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Investigating interaction between South America and West Mexico through the lexicon of metallurgy

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1. Introduction

Scholars in several disciplines have suggested the existence of long-distance interaction between peoples in the Andean region of South America and West Mexico[2] from the Formative period to the Late Postclassic[3]. In archaeology, the evidence for this contact includes similarities in weaving techniques and clothing styles (Anawalt, 1992), shaft tombs and their funerary offerings (Albiez-Wieck, 2011: 405), certain pottery styles (Coe & Koontz, 2008: 48), and metallurgical techniques and objects (Hosler, 2009, 1994; Gorenstein & Pollard, 1983). Recent findings in genetics (Brucato et al., 2015) indicate the presence of a small but significant Andean component in certain Mesoamerican populations, also suggesting contact between the two regions. In linguistics, Swadesh's (1967) proposed genealogical link between Purépecha in West Mexico and Quechua in the Andes has been largely discredited (Campbell, 1997), but does continue to hold sway in some, less mainstream, circles (e.g. Sánchez Diaz, 1999).

Of the different types of evidence offered for this long-distance interaction, metallurgy is the most convincing. While the origins of extractive metallurgy continue to be debated, it is clear that it evolved independently in more than one place worldwide (Radivojević et al. 2010: 2775), with the Americas providing a particularly compelling example (Mapunda, 2013) outside of the Old World. However, metallurgy as a complex multi-stage technology was present prehistorically in only three regions of the Americas: (i) the Peruvian/Andean area, (ii) Colombia-Lower Central America, and (iii) West Mexico (Maldonado, 2012; West, 1994). The two phases of metalworking identified for West Mexico (Hosler, 1994: 45) both display remarkable influence from South America, notably Colombia in Phase One (roughly from 700-1100 CE) and the Andean/Pacific coast regions in Phase Two (from around 1100 CE onwards), in terms of both the techniques used and objects produced. Even more convincing is the notable lack of technological evolution in West Mexico, suggesting a direct import rather than a local development (Hosler, 1994: ch. 6).

The presence of prototype artefacts and South American-style technological information in West Mexico points to the presence of South American metalworkers. Traders from the south may have imparted some knowledge of metallurgy, but in order for a complete transfer to take place, and in the absence of continuous overland diffusion, metalworkers must have come to West Mexico (Hosler, 1994: 185). It seems reasonable, therefore, to postulate that interaction took place for the steps involved in this complex process to be transmitted. In this paper, I investigate this proposed interaction through the lexicon of metallurgy, seeking to identify lexical borrowing as evidence of interaction between peoples from the two regions. Minimally, one could expect the transfer of key lexical elements related to processes and objects, elements that may survive in a language beyond the lifespan of the contact event. However, I find no evidence of such language contact between the two regions in metallurgy-related vocabulary. This result contradicts certain findings from archaeology and genetics, but can be explained in terms of the largely non-verbal nature of the transmission of technical knowledge, as well as the cultural continuity of technology.

The rest of this paper is structured as follows: Section two offers an overview of the evidence for the proposed interaction between the two regions from archaeology, genetics and linguistics. Section three outlines the linguistic material and samples used, while section four presents the key results. I offer a discussion of the results in section five and conclude the paper in section six.

2. Background

In this section, I provide an overview of the evidence for interaction between South America and West Mexico from archaeology (2.1), genetics (2.2) and linguistics (2.3).

2.1 Archaeology

Interaction between the Andean and northwest Pacific coast regions of South America (notably Ecuador and northern Peru) and West Mexico has been posited for periods from the Early Formative to the Late Postclassic. Early statements lacked stratigraphic support and so relied solely on surface similarities: consider Reichel-Dolmatoff's pronouncement that there was "something vaguely familiar" about the Capacha material (Kelly, 1980: 35). Borhegyi (1961: 143-144) more systematically assembled a list of eight groups of parallel traits found in the two regions: settlement patterns, ceramics, techniques, figurines, miscellaneous pottery objects, stonework, metallurgy and miscellaneous traits, although many of them now seem too general to be diagnostic of interaction. Nonetheless, the largely unidirectional south to north nature of the transfer (but see the discussion of shaft tombs below), as well as the lack of these features

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[2] West Mexico is defined as encompassing the modern-day states of Michoacán, Jalisco, Nayarit, Colima and Sinaloa (Weaver, 1972) and perhaps also Durango, Guanajuato and Zacatecas (Adams, 1977). The area can be considered a cultural area, whose core comprises Michoacán, Nayarit, Jalisco and Guerrero.

[3] Following Coe & Koontz (2008: 236), the chronological periods cited for Mexico refer to the following: Formative/Preclassic (1800 BCE-150 CE), Classic (150-650 CE), Epiclassic (650-900 CE), Postclassic (900-1521 CE). Central Andean periods (or horizons) cited follow Lechtman (2014: 15): Archaic (pre-2000BCE), Initial period (2000 BCE-800 BCE), Early Horizon (800 BCE-0), Early Intermediate Period (0-650 CE), Middle Horizon (6550 CE-1000 CE), Late Intermediate Period (1000 CE-1450 CE), Late Horizon (1450 CE-1532 CE).

in Central America, points to a long distance, long-term maritime interaction scenario (see, e.g., Callaghan, 2003). Furthermore, the topography of Central America between these two regions – mainly mangroves and steep slopes – makes overland travel an unlikely possibility (A. Geurds, p.c. 28/10/2015). Therefore, it is unlikely that these traits diffused gradually between groups by overland routes.

The earliest indication of interaction is provided by the Capacha cultural complex of West Mexico, dated to around 1450 BCE (Williams, 2004). Among the four types of pottery vessels associated with this horizon, the stirrup-spout pot displays affinities with similar items in archaeological contexts related to the Formative in the Andes, as well as in other parts of modern-day Mexico[4]. An example of the dichrome (red-on-cream slipping) decorative style from a similar period found in the Machalilla seacoast culture of Ecuador indicates a further possible connection with Capacha (Kelly, 1974). The later shaft tomb tradition (a possible successor of the El Opeño culture found in northwest Michoacán, also culturally linked to the Capacha complex (Williams, 2004)) of the West Mexican states of Jalisco, Colima and Nayarit also displays functional and morphological similarities with tombs located in Colombia, Ecuador, Peru, western Venezuela and Pacific Panama (Smith, 1978: 186-189). The earliest of these southern shaft tombs dates to 555 BCE at San Agustín, Colombia (Smith, 1978: 188), while the West Mexican tradition dates to the Late Formative and Early Classic periods. Moreover, we can note a similarity in type of cranial deformation known as *tabula erecta* found in Machalilla (Ecuador) and Capacha, as well as at the El Opeño and Tlatilco sites of West Mexico (Kelly, 1980: 35).

At the Chorrera-phase site of Chacras in Ecuador (c. 1500-300 BCE), hollow figurines were found that depict females wearing short skirts and mini-mantles. Very similar costumes can be observed on ceramic figurines from the West Mexican shaft tomb site of Ixtlán del Río (400 BCE-400 CE), which also display multiple earrings and geometric polychrome motifs on their clothing. The *Relación de Michoacán* (de Alcalá, 1988), a sixteenth century ethnohistory of the Tarascan[5] people, indicates that these garments were being worn in the protohistoric and early colonial periods in Michoacán. Anawalt (1992) notes that Tarascan clothing styles differed considerably from those of other Mesoamerican groups (Anawalt, 1992: 115-116), possibly indicating outside influence. Loom-woven textile fragments found in Ecuador and West Mexico (as well as in the southwestern USA) made using the supplementary-weft and alternating-warp float weave weaving techniques (Anawalt, 1992: 124–126) are also held up as evidence of interaction.

Some of the strongest evidence for contact lies in the domain of metallurgy. Extractive metallurgy developed relatively late in the Americas, several millennia after the Near East and Europe, emerging in the central Andean region between 1800 and 200 BCE (Maldonado, 2012), although small hammered pieces of gold and native copper have been found from the Terminal Archaic (2155–1936 BCE; Lechtman, 2014: 15). By the time of the Spanish conquest, three main metalworking areas existed in the New World: (i) Peruvian/Andean area; (ii) Colombia-Lower Central America[6], which can be divided into the Altiplano cultures and the Muisca, Quimbaya, Sinú and Tairona cultures of central/northern Columbia (Shimada, 1994); and (iii) West Mexico (Maldonado, 2012; West, 1994). These areas are not considered to be loci of independent innovation (but see de Grinberg, 1990: 21); rather many scholars propose that metallurgical techniques spread northward from South America to West Mexico via a maritime route (e.g. Arsandaux & Rivet, 1921; Edwards 1960, 1965; Hosler, 1994, 2009). Previous accounts claiming an Asian influence on metallurgy in South America particularly (e.g. Heine-Geldern, 1954) have been universally discounted.

