

The Role of Agriculture in Explaining the Diversity of Amerindian Languages

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RESUMEN

El papel de la agricultura en las explicaciones para la diversidad de las lenguas amerindias

Las lenguas de las Américas representan una situación única desde en una perspectiva global. Comparados con las leguas del Viejo Mundo, ellas se dividen en un gran número de *phylos* (filos), no relacionadas entre si. Eso resulta problemático, tomando en cuenta las fechas relativamente tardíos generalmente aceptadas para la población humana del Nuevo Mundo. Aquí se citan algunos estimados tempranos de Bernabé Cobo acerca el número de idiomas en las Américas. Varias hipótesis han sido presentadas para explicar esta situación, generalmente estos da gran importancia a la expansión demográfica propulsada por agricultura. En esta contribución algunos de aquellos modelos explicativos son revisados con la sugerencia que una diversidad de operadores es necesaria para dar cuenta del patrón global de distribución de lenguas. Las tablas presentan los opiniones actuales sobre filos de lenguajes de las Américas, dividiendo estos en cuatro categorías, aislados, filos pequeños, filos grandes esparcidas y grupos densos e expansivos asociados a la agricultura. Fechas actuales para la agricultura en los Neotrópicos pueden tener una antigüedad de 10.000 AP. Los argumentos lingüísticos para asociar la reconstrucción de cultivos con expansión de filos esta presentados y lleva a la conclusión que también casos bien establecidos pueden ser cuestionados. El trabajo sostiene que se debe dar más peso a las fechas más tempranas de la intrusión humana en las Américas. Crucialmente, parece como si la relación entre agricultura e expansión lingüística puede ser a opuesta a la hipótesis común; que la domesticación fue una respuesta, no una causa, de crecimiento demográfico.

The absurd theories which have been advanced and gravely defended by men of learning and acuteness respecting the origin of the Indian races are hardly worth even a passing reference... When men sit down crammed with scattering items of historical information, abounding in prejudices, and teeming fancies, to the solution of questions respecting whose conditions they know nothing, there is no folly which they are not prepared to commit (Whitney 1867 [quoted in Campbell 1997:99]).

Introduction

Claims about agricultural expansions in prehistory

Associated principally with archaeology are a number of questionable claims concerning the antiquity of language phyla and the driving force of their expansion. This idea has a long history within Indo-European studies, but has most recently been associated with the work of Peter Bellwood who has energetically propagated the notion that many language phyla expanded as a result of the development of agriculture and consequent demographic growth (e.g. Bellwood 2005; Bellwood and Renfrew 2002). Such models may be valid in a small number of specific cases, for example the Tai-Kadai languages (Blench 2011) or Nilotic (Blench 2006:83; see also Blench 2007), but attributing this hypothesis a more global explanatory power is questionable. The difficulties of validating it in many situations (e.g. Wichmann 2002) have not deterred those making claims for it. The problem for linguists is that it rarely addresses language evidence directly and indeed, in many cases, the actual data appears to contradict the model. At the same time, linguists do not always present their results in the most accessible way and sometimes offer reconstructions that are chronologically improbable or culturally unrealistic.

Linguists also frequently disagree, rather forcefully in some cases. The case of Sino-Tibetan springs to mind: Matisoff (2003) has advocated a coherent tree-like structure implying a relatively recent dispersal and a primary branching of the Chinese languages, whereas Van Driem (2005) believes this is not supported by the evidence and that a very large number of individual groups must be postulated, whose present relationships are undetermined. No wonder many archaeologists and linguists on the margins of the debate simply shrug their shoulders in disbelief over the rigour of historical linguistic models. One region of the world where disagreement has been particularly acute is the Americas; the dates for first settlement, the classification of languages and the role of agriculture in the expansion of particular phyla are all controversial. This paper looks at the general pattern formed by languages in the Americas and the particular difficulties of explaining the nature of phyletic expansions. It examines the evidence for individual language phyla, where agriculture has been suggested as an engine for their evolution and summarises the linguistic evidence.

Is it necessary for there to be any engine of language phylum expansion?

It might be asked whether it is necessary to adduce any motive for language phylum expansion other than natural population growth. The answer is that in most parts of the world, the dominant language phyla are manifestly recent. Indo-European, Pama-Nyungan, Austroasiatic, Austronesian, Kartvelian, Mixe-Zoque and Mayan are all relatively tightly knit phyla which have clearly expanded recently, eliminating much prior diversity. “Recent” in this context refers to the last 8000 years, with phyla such as Austroasiatic—previously considered to be of great antiquity—now redated to as recently as 4500 BP (Sidwell and Blench 2011). By contrast, phyla such as Nilo-Saharan and the Trans-New Guinea phylum are likely to be much older. In Drake et al. (2010), Blench argues the Nilo-Saharan must be associated with the “Green Sahara,” i.e. at 10,000 BP, and Pawley (2005) that the Trans-New Guinea phylum is associated with the rise of vegiculture, i.e. not less than 8000 BP.

