miscellaneous copper objects of various types in a secondary role. After the Inka conquest, the amount of copper in circulation more than quadrupled (Table 8). Because the copper metals assemblage is different from that of other areas, as discussed above, this increased quantity of copper goods probably represents a boom in local copper manufacturing more than increased trade.

At the same time, the amount of silver in circulation dropped by 50%. The ubiquity of lead objects increased slightly in the Late Horizon; the total mass of the lead artifacts more than tripled even though somewhat fewer Late Horizon loci than Wanka II loci were excavated. If silver was extracted from galena, as is highly likely, then lead was a byproduct of silver production. Thus the increasing quantity of lead suggests that local silver production rose, or at the very least did not drop, in the Late Horizon. This striking decline of silver in circulation in the face of increasing production implies that silver was being removed from the area. Presumably the Inka were diverting locally produced silver to the state, possibly requiring so much that local silver production had to rise to meet the new imperial demands.

Because most of the Wanka II silver was in the form of disks, the drop in silver is most clearly seen in a sharp decline in the ubiquity of silver disks. At the same time, copper disks appear in the assemblage, as though to replace the increasingly scarce silver ones (Table 9).

It appears that the overall stratification of Wanka society, as reflected in differential access to metal goods, was not much affected by the Inka conquest. Elites suffered somewhat more of a loss of silver than did commoners, and the elites gained a bit more copper. Despite minor readjustments, the elites still had about the same 2:1 advantage over commoners in copper goods, and roughly the same 4.5:1 advantage in silver (Table 9). The ubiquity of the status-related tupus and the utilitarian copper needles increased by the same amount, again suggesting that there was no disproportionate increase in status markers in the Late Horizon.

Finally, tin bronze was introduced to the Yanamarca and universally adopted there in the Late Horizon. Eight Late Horizon finished copper objects and four Early Colonial pieces were analyzed by SEM/EDS (Scanning Electron Microscope/Electron Dispersion Spectroscopy) and AAS (Atomic Absorption Spectrophotometry) (see Appendix B). All had distinct additions of tin. Most had between 1.3 and 8.1 percent tin, but three examples were in the high twenty percents and one registered almost fifty percent tin, probably due to a natural surface enrichment effect of corrosion. In contrast, seven of the eight Wanka II finished copper pieces that were analyzed had no measurable tin content, and the remaining one had a minuscule .02 percent tin, which is presumably natural. Such a low concentration would not have been detected at all by SEM/EDS.

In the Late Horizon, tin was apparently simply added to metals that were otherwise the same as the metals used before the Inka conquest, including low arsenic bronze. Two fifths of the analyzed Wanka II finished copper objects have low concentrations of arsenic, probably derived directly from smelting arsenical sulfide ore (Lechtman 1976). In the Late Horizon, all the finished copper objects have tin added, but approximately the same fraction (three out of seven) have low concentrations of arsenic comparable to the Wanka II pieces. Tin did not supplant arsenic in Late Horizon bronzes, it supplemented it; the conversion to tin bronze was a simple matter that probably did not involve anything more complicated than throwing some tin into the melted metal.

The tin used to make bronze was apparently added at a late stage in the manufacturing process, probably just before casting the object or forging blank. Bulk copper generally circulated in unalloyed form. These suggestions are based on analyses of all the UMARP copper objects that appear to be ingots or excess metal from casting or remelting operations. These pieces are solid chunks of copper with shapes suggesting that they solidified on more or less flat, horizontal surfaces, sometimes so suddenly that large blowholes formed in their bottom surfaces as gasses came out of solution when the metal was cooled by the surface below, but were unable to escape from the rapidly hardening mass. Five of the six Late Horizon examples contained no tin, in contrast to the finished objects from the Late Horizon, which are all tin bronzes. Similarly, neither the two Early Colonial copper chunks nor the one Wanka II example contained any tin. One of the Late Horizon chunks was a good bronze, however, with 2.9 percent tin. It may represent excess metal from a casting job, or a bronze object that was melted down.

While copper circulated as chunks of pure metal, tin may have circulated either as pure metallic tin, or as pieces of very high tin bronze that were intended to be remelted with pure copper to make a lower tin alloy. The only metallic tin mentioned in the literature or encountered in this study are the pieces from Machu Picchu. Bingham (1930) mentions two pieces of wadded up sheet tin, apparently not recognizing that two additional flat, irregular masses of metal that he collected were also tin. These pieces could be the immediate result of smelting cassiterite for tin, with the matted, fibrous residue of the smelting charge still preserved on their surfaces.

There is no tin in the UMARP assemblage, but there is an odd, steel-grey sheet fragment without a trace of corrosion that is a bronze with slightly more than 28 percent tin. This piece is from a good Late Horizon context, and unlike the other anomalously high tin bronzes, the measurement cannot be blamed on the surface enrichment effect of corrosion. Nordenskiold (1921) suggests that bits of very high tin bronze, rather than pure tin, may have been used for alloying. Since 28 percent tin bronze is so brittle that you can easily break it with your fingers, alloying would seem to be one of the few plausible uses for such a material.

Other Aspects of the Role of Metal Objects

In the Upper Mantaro area, as elsewhere in the Andes, metal objects were apparently made at least some of the time in batches or matched sets. The UMARP assemblage includes several matching pairs of tupus, tweezers, and needles, and one three piece tupu set. These sets are always found in the same patio, although frequently not in the same locus. Disks are also found in sets of up to three in single UMARP loci, probably sewn onto a single piece of cloth. For comparison, matched sets of two to dozens of very similar tupus, tweezers, needles, disks, and other goods are encountered all along the coast and in the highlands south of

Titicaca, and certain types of sheet ornaments and tupus were buried in large, fairly homogeneous sets in apparently ritual contexts on the Island of Titicaca. Neat bundles of identical copper needles tied together with string have been found on the coast, and the north coast is notable for burials with caches of matching "money tumis" and "leaves", the latter generally nested and tied together in orderly stacks. Copper spindle whorls are also often found in caches, but usually of several varieties rather than identical types. The possibility that some of these sets of objects represent production batches or stocks intended for eventual exchange cannot be ignored, while the smaller and showier sets, such as the matching tupus, may have been intended for use together.

Finally, the UMARP material includes a substantial proportion (12%) of objects that have clearly been intentionally destroyed, such as needles bent double, tupus with the heads neatly broken in half and folded up, folded and crumpled disks, and so on. There is a fairly standard way to fold and break each artifact type. For example, in other areas where more tumis are found, the blade tips are often folded over or broken off. Often there have been attempts to fix destroyed items, usually with poor success.

This intentional destruction of metal objects is seen throughout the Andes (figure 61). The most obvious examples are from north coast burials, where caches of "money tumis" usually include a large proportion of pieces that have been folded up and broken in a stereotyped way. Because of the poor provenience information available for most pieces, only in the UMARP area is it clear that intentional destruction is by no means limited to burials or other obviously ritual contexts. Most of the UMARP examples (15 of 17) come from middens and other occupation deposits. These pieces might have found their way into occupation debris as objects of little worth, folded up and broken in anticipation of melting them down or exchanging them as scrap, but the presumed value of copper in itself makes it unlikely that copper objects would ever have been percieved as worthless. More likely, they were destroyed for ideological reasons. If the point of this destruction was primarily to take the pieces out of circulation, then it would make sense that they would be discarded in the same corners of the patio as other household garbage. Alternatively, the destroyed pieces could have been intentionally buried in patio contexts as offerings, much as modern highlanders make offerings of coca leaves, ceramic vessels, bottles, and so on in agricultural contexts today.