Hosler (1994, 2009) identifies two periods in West Mexican metallurgy: (i) Period I, 700-1100 CE, which originates in Central and South America (notably Colombia), and (ii) Period II, 1100 CE to Spanish contact, stemming from the Andean and Ecuadorian coastal regions of South America. During Period I, the lost wax casting method was common in West Mexico, reflecting techniques employed in Columbia, especially amongst the Quimbaya (Shimada, 1994). Both the Tarascan and Andean cultures made intentional use of bronze and copper-arsenic alloys, seemingly for their physical and sonic properties (Hosler, 1994). In Period II, bronze[7] was also used to make practical objects such as needles, fishhooks, tweezers, axe heads, awls and possibly also agricultural *coa* blades, although the lack of weapons in both periods is notable. The colour of these alloyed objects was their most important property in this later phase, with Hosler (1994: 138-139) claiming that West Mexican metalworkers purposefully over-alloyed their bronzes in order to create objects that displayed a brilliance and radiance akin to gold and silver (see also Roskamp, 2010).

[4] Kelly (1980) claims, however, that this style cannot be defined as either wholly Mesoamerican or South American. This reluctance to link the two styles is also supported by the lack of stylistic similarities in the figurines found in the two regions in the same period, as well as disagreement over the tomb chronology in northwest South America (see Kelly, 1980: 36), which stretches from 1500 BCE to 500 CE. As such, the Mexican shaft tombs have temporal priority over their South American counterparts, rendering a south-to-north direction of influence harder to support.

[5] I use the term Tarascan to refer to the ancestors of the modern-day Purépecha, notably in the prehispanic and early colonial period, in line with general usage. For the modern language and people, I use the more accepted autodenomination Purépecha (see, e.g. Warren, 1991: ix-x).

[6] Some scholars (e.g. Sauer, 1966; Helms, 1979, cited in Cooke and Bray, 1985:35) contend that the evidence in Central America suggests a trade rather than production scenario. This position is countered by, for example, West (1994) and Cook and Bray (1985), mainly on the basis of descriptions found in contact-period chronicles.

[7] A curious anomaly can easily be observed, however: alloys were being produced and used in South America when metalworking was first introduced into West Mexico, but it is only after 1100 CE that alloying began to be used in the latter region. The gap in transmission is curious and has not yet been adequately explained in the literature.

The presence of prototype artefacts and particular processing techniques certainly suggests the presence of South American metalworkers in West Mexico. Traders from the south may have imparted some metallurgical knowledge, but metalworkers proper must have come to West Mexico to transfer the technology (Hosler, 1994: 185). Indeed "[t]he physical presence of Andean artisans in West Mexico is the most plausible way to explain the transmission of smelting, smithing and casting techniques" (Hosler, 1994: 186). Hosler claims that "[s]ome elements of Period 2 metallurgy were introduced via the same maritime exchange system[8] operating off the coast of Ecuador that had earlier transmitted the technical know-how and prototype objects of Period 1. […][9]" (Hosler, 1994: 184). Indeed, merchant groups in Ecuador and Peru had balsawood rafts and dugout canoes with sails; the former were used for shorter haul trips, e.g. to central Peru, while the larger canoes were used to travel to West Mexico (Edwards, 1960). These merchants probably travelled to West Mexico in search of the highly prized *Spondylus princeps* shells (e.g. Marcos, 1977/78). Andean demand for *Spondylus* shells could not always be met from the Ecuadorian coast alone, so merchants from this region travelled further north in search of the prized bivalve, which grows in warm waters of the Pacific Ocean in discontinuous pockets from the Gulf of Guayaquil in Ecuador to the Gulf of California (Mexico). In exchange for *Spondylus*, merchants received obsidian and copper, prized materials found further inland. It is of note that most metalworking sites in West Mexico are located along the coastal plain or have riverine access to it, i.e. where the bivalves were harvested. Hosler, Lechtman & Holm (1990) and Horcasitas (1980) also cite the appearance of so-called axe-monies dating to between 500 and 1500 CE in coastal Ecuador and Peru, as well as West Mexico and Oaxaca, as additional support for this maritime diffusion theory.

In a letter to the Spanish king (Charles V) in 1525, the chronicler Rodrigo de Albornoz wrote that Indians in Zacatula (modern-day Zacatotlán, West Mexico), at the mouth of the Río Balsas, claimed that their fathers and grandfathers spoke of the periodic appearance of other Indians from certain "islands" who came to the coast from the south in large dugout canoes (García Icazbalceta, 2010). They brought with them "exquisite" trade items and took back other local goods. If the sea was high, these traders stayed for five to six months, until the sea calmed and they could return. In contrast, the *Lienzo de Jucutacato*, a pictorial account from 1565 regarding the origins of the people of Jicalán (Michoacán), their settlement and first offices, claims that Nahuatl-speaking Toltec groups with metalworking skills arrived from Veracruz in gulf southeast Mexico, passing through Central Mexico and settling in a number of locations in Michoacán (see Roskamp 1998, 2005). This native account constitutes a sacred history, combining both historic and mythical elements to support the authors' claims to the ownership of mines and natural resources (Roskamp, 2013). It also contradicts the South American introduction of metallurgy favoured by Hosler and predecessors, while also highlighting similarities in cosmovision between central and western Mexican groups, notably the Nahuas and Tarascans.

Indeed, it should be emphasised that these essentially diffusionist accounts are not universally supported. Schulze (2008: 214-218) draws attention to relevant issues in West Mexico, notably problems in identifying the provenance of certain isotopes, as well as the lack of a complete typology of, for instance, copper bells. Furthermore, some metal artefacts, such as those found at Tzintzuntzan, Michoacán (a former capital of the Tarascan Empire), display closer similarities to others in southern Mexico and the Mayan region, suggesting a closer connection to those regions (cf. the migration scenario described in the *Lienzo de Jucutacato*, above). Moreover, since the publication of Hosler (1994), very little new material has emerged in support (or otherwise) of the South America-West Mexico connection, reflecting the difficulties associated with conducting fieldwork in much of West Mexico, but also mirroring the move away from macro-level approaches in the discipline.

2.2 Genetics

No full genetic studies have addressed the question of interaction between South America and West Mexico, although Brucato et al. (2015) offer some initial suggestive results. In this study based on a genome-wide database of 62 Native American populations, a clear 'Andean' component is identified mainly, as expected, in individuals from Andean populations. However, this Andean component is also significantly present – albeit as a very small proportion – in the genome of four Mesoamerican populations, namely the Kaqchikel, Mixtec, Maya and Purépecha. Its presence in Mesoamerica is not correlated with the presence of other South American components, thus ruling out the possibility that it was brought by contacts via the Caribbean islands. It is also virtually absent in Central America, suggesting that it also was not introduced via overland routes.

We know that the Purépecha and Mixtec were renowned prehispanic metalworkers (see, e.g., Hosler, 1994; McEwan, 2000), while recurrent bat motifs on bells found in a huge cache in Honduras in the early twentieth century point to links in iconography and cosmovision with the Kaqchikel and other Mayan groups (Blackiston, 1910). Copper bells were also produced and traded in the Yucatan Peninsula, even though the metal does not occur

[8] The more southerly arm of the Andean maritime exchange system, linking Ecuador and southern Peru, referred to here is the Chincha Kingdom of Peru, a supposedly powerful coastal state and key trading port that emerged around 1100 CE. Within this system, copper was used as an exchange commodity, and exchange rates for both gold and silver were fixed (Nigra et al., 2014: 43). So-called *mindalaes*, or merchant Indians, also bartered exotics including gold and silver from their base in Quito (Ecuador), paying tribute in, *inter alia*, gold to local lords from whose service they were exempt (Salomon, 1986: 105).

[9] Hosler also claims that "some lower Central American and Colombian components of the technology, such as buttons, may have diffused overland […]" (Hosler, 1994: 184). I will not discuss the possibility of an overland introduction in this paper as the evidence for it is much scarcer.

there naturally (Paris, 2008). As such, Brucato et al. (2015) calculated the shortest distance separating each Mesoamerican group from an archaeological site with evidence of metalworking. This distance proved to be significantly correlated with the percentage of the 'Andean' component in the populations, indicating that its presence in Mesoamerica might partly be mediated by the transmission of metallurgy. While these findings are certainly suggestive of some kind of long-distance interaction, the lack of chronology – i.e. when this 'Andean' component arrived in Mesoamerica – limits their influence.