This is one factor that makes a link with the rise of farming credible; what driving force would be behind this population growth and settlement expansion if not agriculture? If agriculture is ruled out then opponents of the hypothesis must present an alternative; close-knit language phyla do not exist simply by chance. Examples of such alternatives might be superior military organisation linked with expansionist ideologies, new technology (metals, maritime techniques, the bow and arrow, or even innovative lithics), climate or environmental change leading to new resource availability, changes in health status and religious and social ideas. These may not be unrelated to intensification, and some, such as the introduction of metals, might only account for the expansion of subgroups of language phyla. Some of these are more easily tested against archaeological and linguistic data than others.

Demographic expansion versus cultural transmission

The language/farming dispersal hypothesis is associated with the hypothesis of demographic expansion, “demic diffusion” in the language of its advocates, but a reinvention of the notion of migration that has had a strongly negative stereotype with many archaeologists. In principle, this is realistic; we know that in the early stages of the evolution of agriculture, farmers move regularly, sometimes in large circular patterns, to allow for the regrowth of fallow, but often pioneering new areas of untilled land. Similarly, pastoralists or fishermen may depend on a resource in a particular area for some time, but the year it fails they explore new territory and their movement patterns and dispersal often change irrevocably. Nonetheless, it is clearly also true that language can spread independently of mass migration; most Americans today have not inherited culture by direct transmission from English-speaking forebears, but by assimilation and diffusion. Similarly, many Chinese populations today were clearly formerly speakers of languages of other phyla and have gradually “become” Chinese over the millennia.

This is not to question the reality of demographic expansions; they clearly occur. However, the relationship with a subsistence strategy has to be demonstrated on a case by case basis. This is not difficult when the populations and their languages expand into uninhabited territory or occupied only by foragers. It would be eccentric to question the reality of demic expansion in the case of Polynesian or Bantu. But this is not an issue to be resolved unambiguously. When people move, artefacts and ideas also migrate, but proving demographic expansion would require the sort of large scale quantitative analysis and sampling unlikely to be available for most parts of the world. Where there are numerous well-dated settlement sites, and it is possible to make numerical models of population increase over time, a credible case can be made for expansion. However, even for a generally accepted expansion such as Austronesian, almost all archaeological sites in island Southeast Asia are caves rather than open-air sites, which do not provide direct support to the model, as they are linked to specialised subsistence strategies, such as hunting. Most reasonable onlookers would accept clusters of villages moving and spreading with characteristic new types of material culture as *a priori* evidence for this type of migration.

In linking archaeology to linguistics, it is not enough to demonstrate the reconstructibility of agricultural terminology to a proto-language. Although it is a common assumption that such reconstructed terminology implies agricultural expansion, agriculture may be the consequence of cultural change, not its cause. Moreover, where agriculture is preceded by the management of landscape or faunal resources, these are often difficult to distinguish linguistically.

Methodological issues

What preconditions are required for there to be a reasonable *a priori* link between the expansion of a language phylum and agriculture (or indeed any other subsistence system, such as fisheries or pastoralism)? The answers may seem obvious, but most published models do not clearly adhere to them. They are:

- 1 That there be an incontrovertible phylum.
- 2 That the phylum be sufficiently large for useful conclusions to be drawn from historical linguistic reconstruction.
- 3 That the internal structure of the phylum is generally accepted and from this that some assessment of the homeland and general direction of migration is available.
- 4 For reconstructions to exist for a significant number of items including those of an ecological nature that broadly support the outline in
- 5 That reconstructions exist of the principal crops, trees, livestock species or other subsistence items relevant to the hypothesis.
- 6 That reconstructions exist of items suggestive of farming rather than just gathering wild relatives of the crops.

- 7 That well-dated archaeobotanical materials exist that correspond to the reconstructions in areas roughly coincident with the proposed homeland.
- 8 That no other competing hypothesis be available to explain the data equally well.

The following numbered paragraphs expand on these individual points.

1. Broadly speaking, language phyla can be divided into those which are almost universally accepted, those which are debatable and those which are not proper phyla, but merely geographical groupings. New World examples of those universally accepted are Eskimo-Aleut, Mayan, Na-Dene, Uto-Aztecan, Arawakan, Tupian and Cariban. In the debated category are Penutian and Hokan. In addition, there are macro-phyla, bundlings of multiple phyla, most notably Nostratic (Eurasian) (Bomhard 2008; Greenberg 2002), Papuan (Wurm 1982) and Amerind (e.g. Greenberg 1987). These are not widely accepted by the linguistic community and, even if real, would have a time-depth too great to admit significant cultural reconstruction.

2. Not all language phyla are large; Eskimo-Aleut, Witotoan and many other groupings in the New World have just two or three members and thus cannot be reconstructed to any great time-depth, since linguistic diversity within a phylum is indicative of age. Even if agriculture, herding or fishing can be reconstructed for their proto-language this does not provide much useful information since we know that these methods of subsistence are older than any hypothetical date emerging from the reconstruction process.

3. The internal structure of most language phyla is debated to some extent. For some phyla, disagreement is so serious that uncontroversial reconstruction is impossible. Arawakan is a good example of a phylum where there are significant disagreements over its membership and internal classification. The significance of this is that there can be no convincing reconstructions of a proto-language without a hierarchical structure. The languages have to be part of a dendrogram with intermediate nodes between languages spoken today and the postulated proto-language, for only then is it possible to establish sound-correspondences to support particular models of diversification. Linguists can extract common forms (i.e. likely abstractions based on synchronic attestations) but these are not the evidence required for the reconstruction of prehistory.

