Accounting for the diversity of Amerindian languages: modelling the settlement of the New World

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But howe the people furst began
In that contrey, or whens they cam,
For clerkes it is a questyon

John Rastell
Interlude of the Four Elements (ca. 1520)
printed in Axton (1979)

The absurd theories which have been advanced and gravely defended by men of learning and acuteness respecting the orgin 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)

1. Introduction

The settlement of the Americas continues to be a major puzzle to students of prehistory. To linguists (and increasingly geneticists), 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. Many archaeologists, especially in North America, still accept the Clovis dates (ca. 12,500 BP) 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 date (Roosevelt et al. 2002).

This situation might be explained in a number of ways;

a. 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
b. Amerindian languages have been faultily classified and falls 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)
c. 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; Kaufman & Golla 2000; Adelaar & 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?

A proposal that has been extended to the language phyla of the world and has been influential far out of proportion to its evidential base is the idea that phylic expansions are driven by agriculture (e.g. Bellwood & Renfrew 2002 and many other places). Although this is clearly true in a small number of cases, its explanatory value has been vitiated by the difficulties of validating it in many situations (e.g. Wichmann 2002). This paper[1] looks at the general pattern formed by languages in the Americas and the particular difficulties of explaining the pattern of phylic expansions. It evaluates the different archaeological models for the settlement of the continent and considers whether DNA studies have yet contributed any significant insights into this process.

2. Amerindian language groupings

As far back the seventeenth century, European authors have commented on the diversity of Amerindian languages. Bernabé Cobo, writing in 1653 (published 1890-1893) estimated there were upwards of two

[1] Thanks to Søren Wichmann for going through the paper and correcting various errors.

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*. He demonstrated this with a comparison of Quechua and Aymara, which he considered related and to have differentiated from a single original mother-tongue[2]. Cobo also argued that spoken languages differentiated faster than written ones, although he gave no estimate of the time-depth of New World languages.

Amerindian languages divide roughly into four categories.

1. Isolates. Many languages in ones or twos with no evident relatives.
2. Small phyla.
3. Large, widely extended families with members scattered over a large area, often close to extinction and even today, often with very small populations.
4. Large, numerous and territorially broad groups, all of whose members seem to have practised agriculture and would be good candidates for agricultural expansions.

Classifications of Amerindian languages, with the exception of Greenberg (1987) have emphasised the difficulties of establishing any very large-scale phyla (e.g. Loukotka 1968; Kinkade & Powell 1976; Campbell & Kaufman 1980, 1983; Witkowski & Brown 1981; Kaufman 1990).

2.1 Isolates

Table 1 lists the Amerindian language isolates recorded in the Ethnologue (2005) supplemented by Fabre (1998). Ethnologue has some quirks in the way it lists languages, in particular distinguishing between 'unclassified' and 'isolate'. An extra column marks languages that are not classified. Classifications not accepted by the main body of the scholarly community, such as those by Greenberg and Ruhlen, are not adopted here. Ethnologue also lists any language with two dialects as a phylum, thereby reducing the number of isolates. Keres, for example, spoken in the United States, consists of two closely related dialects, and is thus effectively an isolate.

Table 1. Living New World Language isolates

Name	Location	Status	Unclassified
Agavotaguerra	Brazil		+
Aikanã	Brazil		
Amikoana	Brazil		+
Andoke	Colombia, Peru (†)		
Camsá	Colombia		
Candoshi-Shapra	Peru		
Carabayo	Colombia		
Haida[3]	Canada		
Himarimã	Brazil		
Itonama	Bolivia		
Kanoê	Brazil		
Karahawyana	Brazil		
Keres	United States		
Kohoroxitari	Brazil		
Korubo	Brazil		
Kutenai	Canada, USA		
Kwaza	Brazil		
Leco	Bolivia	[?]	

[2] 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.

[3] Traditionally classified as Na-Dene, this is now rejected by various scholars

Name	Location	Status	Unclassified
Lenca	El Salvador, Honduras		
Lule-Vilela	Argentina	[?]	
Miarrã	Brazil		
Movima	Bolivia		
Muniche	Peru	[?]	
Paez	Colombia		
Papavô	Brazil		
Pirahã	Brazil		
Puelche	Argentina		
Puinave	Colombia, Venezuela		
Pume	Venezuela		+
Purepecha	Mexico		
Quileute	United States		
Taushiro	Peru	[?]	
Ticuna	Brazil, Peru		
Tinigua	Colombia		
Tlapanec[4]	Mexico		
Tol	Honduras		
Tremembé	Brazil		
Trumaí	Brazil		
Urarina	Peru		
Uru-Pa-In	Brazil		
Warao	Venezuela		
Waraoni	Ecuador		
Yámana	Chile	[?]	
Yarí	Colombia		
Yuchi	United States		
Yuracare	Bolivia		
Yuwana	Venezuela		+
Zuni	United States		