2.3 Linguistics

The linguistic evidence for a connection between South America and West Mexico is probably the least convincing, and most controversial, of the three types presented in this paper. Moreover, the connections proposed relate to genealogical rather than contact relationships, indicating a potentially different type of connection. In short, two main linguistic relationships have been proposed. The first claims a deep-time (around 46 minimum centuries) link between two language isolates: Purépecha in West Mexico and Quechua in the Andes (Swadesh, 1956, 1967). The second posits a sub-group of the Chibchan group, encompassing languages from Mesoamerica (including Purépecha), Central America and the Isthmo-Colombian area[10] (Greenberg, 1987).

The genealogical relationship proposed in Swadesh (1967) has been cited in some archaeological papers (e.g. Anawalt, 1992), somewhat problematically, as both accepted fact in linguistics and as support for a contact relationship. Campbell claims, however, that a Purépecha-Quechua relation is "out of the question" (1997: 325-326), but concedes that his decision is based on scarce linguistic evidence, since Swadesh's study was small and, tellingly, supports much archaeological evidence (see 2.1). McClaran (1976: 154) supports this view, while conceding that that linguistic relations between Mesoamerica and South America definitely exist but are "vacuously postulated in the absence of reconstructions and rules for deriving the attested languages […] from the reconstructions" (McClaran, 1976: 154).

In short, the comparative linguistic data do not currently support an argument for relatedness between languages of the two regions. But the lack of a proven genealogical connection should not rule out the possibility of finding evidence for language contact, which would support the archaeological and genetic arguments (see 2.1 and 2.2). The weight of archaeological evidence in metallurgy particularly motivates an argument for contact between people, likely artisans, of South America and West Mexico from the Late Classic onwards. Interaction generally implies some form of communication, and in both short-term and long-term scenarios, linguistic material can be transferred (see, e.g., Thomason, 2001). Through the use of two languages, lexical items can be transferred, especially in the case of culturally-specific vocabulary, often in order to fill a lexical gap. In other words, "[i]f there has been diffusion of any sort, there is every reason to suppose that some loanwords must also exist" (Swadesh, 1964: 538). This article thus explores the interaction theories put forward in archaeology and genetics through the lens of language contact.

3. Sample

Two key elements were compiled for this study: the language sample and the metallurgy vocabulary wordlist. In order to select a language sample, I first delimited the regions where metalworking is known to have occurred in the prehispanic period (from the Formative to Spanish invasion), namely: (i) Andean region, (ii) Colombia/Lower Central America (also known as the Isthmo-Colombian area)[11], and (iii) West Mexico (or, more precisely, the West Mexican Metalworking Zone (Hosler, 2009)). On the basis of known modern language distributions (e.g. Lewis et al., 2015; Kaufman, 2007), as well as colonial language surveys (e.g. Gerhard, 1993), I compiled a list of languages in the regions, totalling 104. Included were modern and sixteenth-century variants of the same language, where available (e.g. Purépecha, Nahuatl, Quechua), modern and pre-modern (but not sixteenth-century) variants (e.g. Otomí), only modern variants (e.g. Cora and Huichol, Uto-Aztecan languages spoken at the northern edge of West Mexico), or only the variant available for now extinct languages (e.g. Cuitlatec, an isolate spoken in Guerrero, Mexico until the 1940s). I also included languages of the cultures mentioned in Hosler (1994) and Horcasitas (1981) as being spoken by societies that had metallurgy, as well as a number of neighbouring languages for comparative purposes (see Figures 1-3, and Appendix A) especially relevant in cases of widespread diffusion.

Comparative lexical studies take as their point of departure a standardised wordlist, which is completed for every language in the sample. Basic vocabulary is often collected on the basis of the so-called Swadesh (1971) or Leipzig-Jakarta lists of cross-culturally valid meanings (Haspelmath & Tadmor, 2009). Vocabulary related to more specific semantic domains may be found in, for example, the Intercontinental Dictionary Series (Key & Comrie, 2007) or Numeral Systems of the World's Languages (Chan, 2016). Given the absence of a readily available list of terms for the domain of metallurgy, I compiled a novel one comprising 123 items (see Appendix B), whose terms cover metals (e.g. copper, gold, silver), processes (e.g. to extend, polish, solder, shape), tools (e.g. file, [sledge]hammer, pliers), objects produced (e.g. bells, rattles, rings, tweezers), occupations (e.g. copper-worker, ironmonger) and the workplace (e.g. bellows, fire, pit, workshop). Key sources for this compi-

[10] This Chibchan group comprises the following languages: Antioquia, Aruak, Chibcha, Cuitlatec, Cuna, Guaymi, Lenca, Malibu, Misumalpan, Motilon, Paya, Rama, Tlamanca, Tarascan, Xinca and Yanoama (Greenberg, 1987).

[11] The Isthmo-Colombian area, also known previously in the literature as the Intermediate Area or Chibchan Sphere, stretches from eastern Honduras in the north to Colombia and Venezuela in the south through the core of Panama and Costa Rica. For a discussion of the defining features and limits of the area, as well of the nomenclature, see Hoopes and Fonseca (2003).

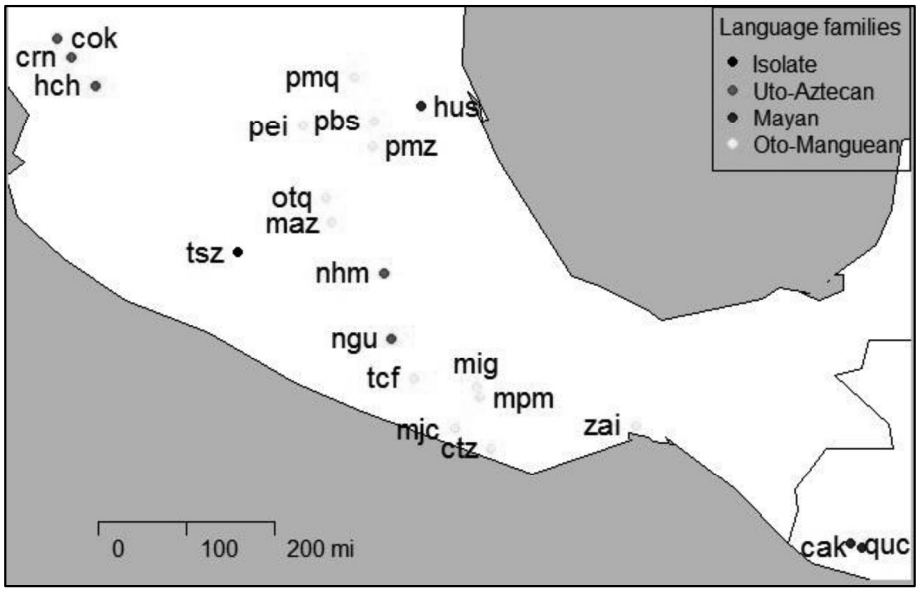

Fig. 1: Location of languages in West Mexico used in this study.

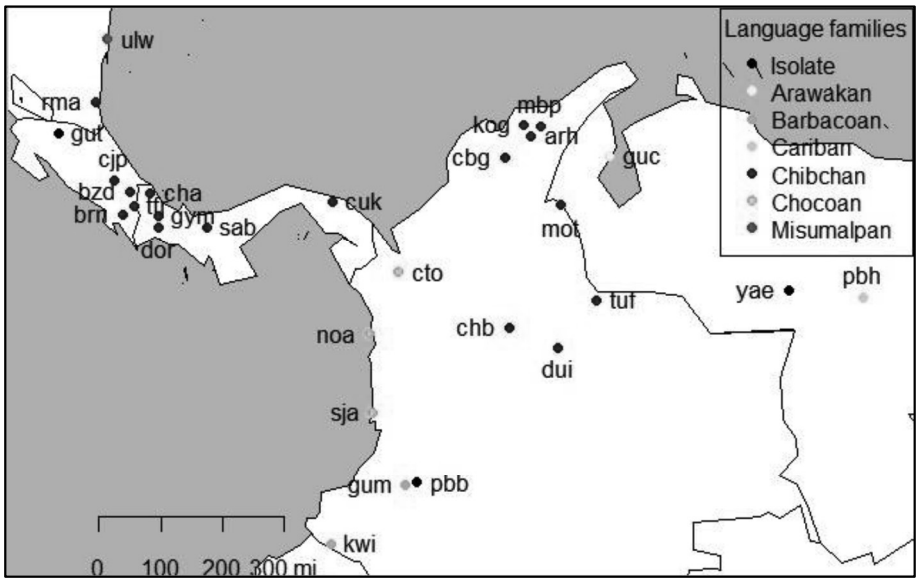

Fig. 2: Location of languages in the Isthmo-Colombian Area used in this study.

lation were a trilingual Purépecha-Spanish-English dictionary of metalworking terms relevant to the hammered copper tradition of Santa Clara del Cobre, Michoacán (Pérez Pamatz & Lucas, 2004), and archaeological works on West Mexico (Hosler 1994, 2009) and the Andes (Shimada, 1994).