4. If there is a dataset of proposed reconstructions then items of significance for ecology and subsistence should be a small proportion of a large dataset which will mostly include more common lexical items. Regular reconstructions of common items increases confidence in more specialised lexemes.

5. To demonstrate that a phylum or subgroup is associated with true farming as opposed to foraging it is not enough to reconstruct crop names. Where crops are domesticated from indigenous species, then the name often is transferred from the gathered wild plant to the cultigen with no evident linguistic discontinuity. For example, it is claimed that “wheat” can be reconstructed in proto-Indo-European, but wild wheat can be gathered almost throughout the range of its proposed homelands.

6. One of the problems of reconstructing only crop names is that the terms are likely to have been applied to the wild relatives of the cultigen, prior to domestication. To be sure that farming is implied, it is useful to have such terms as “field,” “furrow” or the names of agricultural tools as well as plant names.

7. The density of archaeobotanical materials is highly variable, for reasons that have to do with aridity, soil type or resources available to archaeologists. Archaeobotany in the New World has typically been highly dependent on preservation of macro-remains in arid environments. In Africa and Southeast Asia, where soils are typically acid and much of the continent humid, the introduction of flotation at excavations has transformed the picture of ancient crop repertoires (Castillo and Fuller 2010). Recent and considerable advances in starch grain analyses offer particularly promising results in understanding early Holocene plant use in the New World (e.g. Piperno 2011).

Amerindian languages and dates for the settlement of the Americas

The settlement of the Americas continues to be a major puzzle to students of prehistory. To linguists (and increasingly geneticists, e.g. Nelson et al. 2008), the extreme diversity of languages looks as if an extremely old date must be assigned to this, something on a par with Australia or Melanesia. But archaeology is stubbornly resistant to such a retrodiction. For a long time, Clovis points were held by North American archaeologists to be the earliest evidence for human occupation and these seem to be no earlier than 12,500 BP. Many archaeologists, especially in North America, still accept the Clovis dates as the main date for the settlement of the Americas, and even where the Clovis primacy is rejected, “Palaeo-Indians” are still deemed to be of similar age (Roosevelt et al. 2002). But early, unfluted, lanceolate El Jobo-like points have also been recovered at Monte Verde in Chile. The Pre-Clovis occupation at Monte Verde has been dated to at least 12,500 BP (Dillehay 1997; Meltzer 1997). In contrast, throughout South and Central America, much earlier dates are part of public discourse, with 30,000 BP commonly featuring in maps of the settlement of the region. The consequence has been that any site which appeared to be older than Clovis was routinely subjected to intensive skepticism, and of course no procedure is ever perfect. The dating of sites

such as Meadowcroft (19,000 BP), Cactus Hill (15,070 BP) and Bluefish Caves¹ in Alaska (at least 14,000 BP) is commonly questioned. Direct dating of coprolites at 5-Mile-Point caves in Oregon has recently given a date of 12,300 BP (Gilbert et al. 2008). Even sceptical authors such as Roosevelt et al. (2002) admit to earlier dates for Alaska. Fagan (2004) provides a somewhat perplexed account of these controversies but finds it difficult to accept “unimpeachable” early dates.² All in all, given the accepted dates for early domesticates, the sheer abundance of sites now claiming to predate the Clovis barrier and the astonishing diversity of languages in the Americas, continued adherence to later dates is now problematic.

These contradictions might be resolved in a number of ways:

- 1 The conservative archaeological dates are correct and Amerindian languages have diversified more rapidly than any other comparable region of the world and produced a highly atypical result.
- 2 Amerindian languages have been faultily classified and they do fall into a restricted number of larger phyla which would then be quite compatible with late dates. This view is associated with the classification of Joseph Greenberg (1987).
- 3 Some early archaeological dates are indeed correct and the settlement of the Americas is significantly older than current models allow.

Since the consensus of the linguists who have looked at the classification of Amerindian languages is that by and large they fall into a pattern of isolates and small phyla, this view will be adopted here (e.g. Campbell 1997; Mithun 1999; Kaufman and Golla 2000; Adelaar and Muysken 2004). Even so, there is much to be explained. Why are isolates so numerous in comparison with all other continents? Why are Amerindian languages so phonologically and syntactically diverse (in contrast to Papuan and Australian for example)? And why are there no very large phyla, comparable to Niger-Congo or Austronesian, composed of hundreds of languages?

Amerindian language groupings

As far back as the seventeenth century, European authors have commented on the diversity of Amerindian languages. Bernabé Cobo (1979), writing in 1653, estimated there were upwards of two thousand languages (not an unlikely estimate for pre-Columbian America), and furthermore proposed they must all originate from a single migration and have differentiated *in situ* (Cobo 1979:40). He demonstrated this with a comparison of Quechua and Aymara, which he considered

¹ Bluefish Caves represent a good example of that research findings that do not “fit” conventional theories are denied additional funding. Excavation has restarted in 2008.

