The Uto-Aztecan Language Family and its Trajectory into the Historical Record.

The Genetic-Linguistic Interface Project.

by Dr. Michael St. Clair, PhD
Wolfschlugener Str. 16
70597 Stuttgart, Germany
May 1, 2023

Email: mstclair@genlinginterface.com
Personal Website: https://genlinginterface.com/

Introduction

Some propose that Uto-Aztecan languages evolved in Mexico and expanded northwards into the United States because of population pressure that was caused by the success of maize cultivation. Others propose an Uto-Aztecan homeland in the United States and link its southward prehistoric expansion into Mexico with climate change. Lexicostatistics is a technique employed by some in the linguistic community to decipher the prehistory of language by using statistical methods to determine the age of a language. The basic idea is that the age of a language family can be factored by determining an average rate of lexical replacement among the cognate sets of its branches. This methodology is controversial (see Trask 2015). Nevertheless, the methodology was applied in a recent paper (Green et al. 2023) in an attempt to resolve the controversy question of Uto-Aztecan language origins.

With this paper, I do not intend to resolve the complex controversial question of Uto-Aztecan origins. Rather, I merely strive to guide the methodology utilized by researchers for exploring this topic. As shown by the discussion below, linguistic, anthropological, genetic, and climate perspectives offer useful insight into the prehistory of the Uto-Aztecan peoples and their languages. In comparison, the reduction of a culture and its language to a formulaic mathematical equation, as advocated by Green et al. (2023), seems neither scholarly nor dignified.

Discussion

Peter Bellwood with his 2005 monograph, *First Farmers: The Origins of Agricultural Societies*, successfully integrates a synthesis of anthropological, climatological, and linguistic perspectives to explain the evolution of early agriculture, a cultural adaptation that arose independently in several regions of the world. One of these regions is Mexico where maize cultivation evolved. With his work, Bellwood was able to demonstrate the benefits of utilizing a large dataset drawn from a large cross section of human cultural diversity. Distinct patterns of human cultural evolution surface through the analysis. One striking observation from Bellwood's monograph is that the contemporary distribution of several language families follows the expansion of early agriculture. This observation has evolved into what he identifies as the *early farming dispersal hypothesis*.

Triangulated Y-chromosome-based modeling from St. Clair (2021) represents a methodological solution for deciphering the prehistory of language. "Y-chromosome-based" describes the initial step in the model building process, the identification of informative Y-Chromosome mutations among contemporary populations for which language has a strong ethnic component. The next step in the model building process is the use of "triangulation" to explain why a mutation attains a significant frequency among speakers of a language family. The concept of triangulation is borrowed from the field of navigation and describes a technique that defines your position at a point where three lines converge on a map. Similarly, his research attempts to draw conclusion at a point where several independent lines of evidence converge: the contemporary distribution of Y-chromosome mutations; phylogenetic relationships; language classification; the archaeological record; the paleo-climatological record; ancient Y-chromosome DNA; and other marker perspectives such as mitochondrial DNA.

Using triangulated Y-chromosome-based analysis, St. Clair (2021) suggests that language entered the historical record along five different trajectories. The first trajectory involves a co-expansion of early farming and language, similar to Bellwood's *early farming dispersal hypothesis*. Indo-European, Niger-Congo, Uralic, Sino-Tibetan, Austronesian, Austro-Asiatic, and Maipurean are examples. The second trajectory involves the *in-situ* co-evolution of agriculture and language. Korean, Japanese, and Quechuan are strong examples. The third trajectory involves a co-expansion of hunter-gatherers and language. Eyak-Athabaskan is a good example. The fourth trajectory involves *in-situ* co-evolution of hunter-gatherers and language. A good example is the Eskimo-Aleut language family. The fifth and final trajectory involves reversion from agriculture to foraging, a rarely observed phenomenon. A solid example is Finnic, a branch of the Uralic language family.