The division into categories – tools, processes, etc. – is reminiscent of the five related components that Lemonnier (1992: 5-6) claims every technology comprises, namely: (i) matter, i.e. the material on which a technique acts, (ii) energy, the forces which move objects and transfer matter, (iii) objects, often called artefacts, tools, or means of work, (iv) gestures, which move the objects involved in a technological action, and which may be organized in sequences, and (v) specific knowledge, which may be conscious or unconscious and not necessarily expressed by the actors, and constitute 'know-how' or manual skills.[12]

4. Findings

The most striking finding is the lack of clear loanwords from South America in any of the West Mexican languages in the sample. Possible explanations for this absence are discussed in Section 5. Nonetheless, a number of observations can still be made regarding loans on a smaller scale, as well as shared naming strategies between the regions for metals (Section 4.1) and metal objects (4.2).

4.1 Metal naming strategies

In the absence of any notable instances of loanwords between the areas under analysis, shared naming strategies become the most worthwhile locus of study. For terms referring to specific metals, as well as for the generic term, six naming strategies have been identified that cross-cut the three metalworking regions in the sample, namely the use of: (i) colour terms, generally compounded, (ii) other physical properties, also generally compounded, (iii) terms for excretions of different types, (iv) borrowings, (v) processes, and (vi) extensions to the environment, i.e. toponyms and hydronyms.

Let us begin with naming strategies based on colour terms. Copper is most frequently considered a red metal, named as such in Purépecha (isolate) *tiyamu charapeti* 'metal/iron red', Coastal Mixtec (Oto-Manguean) *xùhùn cuaahá* 'copper money, copper' (lit. 'money red'), Classical and Modern Huastec (Mayan) *tzacpatal* 'red iron/metal', K'iche' (Core K'iche'an) *kiäq puaq* 'red money/silver', Lengua (Lengua-Mascoy) *yan-sowu ikyithwase* 'like red iron', and Cofán (isolate) *kɨʔa yošaβa* 'red metal'. However Chiriguano (Tupían) and Wichí (Matacoan), both in South America, use terms including an element meaning 'yellow' to label their copper, viz Chiriguano *korepoti iǰuag^{w}e* 'lit. mine.excrement-yellow',

[12] An anonymous reviewer notes that Lemonnier's categorisation lacks the products of the metalworking process. While the match between the two categorisations is clearly not exact, the broad parallels are worth mentioning, especially in light of the discussion regarding the anthropology of technology and the nature of knowledge transmission in Section 5.

and Wichí *la-činah-'tʔoh kaʔteʔ* 'copper, bronze' (lit. 'poss.-iron (its) skin yellow'). Highland Mixtec, in contrast to its Coastal counterpart, displays *kaa kuaan* 'metal, iron, steel yellow' to refer to both copper and gold, while Classical Otomí also combines the terms for yellow and iron in *xancaxtii bueca* 'copper'. K'iche' (Core K'iche'an) uses a different colour again in the compound *räx ch'ich'* 'iron; steel' (lit. 'blue, green metal'). Moreover, the four colours of copper (blue, green, yellow and red, found in its various forms pre- and post-processing) can all be discerned on the insect known as the *tepuzchapule* or *chapulín del cobre* 'copper-grasshopper' in Nahuatl (Uto-Aztecan) and Spanish respectively, found in Guerrero, West Mexico (Hendrichs, 1944).

Compounds with 'money, metal' and 'white' predominate in terms for silver, for example, Coastal Mixtec (Oto-Manguean) *xùhùn cuitsín* 'money white', Mazahua (Oto-Pamean) *tʔɔxʉ* 'white', Otomí *nataxii* 'white' (the latter two forms may be related), Kaqchikel (Core K'iche'an) *saka mero* 'white money', Paez (isolate) *gueyóchime* 'white metal', Chiriguano (Tupían) *korepoti-tĩi* '(arse)hole.excrement-white', Lengua (Lengua-Mascoy) *yan-sowu ik-mopaiya* 'like white iron', and Teribe (Chibchan) *dëburr frubrunë* 'money white'.

Gold is described as yellow in Classical and Modern Purépecha (isolate) *tiripeti*, from the root *tirí-* 'dull yellow', Classical and Modern Huastec (Mayan) *taquimanul* 'yellow metal', Classical and Modern Kaqchikel (Core K'iche'an) *3ana puvak, q'anapuwäq* 'yellow silver/money', K'iche' (Core K'iche'an) *q'än puaq* 'yellow silver, money; also copper', Coastal Mixtec (Oto-Manguean) *xùhùn cuàan* 'money yellow', Bribri *inúkür xiká skiriri* 'money material yellow' and Teribe (both Chibchan) *dëburr xoñõró* 'money yellow', Chiriguano *korepoti-ĵu* and Guaraní *kuarepoti-ĵu* (both Tupían) 'mine.excrement-yellow', Lengua (Lengua-Mascoy) *yan-sowu ik-yatiktama* 'like yellow iron', Tsafiki (Barbacoan) *laske kala* 'yellow silver'. The term for 'gold' in Miskito (Misumalpan) is synonymous with that for 'yellow' - *lalahni* – but with no compounding. Paez (isolate), on the other hand has a term for gold including 'red' and not 'yellow': *βyuu beh* lit. 'money red'. Ayoreo (Zamucoan) far to the south of the Andean region has *ge'beeke naaŋana-'taai* lit. 'metal that shines', although the element *naaŋana-* seems to be related to *naaŋana-'taai; naaŋana-taa-'ge* 'blue'. This relation reminds us of the Cha'palaa (Barbacoan) term *lushi* 'money', which is also related to the term for 'blue'. The colour term probably derives from the word for silver rather than vice versa; in order to construct the colour term additional morphology must be added, e.g. *lushkatata* 'blue, green' (Wiebe & Wiebe, 2015), *lushishi* 'sky blue'. The latter term demonstrates how the final syllable must be reduplicated for a special ideophone-like class of words for qualities (Floyd, p.c. 27/09/2015).

The Ayoreo 'shiny metal' example could also be included under the second naming strategy, namely that based on the physical properties of the metals. Ulwa (Misumalpan) and Guambiano (Barbacoan) emphasise the shininess of

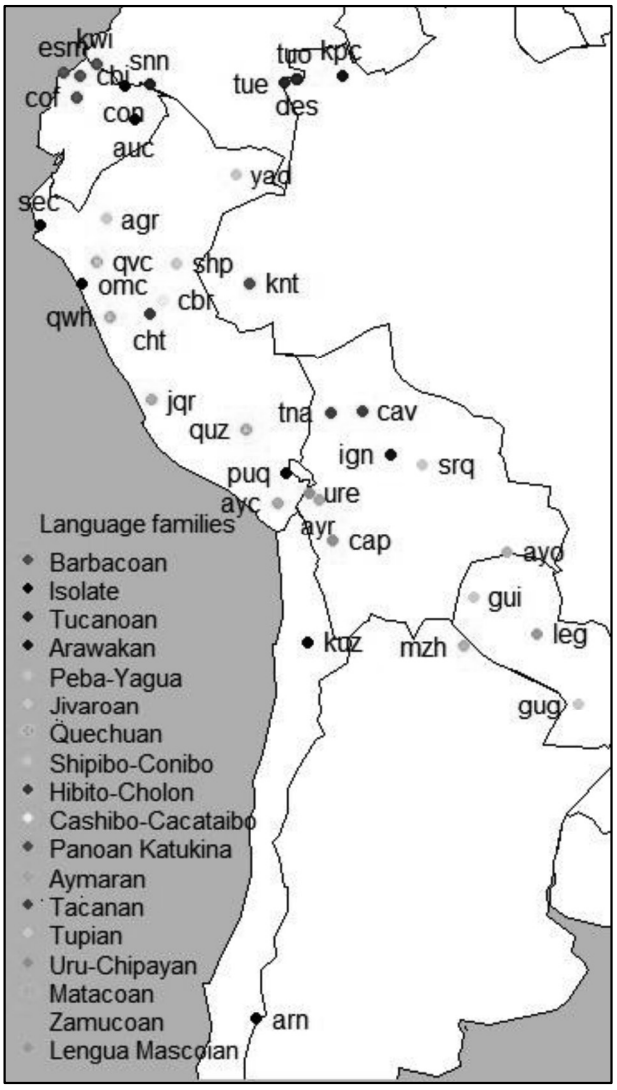

Fig. 3: Location of languages in the Andes and neighbouring regions used in this study.