² See also a valuable review of sites and dates at <http://www.jqjacobs.net/anthro/paleoamericans.html>.

related and to have differentiated from a single original mother-tongue. Linguists do not now consider Quechuan and Aymaran to belong to the same phylum, but long periods of mutual influence are responsible for numerous surface similarities. It is surprising how historians of linguistics have ignored this early insight into language diversification, while the insights of the later Father Gilij into Arawakan and Cariban are now regularly cited. Cobo also argued that spoken languages differentiated faster than written ones, although he gave no estimate of the time-depth of New World languages.

Father Cobo's insights were not followed up for several centuries, until the first major attempt to classify Amerindian languages was undertaken at the end of the nineteenth century. Classifications of Amerindian languages, with the exception of Greenberg's (1987) have emphasised the difficulties of establishing any very large-scale phyla (e.g. Loukotka 1968; Kinkade and Powell 1976; Campbell and Kaufman 1980, 1983; Witkowski and Brown 1981; Kaufman 1990; Campbell 1997; Mithun 1999). This paper will take the "mainstream" view that the consensus of linguists is correct and there are very many isolates and small phyla. Amerindian languages can be roughly divided into four categories:

- 1 Isolates. Many languages in ones or twos with no evident relatives.
- 2 Small phyla with 3–7 members, reflecting a recent diversification.
- 3 Large, widely extended families with members scattered over a large area, often close to extinction and with very small populations.
- 4 Large, numerous and territorially broad groups, all of whose members seem to have practised agriculture

In the case of category 4, it is important not to read present distributions into the past, especially in the case of the Amazon. More and more archaeology is coming to light to suggest the "primeval" rainforest was anything but that, and complex societies with elaborate agriculture may have existed in many places (e.g. Denevan 1992; Balée and Erickson 2006; Heckenberger et al. 2008; Woods et al. 2009; Pärssinen et al. 2009). The reasons for the collapse of these societies and the appearance of low-density foragers are debated, although the spread of Old World pathogens prior to the physical presence of Europeans was clearly a major factor. So a region which appears today to be home to scattered and fragmentary

Table 1. New World language groupings. – Agrupaciones lingüísticas del Nuevo Mundo.

Category	Number
Living language isolates	48
Extinct language isolates	27
Living small phyla	32
Extinct small phyla	9
Large, geographically dispersed phyla	13
Larger New World phyla forming territorially coherent blocs	12

populations may formerly have been the locus of agricultural expansions which are obscured by the vagaries of recent history, and interpretations of the pattern of its languages will need to take this into account.

A new count made for this paper, based on information to 2008, reaches an overall total of seventy language isolates in the New World. Table 1 shows the counts made for both living and extinct language isolates and small and large phyla.

A feature of American languages is the presence of geographically dispersed phyla. Arawakan and Cariban are good examples of this; both have a concentrated nuclei along the northeast coast of South America and extend into the Caribbean (possibly recently) but also have scattered populations in small communities all across the Amazon, apparently following the major river systems. Algic (a name for Algonquian in the northeast of North America plus two languages in California) has a geographical extent approaching Indo-European, despite having many fewer members and a lack of association with agriculture. Most surprising is Dene-Yeniseian, which brings together the Athabaskan languages of North America, Apache/Navajo in southwestern United States and the Yeniseian languages of central Siberia (Kari and Potter 2010). Long hypothesised, the linguistic evidence recently presented has now been generally accepted by the research community (Vajda 2010).

Although the division is not absolute, the remaining phyla are relatively well-attested, large, numerous and territorially coherent groups (Table 2). These suggest expansions in the last five thousand years, and the potential for archaeological and genetic correlations.

Agriculture and language expansions

Introduction: the genesis of agriculture in the Americas

The idea that there was a relation between the language phyla of the Americas and agriculture goes back to Spinden (1915) who, however, had no evidence for correlations with particular phyla. The modern consensus is that agriculture originated independently in the New World, apparently several times. Major reviews of the relevant archaeobotanical data can be found in Piperno and Pearsall (1998) and Iriarte (2007). The most ancient evidence for incipient plant domestication is in the Cauca valley in Peru where the corozo palm (*Acrocomia* sp.) and arrowroot (*Maranta* sp.) are dated to c. 10,000 BP (Piperno and Pearsall 1998:199–203), equivalent to the earliest dates in other regions of the world, such as the Near East and New Guinea. Isendahl (2011) dates the domestication of manioc to between 10–9000 BP in the Brazilian Cerrado. Dillehay et al. (2007) give evidence for domestic peanut (*Arachis hypogaea*), squash (*Cucurbita* spp.), cotton (*Gossypium* spp.) and manioc (*Manihot esculenta*) on the western slopes of the northern Peruvian Andes between 9240 and 5500 BP. Ranere et al. (2009) and Piperno et al. (2009) show that maize (*Zea mays*) was present by 8700 cal. BP in the Central Balsas Valley of tropical southwestern Mexico. Phytolith data

Table 2. Larger New World phyla forming territorially coherent blocs. Note: * Søren Wichmann (personal communication) observes that 30 might be a more credible figure. – Filos mayores del Nuevo Mundo formando bloques coherentes. Nota: * Søren Wichmann (comunicación personal) observa que 30 podría ser una cifra más observable creíble.