Three of these languages, Aikanã, Kanoê and Kwaza, do not occur in the Ethnologue, but are discussed in Voort (2005). Fabre (1998) lists languages as isolates that are classified in the Ethnologue; thus Cofán (Ecuador) is listed as Chibchan in the Ethnologue but as an isolate in Fabre. There are very large numbers of other languages that now exist only as fragmentary records which have also resisted classification. Lists of these may be found in Campbell (1997) and Mithun (1999). Since it is impossible to collect further data it is unlikely whether we will ever know whether these were genuine isolates. Table 2 shows the (probably) extinct New World language isolates;

Table 2. Extinct New World Language isolates

Name	Where	Unclassified
Abishira = Vacacocha[5]	Peru	+
Aguano	Peru	+
Arára	Brazil	+
Canichana	Bolivia	
Cayubaba	Bolivia	
Culle	Peru	+
Kaimbé[6]	Brazil	+
Kakán	Argentina	

[4] Tlapanec has four dialects and was grouped with the extinct Subtiaba, making it appear as a small phylum, whereas it is in effect an isolate.

[5] As of August 2008, some 'rememberers' of this language have been traced and further data may be forthcoming

[6] I have been unable to trace an exact location for Kaimbe.

Table 2. Extinct New World Language isolates

Name	Where	Unclassified
Kambiwá	Brazil	+
Kapinawá	Brazil	+
Karirí-Xocó	Brazil	+
Kunza	Chile	
Maratino	Mexico	
Naolan	Mexico	
Pankararé	Brazil	+
Pankararú	Brazil	
Pataxó-Hãhaãi	Brazil	+
Puquina	Peru	+
Tapeba	Brazil	+
Tingui-Boto	Brazil	+
Tonkawa	United States	
Truká	Brazil	+
Tuxá	Brazil	
Uamué	Brazil	+
Wakona	Brazil	+
Wasu	Brazil	+
Xukurú	Brazil	+

The overall total is thus seventy language isolates in the New World.

2.2 Small phyla: local expansions of isolates

Apart from isolates there are also very small phyla, groupings that appear to be expansions of isolates, a pattern also familiar from Siberia. Table 3 shows the living New World small phyla with the number of languages they encompass;

Table 3. Living New World small phyla

Name	No.	Where	Reference
Alacalufan	2	Chile	
Arauan	8[7]	Brazil	Rodrigues (1986); Dixon (1999)
Araucanian	2	Chile	
Arutani-Sape	2	Brazil, Venezuela	Migliazza (1978)
Barbacoan	7	Colombia, Ecuador	Key (1979), Curnow & Liddicoat (1998)
Cahuapanan	2	Peru	
Chapacura-Wanham	5	Bolivia, Brazil	Angenot & Angenot (1997)
Chinookan	3	US	
Chocoan	12	Colombia, Panama	Constenla Umaña & Peña (1991)
Cochimi-Yuman	10	US, Mexico	Wares (1968)
Guahiban	5	Columbia, Venezuela	Christian & Matteson (1972), Keels (1986)
Harakmbet	2	Peru	
Huavean	4	Mexico	
Jivaroan	4	Peru	
Katukinan	3	Brazil	
Keres	2	US	
Kiowa Tanoan	6	US	

[7] Dixon (1999) counts five languages in Arauan

Name	No.	Where	Reference
Mascoian	5	Paraguay	
Misumalpan	4	Nicaragua, El Salvador	Constenla Umaña (1987)
Muskogean	6	US	
Nadahup [=Makú]	4	Brazil, Colombia	cf. Martins & Martins (1999), Martins (2005), Epps (2006) for exclusion of Kakua and Nukak
Nambiquaran	3	Brazil	Price (1978), Lowe (1999)
Peba-Yaguan	2	Peru	
Salivan	3	Venezuela, Colombia	
Tacanan	6	Bolivia	Key (1968)
Totonacan	11	Mexico	
Tsimané-Mosetén	2	Bolivia	Adelaar (1991)
Uru-Chipaya	2	Bolivia	
Wakashan	5	Canada, US	
Yanomam	4	Brazil	
Zamucoan	2	Paraguay	
Zaparoan	7	Peru	

This makes a total of 35 small phyla. One branch of Chocoan, Jirajaran, is entirely extinct and so is not listed in the Ethnologue (Constenla Umaña & Peña 1991).

Apart from these there are also extinct New World small phyla, language groupings where all members are now no longer spoken (Table 4).