precious metals by using the terms *kî yaringka* 'gold' (lit. 'stone shiny') and *pilapik* 'gold, silver', related to the term for 'shiny' (Floyd, p.c. 27/09/2015), respectively. Aymara possesses the term *isayawri* 'very hard copper', reflecting the stronger, less brittle properties of bronze as compared with copper once heated and worked. In line with the known geographic distribution of alloying knowledge in the Andean region, we also find *kisu* 'another type of copper which the Indians used like steel because when mixed with another metal it becomes harder' in Classical Aymara (Aymaran).[13] Kallawaya (mixed language) displays *jichcha jiri* 'bronze, lit. false stone' and *llalle jiri* 'iron, copper; lit. good stone', while Uru (Uru-Chipayan) gives *čok-kxā* 'copper; lit fat silver'. In Ngäbere (Chibchan) we find *jä tuäre* 'stone beautiful' for 'gold', reminiscent of these Kallawaya compounds including a familiar material. Sonic properties are also present in the sample, but only in West Mexico with Matlaltzinca (Oto-Pamean) *inmahathi* 'silver, lit. that which rings/sounds'.

[13] We also find *kis* in the Chumulu dialect of Dorasque (Chibchan), which may be a loan from Classical Aymara.

The third strategy identified is naming according to various types of excretions. In Chiriguano and Guaraní (both Tupían), we find *korepoti iǰuag^{w}e* and *kuarepoti-ǰu* 'copper' (lit. mine.excrement-yellow); Chiriguano (Tupían) *korepoti-tĩi* 'silver' (lit. (arse)hole.excrement-white), Chiriguano *korepoti* and Guaraní *kuarepoti-ǰu* 'gold' (lit. sun=defecate-yellow, 'yellow sun faeces'). The circumlocution for copper is apparently a "Jesuitic depreciative creation" (Dietrich, 2015 [2007]), reflecting native ideas regarding the origin of metals. However, Roskamp (2010: 70) notes that two prehispanic Mesoamerican cultures also possessed conceptions related to excrement of the main celestial bodies: Nahuas, from the central valleys of Mexico, referred to gold as *teocuitlatl* 'holy shit' or *tonatiuh icuitl* 'excrement of the sun'. The Tarascans of Michoacán also believed gold to represent the sun's excrement, and silver that of the moon, but did not encode this lexically (idem.).

As indicated in the introduction, no long-distance lexical borrowing has been identified in this study. However, borrowing at a more local level can be observed, especially in the case of Quechua *qori* 'gold' (see Figure 4). The term has been borrowed into various other languages across the Andes and Amazon regions, often with the same meaning and little phonological adaptation, viz: *qori* (Aymara, Aymaran), *qori* (also 'tin, tinplate', Chipaya, Uru-Chipayan), *qori* (Uru, Uru-Chipayan), choa-*curi* lit. 'earth gold' (Tukano, Tucanoan), *kuri* (Aguaruna, Jivaroan), *kuri* (Cashibo, Panoan), *kori* (Cofán), *kori* (Shipibo-Conibo, Panoan). A related case is *kuruki/kuriki* (Yagua, Peba-Yaguan), which is borrowed from Quechua *qullqi* 'money' despite its surface similarity to *qori*. The variation in the medial vowel reflects the lowering of the original Quechua /u/ to /o/ in a uvular environment (/q/).

No such examples of diffusion can be found in unrelated languages in Mesoamerica or the Isthmo-Colombian Area. However, it is also worth noting the case of Taíno *wanĩ* 'low grade of gold', which gives us the Modern Spanish *guanín* 'idem'. Moreover the Galibi (Cariban) term for copper, *karakuli* lit. 'money-gold', emerges as a loan in Warao (isolate) *karakori/corucuri* (also 'tool blade'), and *kalakuli (*also 'silver') in Wayampi (Tupían). Note the parallel here with Quechua *qara qori* lit. 'bare/naked gold'.

Ironsmithing only emerged in these original metalworking areas with the arrival of the Spanish, who brought their own techniques from Europe. Until that point, native technologies had focussed on copper, gold, silver and alloys thereof, notably arsenic and tin bronzes. As such, we might expect fewer native terms for 'iron', i.e. a higher proportion of loanwords from Spanish. In fact, there are no more loans from the Spanish *fierro, hierro* 'iron' in the sample than for other terms: *fi̇rru, fyerru, jirru, jyerru* (Cajamarca Quechua), *fi̇rru* (Jacaru, Aymaran), *hiru* (Chipaya, Uru-Chipayan), *hiórro* (Emberá, Chocoan), *ɸe'ro*, *he'ro* (Tsafiki, Barbacoan), *jeru* (Cha'palaa, Barbacoan), and *hihu* (Aguaruna, Jivaroan), a total of seven (the same as for copper), all in the Andean region.

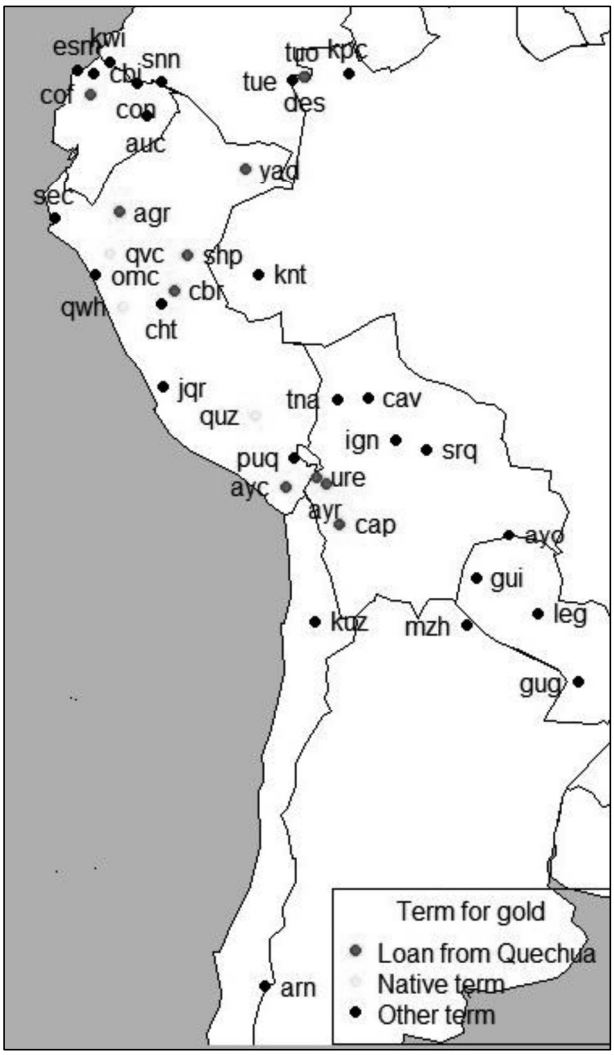

Fig. 4: Distribution of terms for 'gold' in the Andes.

A number of other localised borrowings are also observable: (i) Cajamarca and Classical Quechua (Quechuan) *qquillay* 'iron; silver, money' appears as *quellaya yauri* 'iron, copper, needle' in Classical Aymara; (ii) Cusco, Cajamarca and Ancash Quechua (Quechuan) *chay-anta* 'iron, metal, tin' (lit. 'shine-copper') emerges as *chuntachay* in Uru (Uru-Chipayan) and possibly also *c'haj* in Mochica (isolate); (iii) the terms *saanzen, saanzén, santsɔn* 'iron' in Guambiano (Barbacoan) and *satsám, cɑ̈m* 'iron, metal' in Paez (isolate) also bear a suggestive resemblance; (iv) the term *carimbo* 'iron for marking/branding Caribbean Indians and black Africans' is loaned from the Kimbundu (Angola; Central-Western Bantu) *kirimbu* (da Silva Maia, 1959) into Island Carib and from there to Taíno (Arawakan). *Carimbo* is used in modern-day Brazilian Portuguese as 'stamp', while *calimba* still exists in Cuban Spanish, but now refers to 'iron with which one brands animals' (RAE, 2014); (v) Miskito (Misumalpan) of Honduras and Nicaragua has borrowed *silak* 'steel' from the Rama (Chibchan) *shílak, sílak* 'iron'. This example demonstrates how a society with no known prehispanic metalworking has borrowed and extended a term from a neighbouring, unrelated language to fill a conceptual gap.