Elites and commoners seem to have intentionally destroyed roughly the same fraction of the metal objects that they had. That fraction did not change with the Inka conquest, suggesting that the practice of intentional destruction of metal objects was a matter not associated with political ideology.

Discussion and Conclusions

This study has built-in biases in favor of finding the broad geographic distributions of artifact types that are predicted for goods associated with the Inka state. Treating poorly provenienced artifacts as if they were contemporary, for example, tends to combine successive localized distributions into artificially broad ones. In spite of this bias, virtually all the metal types and traits that were considered proved to be restricted to either the highlands or to the coast, and often to even more specific subregions. There are few, if any, spatial distributions widespread enough to confirm the hypothesis of Inka state influence in local metalworking industries. In addition, the strongly restricted spatial distributions are evidence against any significant long-distance trade in metal goods.

Nor do the temporally controlled data conform to the patterns predicted for artifacts with state associations. There is no general trend of parallel or convergent change in the dated assemblages. The unmixed Late Horizon assemblages are radically varied outside the highlands, without a trace of the similarity expected among Late Horizon assemblages if the Inka state were in some way involved with local metal styles.

Combining spatial, temporal, and historical data, a few individual artifact types and categories emerge that might have been associated with the Inka state, but the data are ambiguous. If there were Inka state metal object types, they must have been a rare and comparatively insignificant part of local metalworking industries.

Without clear formal correlates, the tin bronze horizon becomes difficult to understand as a symbolic statement by the Inka. An alloy makes an exceedingly subtle symbol. On the other hand, the state must have been involved in the distribution of tin to local craftsmen, at least to the extent of allowing free passage of traders, if not of controlling the metal's distribution. Local metalworkers clearly adopted tin for some or all of their work in local forms, presumably for practical reasons. The economy of tin and tin bronze, then, would have resembled that of unglamorous raw materials like wood for construction, rope, or pigments for ceramics and textiles, rather than the economy of status-related, symbolic, or wealth items like goldwork, fine cloth, or Inka aryballoids.

The hypotheses presented here are clearly simplified, and there are obvious problems with the quality and quantity of the data. Negative evidence is rarely strong. But on the other hand, it is clear that these data would not convince anyone that the Inka state did influence local metalworkers in any significant way. A good case cannot be made for any of the potentially state-associated objects; the best that can be said for any of them is that state associations cannot be ruled out.

The primary evidence for Inka involvement in local metalworking industries is still the tin bronze horizon, which evidently started at least in the Late Intermediate Period in the southern highlands (Lechtman 1979), was incomplete at least on the South Coast (Root 1949), and may well have had practical, rather than symbolic importance. There is no convincing evidence for a state style, for state standardization, for control of production, or even for local tendencies to imitate the objects found in the Inka heartland. Such controls or inspirations may have existed, but Inka influence must have been quite minor relative to the continuity of local metal traditions.

This should be a surprising conclusion. Copper and silver are eminently suitable for symbolic or status items, one would suspect even more so than ceramics. The Inka were clearly capable of controlling gold and some fraction of silver production, as shown both by historical sources and by the apparent draining of silver from the Upper Mantaro region in the Late Horizon. At least in the Upper Mantaro area, the Inka domination was accompanied by a massive increase in bronze production, relating to both a new availability of tin under the auspices of the state, and a surge in mining, smelting, and manufacturing of local-style objects for local consumption. Copper and silver objects, even the comparatively common forms considered here, were available primarily to the wealthy and powerful, as was demonstrated in the Upper Mantaro area. And the historical sources are full of hints that certain items, from earspools to star maces to "yauri" pikes (Larrea 1941), were signs of nobility or of association with the Inka state.

Why, then, did the Inka apparently fail to take advantage of copper and silver as media for state symbolism, at least in any major way? Two answers suggest themselves, the choice between them depending on the degree of organization one wants to attribute to the Inka state. The first possibility is that the failure to bring local metalworking under a state-wide umbrella of control or common inspiration was a purposeful tactic of the

Inka, part of the same strategy as the codification of local ethnic costume into sumptuary laws, and the restrictions on personal travel. Perhaps the Inka were glad to perpetuate regional diversity in many fields such as metalworking, rather than to encourage assimilation, as a way to inhibit cooperation in large scale, organized insurrections.

This is quite the opposite conclusion from that reached by Lechtman (1979), who says that the Inka "could impose tin bronze throughout the Andes just as they imposed Quechua." Lechtman further suggests that "Both were deliberate attempts to unify, standardize, and control aspects of culture that could easily be equated with membership in the State." But all the metal evidence other than the sometimes sporadic presence of tin bronze points the other way. Apparently, the Inka simply let local traditions, including metalworking traditions other than elaborate gold and silver work, continue in their own directions. The state did not go to the effort of controlling metalworkers or promulgating a style to be imitated, which would only serve to unite the very craftsmen and elite consumers of metals whom other aspects of state organization were trying to keep divided.

The other, more readily acceptable explanation demands less calculation on the part of the Inka. It suggests that ceramics, textiles, and occasional unique gold and silver items were sufficient for the symbolic needs of the Inka and their representatives in local settings. The conquest state of the Inka was successful in extracting labor and goods from its subjects, but its solutions to local problems of political and social control were local solutions, tailored to the existing relations and traditions of the each region. The Inka state did not weigh heavily on local daily life and material culture. The Inka were simply spread too thin and loose to need copper and silver as additional symbolic goods.

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Appendix A

Description of the Metal Artifact Types

The column headed "Records" shows the number of database records of that type, and the column headed "Indivs" shows the total number of individual items of that type in the database. Where the number of individuals in a single record could not be determined, it is conservatively assumed to be one, even in cases where there were probably many pieces. Types represented by fewer than four records are lumped into "other" categories. Some records represent more than one object, especially those for items which are found in caches, such as spindle whorls, needles, some tupus, multiple disks sewn onto a single textile, and so on. Some types that are separated in the database are merged into more general categories here for the sake of simplicity. Many records are excluded from particular analyses; this appendix lists all records in the database, regardless of whether or not they were used. Figures are mostly from Baessler (1906), with a few from Bingham (1930) and a few new sketches.

Artifact Type	Records	Indivs	Description of Type
atl-atl thumb loop	4	4	Cast ring with projection for attaching to shaft. There may be corresponding atl-atl hooks in the "other" category.
axe, T	20	20	Heavy, forged axe head with arms at butt end for lashing the head into a grooved haft. Often with squared, rather than sharp, edge. Fig. 17, 84.
axe, various other types	31	31	Heavy, forged and/or cast axe heads. Some have arms like T axes, some have a single large hole in the butt end; some have flaring, wide crescent blades, others have trapezoidal blades like T axes. Fig. 34, 85.
axe/celt indeterminate	5	5	Heavy blade fragment without butt end.
bangle, various types	37	175	Thin sheet metal rectangle, oval, fish, or other shape with a suspension hole at one end. Coastal examples sometimes found sewn onto cloth. Some have repousse designs. Fig. 7, 86.
bar	8	8	Plain light bar stock, rectangular section.
bead, various types	43	many	Cast beads, rolled sheet tubular beads, biconical rolled beads, spherical beads assembled from raised sheet halves, etc. Fig. 6, 87.
bola, circumferential groove	3	3	Lead egg-sized ovoid bola weight with a circumferential groove. Some have rope preserved in the groove and copper pieces pressed onto the surface. Historically used in sets tied to rope for hunting camellids. Identical forms seen in stone.
bola, elaborated	4	4	Copper bola weight with a hole in one side with a bar across it for attaching cord. Sculptured shape, incised design, alloy inlays, etc. Typically 15-30 mm diameter.