Table 4. Extinct New World small phyla

Name	No.	Where	Reference
Chon	2	Argentina	Suárez (1970)
Chumashan	7	United States	Klar (1977)
Comecrudan	3	Mexico, United States	Swanton (1915), Saldivar (1943)
Guaicurian	8	Mexico	
Gulf	4	US	
Hibito-Cholon	2	Peru	
Kusan	2	United States	
Xincan	4	Guatemala	
Yuki	2	United States	

Including both living and extinct phyla, the total for the New World is 44 small phyla.

2.3 Large, geographically dispersed phyla

Another atypical feature of language phyla in the Americas 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). Both have branches in the Amazon in Southern Brazil. Algic (a name for Algonquian in the northeast of North America plus two languages in California) has an extension approaching Indo-European, despite having many fewer members. These contrast with Mayan and Otomanguean (§2.4), whose members are all closely packed together. Large, widely extended families with members scattered over a large area, can often be close to extinction and even today, often very small populations. Table 5 lists the large, geographically dispersed phyla;

Table 5. Large, geographically dispersed phyla in the New World

Name	No.	Where	Published reconstructions?	Reference
Algic	44	US, Canada	+	Siebert (1967), Aubin (1975), Fiedel (1987, 1991), Hewson (1993)
Carib	32	Caribbean to Brazil	+	Durbin (1977) Villalón (1991), Derbyshire (1999), Meira & Franchetto (2005)
Eskimo-Aleut	11	Russia, US, Canada, Greenland	+	Dumond (1987), Fortescue et al. (1994)
Hokan with Pomoan [?]	35	US, Mexico	+	Langdon (1974)
Iroquoian	11	US, Canada	+	Mithun (1984), Snow (1995)
Macro-Ge [?]	32	Brazil		Davis (1968), Rodrigues (1999)
Mataco-Guaicuru	11	Brazil, Paraguay		Campbell & Grondona (2007)
Na-Dene° [Athabaskan-Eyak] [?]	47	Canada, US	+	Cook & Rice (1989), Enrico (2004)
Panoan	28	Brazil, Peru		Shell (1965, 1975), Loos (1999)
Penutian [?]	31	US, Canada		Whistler (1977)
Salishan	27	US, Canada		Suttles (1987), Czaykowska-Higgins & Kinkade (1998), Kroeber (1999), Kuipers (2002)
Siouan	17	US, Canada		Parks & Rankin (2001)
Tupian	76	Brazil, Bolivia, Paraguay		Lemle (1971), Jensen (1999)

°Na-Dene is problematic (Dürr & Renner 1995). Scholars such as Campbell (1997) do not accept that Haida is part of Na-Dene and use the reduced form. Enrico (2004) presents evidence for the affiliation of Haida, but also accepts that there are many early loanwords that make the evidence problematic. Vajda (2008) has presented evidence for a link with the Yeniseian languages of Siberia which seems to have gained wide acceptance, which case the phylum may be renamed Dene-Yeniseian.

A recent publication on microblade technology (ca. 9000 BP) has proposed a connection with the Athabaskan expansion. The suggestion is that these may have represent the expansion of foragers, similar to Pama-Nyungan, and that agriculture was only adopted later (or not at all). Rivers may have played an important role in the expansion of some groups.

2.4 Larger phyla forming territorially coherent blocs

Although the division is not absolute, the remaining phyla form part of relatively well-attested, large, numerous and territorially coherent groups (Table 6). These suggest expansions in recent time, and the potential for archaeological and genetic correlations, as well as historical modelling.

Table 6. Larger New World phyla forming territorially coherent blocs

Name	No.	Where	Comment	Reference
Arawakan = Maipuran	64	Caribbean to Brazil		Noble (1965); Matteson (1972); Oliver (1989); Payne (1991); Aikhenvald (1999)
Aymaran	3	Bolivia	Exceptional. Language levelling?	Adelaar & Muysken (2004).
Caddoan	5	US		Chafe (1976, 1979)
Chibchan	22	Colombia to Honduras		Wheeler (1972), Constenla Umaña (1981, 1990)
Guahiban	5	Colombia		Christian & Matteson (1972)
Mayan[8]	69	Mexico, Guatemala	Count inflated by dialects	Campbell (1978), Dienhart (1989)
Mixe-Zoque	16	Mexico		Wichmann (1995, 1998)
Oto-Manguean	174	Mexico, Nicaragua		Longacre & Millon (1961), Rensch (1976, 1989)
Quechuan	46	Peru, Bolivia, Andes		Cerrón-Palomino (1987)
Tucanoan	25	Brazil, Ecuador, Colombia		Waltz & Wheeler (1972), Wheeler (1992), Barnes (1999)
Uto-Aztecan	62	US, Mexico		Miller (1967), Hill (2002)
Witotoan	6	Colombia, Peru		Aschmann (1993)