The fifth, but not very widespread, strategy is the use of processes used in metalworking to name the metals themselves. Siona (Tucanoan) possesses a compound that refers to the process of gathering placer gold, namely *sˀoa kut'i* 'lit. wash money'. Classical Quechua *hičʰay* 'to pour into mould, smelt' now refers only to the more generic verb 'to pour'. Purépecha (isolate) recalls the shaping phases of the process in *tayacata* 'silver' from the root *taya-* 'to give blows'. Shipibo-Conibo (Panoan) *yami βoi* lit. 'metal beeswax[14]' also seems to reflect an aspect of the lost-wax casting process.

Finally, terms for metals also emerge in toponyms and hydronyms in both the Isthmo-Colombian and West Mexican regions. Kuna (Chibchan) incorporates *or* 'gold' (likely not a borrowing from Spanish, cf. Cabécar (Chibchan) *oloi* 'shine') into a hydronym, *Tiórti* 'gold river'. Ngäbere (Chibchan) displays the toponym *Pocri* in Los Santos department (Panama), meaning 'place of the lance/spear' (Pinart, 1897). *Bugaba* (Dorasque, Chibchan) has the same meaning. In West Mexico copper prevails over gold in toponyms, e.g. *Tepoztlán* 'place where copper abounds' (Nahuatl, Southern Uto-Aztecan), whence *tepuztecatl* 'native of Tepoztlán'.

4.2 Naming strategies for metal objects

In the same vein as the metal naming strategies, metal objects in the sample display certain similarities in naming strategies, namely: (i) Use of metal terms (polysemy), (ii) natural world predecessors, (iii) loans (largely from Spanish), and (iv) sound symbolism, which is possibly also related to the natural world predecessors.

A large amount of polysemy is also observable in the terms for metal objects in the sample wordlist. For example in Huastec (Mayan), *patal* means 'bell' and 'lance' as well as 'metal', a pattern also partially reflected in Cuitlatec (isolate) *pɨhpɨ* 'bell; metal, iron'. In Awa-Pit (Barbacoan), *pyalmiŋ* 'axe' is also 'silver, money', a pattern reminiscent of the so-called axe-monies that were used as a type of currency in long-distance trade between South America and West Mexico (see, e.g. Hosler et al., 1990). Note also Quechua *tumi* 'sacrificial axe', which can also refer to these axe-monies. Miskito (Misumalpan) possesses *ayan* 'iron; *plancha*', Bribri (Chibchan) *ta-be* 'iron, knife, anything made of iron', Mazahua (Oto-Manguean) *tʔëzi* 'iron; machine, tractor'. Cashibo (Panoan) also classifies *manɨ* as 'metal axe and things of foreign origin', the Classical Huastec *lencodpatal* is literally analysed as 'fishhook-metal', while Nahuatl (Southern Uto-Aztecan) *tepuz(tli)* conflates 'pin' and 'copper'. An even broader meaning can be found in Classical Aymara (Aymaran), where *juch'usa* refers to a 'round thing such as a stick, pole, pin'.

A further example of polysemy, as well as a clear case of borrowing, is the Quechua *yawrina* 'fishhook' and Cusco Quechua *yawri* 'needle', from Aymara *yawri* 'copper, iron'. Another clear case of borrowing in the Andes is found in Classical Quechua (Quechuan) *ttipqui ttopo* 'pin', Cusco/Cajamarca/Ancash Quechua (Quechuan) *tupu* 'pin, brooch' which emerges in Puquina (Puquinan) *tupu* 'pin, needle', Classical Mapudungun *tupú* 'pin' and Chipaya (Uru-Chipayan) *tupu* 'pin'. In Mapudungun we also find *tirana* 'tweezers', borrowed from (here) Cusco Quechua *t'irana* (< *t'ira-* 'to pluck' and *-na* instrumental nominalizer) 'idem'.

Yet it is clear that new metal objects did not necessarily require a new label, especially in areas where metallurgy emerged later. Some objects that came to be made of metal had predecessors (and thus labels) in the natural world or as part of lithic or wooden technology. Examples include 'arrow', which in Damana/Malayo (Chibchan) is *bi-ngɯla* 'maguey arrow/spine', Classical Aymara (Aymaran) *piqacha, phichaqa, pichaqa* 'long needle of thorn, copper or iron that can be used for sewing'. Taíno (Arawakan) had the term *manaya* 'stone knife, axe made of planks of royal palm'. We also find Guatuso (Chibchan) *zafára* 'wooden knife', Sirionó (Tupían) *yvyra raimbe* 'wooden sword' (Cadogan, 1992); Huichol (U-A) *oparu* 'stick in the form of a sword'. Chimila (Chibchan) has extended the meaning of *kangʔraʔ* 'arrow shaft' to 'gun' on the basis of similarities in shape or use[15]. It is also worth noting a parallel in terms for precious stones and gems, which may come to refer to new materials, as in the Quechua *qispi* 'crystal, glass', where the former term is likely the original meaning (Adelaar, p.c. 23/10/2015).

Two major Spanish loans can be noted in the terms for 'coin, money'. The first is *tumín* in various West Mexican languages: *tuminu* (Purépecha, isolate), *tamèiŋ* (Pame, Oto-Pamean), *tumino* (Cuitlatec, isolate), *tomin* (Nahuatl), *túmiin* (Cora); *tumini* (Huichol; all three Southern Uto-Aztecan), *tumin* (Huastec, Mayan); *tomim* (Classical Huastec, Mayan), *tomines* (Classical Zapotec; Oto-Manguean). *Tumino* must be a relatively early loan into Mesoamerican languages since it appears, albeit not as the simple translational equivalent for 'money', but as part of phrases containing this meaning, in the Classical Purépecha *Diccionario Grande* which, while undated, is thought to date from before or around 1587 (Warren, 1991: xix). The term also occurs in other ethnohistorical documents, such as those from Zinapecuaro (Michoacán) dating to 1566, indicating an even earlier appearance. The second major loan from Spanish is *plata* 'silver, money', found in a smaller number of only South American languages: *burata* (Warao, isolate), *parata thórro*, *parata* (Emberá, Chocoan), *pʰaratʰa* (Epena, Chocoan), *arata* (Panare, Cariban), *podata* (Waorani, isolate). A third and more minor loan derives from the Spanish *dinero* 'money', being found in *nnehrrü* (Guajiro, Arawakan) and *niyeruse* (Desana, Tucanoan).

[14] The term 'wax' reconstructs to Proto-Panoan *βoičo. See also *yami with related meanings 'iron, machete, metal' (IDS, 2007), found in modern reflexes such as Amahuaca *yamí* 'metal axe', Capanahua *yami* 'axe'.

[15] I thank an anonymous reviewer for the second interpretation of the semantic extension, but cannot clarify which is more appropriate for this term.

Finally, there are a number of examples of apparent sound symbolism, e.g. terms for 'blowtube' or 'to blow' begin with /p-/ or /ph-/ in Quechua, Aymara, Puquina, Mochica, Kunza, Mapuche, Tsafiki, Atacame, Chipaya, Paez, Desana, Tukano, Chimila, Waunana (all South America). The Classical and Modern Quechua terms *taca taca* 'silver- or coppersmith hammerer' and *takana* 'to hammer' respectively may also fall into this category. Also note the reduplicated forms, Guatuso *ku:tʃ-ku:tʃ* 'hammer' and Warao *jurujurú* 'to file', which may reflect the repetitive action or motion both associated with the tool or process in question.

5. Discussion

We saw in Section 4 that there is little evidence of direct lexical borrowing between the Andean region and West Mexico in the domain of metalworking, despite support from archaeology and genetics for interaction in this, and other, domains. The only evidence of widespread borrowing was from Quechua to other unrelated languages in the Andes; Mesoamerica and the Intermediate Area displayed a small amount of borrowing within their own boundaries but no evidence of longer-distance loans. In this section, I will discuss several possible explanations for this absence, as well as offering tentative motivations for certain shared patterns.