Artifact Type	Records	Indivs	Description of Type
bola, spheroid	25	25	Spherical bola weight with a hole all the way through (most lead examples) or partway through with a bar across it for attaching cord (copper examples). Typically 15-30 mm diameter. Fig. 14, 88. See Mathewson (1915) for cross section and metallography.
built-up sheet figurine, etc.	34	35	Various sculptural objects built up of pieces of raised and/or folded sheet.
cast figurine, Tiahuanaco type	16	17	Cast copper figurine/pendant with spatulate lower end and transverse suspension hole. Characteristic of Tiahuanaco area. Fig. 32, 89.
cast figurine, human	16	17	Various types. Fig. 90.
cast figurine, indet and other	21	22	Cast figurine, various types.
cast figurine, llama	11	11	Various types. Fig. 91.
celt	22	22	Heavy, oblong copper blade without hafting traits. Possibly foot-plow blades. Some may be chisels, adze blades, etc. Fig. 92.
chisel, fine	39	39	Delicate copper chisel; typically long rectangular-section shaft with slightly flaring forged and sharpened edge. Possibly woodworking tools. Some hafted. Fig. 41, 93.
chisel, heavy	5	5	Heavy, oblong copper blade, too small to be a "celt", but clearly not a fine chisel.
cone "bell", plain	18	22	Elongated hollow cast cone with transverse hole at apex. Typically 30-50 mm long, 15-20 mm wide at base. See next type illus.
cone "bell", with decoration	9	9	Elongated hollow cast cone with transverse hole at apex. Usually a rod "arm" extends down the side from below the transverse hole. Some have modeled faces. Typically 30-50 mm long, 15-20 mm wide at base. Fig. 19, 94.
crow bar	4	4	Large rectangular copper bar with rounded ends, sometimes bent. 40-70 cm long.
digging point	64	64	Heavy, socketed copper point or blade for mounting on a wooden shaft. Fig. 26, 95.
disk	188	312	Sheet metal disk with one or more holes, flat or concave, apparently sewn onto cloth. Typically 7-30 mm diameter. Fig. 36, 96.
disk with hang tab	11	11	Sheet metal disk with pierced tab for hanging. Fig. 51, 97.
disk, various types	5	12	Sheet metal disk with raised and/or repousse decoration, or larger than 50 mm diameter. Fig. 98.
donut disk	5	5	Sheet metal disk with large central hole, typically 20-30 mm diameter.
earspool, flaring tube	21	42	Earspool in which the tube passing through the ear flares out to join the face of the earspool at or near its circumference. Fig. 30, 99.
earspool, indet and other	5	8	Earspool of indeterminate or rare type.

Artifact Type	Records	Indivs	Description of Type .
earspool, large tube, various	18	22	Earspool in which the tube passing through the ear is the same diameter at both ends, straight-sided or concave-sided, and is close to the diameter of the face of the earspool. Fig. 29, 100.
earspool, small tube, various	54	75	Earspool in which the tube passing through the ear is the same diameter at both ends, usually straight-sided, and is considerably smaller in diameter than the face of the earspool. Fig. 52, 101.
fishhook	10	11	Bent or forged wire fishhook. Fig. 102.
headdress	6	6	Cylindrical sheet metal headdress, often with concave sides, with attachment for one or two sheet metal plumes. Fig. 103.
headdress plume	28	33	Sheet metal ornament with tang for attaching to a metal headdress. Fig. 104.
indet shaft	85	98	Fragment of rod, typically 1.5 to 3.5 mm in diameter, that could be part of a needle or a tupu.
ladle	22	22	Forged sheet ladle. Many have thick, red clay-like deposit inside. Fig. 105.
Lambayeque "leaves"	6	NA	Very thin sheet metal strips or long trape-zoids formed into shallow trough shape or several parallel shallow troughs. Usually stacked in neat bundles, often tied together with string, usually found in large burial caches. Fig. 27, 106.
"ingot"	5	5	Rounded metal chunk, apparently poured onto a flat, smooth surface and allowed to cool with its natural meniscus shape. Sometimes very slightly worked or cut into pieces.
lime spoon, bird head	25	26	Shaft with tiny spoon bowl at one end and sculptural bird with very long, straight beak at the other. Fig. 49, 107.
lime spoon, indet and other	29	29	Shaft with tiny spoon bowl at one end and various types of finals on the other.
chunk	39	44	Irregular chunk of metal formed from melt, apparently casting waste, smelting product, etc.
misc. fragment	27	30	Unidentifiable fragment. Most records contain many pieces.
misc. metal object-other	167	465	Metal object that does not fit any of the other categories. Usually rare or unique.
"money tumi"	67	173	Sheet metal cut into tumi/axe shape. Not a usable tool. Often found folded up or broken, in caches in burials. Fig. 108.
mummy mask	15	20	Sheet metal rectangle with repousse details of a face, often attached sheet nose, sewn onto cloth or a mummy bundle (usually not still present). Some are independent parts, such as eyes, noses, etc. Fig. 109.

Artifact Type	Records	Indivs	Description of Type
needle, indet and other	6	6	Straight shaft with eye at one end; type of eye indeterminate or different from named types.
needle, loop eye, various	45	60	Straight shaft with eye formed by looping a narrowed portion of the shaft back onto itself. Fig. 48, 110.
needle, pierced eye, various	65	65	Straight shaft with eye formed by flattening the end, poking a hole, and forming the flat part back into the shaft shape and diameter. Fig. 16, 111.
nose ornament, solid and sheet	20	20	Any object apparently intended to hang from the nasal septum. Usually an open ring or a sheet shape with a 5-10 mm hole near the top edge and a narrow slot connecting the hole to the upper edge. Highly varied. Fig. 112.
oblique knife	10	10	Knife in which the handle or ornament emerges from the end of the blade, rather than the back, as with tumis. Fig. 113.
pike, various types	4	4	Weapon head with a long spike hafted perpendicular to the shaft or handle. Fig. 114.
plume holder	6	6	Sheet metal cone, sometimes with repousse face, similar to ones found in Chincha with plumes of feathers rising from the wide end.
rectangular folded-up plaque	6	42	Rectangular sheet silver ornament with repousse designs and edges folded back to form a shallow, open box.
ring, decorated sheet	9	9	Finger ring made from a strip of sheet metal with traced or applique decoration. Fig. 115.
ring, other	11	11	Finger ring that is not made from sheet metal, usually cast, various types.
ring, plain sheet	38	53	Finger ring made from a plain strip of sheet metal bent to shape. Fig. 116. Distribution of all rings: Fig. 4.
sheet fragment	148	NA	Unidentifiable fragment of sheet metal. Most records include many fragments.
sheet from mouth of mummy	4	4	Fragment of sheet copper found in the mouth of a mummy or other burial. Shapeless. May be as old as Moche.
sheet ornament, various types	67	169	Various pierced, cut, and repousse ornaments made from sheet metal and still roughly flat. Fig. 117.
sheet scrap	59	NA	Piece of sheet metal with ragged, cut edges; remains of the decoration of an object that was cut up; stacked packet of sheet fragments, often held together by one piece that is bent around the others; sheet piece that was folded many times into a little packet; etc. Most records contain many pieces.