Focusing now on Uto-Aztecan, this language family has a vast geographical distribution, from Oregon in the United States to Panama (Campbell 1997: 133). This family consists of 61 languages. The two main divisions are Northern Uto-Aztecan and Southern Uto-Aztecan. Northern Uto-Aztecan consists of 13 languages found in the United States. Examples include Hopi, Comanche, Shoshoni, and Paiute. The Southern Uto-Aztecan branch consists of 48 languages. Forty-seven of these languages, such as Nahuatl, the language of the Aztecs, are found in Mexico and Central America. O'odham, the language of the Pima and Papago, is the only Southern Uto-Aztecan language found in North America.

It should be noted that the linguistic tapestry of prehistoric Mexico and Central America not only includes Southern Uto-Aztecan languages but also the Otomanguean, Mayan, Mixe-Zoquean, and Chibchan language families. Bellwood (2005: 237-239) provides a short discussion of the co-evolution of farming and language in Mexico and Central America. He suggests that early maize cultivation fueled the evolution of the Mayan, Otomanguean, and Mixe-Zoquean language families. Bellwood (2005: 240-244) also discusses the Uto-Aztecan language family. He takes the position that the distribution of this language family follows an expansion of maize cultivation out of Mexico into the United States, and as such, the language family stands an example of the *early farming dispersal hypothesis*. This opinion was shaped by collaboration with the anthropologist Jane Hill. In a paper published in 2001 she suggests that Uto-Aztecan speakers were among the early maize farmers of Mexico. Around 6,000 years ago as the result of population pressure they began to expand northwards. Between 3,000 and 4,000 ago they migrated into the American Southwest and continued to cultivate maize and other crops. Hill supports her model mostly with linguistic reconstructions.

The position taken by Hill (2001) is controversial as she places the origins of Proto-Uto-Aztecan in south-central Mexico where maize was first cultivated. Campbell, on the other hand, places the putative homeland of Uto-Aztecan languages somewhere in the southwestern United States or northern Mexico (1997: 150). Additionally, the Uto-Aztecan language-farming expansion, as posited by Hill (2001), was contested in a 2009 paper by Merrill et al. Here, researchers assert that phonological reconstructions for flora and fauna place the putative homeland in Nevada and not in southern Mexico. Based on climatological data, the researchers further assert that a drought led to a bifurcation of Proto-Uto-Aztecan into the Northern and Southern Uto-Aztecan branches about 9,000 years ago. Southern Uto-Aztecan then expanded southwards from Nevada into Mexico. The researchers also suggest, based on their analysis of climatological and archeological data, that a Southern Uto-Aztecan group back-migrated from Mexico into the southwestern United States occurred about 6,000 years ago. According to the report, this back-migration brought domesticated maize from Mexico into the region. Finally, Merrill et al. (2009) suggests that this expansion of maize and language was fueled by climate change rather than population pressure.

A study from 2010 (Kemp et al.) present Y-chromosome data to provide genetic support for Hill (2001) and her model of Uto-Aztecan prehistory. These data follow the distribution of Q1b-M3 and Q1b-Z780 mutations and analysis of a short tandem repeat (STR) data. However, higher resolution Y-chromosome markers emerged in 2019 (see Grugni et al.). They include Q1b-Y12421, which represents the majority of Q-M3 variation among Panamanians; Q1b-M924, which represents most of the Q-M3 variation in Mexico; Q1b-Z5906, which is distributed from Mexico to Argentina with a peak frequency in Peru; and Q1b-Z5908, which is distributed from Mexico to Argentina with a peak frequency in Peru. These recently reported markers suggest population growth in Central and South America beginning about five thousand years ago. However, we cannot build farming-language expansion models with the currently available Y-chromosome data. Rather, the available genetic data support *in-situ* co-evolution of language and agriculture in Mexico that could have been driven by agriculture.