3. The pattern of languages in the New World

3.1 The worldwide pattern of isolates

Looking at the worldwide pattern of isolates, it is evident that they are very unevenly distributed. There is almost a gradient from west to east, with few in Europe and the greatest number in the New World[9]. To compare like with like, known Eurasian isolates that have long become extinct, such as Sumerian and Etruscan would need to be excluded. Austerlitz (1980:2) may have been one of the first writers to focus on this uneven pattern, although his explanation was that the related language phyla that must once have existed in NE Asia subsequently disappeared. Nichols (1990) following a complex argument not reproduced here, argues that the linguistic diversity of the New World must imply an antiquity of some 35 kya. The high density of isolates in the Americas, is surely no accident but tells us something very important about the peopling of the New World, namely that such a rich diversity cannot have arisen within the constrictions of the chronology accepted by many North American archaeologists. For so many languages to have been diversifying for so long as to eliminate all traces of links with neighbouring languages requires time-depths similar to those accepted for Papua and Australia.

Table 7 shows the different regions of the world and the numbers of isolates and small phyla. Totals do not include extinct languages, otherwise the numbers for the New World would be significantly higher.

Table 7. Isolates, small phyla by continent

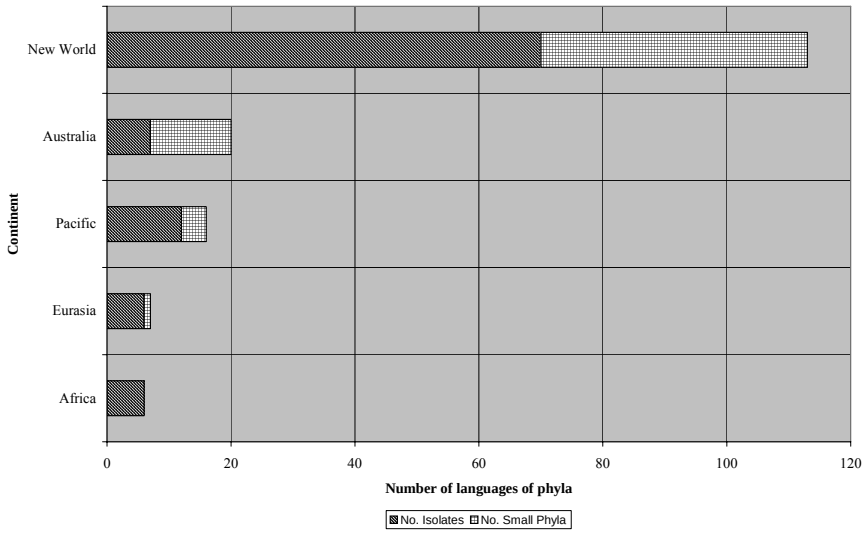
Continent	No. Isolates	No. Small Phyla	Total living languages
Africa	6	0	2092
Eurasia	6	1	2508
Pacific	12	4	1079
Australia	7	13	263
New World	70	44	1002

[8] Wichmann (p.c.) observes that 30 might be a more credible figure

[9] The argument of this paper is that attempts, like those of Nettle (1999), to apply mathematical formulae to somehow account for this diversity constitute a misunderstanding of the issue and that our understanding must be based on a specific account of the prehistory of the continent.

Figure 1 represents this graphically, to underline the distinctiveness of the Americas;

Figure 1. Proportions of language isolates and small phyla by continent



These totals are somewhat counter-intuitive in the light of current understanding of the peopling of the world. Africa should probably be the most diverse, followed by Papua and Australia. Even with an extended chronology, the Americas are the most recent continent to be settled and should be much less diverse.

More difficult ground is the differences between languages in terms of structure. Measuring such diversity is always problematic, but some estimates can be gained from the recently online 'World Atlas of Language Structures'[10]. It is possible to map out features such as 'size of consonant inventory' and gain a sense of the relative homogeneity of geographic areas. Africa and the Americas come out consistently high on the scale of diversity and the Pacific and Australia are broadly much less diverse. This should be somehow related to the genetic pattern of languages, but the exact nature of that relationship is unclear.