The nature of knowledge transmission, in both technical processes and everyday life, may impact upon the amount of linguistic interaction between individuals. Evidence from, *inter alia*, history, ethnoarchaeology and ethnography, indicates that "the transmission of technological knowledge in pre-industrial setting was, and is, fundamentally different from that in modern industrial societies" (Killick, 2004: 573). In industrial societies, technological knowledge and skills are acquired largely through language and illustrations, whereas in non-industrial societies, technical skills were, and are, communicated "through a blend of verbal and non-verbal instruction" (Killick, 2004: 573). Pfaffenberger (1992: 501-502) also notes that another key feature of such systems "is their *silence*, the relatively insignificant role played by human language as against nonverbal communication in ritual […] as a coordinator of technical activities." The few studies of specialized crafts requiring apprenticeships (into which metallurgy falls), such as those concerning Liberian tailors (Lave, 1988) and Ghanaian weavers (Goody, 1978), have noted the small part language seems to play in the knowledge transmission process (Bloch, 1992: 186), as well as the tendency for people not to talk about the activities involved. Given that language is not central in the transmission or production processes, we could view the way in which a task is explained as a "*post hoc* overlinguistic rationalization" (Bloch, 1998: 23-24), i.e. a retrospective explanation using (an inherently inadequate) verbal medium to explain a non-verbal action.

Support for the lesser importance of language in the knowledge transmission process is also found in practical, everyday tasks, which can be viewed as culturally specific, complex and embedded in social life (Bloch, 1992: 186, following the renowned French anthropologists of technology Mauss, Leroi-Gourhan and Haudricourt). This lack of linguistic explicitness is particularly observable in the way everyday tasks are taught to children; we do not generally go through a step-by-step verbal explanation of how to do something, we often show by doing. Similarly, the process of becoming an expert in a particular domain "seems to involve the transformation of the [linguistic] propositions of the teacher into fundamentally non-linguistic knowledge" (Bloch, 1992: 187). Nonetheless, even if the explicit language used to explain a process may not constitute the most accurate record of the process itself, the fact that a process can be explained in the language of the society that uses it indicates that the terms can be communicated to members of other [linguistic] groups.

The transfer of existing terms to new metallurgical objects or processes that may be viewed as largely analogous could also account for the small number of loans. In her discussion of the transfer from stone working to copper working in the Lake Superior basin, Martin (1999: 117), following Cushing (1894), notes that "no new art [in the sense of working new or unaccustomed material] was ever practiced by aboriginal Americans as strictly new". Indeed, Cushing linked metalworking with established technologies using stone, wood, hide, shell and bark (idem.), indications of which we observed in the use of terms for pre-metal objects in Section 4.2. The methods chosen to design and produce metal (and other types of) artefacts are constrained "not only by the practicalities associated with metalworking from raw metal to finished product but also by cultural influences, some of which will have been borrowed from existing material technologies such as ceramics, carpentry and textile manufacture" (McEwan, 2000: 236). This recalls the social constructionist approach to the study of technology (see Killick, 2004 for a short overview) whereby metallurgy, along with all other technologies, is viewed as a social production determined by, or compatible with, other social phenomena (Lemonnier, 1992: 17), and as such develops as part of a particular societal system. This "fully human experience" (Hosler, 1994: 250) both draws our attention to the agency of the actors involved, as well as helping to account for cultural (and linguistic) variation in terminology and patterns of borrowing.

A further point to consider is that the contact situations for metallurgy transmission were simply of insufficient length for borrowing to occur. Lexical (and other) items will only be transferred if they are heard frequently enough; if the contact scenarios for the transfer of metallurgy were relatively short, or if indeed the linguistic element of such interactions was minimised, then the absence of loanwords is to be expected. In the case of the widely diffused terms in the Andes, the use of Quechua as a *lingua franca* and as the language of a large, powerful empire makes the imposition of terms for new materials is more understandable, with reference to linguistic dominance and exposure to new terms.

Turning from the more conceptual to the methodological, an implicit limitation of this study is the lack of data for, in particular, languages of the Ecuadorian and Peruvian coast, from where much of the maritime trade is claimed to have originated. Furthermore, I cannot claim to have included all the languages spoken in the metalworking regions prehispanically, since many of these languages died out before being described. It is well known, for example, that the population of modern-day Mexico fell by around 90% in the first 100 years of Spanish occupation, meaning a large number of languages were also lost forever. Unfortunately, these are gaps in the data that are impossible to fill and have to be accepted in a study such as this.

Nonetheless, certain patterns in the data can be observed in the three areas under study that merit consideration in the wider archaeological-anthropological context. A key factor to note from the outset is the differences in the socio-political situations in the three areas, which can impact on the type of interaction between speaker groups. The Andes appears to be the only region where widespread lexical borrowing has occurred, for example Quechua *qori* 'gold' is found in a number of other unrelated Andean languages (see Figure 4). In other lexical domains (including basic vocabulary), Quechua influence is observed in many Andean and western Amazonian languages (Adelaar, 2012). This influence can be attributed mainly to Quechua's status as a *lingua franca* in the late stages of the Inca expansion (1470-1532 CE) and during Spanish occupation (1532-1770 CE), where it was used, *inter alia*, for Christianising purposes. As such, Quechua was imposed upon speakers of other indigenous languages, entailing the imposition of new terms perhaps related to new technologies or the knowledge of such technologies. The existence and use of a *lingua franca* also entails more stable and widespread bilingual situations, which in turn lead to the increased likelihood of borrowing. In contrast, Purépecha, the lingua franca of the Tarascan Empire of West Mexico (a heartland of metallurgy in the region), was also used by Spanish friars in the sixteenth and seventeenth centuries for evangelizing purposes (Hamel, 2008: 313), but no comparable widespread lexical borrowing can be observed. One or more of a multitude of factors could account for these differences in borrowing patterns, but direct comparisons are clearly hard to draw.

Indeed, the major dynasties of Postclassic Mesoamerica – notably the Aztec Triple Alliance and the Tarascan State – co-existed along bellicose lines until contact with the Spanish in 1519. Despite at least four languages being spoken in the Tarascan Empire (Purépecha, Otomí, Nahuatl and Cuitlatec), there is very little evidence of lexical borrowing between them, not even from Purépecha, the language of the rulers who also managed mineral resources (Pollard, 1987), to other languages.[16] The lack of borrowing is perhaps all the more surprising when we consider that Mesoamerica, which includes all of West Mexico, has been held up as a prime example of both a linguistic area (LA; Campbell, Kaufmann & Smith-Stark, 1986) and a cultural area (Kirchhoff, 1943). Of the five core features that define Mesoamerica as a LA, four are grammatical while the fifth constitutes a number of semantic calques such as 'head of leg' for 'knee' and 'stone/bone of bird' for 'egg' (Kaufman, Campbell & Smith-Stark, 1986: 554), indicating a certain amount of conceptual diffusion. We might expect more conceptual diffusion then, even if lexical borrowing *per se* is not as widely attested across the area.

A feature not included in the LA diagnostic traits, but also quite widespread, is the association of particular colours with cardinal points or directions (See De Wolf, 1994).[17] Colour symbolism is shared in the metallurgy domain by, for example, Purépecha and Nahuatl, as in 'copper, lit. red metal/iron', as well as with Huastec, a Mayan outlier that most probably acquired metalworking from central Mexico (probably through Nahuatl speakers; see Hosler & Stresser-Pean, 1992). Yet Highland Mixtec (Oto-Manguean), also said to be part of the LA, makes use of a compound including the term 'yellow' to describe the same metal. That said, colour as a naming strategy is not restricted to Mesoamerica, or the Americas more broadly; indeed, many African languages refer to copper as "red metal" or "red iron" (Herbert, 1984: 10). Yet this variety in conceptual associations is not unusual, even in an area well connected through commercial networks such as Mesoamerica and its neighbouring regions (Weigand, 2001).