From an anthropological perspective, the cultivation of maize ultimately became an important food resource among many of the Native American cultures including speakers of Uto-Aztecan languages. It was the only grain-like food resource of the Western Hemisphere that could be stored for a long period of time. However, the evolution of maize agriculture in Mexico appears not have driven a population expansion from Mexico, which seems odd because the *early farming dispersal hypothesis* explains much of the contemporary diversity of language. An explanation follows observation that the road to maize domestication was a long and complicated process that required considerable genetic modification of teosinte, the wild plant from which modern domesticated maize evolved.

A study from 2018 (Kistler et al.) examined the origins of maize cultivation in South America using a synthesis of genetic, archaeological, and botanical data. The researchers suggest that domestication of maize began roughly 9,000 years ago in south-central Mexico and that semi-domesticated variants of maize in appeared in South America about 6,000 years ago. However, according to the study, even 5,300 years ago the Mexican variant of maize had not evolved into a food staple. As such, the proposed timing of northward co-expansion of Uto-Aztecan and maize about 6,000 years ago, as suggested by Hill (2001), seems problematic because at this point in time maize could not have fueled reproductive success, which is an essential component of her hypothesis.

Figure 1. Teosinte (top), Teosinte-Maize Hybrid (middle), and Maize (bottom). Source: Wikipedia and John Doebley.

Hill's hypothesis is also undermined by evidence that suggests Maize was initially cultivated in the southwestern United States as a recreational crop rather than a food staple that is capable of sustaining rapid population growth, an essential characteristic of the *early farming dispersal hypothesis*. This evidence was presented by Smalley and Blake in a 2003 paper that provides a useful discussion of maize origins from botanical and anthropological perspectives. As previously mentioned, modern domesticated maize evolved from the wild teosinte plant. Smalley and Blake note that teosinte cobs are much smaller than modern maize. Moreover, the kernels are barely edible. The study even describes teosinte kernels as "starvation" food that is otherwise "utterly useless." As such, this poses an interesting question: why would anyone waste so much time and energy to cultivate such a useless plant? According to Smalley and Blake (2003), the answer is alcohol.

Teosinte stalks are sweet and initially people chewed them. Smalley and Blake (2003) suggest that at some point someone discovered that when pressed the teosinte stalks yield syrup that can be used for corn wine. As such, people initially cultivated maize as a recreational product rather than for food. According to Smalley and Blake (2003), during the recreational phase of maize domestication, farmers planted seeds that they had gathered from the larger maize stalks with the idea of obtaining a larger yield of syrup with the next harvest. This selection of seeds from larger stalks eventually produced the large cobs that are characteristic of modern domesticated maize. At this point people started to dry maize kernels and maize became part of the subsistence strategy among Native Americas. However, the degree to which maize was cultivated among Uto-Aztecan peoples is open to debate.

The idea that agriculture follows a gradient of intensification was explored by Stevens and Fuller in their 2017 paper. They suggest that the transition to agriculture only occurs when a population obtains 50 percent of its calories from domesticated plants and animals. According to the report, the road to agriculture can have a lengthy pre-agricultural phase. During this phase, hunter-gathers often cultivate crops on a smaller scale. However, this is not agriculture. Rather, as suggested by the study, the transition to agriculture essentially marks a point-of-no-return. Agriculture vastly improves reproductive success, and this comes with a price. At this point foraging is no longer an option because you must feed many more people. Furthermore, habitat for wild animals and plants are now utilized as farmland.

Among Uto-Aztecan-speaking peoples, the degree to which maize was cultivated, and the capacity of maize to sustain rapid population expansion, present important factors in modeling the trajectory that guides this language into the historical record. Based on the available data, maize cultivation among Southern Uto-Aztecan-speakers appears to have pushed this language group into the historical record along an *in-situ* co-evolution of language and agriculture trajectory. Northern Uto-Aztecan, on the other hand, appears to have followed a different path. Numic languages, a sub-branch of Northern Uto-Aztecan, include the Comanche, Paiute, Mono, and Shoshoni peoples. According to the archaeological record, it appears as though they abandoned maize farming in the Great Basin of the United States about a thousand years ago and adopted foraging as their subsistence strategy (See LeBlanc 2013). Taking this a step further, this suggests that Northern Uto-Aztecan entered the historical record along a reversion to foraging trajectory similar to Finnic languages.