Figure 2. Gruhn's 1988 map of linguistic diversity

3.2 West coast diversity

The observation that the linguistic diversity of the Americas was somewhat lopsided and that the greatest numbers of languages are found on the west side of the continent goes back to Barton (1797) who also drew the conclusion that its populations were of Asiatic origin. Adelaar (2000) sets out the main history of this argument. Sapir (1949) re-analysed Powell's classification to reach the same conclusion. Gruhn (1987, 1988, 1997) has been a strong proponent of West Coast diversity and its

[10] http://wals.info/index

archaeological correlates and produced the map of language isolates shown in Figure 2. A similar conclusion can be drawn from the maps accompanying Adelaar and Muysken (2004) where the dense language situation in pre-conquest northwest South American is plotted out. Figure 3 shows the distribution of living and extinct isolates and small phyla in the New World, given in the tables above. The West Coast skewing remains highly visible, accentuated by the very large number of isolates in northwest South America. A comparison of the two maps also shows how rapidly scholarship has moved on during the two decades since Gruhn produced her map.

Figure 3. Living and extinct isolates in the New World (2008)

Source: Author's compilation

Whatever the explanation, the skewed linguistic geography has struck many authors and it has been related to models of settlement (§5.). Not all authors agree with this analysis (see counter-arguments in Campbell 1997:104) or else claim that this is a consequence of recent expansions or resource availability.

3.3 Types of linguistic diversity

An aspect of the linguistic diversity of the New World that is highly distinctive is the ways in which languages are diverse. First of all, the languages are highly lexically diverse. In other words it is simply hard to find cognates between languages, even if they appear to be typologically very similar. It is this feature that has led to the construction of some of the more problematic linguistic groupings such as Hokan. The original argument for Hokan is based more on grammatical features than on cognate lexemes. Even today, the lexical database for linking all the languages in this purported grouping remains very limited. In this, the New World can be compared to Melanesia and Australia, where typological similarities between languages are even more pronounced and lexical resemblances still more difficult to establish.

Grammatically, New World languages are also similar at a broad level of generality; they are almost all polysynthetic, i.e. words incorporate long strings of morphemes which would independent words in other language types. For this reason, they are rather unsuited to making dictionaries as all the possible combinations of incorporated words have to be listed. In contrast to Africa, for example, where very different types of languages can co-exist and indeed order one another (i.e. polysynthetic languages can be neighbours to those with extremely eroded words and highly tonal systems of lexeme discrimination.

Phonologically, New World languages tend be medium-inventory. The extreme inventories typical of Central Nigeria, Southern Africa, the Caucasus or SE Asia never occur. The complex prosodic processes with multiple features typical of Africa are largely absent. Vowel inventories are never high. On the other, the extreme reductions seen in the Pacific and Australia also never occur.

4. Agriculture and language expansions

4.1 Introduction: the genesis of agriculture in the Americas

The idea that there was a relation between the language phyla of the Americas and agriculture appears to go back to Spinden (1915), who, however, had no evidence for particular correlations. 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 & 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 ca. 10,000 BP (Piperno & Pearsall 1998: 199-203), virtually equivalent to other regions of the world, such as the Near East and New Guinea. 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.

The reasons for the genesis of agriculture have been much debated, but with no very conclusive result (Piperno & 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. Indeed it seems that agriculture did not produce any sort of dramatic shift in human social and economic organisation and there is no evidence for any link with expansion of specific language families at this early period. Also in contrast to the Old World is the apparent genesis of agriculture in the lowland neotropics; elsewhere in the world, semi-arid regions and highlands are the favoured locales for early domestication.

Iriarte (2007: Figure 9.3) identifies at least four locales in South-Central America where agriculture may have begin independently; Central America, Colombia, Ecuador and NW Peru, Brazil, Bolivia and south and Coastal Peru. To these may be added at least one region in North America, the East-Central region (Smith 1987, 1992a,b, 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) note that the bitter *Cucurbita pepo* may have been domesticated as a fishing float. Fritz (2007) notes that strong academic pressure for the early moundbuilders to be farmers may have led to an over-emphasis on agriculture. Nonetheless, only when maize reached the area (as late as 1000 AD) was farming the basis of subsistence.

All of this suggests that the evolution of agriculture had a completely different profile in the New World. Its low populations and abundant resources meant that foraging persisted into the historic period in many areas, and was made possible by intensive landscape management (Peacock & Turner 2000). As a consequence, it

may be difficult to argue for any strong link between agriculture and the expansion of language families, *even if* domestic plants and animals are reconstructible to a proto-language. The next section considers the arguments as they have been advanced for particular Amerindian families.

4.2 Reconstructions of agriculture in particular language families

4.2.1 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, authors do not always choose the species prehistorians regard as of most interest and occasionally reconstruct species which are introductions from elsewhere, sometimes 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. Even so, the evidence offered for published reconstructions is often tenuous in the extreme.