Name	No.	Where	Comment	Reference
Arawakan (Mairapan)	64	Caribbean to Brazil		Noble (1965); Matteson (1972); Oliver (1989); Payne (1991); Aikhenvald (1999)
Aymaran	2–3	Bolivia	Exceptional. Language leveling?	Adelaar and Muysken (2004)
Caddoan	5	US		Chafe (1976)
Chibchan	22	Colombia to Honduras		Wheeler (1972); Costenla Umaña (1981, 1990)
Guahiban	5	Colombia		Christian and Matteson (1972)
Mayan*	69	Mexico, Guatemala	Count inflated by dialects	Campbell (1978); Dienhart (1989); Brown and Wichmann (2004); Wichmann (1995, 1998)
Mixe-Zoque	16	Mexico		Longacre and Millon (1961); Rensch (1976, 1989)
Oto-Manguean	174	Mexico, Nicaragua		Cerrón-Palomino (1987); Torero (1983)
Quechuan	46	Peru, Bolivia, Andes		Waltz and Wheeler (1972); Wheeler (1992); Barnes (1980, 1999)
Tucanoan	25	Brazil, Ecuador, Colombia		Miller (1967); Hill (2002)
Uto-Aztecan	62	US, Mexico		Aschmann (1993)
Witotoan	6	Colombia, Peru		

also indicate a preceramic presence of domesticated squash, possibly *Cucurbita argyrosperma*, of the same period. Shortly after this, sites produce cucurbits and lesser-known plants such as leren (*Calethea alluioa*) and bataua (*Oenocarpus* sp.). Smith (1997) documents domestic pumpkin (*Cucurbita pepo*) at much the same horizon. Starch grain analysis has also produced exceptionally rich data for root crops (e.g. Piperno and Holst 1998; Piperno et al. 2000; Piperno 2006). Piperno (2011) provides a convenient summary of the latest results and bibliographic references.

The reasons for the genesis of agriculture have been much debated, but with no very conclusive result (Piperno and Pearsall 1998:10–30). However, it is clear that there is no relationship with population density as has been posited elsewhere in the world; human populations were extremely sparse at this period. There is also no relationship with urbanism; cities appear first in Peru at 5000 BP (Shady

and Kleihege 2008), and appear to reflect abundant marine resources rather than agriculture, which is anyway significantly earlier (Dillehay et al. 2007). Indeed it seems that incipient agriculture did not produce any sort of dramatic shift in human social and economic organisation, nor is there evidence to link it with the expansion of specific language families at this early period.

Iriarte (2007:Figure 9.3) identifies at least four locales in South and Central America where agriculture may have begun independently: (1) Central America; (2) Colombia, Ecuador and NW Peru; (3) Brazil; and (4) Bolivia and coastal Peru. How independent these were in reality is open to discussion. For example, Zarrillo et al. (2008) report domestic maize in southwestern Ecuador 5300–4950 cal BP, which they attribute to diffusion from the sites in south-eastern Mexico, which are some 4000 years older (see also Pohl et al. 2007 for the Mexican evidence). To the Central and South American sites may be added at least one North American zone, the east-central region (Smith 1992a, 1992b, 2006). The North American case is particularly interesting as it is late (2500–1500 BC) and many of the domesticates, such as sumpweed (*Iva annua*) and chenopod (*Chenopodium berlandieri* ssp. *jonesianum*) are now no longer cultivated. Hart et al. (2004) observe that the bitter *Cucurbita pepo* may have been originally domesticated as a fishing float, rather than as a food plant. Fritz (2007) notes that strong academic pressure for the early mound-builders to be farmers may have led to an over-emphasis on agriculture. It may be that only when maize reached the area (as late as 1000 AD) did farming become the basis of subsistence. Similarly, in Peru at the coastal site of Caral, the first urban centre in the New World, there is evidence for the domestication of cotton and gourds, not apparently for direct food consumption but to assist in fish production (Shady and Kleihege 2008).

All of this suggests a different profile for early agriculture in the New World. Far from accompanying a social and demographic revolution, it remained a low-level adjunct to economies that were still essentially focused on foraging. Low populations and abundant resources meant that foraging persisted into the historic period in many areas, and the economic returns were heightened by intensive landscape management (Peacock and Turner 2000). As a consequence, it may be difficult to argue for any strong link between incipient agriculture and the expansion of language families, *even if* domestic plants and animals are reconstructible to a proto-language. Piperno (2011:462) argues that the “appearance of large sedentary and nucleated villages, which postdates 6000 BP throughout the Americas, should no longer be considered a necessary backdrop for the occurrence or recognition of effective and productive agriculture in the Americas.”

It may well be that the language spread and the much later intensive agriculture *are* related, and that these in turn are related to the development of urbanism and centralised religious practice. With the development of Caral-Supe on the Peruvian coast around 5000 BP (Shady and Kleihege 2008) the pattern for urbanism in the New World was established, and this was associated with a particular type of centralised religion. These early cities could depend on abundant foraged resources rather than agriculture, but once populations expanded beyond

a certain density, intensive agriculture similarly begins to evolve. The next section considers the arguments as they have been advanced for particular Amerindian families.

Reconstructions of agriculture in particular language families

General

Reconstructions of proto-languages in the Americas are usually carried out by linguists, not agricultural historians, and often without a view to the reconstruction of economic prehistory. As a consequence, linguists have not always chosen the species prehistorians would regard as of most interest and occasionally reconstruct terms for species which are introductions from elsewhere, casting doubt of the veridicality of their reconstructions. As a consequence many apparent reconstructions for “manioc” or “corn” probably reflect no more than widespread loanwords. Furthermore, the evidence offered for published reconstructions is often tenuous in the extreme.