Artifact Type	Records	Indivs	Description of Type
sheet sheathing, various types	28	28	Sheet metal that was wrapped around a form such as a wooden rod, often with nail holes or nails for attaching it. Most records contain many pieces, and some original objects may be represented by several records. Fig. 118.
sheet star	6	14	Sheet disk or rectangle formed into a four-pointed convex star shape. Found sewn onto clothing in fringes on the coast. Fig. 119.
spindle whorl	32	147	Cast copper spindle whorl, usually 5-15 mm in diameter, sometimes sculptural or decorated with traced designs. Often found in caches. Most records include multiple spindle whorls. Fig. 8, 120.
split bell, forged or cast	31	34	Bell shaped like a slightly open clamshell or sphere with a slit part of the way around the circumference. May contain a rattle stone, may have added decoration. Fig. 121.
star mace head	20	20	Five or six pointed mace head, usually cast. Fig. 12, 122.
strip	61	65	Sheet metal strip, sometimes with repousse dots, traced designs, etc. Typically 10-30 mm wide. Often in fragments, so some records include many pieces.
strip or wire with hooks	12	13	Sheet metal strip, usually 5-15 mm wide, or wire with one or both ends bent into a hook. Complete examples are hoops with inter-locking hooks, possibly neck ornaments. Fig. 28, 123.
Tiahuanaco clamp	4	4	Flat, I-shaped pieces of copper, said by Bandelier to fit in corresponding notches in adjacent architectural stones at Tiahuanaco.
Titicaca sheet ornament	19	19	Thin, flat ornament with distinctive shape and four small mounting holes. Either cut from sheet or lost-wax cast from cut forms. Fig. 124.
tool, hand held, other	13	13	Various spatulas, cutting tools, and so on, some hafted, all for hand use. Fig. 125.
tumi	111	111	Copper knife with inverted T shape, handle perpendicular to the blade, blade longer than it is wide. Cast or forged. Sometimes hafted. Generally could be functional. Fig. 39, 126. Note that this definition does NOT include the sheet metal "tumis" from the north coast here called "money tumis", which were not functional and have a different shape. Fig. 108.
tupu, 2-piece flat mold llama	7	7	Tupu cast in a shallow 2-part mold, with low relief rendition of a llama head. Fig. 20, 127.
tupu, 2-piece flat mold other	12	12	Tupu cast in a shallow 2-part mold, with low relief sculptural head other than a llama.

Artifact Type	Records	Indivs	Description of Type
tupu, Bolivian bifurcated	10	10	Various complex cast tupus in which the shaft splits into two branches, each with an identical cast ornament on the end. Fig. 128.
tupu, applied spirals	5	5	Tupu with head constructed of two separate wires formed into four spiral motifs, attached to the shaft rather than part of it. Fig. 129.
tupu, axial	16	16	Tupu with axial symmetry, head formed by slight expansion of shaft diameter. Often found in large caches; some records contain many tupus. Fig. 24, 130.
tupu, cast animal head	4	4	Cast tupu terminating in sculptural animal head, often a llama. Fig. 131.
tupu, diamond	4	4	Tupu with flat, diamond-shaped head. May actually be spatulas or some tools. Fig. 132.
tupu, fat-shaft llama head	5	5	Cast tupu with large diameter shaft (4-6 mm), and very blunt tip, with stylized llama head and loop. Fig. 133.
tupu, indet	70	72	Tupu too poorly preserved to be categorized.
tupu, lobed	17	18	Tupu with flat head with drooping tips. Fig. 23, 134.
tupu, long taper	29	29	Tupu with flat head tapering gradually out from the shaft. Fig. 47, 135.
tupu, misc. cast in the round	13	13	Tupu with various ornaments or scenes cast on the head. Fig. 136.
tupu, nail head, thick and thin	7	7	Tupu with disk-like head perpendicular to shaft. Fig. 137.
tupu, other	40	40	Tupu that does not fit into any category.
tupu, probably colonial	13	13	Tupu with traced floral motifs, showing bearded men on horses, etc.
tupu, rattle(s)	40	40	Tupu with one, two, or three hollow ovoid ornaments on the end, many with rattle stones inside. Fig. 21, 138.
tupu, round flaring bump	6	6	Tupu with round, flat head with flaring projection on the top edge. Fig. 139.
tupu, round neck lobe	5	5	Tupu with round, flat head with flat lobes or wings on the shaft below the head. Fig. 22, 140.
tupu, round neck step	12	12	Tupu with round, flat head with a short, straight step in the curve from the shaft to the bottom of the head. Fig. 22, 141.
tupu, round plain	188	190	Tupu with round, flat head. Fig. 142.
tupu, round spirals	6	6	Tupu with egg-shaped head with two spirals rising from the top edge. Fig. 143.
tupu, semilunate/lobed indet	10	10	Tupu that might be semilunate or lobed; too poorly preserved to tell.
tupu, semilunate thin	66	66	Tupu with flat half-circular head, the shaft connected on the straight side. Fig. 18, 144.

Artifact Type	Records	Indivs	Description of Type
tupu, semilunate thick head	11	11	Tupu with flat half-circular head, the shaft connected on the straight side, the head as thick as the shaft diameter. Fig. 145.
tupu, straight (needle?)	6	6	Shaft with neatly squared end. May be a needle or other tool.
tupu, tiny cast in the round	16	16	Tiny cast tupu, shaft diameter 1.5-2.5 mm, with small, complexly shaped head of various types. Fig. 46, 146.
tweezer, asymmetrical, various	24	24	Tweezer with asymmetrical valves. Often spiral, figural, or arbitrary rounded shape. Fig. 147.
tweezer, circular flaring neck	22	22	Tweezer with circular valves and trapezoidal neck, flaring out from the valves. Fig. 148.
tweezer, circular straight neck	9	9	Tweezer with circular valves and rectangular neck. Fig. 149.
tweezer, circular transitional	6	6	Tweezer with circular valves and slightly trapezoidal neck, flaring slightly out from the valves.
tweezer, fish shaped	12	12	Tweezer with valves shaped like fish, with traced details. Fig. 150.
tweezer, flaring	19	19	Tweezer with diverging, roughly straight sides and no distinct neck. Fig. 151.
tweezer, indet	12	12	Tweezer too poorly preserved for classification.
tweezer, narrow necked	38	38	Tweezer with a long, narrow neck (3-4 mm wide, 8-20 mm long). Fig. 152.
tweezer, other symmetrical	24	24	Tweezer with symmetrical valves that do not fit in any other category.
tweezer, oyster shaped	4	4	Tweezer with long, elliptical valves. Fig. 153.
tweezer, pointed	6	6	Tweezer with flat, narrow valves tapering to a blunt point. Some have traced decoration. Fig. 154.
tweezer, spiral armed	12	12	Tweezer with long, straight neck crossed by perpendicular arms, each terminating in a spiral motif.
tweezer, straight	13	13	Tweezer with straight, parallel sides and no separate neck. Fig. 155.
tweezer, straight transitional	39	40	Tweezer with straight, slightly divergent sides or slightly curved sides.
tweezer, teardrop	27	27	Tweezer with teardrop shaped valves and flaring neck. Sometimes with "neck step". Fig. 156. (See Fig. 157 for "neck step".)
tweezer, teardrop transitional	7	7	Tweezer with valves intermediate between teardrop and circular shapes.
tweezer, triangular	43	43	Tweezer with triangular valves and flaring neck. Sometimes with a distinctive step in the thickness of the neck. Fig. 50, 157.
tweezer, triangular transition	5	5	Tweezer with valves intermediate in shape between triangular and teardrop shapes.
vessel, carinated pan	30	30	Raised sheet metal pan with flat bottom and low, in-sloping sides. Fig. 158.