Conclusions

As stated previously, the goal of my paper is not to resolve the controversial question of Uto-Aztecan origins. Rather, my goal is to advocate a more scholarly debate of this question. In doing so, I ask the reader to consider whether lexicostatistics is a serious methodological solution for exploring the prehistory of language. It seems that this complex question should be explored with a synthesis of linguistic, anthropological, genetic, and climate perspectives. Moreover, these perspectives should be drawn from the full range of cultural and linguistic diversity. My paper demonstrates that such a methodological approach is possible for exploring the prehistory of Uto-Aztecan languages. Moreover, future research should refine the concept of “trajectories into the historical record.” When multidisciplinary perspectives are examined cross-linguistically, behavioral similarities surface within the vast linguistic diversity of our planet. These similarities offer a means of managing the vast amount of empirical data that ultimately contribute to our understanding of language prehistory.

Bibliography

Bellwood, Peter 2005. *First farmers: the origins of agricultural societies*. Malden, MA; Oxford, UK; Victoria, Australia: Blackwell Publishing.

Campbell, Lyle 1997. *American Indian Languages: the Historical Linguistics of Native America*. New York: Oxford University Press.

Greenhill, S. J. et al. (2023). A recent northern origin for the Uto-Aztecan family. *Language* 99(1): 81-107.

Grugni, Viola et al. 2019. “Analysis of the human Y-chromosome haplogroup Q characterizes ancient population movements in Eurasia and the Americas.” *BioMed Central Biology* 17:3.

Hill, Jane H. 2001. “Proto-Uto-Aztecan: a community of cultivators in Central Mexico?” *American Anthropologist* 103(4): 913-934.

Kemp, Brian M. et al. 2010. “Evaluating the farming/language dispersal hypothesis with genetic variation exhibited by populations in Southwest and Mesoamerica.” *Proceedings of the National Academy of Sciences of the United States of America* 107(15): 6759-6764.

Kistler, Logan et al. 2018. “Multiproxy evidence highlights a complex evolutionary legacy of maize in South America.” *Science* 362, 1309-1313.

LeBlanc, Steven A. 2013. “Mesoamerica and the southwestern United States: archaeology.” In: *The Global Prehistory of Human Migration*. Edited by Peter Bellwood. West Sussex, UK: John Wiley and Sons, pp 369-375.

Merrill, William L. et al. 2009. “The diffusion of maize to the southwestern United States and its impact.” *Proceedings of the National Academy of Sciences of the United States* 106(50): 21019-21029.

Smalley, John and Michael Blake 2003. “Sweet beginnings: stalk sugar and the domestication of maize.” *Current Anthropology* 44(5): 675-703.

St. Clair, Michael R. 2021. *The Prehistory of Language: A Triangulated Y-Chromosome-Based Perspective.* Stuttgart, Germany: The Genetic-Linguistic Interface. https://genlinginterface.com/wp-content/uploads/2021/11/St-Clair-2021.pdf

Stevens, Chris J. and Dorian Q. Fuller 2017. “The spread of agriculture in eastern Asia: archaeological bases for hypothetical farmer/language dispersals.” *Language Dynamics and Change* 7: 152-186.

Trask, Larry 2015. *Trask’s Historical Linguistics. Third Edition*. Edited by Robert McColl Millar. Oxon, UK; New York: Routledge, pp. 350-364.

Licensing Information for Figure 1: Teosinte, Teosinte-Maize Hybrid, and Maize.

Source: Wikipedia and John Doebley
Accessed: September 27, 2021
URL: https://commons.wikimedia.org/wiki/File:Maize-teosinte.jpg