Methodologically, it is important to take into account the distortions in our image of the language situation in the New World as a consequence of the depredations following European conquest. The dry coast of Ecuador, Peru and Chile are the sites of large complex settlements, and highly significant in the genesis of urbanism in the Americas. With the exception of the fragments of Moche, we have no idea what languages were spoken in these regions in the pre-1500 era. Despite the abundant macro-remains testifying to a flourishing agriculture, the absence of linguistic data makes it impossible to determine the relationship between language and subsistence in this region.

In the case of Chibchan in Central America, Wheeler (1972) proposed a reconstruction for “corn/maiz,” while Constenla Umaña (1981, 1990) reconstructs a variety of terms both for agricultural practice and for specific crops. Given the internal diversity of the group, various authors have placed its origin 6–5000 BP, making it one of the earliest New World agricultural expansions. Given the location of Chibchan, it is very tempting to correlate it with the preceramic horizons at the Aguadulce Shelter site in Panama, dated between 7000 and 5000 BP (Piperno et al. 2000). Assemblages extracted from plant milling stones show starch grains identifiable as manioc (*Manihot esculenta*), yams (*Dioscorea* spp.) and arrowroot (*Maranta arundinacea*). The artefacts also contain maize starch, indicating that early horticultural systems in this region were mixtures of root and seed crops.

Waltz and Wheeler (1972) linguistically reconstruct *achiote*, chili, coca, corn, cotton, cultivated clearing, manioc, plantain (although this is evidently a transferred term), sweet potato and tobacco for proto-Tucanoan, a repertoire sufficiently large to suggest that agriculture was essential to its speakers. Price (1978) includes tobacco, manioc and maize as proto-Nambiquara while excluding yam and gourd. Whistler (1977) reconstructed plant and animal names for part of Penutian (in itself a controversial hypothesis) and found nothing suggestive of

Table 3. Proto-Mayan crop reconstructions (Brown and Wichmann 2004; Søren Wichmann, personal communication). – Reconstrucciones de cultivos Proto Maya (Brown and Wichmann 2004; Søren Wichmann, comunicación personal).

Proto-Mayan	Gloss	Proto-Mayan	Gloss
(‘ix-)’ii’m	maize	maa’y	tobacco
’aak’aach	(female) turkey	matzati’	pineapple
’ajan	ear of corn	Mulul	jícara, guacal
’alaq’	domestic animal	nooq’	cotton
ch’oop	pineapple	’oong	avocado
’iihk	chili pepper	Palach	turkey
’iis	sweet potato	Pitaq	corn cob
’is-k’um	a kind of gourd	q’ohq’	gourd, squash
’i’taaj	greens, cabbage	Sakiil	squash seed
johm	jicara, guacal	siik’	cigar, tobacco
keenaq’	beans	tz’ihn	yucca
k’uhtz	tobacco	tzoq’	male turkey
k’u hm	calabash	Tzuh	gourd, squash

agriculture. Mithun (1984:271) specifically discusses the question of whether agriculture can be reconstructed for Iroquoian and concludes that it cannot. However, she notes that agricultural terminology is found in proto-North Iroquoian (i.e. excluding Cherokee).

Mayan

The Mayan languages form a phylum with 69 members spoken in Mexico and Guatemala. Speakers of the geographically defined lowland Mayan languages have brought fame to the family as a whole through their spectacular stone architecture and their writing system. Campbell (1997:165) mentions the agricultural inventory of Mayan specifically and extensive cognate sets can be found in Di-enhart (1989). Table 3 shows a list of reconstructions for crops in Proto-Mayan.

Apart from crops, many terms relevant for agriculture such as tools and field names can also be reconstructed, as well as specific food types. Kaufman (1976) argues that a date of >4000 BP must be attributed to proto-Maya. Xincan, a language isolate spoken in southern Guatemala, has been shown to have borrowed all its agricultural terminology from Mayan languages (Campbell 1978).

Otomanguean

Otomanguean was spoken between southeast Mexico and Costa Rica although its eastern outliers are now extinct (Swadesh 1960). There are no living Otomanguean languages outside Mexico, but the extinct Subtiaba was formerly spoken in Nicaragua, and its closest relative, Tlapanec, is still spoken in Mexico. Prior to the definition of Otomanguean proper, Longacre and Millon (1961) reconstructed proto-Amuzgo-Mixtecan specifically with a view to identifying

the subsistence modes of its speakers. Longacre and Millon (1961) and Rensch (1976) reconstructed a large number of crop names for proto-Otomanguean. The following crops have credible proto-forms: avocado, bean species, cacao, chili, maguety, maize, sweet potato (or *camote?*), squash, cotton and tobacco. In addition, terms that point to processing and cooking are also reconstructed, including maize dough, *metate* (grindstone), oven and *pulque* (maize beer).