Artifact Type	Records	Indivs	Description of Type
vessel, indet and other	24	24	Raised sheet metal vessel that is too poorly preserved to classify or does not fit in any type.
vessel, kero	31	35	Raised sheet cup, usually 10-20 cm tall, often with repousse designs. Fig. 159.
vessel, gourd shaped	7	7	Raised sheet bowl with peanut-shaped plan, possibly made to represent a squat gourd cut axially. Fig. 160.
vessel, rounded bowl	21	22	Raised sheet bowl with hemispherical shape. Fig. 161.
vessel, tiny	6	6	Tiny vessel made of sheet metal. Typically small; with narrow, tall neck, hanging loops; most are probably lime containers. Sometimes raised, sometimes made from several separate bent pieces. Fig. 162.
vessel, vaso retrato	31	31	Raised sheet cup or vase with high relief face with projecting nose. Fig. 163.
Vicus disks, ornaments, etc.	7	7	Various heavy, cast, pierced objects, some probably mace heads, others ornaments, with traces of gold surface, incised designs, and distinctive style, found only near Vicus.
weapon head, other	7	7	Weapon head, usually cast, that does not fit in any of the other categories.

Appendix B

Chemical Compositions of Copper, Silver, and Lead Artifacts excavated by the Upper Mantaro Archaeological Research Project

Key to the Tables

Provenience: Identifies UMARP site, patio, patio subdivision, excavation unit, level, and locus for objects excavated in 1982 and 1983.
Identifies UMARP site, trench or feature number, level, and locus for objects excavated prior to 1982.

ID #: A unique number assigned to each metal artifact.

Date: Archaeological period of the deposit from which the artifact came.
MH = Middle Horizon; W I = Wanka I (early Late Intermediate); W II = Wanka II (late Late Intermediate);
W III = Wanka III (Late Horizon); W IV = Wanka IV (Early Colonial).

Comm/Elite: Commoner or elite status of the patio from which the artifact came.

Method: Method of analysis.

A = Atomic Absorption Spectrophotometry (AAS).
All AAS values are plus or minus .01, to 95% confidence, except the large Cu values.
AAS analysis is insensitive to sulfur, which is ignored in the AAS compositions.

SM1 = Standardless Semiquantitative Electron Dispersion Spectroscopy using a Scanning Electron Microscope (SSQ EDS/SEM).
Using the Scanning Electron Microscope facility of the Objects Conservation Department of the Metropolitan Museum of Art, New York, 1983-1984.
H: > 10% M: 1.0% - 10.0% L: 0.1% - 1.0% T: .01% - 0.1% P: Possibly present

SM2 = Standardless Semiquantitative Electron Dispersion Spectroscopy using a Scanning Electron Microscope (SSQ EDS/SEM).
Using the Scanning Electron Microscope facility of the Objects Conservation Department of the Metropolitan Museum of Art, New York, 1985.

Y = Standardless Semiquantitative Electron Dispersion Spectroscopy using a Scanning Electron Microscope (SSQ EDS/SEM).
Using the Scanning Electron Microscope facility of the Yale Peabody Museum, 1985.
Note: These are the only analyses that calculate in silicon; the rest assume Si is extraneous.

Cu, As, etc: Weight percentage of the listed element.

Total: Total of weight percentages. Low values indicate contaminated samples or incomplete analyses, especially with AAS, which does not measure sulfur.

Description: Brief description of the object and circumstances of analysis.

Copper Objects
Except "Ingots" or Casting Waste
Upper Mantaro Archaeological Research Project

Provenience	ID #	Date	Comm/ Elite	Method	Cu	As	Sn	Fe	Ag	S	Pb	Zn	Si	Ni	Sb	Total	Description and comments
J1=T4-9-1	8	MH-W II	COM	A	99.05	.02	-	.07	-	?	.01	-	-	.01	.03	99.19	Pin. Circular section. "Wing" head--broken?.
7=1-2-1-1-1	66	W II	EL	A	97.74	.85	.02	-	.01	?	.59	.01	-	-	.04	99.26	Shaft fragment. Dull, round point. Bent double, broken.
41=1-53-4-4-1	84	W II	EL	A	100.13	.09	-	.28	-	?	.01	-	-	.10	.04	100.56	Needle, broken at eye.
7=2-54-4-1-2	77	W II	EL	SM1	H	P	-	-	L	-	-	?	-	?	?		Needle. Dull point. Bent.
41=1-1-4-2-1	81	W II	EL	SM2	96.0	4.0	-	-	-	-	-	-	-	-	-	100.0	Needle. Lacks point.
54=7-1-2-3-4	639	W III	EL	Y	94.2	-	5.8	-	-	-	-	-	-	-	-	100.0	Tupu, nick on neck.
54=7-51-1-2-1/2	641	W III	EL	Y	91.4	-	8.1	-	-	-	-	-	.5	-	-	100.0	Tupu, shaft.
2=1-1-3-3-1	604	W III	EL	Y	67.7	1.7	28.4	-	-	-	-	-	1.4	.8	-	100.0	Flat steel-grey sheet frag. Clean surfaces with no
54=10-1-2-2-1	658	W III	COM	Y	84.6	-	4.1	.5	-	.9	-	-	4.4	-	-	100.0	Small chisel, pick damaged spot at edge. 2.8% Al, 0.9% Cl, 1.8% Ca.
J2=F1-3-3/2	14	W III	?	A	96.67	.42	3.16	.01	.10	?	.09	.01	-	-	.09	100.56	Axe or chisel blade. Sharpened.
J2=F1-3-3/1	10	W III	?	SM2	25.1	4.6	58.3	1.8	-	.2	-	-	-	-	-	90.0	Bola; dendrite area; ASAP
	10			SM2	30.9	2.9	57.9	1.6	-	-	-	-	-	-	-	93.3	Same; APP
	10			SM2	43.5	3.4	47.8	.8	-	.1	-	-	-	-	-	95.6	Interdendritic area; ASAP

Provenience	ID #	Date	Comm/ Elite	Method	Cu	As	Sn	Fe	Ag	S	Pb	Zn	Si	Ni	Sb	Total	Description and comments
J2=F1-2-3/6	11	W III	?	SM2	93.3	-	2.7	.3	-	-	3.7	-	-	-	-	100.0	Bola, corrosion, ASAP
	11			SM2	91.9	-	1.6	.2	-	-	6.3	-	-	-	-	100.0	Same, APP
	11			SM2	92.4	-	2.5	.3	-	-	4.8	-	-	-	-	100.0	Same, 10 degree tilt, ASAP
	11			SM2	93.0	-	1.3	.1	-	-	5.5	-	-	-	-	99.9	Same, APP
	11			SM2	77.1	-	14.9	.7	-	2.2	5.2	-	-	-	-	100.1	Bright metal; ASAP
	11			SM2	78.7	-	12.5	.5	-	2.6	5.8	-	-	-	-	100.1	Same, APP
54=1-52-6-3-1	44	W IV	EL	A	94.71	1.59	2.62	.22	.07	?	.66	.01	-	.01	.05	99.94	"Tweezer" fragment.
54=1-55-2-3-1	47	W IV	EL	A	97.90	1.18	-	.16	.01	?	.03	.01	-	.01	.02	99.32	Lug with blowholes. Residue not analyzed, probably CuS.
	47a			A	72.78	.13	-	.76	-	?	.01	-	-	.01	-	73.69	Corrosion from #47. Lots of residue: CuS, S, some Fe.
	47a'			A	77.32	.23	-	1.46	-	?	.01	.01	-	.01	.01	79.05	Corrosion from #47 dissolved in aqua regia. Residue: S. Sample approx. 15% S.
54=1-2-1-1-1	56	W IV	EL	A	94.97	.41	2.93	.30	.06	?	.21	-	-	.02	.01	99.14	Curved sheet strip with one rounded end.
54=1-60-2-5-1	61	W IV	EL	A	96.44	.42	1.77	.10	.19	?	.13	-	-	.01	.08	99.14	Sheet strip bent to screw shape. Pointed.
54=1-60-2-5-1	62	W IV	EL	SM2	66.3	-	27.2	1.0	.1	-	-	-	-	-	-	94.6	Needle. Lacks point.
J54=1-55-1-3-3	43	W IV	EL	SM2	73.7	5.0	29.8	.3	-	-	-	-	-	-	-	108.8	Tweezers; corroded surface
	43			SM2	73.2	7.0	23.1	.7	1.0	-	-	-	-	-	-	105.0	Another corroded spot