Similarly, the small number of borrowings in the languages of the Intermediate Area is intriguing, especially since the region has long been a locus of long-distance exchange and a commercial nexus (O'Connor, 2014: 77). Equally interesting is the high number of cognates per term: take for example the term 'gold' which offers at least eight cognate sets in the Chibchan languages alone. This may seem odd at first sight, given how genetically (Barrantes et al., 1992) and linguistically (Constenla, 1991) stable the region has been since the earliest stages of its continuous inhabitation some 10-12,000 years ago (O'Connor, 2014: 77). Moreover, Bray (1992, in Hoopes & Fonseca, 2003: 64) describes the region as "one metallurgical province", encompassing both Chibchan and Chocoan speakers, on the basis of stylistic similarities termed the 'International Style'. Nonetheless, the similarities in material culture and belief systems, coupled with long-term conflict, have led to the region being described as a "diffuse unity" (Fonseca & Hoopes, 2003). Bray (1984, in O'Connor, 2014: 80) again counters that the cultures in the area remained distinct despite constant contact (and conflict), accepting, for example, new technologies, practices and artefacts, but adapting and reproducing them in line with locally relevant cultural con-

[16] But see Cuitlatec (isolate) *navajo* 'knife', from Puebla Nahuatl (Uto-Aztecan), a term that also found its way into Spanish and continues to be used across Mexico; RAE, 2014.

[17] De Wolf (1994: 182) states that "the terms for cardinal points – as rather important representatives of the cultural vocabulary of a people – can give us information about cultural contacts and in some cases about the migration paths of the ancestors of the speakers of a language." (My translation).

texts. This scenario echoes the social constructionist view regarding the nature of technology, and indeed such an analysis might favour the use of existing terms or neologisms over terms from neighbouring ethnolinguistic groups.

The variation and multiplicity of terms, coupled with the lack of loanwords in the domain of metallurgy, might lead one to question the validity of an argument for the diffusion of the technology from South America to West Mexico. Certainly, "[…] the idea of multiple sources and multiples centres of secondary dispersion [of metalworking in Black Africa] is altogether plausible, especially in the light of the linguistic complexity […] in connection with metalworking vocabulary" (Herbert, 1984: 9). We may wish to consider, then, whether the sheer variety of forms found for metallurgical terms in the three regions of extractive metalworking in the prehispanic Americas may also be due to multiple sources and centres or production (see, e.g. de Grinberg, 1990). Such a scenario, coupled with the largely non-verbal nature of knowledge transfer, may help to account for the linguistic data observed in this sample.

6. Conclusion

This paper has shown that the lexicon of metallurgy, in this sample at least, is not able to demonstrate contact at the macro-level between South America and West Mexico to the extent that data in archaeology and genetics have. At the regional level, it has highlighted different patterns of lexical diffusion, with the Andes displaying more widespread borrowing compared with the other two areas. Certain naming strategies for terms, such as the colours for metal terms, follow similar patterns but seem to display no particular regional biases. This finding echoes Lechtman's (2007: 344) statement that "Pre-columbian metallurgy was Pan-American", in the sense that it comprised certain shared salient features. These features were (i) an emphasis on the development of specific colours or colour ranges in metals and alloys (as well as for gems and other precious stones), (ii) a stress on shininess, reflectivity, and the iridescence of metallic surfaces, following Saunders' (2003: 20) "aesthetic of brilliance" that also applied to other natural resources and objects, and (iii) the predominant use of copper, silver and gold and their alloys. These production and stylistic similarities are then adapted to individual cultural contexts, encouraging the diversity – or diffuse unity in the Chibchan sense – observable across the metalworking regions.

As indicated in the discussion, the small amount of borrowing may be due to knowledge transfer practices in non-industrialised societies and everyday situations more generally, where the non-verbal takes precedence over the verbal. Given that patterns have emerged at the regional level of analysis in this study, it is worth recalling Geurds and Van Broekhoven (2010: 68), who state that the analysis of social interaction, of which linguistic interaction is clearly a part, should include "an appreciation of localized processes of development at the level of technology, material procurement and semiotic patterns before the regional system can be elucidated." As such, future linguistic investigations could benefit from a more post-processual approach, focussing on more micro-level situations, before trying to address the larger-scale questions of interaction.

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Appendix A: Language sample and references consulted

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Appendix B: Wordlist
Alloy, anvil, arrow [point], arsenic, awl, axe, axe money / naipe, axehead, balance / scale(s), bead, bell (different types), bellows, blade, curved (for cleaning plancha), blowtube, bowl, bracelet, brazier / clay furnace, breastplate, bronze, brooch, burin, button, cast / mould, chisel, cinnabar, clamps, c-clamps, compass, copper, crown, crucible, deposit (of ore/mineral), digging stick tip, disc / coin, disc, flat used in electric grinders, disc, flat and thick of hammered copper, ear spool, earring, enamel, fan (electric), file (iron or steel for smoothing), finger ring, fire, firewood, fishhook, form / stake used to give a piece form, fuel, furnace, gilding, gold, hammer, head ornament, helmet, hoe, hot, ingot, iron, knife, lip plug, labret, lost wax casting, metalworker, mine, moneychanger, barterer, moveable metal stake, necklace, needle, nose ring, open ring, ore, outline/trace, pin, pit, pliers, pole, wooden for removing impurities, rattle, rocks around mouth of cendrada, scraping pole, scribed guidelines, shears, shield, silver, silversmith, slag, sledgehammer, smelter, smithy, smoke, soldering, spear head / point, stick for cleaning molten copper, stones for containing old metal, sword, temperature, tin, to add height to walls of vessel whilst deepening, to alloy, to cast, to crush [slag], to even up, to fold object's edge, to gild, to give the object (cazo) the desired height, to hammer, to locate ore, to melt, to mine, to polish / shine / burnish, to shape, to silver-plate, to smelt, to solder, weld, to stretch, extend, to work metal, tongs, tool blade, tumbaga, tweezers, vessel, wide-mouthed, wax, white hot, woodblock, dapping bench, wooden piece for tracing circles, workshop.

(Re)Considering the Archaeo-Linguistics of Mesoamerica

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The history of archaeo-linguistic research in Mesoamerica has been fraught with forced correspondences between archaeological and linguistic data as well as inherited assumptions about cultural primacy. These difficulties are particularly problematic in the region's southeastern periphery, where such tendencies are exacerbated by a dearth of linguistic data as well as an ongoing adherence to core-periphery models in which influence – including, arguably, linguistic influence – is assumed to have flowed from seemingly more 'advanced' population centers to their supposedly less-developed neighbors. The indicators of this advancement unsurprisingly reflect the kinds of features that appeal to archaeologists and the institutions that support them, and the resulting assumptions concerning their significance create a skewed historical perspective in which cultural and political identities are easily conflated.

The comparative methodology dominant in considerations of Mesoamerican linguistic history exacerbates these homogenizing tendencies. Such work is frequently based primarily on historical documentary sources whose contents are, by nature, skewed to emphasize or illustrate particular kinds of features. The incorporation of data from contemporary linguistic fieldwork is also potentially problematic, since many surviving indigenous populations in the region are facing language endangerment, death, or collective consolidation in an attempt to retain some measure of social or political influence. This is not to say that comparative studies have nothing to offer; in fact, when done well, such research can shed considerable light on ancient associations. However, the successful use of such methodologies requires a critical perspective and robust understanding of the nature of the available data, what they can and cannot reveal, and the scope of their applicability.

This paper will focus on the southeastern periphery of Mesoamerica, presenting a preliminary review of ongoing research focused on the intersections of the region's archaeological and linguistic heritages. This work, which juxtaposes information on non-elite material remains – particularly ceramics – with data concerning linguistic distributions and patterns of relatedness, is part of an ongoing field project, directed by the authors, in the lower Ulúa Valley of Honduras. Its focus on non-elite materials reflects a conscious attempt to correct for the socio-political conflation inherent in many orthodox analyses and a firm belief that non-elite materials offer a more reliable indication of the linguistic and cultural practices most common in a region than their elite counterparts. While it remains a work in progress, these analyses can nonetheless illustrate the problems inherent in traditional methodologies and indicate potentially fruitful avenues for future research.

On the Intersections of Language and the Archaeological Record
Using the perspectives of historical linguistics in conjunction with material remains has been an enduring dimension of archaeology, but its popularity has varied wildly across subdisciplines and geographic regions, and through time. In areas with ancient writing systems, especially the Mediterranean and Near East, analysis of texts and philological approaches to reconstructing the past have been central to the archaeological enterprise since its inception as a recognizable academic discipline. "Linguistic palaeontology" (Heggarty 2007), like the "Wörter und Sachen" approach – employing reconstructed lexicons of early languages in combination with material remains to reconstruct past cultures – has never gone entirely out of fashion. The popularity of other kinds of analyses based on the assessment of congruences between historical linguistic reconstructions and the archaeological record has fluctuated wildly. By the mid-20th century, most archeologists, especially those working on prehistoric periods in the Americas, had come to be deeply suspicious of the plausibility of relating material remains to language in any significant way. At the same time, Swadesh (1950, 1955) was developing his glottochrono-