Hopkins (1984) has connected the spread of Otomanguean with the evidence for agriculture in the Tehuacán horizon (5000–2300 BC) in the Tehuacán Valley in southeast Mexico (Byers 1967). Its culture history has attracted considerable attention and there are competing reconstructions of its hypothetical past (Josserand et al. 1984). Winter et al. (1984) sound a sceptical note: the scattered direct evidence for early crop domestication in Central America cannot make it certain that agriculture was the engine of the Otomanguean dispersal. Nonetheless, if the reconstructions implying cooking and food preparation are accepted, then a correspondence between true agriculture and the spread of Otomanguean is credible, although the link with the Tehuacán horizon remains to be fully confirmed.

The Uto-Aztecan controversy

Uto-Aztecan is a family of languages stretching between southern United States and southern Mexico and including the language of the Aztecs. Its southern branches are fully agricultural and seem to have been this way for a considerable period of time. However, speakers of the northern (Numic) branch were foragers at the period of European contact. Earlier arguments (e.g. Fowler 1972) supposed that Uto-Aztecan was originally a forager phylum, but Bellwood (1994, 1997, 2001, 2005 and elsewhere) and others (e.g. Hill 2002) have turned this argument on its head and supposed that this *was* an agricultural expansion from Mesoamerica into southwestern United States. They argue for “devolution,” i.e. the return of Numic-speakers back to foraging on the grounds that the archaeological evidence can be interpreted as indicating abandoned maize agriculture. Bellwood and Oxenham (2008) summarise recent developments, which point to the appearance of storage pits and maize cobs by 2100 BC and irrigation canals by 1500 BC (Mabry et al. 2008). In support of this, Hill (2008) has argued that speakers of proto-Kiowa-Tanoan must have borrowed maize vocabulary from Northern Uto-Aztecan. Opposed to this, Campbell (2002) argues strongly that the linguistic case is weak and archaeological evidence rather tenuous. An interesting study not cited by these authors is Beals (1932), who surveyed the evidence for agriculture among Northern Uto-Aztecan speakers as part of a broader comparative ethnology. Beals concludes that most of these peoples were principally foragers who supplemented their subsistence by occasional maize cropping. In other words, although these populations have technically made the transition to farming, domesticated plants played only a minor role in their diet. Evidently, reading back ethnographic evidence into the remote past is fraught with problems. Nonetheless, it should serve as a caution when arguing for farming as the “engine” of Uto-Aztecan expansion even if its speakers practised some cultivation.

Cariban

The Cariban language phylum is widespread across northern South America, from the mouth of the Amazon River to the Colombian Andes and from Maracaibo (Venezuela) to central Brazil. Cariban languages are relatively close to each other, with 20–30 still currently spoken. Villalón (1991) has made a strong case for the Cariban expansion as being essentially “trading and raiding” rather than agricultural although an absence of published reconstructions means that the interpretation of Carib prehistory is rather inconclusive. Meira and Franchetto (2005) show that the Southern groups are quite coherent and there is no argument for a southern origin of Cariban based on diversity.

Arawakan

The Arawakan languages are spoken from the eastern slopes of the central Andes in Peru and Bolivia, southward into Paraguay and northward to the north coast of South America and their extension into the Caribbean is thought to be recent (Aikhenvald 1999). Arawakan is the largest family in the Americas in respect to the number of languages and geographical coverage. It has been the subject of a number of puzzlingly contradictory linguistic reconstructions (e.g. Noble 1965; Matteson 1972; Payne 1991), partly because the affiliation of languages such as Arauan and Harakmbet is unsettled. Payne’s version includes at least some agricultural terms, but the evidence remains ambiguous.

The cultural reconstruction of Arawakan has a long history, beginning with Schmidt (1917). Lathrap (1970, 1973) offered an early synthesis of Arawakan and Oliver (1989) an interpretation of the pottery which inadvertently proposed an upside-down version of the expansion (i.e. from south to north). Williams (2003) has proposed a link between the so-called Timehri petroglyphs and Arawak expansion and Heckenberger (2002) a cultural model that links them to the Barrancoid ceramic complex of the Amazon. Indeed, the range of papers in Hill and Santos-Granero (2002) provides useful updates on various aspects of the Arawakan expansion. However, these models do not cover the whole Arawakan-speaking area. Hornborg (2005) has proposed ditching the traditional migrationist model in favour of modern ethnogenesis. While this may play well in anthropology seminar rooms, it seems very unlikely to be true in the Amazon, a vast region cut through with waterways, providing almost ideal conditions for actual migration, not just the conceptual space for a trading network. Curiously, Hornborg does not reference any linguistic work on Arawakan, something of an omission since the whole concept is a linguistic construct. Suffice it to say that the diversification of Arawakan subgroups points to a classic pattern of language splits, likely to arise from the breakup and migration of individual populations, and shows no features which might characterise it as a trade language. Trade languages typically have extensive loanwords, and fixed phonological forms that indicate constant contact between subgroups, rather than the regular phonological change characteristic of language diversification following geographical shift.

Table 4. Agricultural reconstructions in New World phyla. RAV = Reconstructed agricultural vocabulary. Note: * Aymara, which essentially consists of two languages, does not really present a meaningful piece of evidence. – Reconstrucciones agrícolas en los filos del Nuevo Mundo. RAV = Vocabulario agrícola reconstruido. Nota: * Aymara, que consiste esencialmente en dos idiomas, en realidad no presentan una fracción significativa de evidencia.