Copper Objects Except "Ingots" or Casting Waste (continued)

Provenience	ID #	Date	Comm/ Elite	Method	Cu	As	Sn	Fe	Ag	S	Pb	Zn	Si	Ni	Sb	Total	Description and comments
54=1-60-2-5-1	61	W IV	EL	SM1	H	-	M	-	-	-	-	?	-	?	?		Thick sheet w. cut mark
J1=T4-5-4	5	?	?	A	98.58	.25	-	-	.81	?	.01	-	-	-	.04	99.69	Shaft fragment. Lacks point. Flattens at end.
J1=T4-2-1	3	?	?	SM2	99.5	.4	-	-	-	-	-	-	-	-	-	99.9	Shaft fragment. Rectangular section. Tapers from point.

Copper "Ingots" or Casting Waste
Upper Mantaro Archaeological Research Project

Provenience	ID #	Date	Comm/ Elite	Method	Cu	As	Sn	Fe	Ag	S	Pb	Zn	Si	Ni	Sb	Total	Description and comments
41=8-52-1-1-1	627	W II	EL	Y	95.1	4.6	-	-	-	-	-	-	.4	-	-	100.1	Lug. Filed spot. Avoiding bright patches visible in backscatter.
	627			Y	9.1	-	81.1	-	-	-	9.1	-	.7	-	-	100.0	Bright patch visible only in backscatter.
	627			Y	22.3	-	-	-	75.5	-	-	2.3	-	-	-	100.1	Another bright patch visible only in backscatter.
	627			Y	12.0	-	4.5	-	-	-	83.5	-	-	-	-	100.0	Another bright patch visible only in backscatter.
J66=F2-3-1/1	28	W III	COM	SM2	98.6	-	-	.1	-	.9	-	-	-	-	-	99.6	Lug, excavated surface pit 20 KV
	28			SM2	99.1	-	-	.3	-	2.1	4.9	-	-	-	-	98.4	30 KV, guessing peak is Pb
	28			SM2	94.4	1.4	-	.3	-	2.3	-	-	-	-	-	98.4	30 KV, guessing peak is As

Copper "Ingots" or Casting Waste (continued)

Provenience	ID #	Date	Comm/ Elite	Method	Cu	As	Sn	Fe	Ag	S	Pb	Zn	Si	Ni	Sb	Total	Description and comments
J66=F2-3-1/11	28	W III	COM	Y	92.9	4.3	-	-	-	2.3	-	-	.4	-	-	99.9	Lug. Filed spot on surface. Possibly a little Pb.
2=6-54-2-3-4	572	W III	COM	Y	98.6	-	-	-	-	1.5	-	-	-	-	-	100.1	Lug. Filed spot. Avoiding bright patches visible in backscatter.
	572			Y	15.2	.8	-	-	-	-	74.0	-	-	-	-	100.0	Bright patch visible in backscatter.
2=1-1-3-3-1	507	W III	EL	Y	67.9	11.2	-	-	2.0	-	15.3	-	2.2	-	.5	100.1	Lug. Filed spot. Silver color. Some of Pb reported is actually S. Avoiding bright patches visible in backscatter.
	507			Y	21.0	45.0	-	-	-	-	34.0	-	-	-	-	100.0	Bright patch visible in backscatter.
54=7-54-1-3-1	642	W III	EL	Y	96.1	-	2.9	-	-	-	-	-	1.0	-	-	100.0	Lug. Filed spot. Avoiding bright patches visible in backscatter; they are primarily Pb.
2=1-1-4-4-1	513	W III	EL	Y	58.9	-	-	-	41.1	-	-	-	-	-	-	100.0	Lug. Avoiding bright patches visible in backscatter; they are primarily Ag with a little Cu.
2=1-1-4-3-2	512	W III	EL	Y	96.8	1.6	-	-	-	1.0	-	-	.6	-	-	100.0	Lug. Filed spot. Avoiding bright spots visible in backscatter; they are primarily Pb with a little Cu.

Copper "Ingots" or Casting Waste (continued)

Provenience	ID #	Date	Comm/ Elite	Method	Cu	As	Sn	Fe	Ag	S	Pb	Zn	Si	Ni	Sb	Total	Description and comments
54=1-52-5-4-1	36	W IV	EL	Y	99.5	-	-	-	-	-	.5	-	-	-	-	100.0	Lug. Mounted polished section; Pb estimated only.
J54=1-55-2-3-1	47	W IV	EL	SM2	72.0	-	-	1.8	-	24.5	-	-	-	-	-	98.3	Lug with blowholes.
J54=1-55-2-3-1	36	W IV	EL	SM2	95.8	.6	-	.2	-	.2	-	-	-	-	-	96.8	Lug, bright surface
	36			SM2	91.6	1.7	-	.2	-	1.5	-	-	-	-	-	95.0	Another bright metallic spot
																	Dark CuS inclusions in contact with patches of Pb with slight Cu.

Silver Objects
Upper Mantaro Archaeological Research Project

Provenience	ID #	Date	Comm/ Elite	Method	Cu	As	Sn	Fe	Ag	S	Pb	Zn	Si	Ni	Sb	Total	Description and comments
J41=1-53-3-5-4	87	W II	EL	SM2	4.7	14.0	-	-	81.3	-	-	-	-	-	-	100.0	Sheet scrap surface; 9/84
	87			SM2	3.2	-	-	-	97.8	-	-	-	-	-	-	101.0	Approximately the same; 7/83
J7=3-52-1-1-1/2	70	W II	EL	SM2	2.4	-	-	.9	96.7	-	-	-	-	-	-	100.0	Disk; broken edge
J66=F2-4-1	29	W III	COM	SM2	3.0	-	-	-	90.9	.8	-	-	-	-	-	94.7	Disk, break surface
	29			SM2	4.1	-	-	-	95.9	-	-	-	-	-	-	100.0	Same; only Ag and Cu checked
	29			SM2	2.6	-	-	-	97.4	-	-	-	-	-	-	100.0	Disk surface
J54=7-1-2-3-1	650	W III	EL	SM2	11.1	-	-	-	92.2	-	-	-	-	-	-	103.3	Tupu head, surface
	650			SM2	20.4	-	-	7.4	40.9	.6	-	-	-	-	-	69.3	Another spot; lots of dirt
	650			SM2	3.5	-	-	-	96.5	-	-	-	-	-	-	100.0	Surface near edge
J54=1-55-3-0-1	39	?	?	SM2	5.8	5.0	-	-	86.6	-	-	-	-	-	-	97.4	Disk.
J41=F7-2-1/4	22	?	?	SM2	1.8	-	-	-	98.7	-	-	-	-	-	-	99.5	Disk surface

Lead Objects
Upper Mantaro Archaeological Research Project

Provenience	ID #	Date	Comm/ Elite	Method	Cu	As	Sn	Fe	Ag	S	Pb	Zn	Si	Ni	Sb	Total	Description and comments
J7=2-52-2-1-1	69	W II	EL	SM1	-	-	?	-	-	P	H	?	-	?	?		Sheet fragment.
J54=1-57-1-4-1	99	W IV	EL	SM1	-	-	?	-	-	P	H	?	-	?	?		Blob, spill.
J54=1-54-4-2-1	63	W IV	EL	SM1	-	-	-	-	-	-	99.?	-	-	-	-	99.?	Flat lug or spill.