In the case of Chibchan, (Wheeler 1972) proposed a reconstruction for 'corn', 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. Waltz & Wheeler (1972) 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. Proto-Pomoan has been reconstructed and the reconstructions specifically exclude any agricultural terminology (Whistler 1988). Price (1978) includes tobacco, manioc, 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 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). 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. Davis (1968) provides a short list of Macro-Ge reconstructions in which manioc is included; this would be a weak basis for reconstructing agriculture.

4.2.2 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 Dienhart (1989). Table 8 shows a list reconstructions for crops in Proto-Mayan;

Table 8. Proto-Mayan crop reconstructions

P-Maya	Gloss	P-Maya	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

Source: Brown and Wichmann (2004) & Søren Wichmann (p.c.)

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 has been shown to have borrowed all its agricultural terminology from Mayan languages (Campbell 1978).

4.2.3 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 & Millon (1961) reconstructed proto-Amuzgo-Mixtecan specifically with a view to identifying subsistence modes of its speakers. Rensch (1976) reconstructed a large number of crop names for proto-Otomanguean Table 9 shows reconstructions relating to proto-Otomanguean subsistence that have been proposed by various authors.

Table 9. Proto-Otomanguean subsistence reconstructions

Authors	Crops	Other terms
Longacre & Millon (1961), Rensch (1976)	avocado, bean sp., cacao, chili, maguey, maize, sweet potato (or *camote*?), squash, cotton, tobacco	maize dough, *metate*, oven, *pulque*,

Hopkins (1984) has connected the spread of Otomanguean with the rise of agriculture in the Tehuacán Valley (The Tehuacán tradition is a horizon 5000-2300 BC). Its culture history has attracted considerable attention and there are competing reconstructions of its hypothetical past (Josserand et al. 1984). Winter, Gaxiola & Hernández (1984) sound a sceptical note; the scattered locales of domestication evidence in Central America cannot make it certain that the proto-Otomangueans spread through agriculture. Nonetheless, if the cooking and food preparations reconstructions are accepted, then this correspondence does appear likely.

4.2.4 The Uto-Aztecan controversy

Uto-Aztecan is a family of languages stretching between the southern United States and Southern Mexico and including the language of the Aztecs. Earlier arguments supposed that this was originally a forager phylum e.g. Fowler (1972), 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 Meso-America into the southwestern US. This however, would involve 'devolution' i.e. the return of at least some populations (Numic-speakers) back to foraging. Hill (2008) has recently argued that speakers of proto-Kiowa-Tanoan must have borrowed maize vocabulary from Northern Uto-Aztecan. Campbell (2002) argues strongly that the linguistic evidence is very weak and archaeological evidence so far non-existent.

An interesting study not generally cited by these authors is Beals (1932) who surveyed the evidence for agriculture among northern Uto-Aztecan peoples as part of a broader study of comparative ethnology. Beals concludes that it is difficult to assign agriculture to most of these peoples who were principally foragers, supplemented by occasional maize cropping. In other words, although these populations have technically made the transition to farming, crops played only a minor role in their diet. It is therefore very hard to imagine how farming could have been the 'engine' of Uto-Aztecan expansion.

4.3 Synthesis

Table 10 shows the New World phyla where agriculture is common synchronically among speakers and these phyla would be good candidates for agricultural expansions. for which published results consider the likely role of agriculture or its absence in relation to their homeland and expansion.

Table 10. Agricultural reconstructions in New World phyla

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

RAV = Reconstructed agricultural vocabulary

5. Archaeological models

Archaeological models of the settlement of the Americas have been dominated by disputes over dating. One of the earliest writers[11] to consider this, Bartolomé de las Casas in his *Historia de las Indias* (1559 published 1875-6) observed;

> *I have seen in these mines of Cibao, a stadia or two deep in the virgin earth…burned wood and ashes as if a few days ago a fire was made there. And for the same reason we have to conclude that in other times a river came there, and in that place they made a fire and afterwards the river went away. The soil brought from the hills by the rains covered it. And because this could not happen except by the passage of many years and most ancient time, there is a great argument that the people of these islands and continent are very ancient.*
>
> Las Casas 1559 [1875-6]

For a very extended period, 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. In contrast, throughout South-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 was that any site which appeared to be older was routinely subjected to intensive skepticism, and of course no procedure can be perfect. The dating of sites such as Meadowcroft[12] (19,000 BP), Cactus Hill (15,000 BP) and Bluefish Caves (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). Similar, very early, unfluted lanceolate points have also been found in South America. Lanceolate El Jobo-like points have been recovered at the Monte Verde site, Chile. The Pre-Clovis occupation at Monte Verde has been dated to at least 12,500 BP. (Dillehay 1997; Meltzer 1997). Even fairly 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[13].

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, it now seems problematic to maintain later dates. Another factor are the confirmed early dates for adjacent Siberia (>30,000 BP) (Pitulko et al. 2004). However, this does not immediately tell what dates we *should* accept.