Name	RAV	Reference
Arawakan	+	Payne (1991)
Aymaran*	n.a.	
Caddoan	?	Chafe (1976, 1979)
Chibchan	+	Wheeler (1972); Constenla Umaña (1981, 1990)
Guahiban	+	Christian and Matteson (1972)
Mayan	+	Fisher (1973); Kaufman (1964, 1976, 1990); Campbell (1977, 1978); Dienhart (1989)
Mixe-Zoque	+	Brown and Witkowski (1979); Wichmann (1995, 1998)
Oto-Man-guean	+	Longacre and Millon (1961); Rensch (1976, 1989)
Quechuan	+	Heggarty (2007)
Tucanoan	+	Waltz and Wheeler (1972)
Uto-Aztecan	+	Hill (2002); Campbell (2002)
Witotoan	+	Aschmann (1993)

Synthesis

Table 4 shows the New World phyla where agriculture is common synchronically among speakers and where at least some agricultural vocabulary has been reconstructed to the proto-language. None of this should be taken as evidence for prehistory; agricultural terms do not necessarily imply that agriculture was a force for demographic expansion. If, for example, the Arawakan expansion was driven by improved watercraft and a trading ideology, manioc (which reconstructs to proto-Arawakan) would have been carried to each place where the Arawaks settled, without this reflecting demographic pressure.

Summary and conclusion

The pattern of languages in the New World is quite unlike any other continent, for reasons that remain unclear. The large number of isolates clearly points to a date of first settlement considerably earlier than that admitted by the North American archaeological establishment, and more in line with the dates of 20–25,000 BP regularly put forward by linguists and geneticists. The abundant food resources, both aquatic and hunted on the plains and in forests, must have encouraged very rapid migration and may well explain widely dispersed non-agricultural phyla

such as Algonquian. The resultant isolation of individual groups may well have accelerated language change, making for a faster loss of mutual inter-comprehensibility.

Unlike parts of the Old World, plant domestication seems not to have been directly associated with demographic increase until a much later period. Plant domestication may have been initiated for variety of reasons, many unconnected with food production. In turn, the argument concerning the relationship between agriculture, demographic growth and the expansion of language phyla seems to be poorly supported by the evidence from the New World. As a consequence, there is also no necessary connection with either the genesis of states and urbanism, although in some cases, such as the Maya, the correlation seems to be a good one. In many areas, agriculture continued to be an occasional resource to supplement a largely foraged diet into historic times. Conversely, large-scale expansions of language phyla occurred among groups with no record of ever practising agriculture, most notably the Na-Dene in North America. This must be connected with either resource availability or, more likely, improved technology making possible more effective exploitation of existing resources. The introduction of the bow and arrow into the New World must have had major consequences for increasing the capacity of plains hunters, although we do not know at what period this occurred (Rogers 1940).

However, with the domestication of key starch staples such as maize or manioc, agriculture does become important in changing social and linguistic patterns (for detailed examples from the history of maize, see Staller et al. [2006]). Such a correlation appears, somewhat imperfectly, with the rise of complex states with powerful religious ideologies, for example in the case of the Maya, the Uto-Aztecs and the Quechua/Aymara. Once ceremonial activity increases and more time and resources are expended on ritual specialists, this imposes a requirement for a more regular and reliable source of starchy staples. Thus there may well be a substantial time gap between the first evidence for domestication and the development of a crop as a major staple. The irony is thus that the sequence implied by the Bellwood/Renfrew model may well be inverted; the imposition of a central ideology stimulates the intensification of agriculture (i.e. a transition from casual cropping to true domestication and phenotypic selection) and demographic growth then follows.

With these caveats, a hypothetical history of the New World leading to the current linguistic mosaic can be reconstructed as follows;

- 1 Hunters walk and paddle across from Siberia >15,000 BP. They people the Americas at extremely low population densities and probably diffuse initially down the Pacific Coast.
- 2 Dispersal of forager communities allows for extreme language differentiation leading to preponderance of language isolates.
- 3 Technological innovations (microblades, bow and arrow, blowpipe) and rich huntable resources lead to large-scale expansions of forager language groups.

- 4 Domestication of cultigens begins in scattered locales by 10,000 BP for a variety of purposes, including food, but does not initiate major socio-economic or linguistic change because of the abundance of foraged resources.
- 5 By 5000 BP the development of urbanism and centralised religious ideologies require greater population densities, spurring the domestication or improvements of key starch staples. At this point, certain groups expand significantly and small groups are assimilated.
- 6 Continuing low population densities in many regions allowed language barriers to persist and an absence of very large polities meant that language levelling was only of limited importance at the era of European contact.

The pattern of languages in the Americas remains perplexing and unlike any other continent. Part of the difficulties arises from standard archaeological models requiring a late migration from Siberia. A combination of a continuing flow of foraging populations from the Old World, abundant food resources spread over a vast area and simple historical contingency all play a part in explaining the synchronic pattern. If, for example, the Americas had been allowed to continue out of contact with Eurasia for further millennia, it seems possible much larger states would have developed and many more language isolates would have been assimilated. The documented disappearance of languages in the Quechua/Aymara zone is evidence for the nature of this process. The challenge of synthesising archaeology and language into an integrated narrative has begun.

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