(The table below was not included in the Master's thesis as submitted)
Copper Slag
Upper Mantaro Archaeological Research Project

Provenience	ID #	Date	Comm/ Elite	Method	Cu	As	Sn	Fe	Ag	S	Pb	Zn	Si	Ni	Sb	Total	Description and comments
71=702-0-0-1-1	688	?	?	Y	5.4	-	-	50.3	-	-	-	-	22.2	-	-	100.1	Slag. Cut surface, general view. 18.9% Ca, 0.6% K, 2.7% Al.
	688			Y	98.6	-	-	.8	-	-	-	-	.6	-	-	100.0	Red center of "inclusion".
	688			Y	75.0	-	-	1.8	-	-	-	-	-	-	-	100.0	Green edge of "inclusion". Another "inclusion" appears to be CuS.
EI-14(H)-951	673	?	?	Y	38.8	-	-	23.8	-	-	-	-	24.8	-	-	100.1	Slag, cut surface, general view. 9.4% Ca, 2.6% Al, 0.7% K.
	673			Y	98.3	-	-	1.2	-	-	-	-	.6	-	-	100.1	Metallic droplet #1.
	673			Y	99.0	-	-	.4	-	-	-	-	.6	-	-	100.0	Metallic droplet #2.

Table 1

Summary of the possible origins of Inka state symbolic goods and the expected spatial and temporal distributions for each case.

Object's Origin	Atemporal Spatial Distribution	Predicted Distributions: In Originating Region	Predicted Distributions: Outside Originating Region
1. Origin in Inka heartland	Widespread; concentration in Inka heartland	In Inka heartland: present before L.H; unspecified change in L.H.	Rare or absent before L.H.; more common in L.H.
2. Invented by/for Inka	Widespread; unspecified region(s) of concentration	Absent or rare everywhere before L.H.; present or common everywhere in L.H.	Absent or rare everywhere before L.H.; present or common everywhere in L.H.
3. Origin in conquered region	Widespread; unspecified region(s) of concentration outside Inka heartland	In unspecified region of origin: present before L.H.; unspecified change in L.H.	In all but region of origin: absent or rare before L.H.; present or common in L.H.
4. Already widespread status good	Widespread; unspecified region(s) of concentration	Present with unspecified concentration everywhere before L.H.; unspecified change in L.H.	Present with unspecified concentration everywhere before L.H.; unspecified change in L.H.

Table 2

Assemblages by Geographic Region

Numbers of Records in Data Base

Excluding indeterminate fragments of needles, limespoons, axes, and ornamental axe variants

	South Coast	Central Coast	North Coast	Upper Mantaro	Cuzco & Machu Picchu	Titi-caca	Tiahua-naco & La Paz	Illi-mani	Pelechuco & Chara-ssani	Ecuador
Totals (3060 in all)	502	740	619	219	193	285	173	154	91	84
donut disk		5								
axe, with hole		2								9
nose ornament, all types		2	7							11
"money tumi"		8	48					6		
lime spoon, other head		22	3							
ladle		3	19							
rectangular folded-up plaque		1	5							
other weapon head		3	4							
other tool, spatula, punch, etc.		6	2							
digging point		4	60							
"ingot"		1	3	1						
axe/celt indet		1		1	3					
oblique knife		4	4		1					
chisel, heavy		2	1		1	1				
headdress plume		2	17		1	8				
cone "bell", all types		4	2		4	5	7	1		4
split bell, all types		7	10		3	1	1	1		2
chisel, fine	1	15	6	2	5	1	4			2
needle, pierced eye		2	1	22	2	4	5	27	1	
tumi	3	12	9	2	28	11	12	2	7	
chunk	6	1	9	14	5		1	2		
strip	24	14	10	6	2	5				
sheet scrap	16	12	13	12	3	1	1	1		
disk	45	46	23	54	3	5	2	4		5
sheet fragment	68	17	27	14	6	2	2	7	2	2
indet shaft	5	6	5	30	2	4	8	21	1	2
misc. metal object, <4 examples	11	61	42	6	7	5	10	8		10
tupu, all types	2	56	34	30	57	180	96	60	79	15
sheet ornament, various types	1	28	30			6		1		1
axe, without hole	1	2	2		10		1	5		5
cast figurine, non-Tiahuanaco types	7	9	21		7	1	1			2
celt	1	6	2		4	1	1			6
tweezer, all types	102	172	19	4	10	5	1			2
disk with hang tab			1	1	5	2	2			
whorl	1	6	21	1		1				2
star mace head	5	8	3		2	1				
bead, all types	8	20	12	1	1					1
needle, loop eye	2	26	8	6	2					
bangle	17	10	2		2					
built-up sheet figurine, etc.	3	8	20		2	1				

Table 2 (con't)

	South Coast	Central Coast	North Coast	Upper Mantaro	Cuzco & Machu Picchu	Titi-caca	Tiahua-naco & La Paz	Illi-mani	Pelechuco & Chara-ssani	Ecuador
bar	2	1	1		2			1		
earspool, all types	44	6	46		1					
vessel, all types	59	56	24		2					
ring, all types	12	32	9		2	3				
lime spoon, bird head	3	16	2		2					
sheet star	2	2	2							
sheet sheathing, all types	20	6	2							
mummy mask	4	5	3							
sheet from mouth of mummy	3	1								
strip with hooks	3	1								
wire with hooks	5									
plume holder	5				1					
pike, all types	1		1			1				1
fish bangle	2		2							
fishhook	3		3							2
Lambayeque "leaves"			6							
Vicus discs, ornaments, etc.			7							
headdress			6							
crow bar					2	2				
Titicaca sheet ornament						19				
bola, all types				12	3	9		7	1	
cast figurine, Tiahuanaco type						1	14			
Tiahuanaco clamp							4			

Table 3

Assemblages by Geographic Region

Percentages of Records in Data Base

Excluding indeterminate fragments of needles, limespoons, axes, shafts, rods, sheet, and misc. fragments
Excluding misc. cast objects, sheet scrap, wire, and axe ornamental variant
Ecuador includes La Plata Is. Inka intrusive burial.

	South Coast	Central Coast	North Coast	Ecuador	Upper Mantaro	Cuzco & Machu Picchu	Titi-caca	Tiahua-naco & La Paz	Illi-mani	Pelechuco & Chara-ssani
Total count (2800 in all)	416	709	593	79	164	182	282	162	125	88
% of assemblage ("-" means <1%)										
donut disk		-								
axe, with hole		-		11.4						
nose ornament, all types		-	1.1	13.9						
"money tumi"		1.1	8.1						4.8	
lime spoon, other head		3.1	-							
ladle		-	3.2							
rectangular folded-up plaque		-	-							
other weapon head		-	-							
other tool, spatula, punch, etc.		-	-							
digging point		-	10.1							
"ingot"		-	-		-					
axe/celt indet		-			-	1.6				
oblique knife		-	-			-				
chisel, heavy		-	-			-	-			
headdress plume		-	2.9			-	2.8			
cone "bell", all types		-	-	5.1		2.2	1.8	4.3	-	
split bell, all types		-	1.7	2.5		1.6	-	-	-	
chisel, fine	-	2.1	1.0	2.5	1.2	2.7	-	2.5		
needle, pierced eye		-	-		13.4	1.1	1.4	3.1	21.6	1.1
tupu, all types	-	7.9	5.7	19.0	18.3	31.3	63.8	59.3	48.0	90.0
tumi	-	1.6	1.5		1.2	15.4	3.9	7.4	1.6	8.0
chunk	1.4	-	1.5		8.5	2.7		-	1.6	
strip	5.8	2.0	1.7		3.7	1.1	1.8			
disk	10.8	6.9	3.9	6.3	32.9	1.6	1.8	1.2	3.2	
misc. metal object, <4 examples	2.7	8.6	7.1	12.7	3.6	3.8	1.8	6.2	6.4	
tweezer, all types	24.5	24.3	3.2	2.5	2.4	5.5	1.8	-		
sheet ornament, various types	-	3.4	4.2	1.3			2.1		-	
axe, without hole	-	-	-	6.3		5.5		-	4.0	
cast figurine, non-Tiahuanaco types	1.7	1.3	3.5	2.5		3.8	-	-		
celt	-	-	-	7.6		2.2	-	-		
disk with hang tab			-		-	2.7	-	1.2		
whorl	-	-	3.5	2.5	-		-			
star mace head	1.2	1.1	-			1.1	-			
bead, all types	1.9	2.8	2.0	1.3	-	-				
needle, loop eye	-	3.6	1.3		3.7	1.1				
bangle	4.0	1.4	-			1.1				