[11] Though possibly preceded by the Chinese polymath Shěn Kuò (沈括) (1031–1095), who formulated the processes of geological uplift and erosion following a visit to the Taihang mountains in 1074.

[12] http://www.mnsu.edu/emuseum/archaeology/sites/northamerica/meadowcroft.html

[13] See also a valuable review of sites and dates at http://www.jqjacobs.net/anthro/paleoamericans.html

Another factor that has become relevant is the means by which Siberian populations entered the New World. Older concepts emphasise the land bridge of Beringia, assuming that early hunters simply walked across to Alaska. They could clearly only do this when the land bridge was 'open'. But maritime adaptations have demonstrably a long history and there is every reason to think that adequate boats were available even in the earliest periods, to simply skirt the southern edge of the ice-sheets (Erlandson 2002). The model then becomes one of coastal adaptation; the earliest Americans were specialised in the exploitation of aquatic resources and would initially have spread down the west coast, rather than heading inland to become hunters of the great plains. Pre-Clovis peoples may have skirted the Wisconsinan ice sheets in boats along the unglaciated coastlines of North America during the glacial maximum (Stanford and Bradley 2002).

This proposal has its precursors, and an early version was propounded by Cotton Mather (1702) who reported walrus-hunting in Siberia. He observes 'I am persuaded that several of those hunters have been carried upon those floating pieces of ice to the northern parts of America, which is not far from that part of Asia'. In its more modern form, it was first advanced on a purely archaeological basis by Fladmark (1975, 1978, 1979). Gruhn (1988, 1997) links the skewed western distribution of small families and isolates to the coastal migrations and Rogers (1985a, b) pointed out the possible relation between language families and the retreat of the ice sheets. Some archaeological confirmation for this has come from recent finds at Eel Point, where there is evidence for the settlement of San Nicolas island, about 60 miles from the nearest landfall, between 8000 to 8500 years ago. Stone tools from Eel Point, San Clemente, California, ca. 9-8000 BP, similar to those used in historic time for boatbuilding (Cassidy et al. 2004). The absence of very early sites along the coast would be a consequence of the rise in sea-level since the last glacial maximum.

What period should we then attach to this early migration? Meltzer (1993, 1994, 1995, 1997) has been the most prominent advocate of a 'deep time' perspective. In this view there is no lack of early sites, merely a distorted perspective on standards of evidence that makes all early dates open to question. Given the dates for Siberia, there seems no reason to suppose that the earliest migrants reached Beringia shortly after the settlement of Siberia ie. < 30,000 BP. Such populations would have been extremely sparse and finding evidence from this period will always be difficult, because of the coastal geomorphology.

The preceding paragraphs assume that the New World was peopled by migrant groups from NE Asia. However, at least two other sources of population have been proposed. Highly controversial is the link between Clovis points and the European 'Solutrean' espoused, among others by Adovasio & Page (2003). This seems problematic both from the point of view of chronology (there is a five millennium gap between the end of the Solutrean and the appearance of Clovis points) and typology (most archaeologists reject the claimed typological similarities. Moreover, it is unclear if it was *ever* possible to walk across the ice westwards from the Old World to the New. This possibility can be rejected at present. More credible is the possibility that Austronesian navigators reached the Americas, perhaps both in California and in NW South America (Jones & Klar 2005; Klar & Jones 2005; Storey et al. 2007). Clearly the linguistic case for such an impact is not transparent, and it is likely that the impact of such landfalls was quite limited in contributing to ethnolinguistic diversity.

6. Material culture: the New World 'bottleneck'

The relative isolation of the New World also points to a significant correlation with the global distribution of material culture. Many cultural traits were not transmitted during the process of peopling and were not subsequently invented, which tends to contradict the general archaeological tendency to assume independent invention. Per contra, many cultural traits typical of the New World do not occur elsewhere, and as a consequence, suggest its relative isolation. For this reason, when characteristic Old World traits do appear, they have typically caused researchers to wonder about the routes of their introduction. For example, the wheel was unknown in the Americas, and was never invented. Nonetheless, wheeled toys occur in sites between Mexico and Panama in the period 600-1100 AD (Diehl & Mandeville 1987). It would seem a strange thing to invent if there was no large-scale model on which to base such a toy, unless the makers had not seen wheeled vehicles but only models made by transoceanic visitors.

This section will argue that some types of material culture can be clearly linked to the bottleneck created by the Bering Strait. Even if, as other sections argue, the foraging populations were quite ethnolinguistically

diverse, they all had in common an absence of agriculture, metal tools, and all were adapted to extremely cold climates.