Table 3 (con't)

	South Coast	Central Coast	North Coast	Ecuador	Upper Mantaro	Cuzco & Machu Picchu	Titi-caca	Tiahua-naco & La Paz	Illi-mani	Pelechuco & Chara-ssani
built-up sheet figurine, etc.	-	1.1	3.4			1.1	-			
earspool, all types	10.6	-	7.8			-				
vessel, all types	14.2	7.9	4.0			1.1				
ring, all types	2.9	4.5	1.5			1.1	1.1			
lime spoon, bird head	-	2.3	-			1.1				
sheet star	-	-	-							
sheet sheathing, all types	4.8	-	-							
mummy mask	-	-	-							
sheet from mouth of mummy	-	-								
strip with hooks	-	-								
wire with hooks	1.2									
wire	-									
plume holder	1.2					-				
pike, all types	-		-	1.3			-			
fish bangle	-		-							
fishhook	-		-	2.5						
Lambayeque "leaves"			1.0							
Vicus discs, ornaments, etc.			1.2							
headdress			1.0							
crow bar						1.1	-			
Titicaca sheet ornament							6.7			
bola, all types					7.3	1.6	3.2		5.6	1.1
cast figurine, Tiahuanaco type							-	8.6		
Tiahuanaco clamp								-		

Table 4

Temporal Changes in Dated Assemblages

Including copper, silver, lead, and alloys
Excluding unidentifiable sheet, shaft, and other fragments
Types comprising less than 1% of assemblages are lumped as "minor others"

	Lambayeque		Chincha & Ica		Upper Mantaro		Pelechuco & Charassani	
Type	preLH	LH	preLH	LH	preLH	LH	preLH	LH
Totals (366 in all)	35	23	38	95	47	73	7	48
tumi								7 15%
tupu					3 6%	15 21%	7 100%	40 83%
bola, spheroid					5 11%	4 5%		1 2%
tweezer	1 3%	6 33%	3 8%	13 14%		2 3%		
disk	2 6%		9 24%	7 7%	27 57%	15 21%		
needle	1 3%				5 11%	16 22%		
sheet scrap	1 3%				2 4%	4 5%		
chunk or ingot					3 6%	6 8%		
chisel, fine						2 3%		
ring		3 17%						
rectangular folded plaque		3 17%						
ladle		1 6%						
nose ornament		1 6%						
whorl	1 3%	2 11%						
"money tumi"	10 29%	1 6%						
"leaves"	5 14%	1 6%						
digging point	7 20%							
sheet ornament	1 3%							
sheet sheathing	1 3%			18 19%				
vessel	4 11%		20 53%	19 20%				
bangle	1 3%		2 5%	12 13%				
earspool			1 3%	11 12%				
plume holder				5 5%				
star mace head				3 3%				
built-up sheet figurine, etc.				2 2%				
strip			2 5%					
limespoon			1 3%					
misc.				2 2%	2 4%	2 3%		
minor others				3 3%		7 10%		

Table 5

Late Horizon Assemblages

Including copper, silver, lead, and alloys
Excluding unidentifiable sheet, shaft, and other fragments
Types comprising less than 1% of assemblages are lumped as "minor others"

Type	Machu Picchu	Lambay-eque	Chincha & Ica	Upper Mantaro	Pelechuco & Charassani	La Plata Island
All objects (398 total)	152	18	95	73	48	12
tupu	51 34%			15 21%	40 83%	9 75%
tumi	24 16%				7 15%	
axe	9 6%					
tweezer	8 5%	6 33%	13 14%	2 3%		
needle	5 3%			16 22%		
chunk or ingot	5 3%			6 8%		
disk with hang tab	4 3%					
cone "bell"	4 3%					3 25%
disk	3 2%		7 7%	15 21%		
bola, spheroid	3 2%			4 5%	1 2%	
sheet scrap	3 2%			4 5%		
chisel, fine	3 2%			2 3%		
split bell	3 2%					
axe/celt indet	3 2%					
ring		3 17%				
rectangular folded plaque		3 17%				
whorl		2 11%				
"money tumi"		1 6%				
ladle		1 6%				
"leaves"		1 6%				
nose ornament		1 6%				
vessel			19 20%			
sheet sheathing			18 19%			
bangle			12 13%			
earspool			11 12%			
plume holder			5 5%			
star mace head			3 3%			
built-up sheet figurine, etc.			2 2%			
misc.	4 3%		2 2%	2 3%		
minor others	20 13%		3 3%	7 10%		

Table 6
Ubiquities of Silver, Copper, and Lead by Period and Status

Period	Status	Silver	Copper	Lead
W II	Commoner	.008	.010	.005
W II	Elite	.043	.021	.008
W III	Commoner	.005	.048	.010
W III	Elite	.022	.121	.008

Table 7
Ubiquities of Various Metal Artifact Types by Status

Artifact	Commoner	Elite	Elites Have *x* Times More Than Commoners (Elite/Commoner)
All Silver and Copper Objects	.0368	.0938	2.55
Tweezers	0	.0020	infinity
Ornaments	0	.0020	infinity
Tupus	.0025	.0148	5.92
Disks	.0101	.0296	2.93
Needles	.0101	.0118	1.17
Metal Prod. Debris	.0076	.0089	1.17
Cu, Ag, or Pb Ore	.0038	.0059	1.55

Table 8
Ubiquities of Various Metal Artifact Types by Period

Artifact	Wanka II	Wanka III	Increase in Wanka III (WIII/WII)
Copper Objects	.017	.083	4.88
Silver Objects	.029	.013	.45
Lead Objects	.007	.009	1.29
All Metal Objects	.0592	.1066	1.80
Silver Disks	.0245	.0118	.48
Copper Disks	0	.0053	infinity
Tupus	.0029	.0184	6.34
Needles	.0049	.0197	4.02

Table 9
Changing Status Relations: Artifact Types by Period and Status

Artifact	Status	Wanka II	Wanka III	Increase in Wanka III (WIII/WII)
All Copper	Commoner	.010	.048	4.80
All Copper	Elite	.021	.121	5.76
All Silver	Commoner	.008	.005	.63
All Silver	Elite	.043	.022	.35
Silver Disks	Commoner	.0051	.0025	.49
Silver Disks	Elite	.0350	.0193	.55
Copper Disks	Commoner	.0026	.0101	3.88
Copper Disks	Elite	0	.0026	infinity
Tupus	Commoner	0	.0050	infinity
Tupus	Elite	.0048	.0331	6.90
Needles	Commoner	.0026	.0176	6.77
Needles	Elite	.0032	.0220	6.88