Another type of evidence which is currently deeply unfashionable can be excavated from the older ethnological literature. For example, Birket-Smith (1971) published some four volumes on 'Circum-Pacific culture relations'. His purpose is to note some of the similarities between various culture elements around the Pacific. Some of these similarities are clearly due to convergent evolution but others have such specificity that they are more likely more likely be evidence for cultural flow along the ice-free corridor. One of these is knot-records (Birket-Smith 1966). These have a distinctive west coast distribution in the New World from Chile to Alaska and occur between Japan and Polynesia on the western side of the Pacific.

In an intriguing and detailed study intended to shed light on the peopling of the Americas through material culture, Izikowitz (1934) studied the distribution of rattles made of deer-hoofs. Although in principle such a rattling device could be invented anywhere in the world, such rattles appear to be made only in the New World. They occur from approximately the centre of North America down to the central Amazon in a virtually continuous strip, suggesting they have not spread recently but were invented during the early peopling of the New World and diffused southwards.

7. Genetic models

It goes without saying that the new molecular biology has found the settlement of the New World an attractive topic without necessarily making a major contribution (e.g. Renfrew 2000). A variety of papers use remarkably small samples to make very grandiose statements about the peopling to the New World. These can be divided into two major themes, those that find support for a single migration that is somehow responsible for the present-day population and those who discern greater complexity. Similarly, on the subject of dates, some authors feel that genetics support very ancient dates, others are more in line with the Clovis-type models. It is very striking how many of these authors take for granted the Greenberg classification of New World languages, regardless of the objections of the main body of linguists. Table 11 shows a sample of the main papers proposing models for the settlement of the Americas with a summary of the time-frame and number of migrations;

Table 11. Genetic analyses of the peopling of the New World

Authors	Date	Time-frame	Migration
Torroni et al.	1992,1994	not given	Four
Shields et al.	1993	> 12 KyBP	Multiple
Bonatto and Salzano	1997	~30-40 KyBP	Single
Stone & Stoneking	1998	23,000–37,000 BP	Single
Starikovskaya et al.	1998	~34,000 BP	Two
Karafet et al.	1999	not given	Two
Ruiz-Linares et al.	1999	9,334–11,456 BP	Single
Bortolini et al.	2000	~14KyBP	Two
Lell et al.	2002	not given	Two
Silva et al.	2002	~21 KyBP	Single
Fuselli et al.	2003	> 13 KyBP	Single [?]
Seielstad et al.	2003	<18 KyBP	not given
Nelson et al.	2008	~23-19 KyBP	Single

From this we can conclude that genetics is yet to provide anything helpful or definitive. Almost certainly the reason for the major discrepancies behind the conclusions of these papers is the sampling frame, which is highly varied in terms of both geography and numbers sampled.

Physical anthropology has played smaller role in the debate in recent years, but its importance has been somewhat revived by the dispute over Kennewick Man, a skeleton of anomalous physical type found by chance in Washington State in 1996. Steele & Powell (2002) review all the complete skeletons of Palaeoindians in the Americas and conclude that despite considerable variation, they are more similar to one another than to modern Amerindians. Strikingly, they resemble more closely Australians and modern-day

South Asians more closely than Northeast Asians. This adds support to the idea that the Americas were peopled by diverse ethnolinguistic groups at different periods and originating in different regions of the Old World.

8. Summary and Conclusion

With these caveats, a hypothetical demographic history of the New World can be reconstructed as follows;

1. Hunters begin to walk and paddle across from Siberia 25~30,000 BP. They people the Americas at extremely low population densities and probably diffuse initially down the West Coast (now largely under water and inaccessible to archaeology).
2. A wide variety of already diverse language groups and physical types continue to cross Beringia, paddling south of the ice when the land bridge is 'closed'. Low population densities accelerate language differentiation processes.
3. There are local expansions of hunting-gathering groups, driven principally by minor technological changes perhaps by flow across the Bering Strait, esp. from 12,000 onwards.
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 change.
5. By 6-5000 BP the domestication of key starch staples causes certain groups to expand significantly and many small groups are assimilated.
6. Possible transoceanic contacts with both the populations of mainland SE Asia and the Austronesians extend cultural and linguistic diversity

To return to the original question, the pattern of languages in the New World is a consequence of two main factors; a long time-span to allow language differentiation to develop and the continuing arrival of new language groups from an already highly diverse region, Siberia. Low population densities allowed language barriers to remain and the absence of very large polities meant that language levelling remained an insignificant factor. Agriculture developed early, but focused on species that made little distinctive change to subsistence strategies. Only later did cereal and tuber staples make a significant contribution to diet, allowing the spread of small language phyla. Hence the pattern that was in situ in the immediate pre-Columbian era.

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