

Tais that Bind

Socioeconomic Data and Applications Center DAAC
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March 28, 2002

Common sense might suggest that the farther a migrating people travel from their homeland, the more their language will change over time. But by tracing the origins and migration routes of the Tai — an East and Southeast Asian ethnic group whose modern-day descendents include many Thai (or Siamese) of modern Thailand — linguists discovered recently that just the opposite is true. Migrating populations tend to cling to historical language patterns acquired from their homelands. Interestingly, linguists find the greatest changes in languages usually occur at their point of origin.

"We know that English originates from England, and in the British Isles you may hear hundreds of dialects — some incomprehensible to American listeners," said John Hartmann, a Thai language professor at Northern Illinois University (NIU). "However, in parts of Appalachia you might hear forms of the English language that date back to Shakespearean times spoken by descendents of original English settlers. At the point of origin, England in this example, pronunciations get 'worn down,' to use a geologic term."

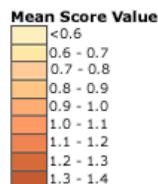
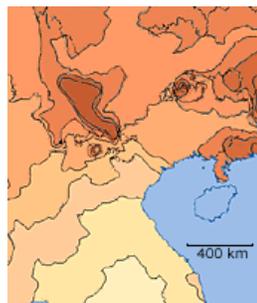
"A lay person might describe this as the 'Away Theory.' The farther a group moves away from its homeland, the more likely the language will preserve older forms," explained Vinya Sysamouth, a graduate student at the University of Wisconsin-Madison who conducted fieldwork with Hartmann and a team of Americans studying Chinese linguistics in China.

Over centuries, changes in language occur due to pressures within the language's sound and semantics system as well as influences from speakers of adjacent languages, according to Hartmann.

"Groups within a society distinguish themselves — rulers from subjects, educated from illiterate, rich from poor — through differences in pronunciation and word usage. At the point of origin, these language divides have simply been at work longer and proliferate over time," he said.

Richard O'Connor, an anthropology professor at the University of the South in Sewanee, Tennessee, studied two of Southeast Asia's neighboring cultural groups, the Tai and Mon-Khmer. O'Connor hypothesized that the development of wet-rice agriculture and the resulting complex political and social structure required to sustain the irrigation system ultimately resulted in Tai dominance over the Mon-Khmer.

In Southeast Asia, a dependable rice crop produces more calories per acre than any other grain and can support rapid population growth and expansion. Tai irrigation methods ensured reliable rice production and, ultimately, a well-fed population. For the Tai irrigation system to work, the minimal political unit was village-sized, requiring a complex division of labor to ensure

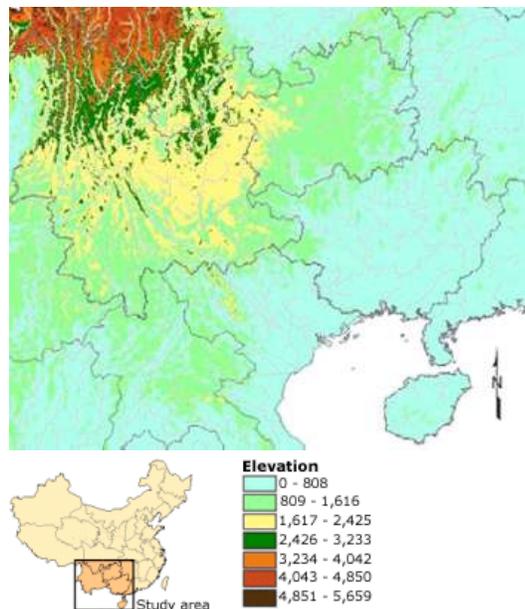


This map shows the mean scores for the current pronunciation of 21 words related to rice culture, 1 being the closest to the proto-Tai pronunciation, and 3 being the most different.

(Images derived from Luo et al.: GIS Mapping and Analysis of Tai Linguistic and Settlement Pattern of Southern China, 2000)

The [China Dimensions Data Collection](#) from the [Socioeconomic Data and Applications Center](#) includes digital administrative boundaries; fundamental GIS layers; county-level data on population, agriculture, economics and hospitals; and interactive access to population census data. The [global digital elevation map](#) from the EROS Data Center DAAC (now named the [Land](#)

system functionality. Alternatively, the Mon-Khmer opted for a less complex system — each family labored independently to grow and harvest rice crops and relied on the elements for adequate rainfall.



This digital elevation model of the study area is based on topographic data from the EROS Data Center. (Images derived from Luo et al.: GIS Mapping and Analysis of Tai Linguistic and Settlement Pattern of Southern China, 2000)

Tai agricultural success resulted in growing population numbers, causing groups of Tai to migrate from their region of origin to other, geographically-similar areas favoring wet-rice agriculture.

Expanding on O'Connor's research and focusing on Tai ethnic groups, Hartmann hoped to determine the Tai people's location of origin and track their movements from southern China into mainland Southeast Asia. By combining the Theory of Linguistic Origins and Spread and Geographic Information System (GIS) technology with population and elevation data, available from NASA's Socioeconomic Data and Applications Center (SEDAC) and EROS Data Center (EDC), Hartmann and colleagues set out to trace Tai migration patterns.

"The Tai — a cultural group that includes the Thai of northern Thailand, the Shan of Burma, and various groups in Vietnam and southern China — used mountain streams and diversionary dams and canals to irrigate rice crops. Because of their irrigation success, the Tai had rice surpluses, which attracted other people to help sustain their system," Hartmann said.

According to Hartmann, some contention exists as to the original location of the Tai. "Many believed the Tai originated in Yunnan Province or the middle Yangtze River region, but based on our research, we believe they originated in the Guangxi-Guizhou region of China," he said.

Funded by a Luce Foundation award, Hartmann and Jerold Edmondson, linguistics professor at University of Texas-Arlington and a veteran Tai dialect researcher, began their work in the summer of 1999. Hartmann invited Professor Li Jinfang from China's Central University of Nationalities to Illinois to collaborate in the research. Hartmann also enrolled in a GIS class taught by Wei Luo, an NIU geography professor who helped him realize the potential utility of GIS in tracing changing linguistic and water resource patterns and in mapping regional Tai minorities.

[Processes DAAC](#)) incorporates

elevation information derived from the

Digital Chart of the World and Digital

Terrain Elevation Data at

approximately 1 kilometer resolution.

(A new window will open for each link.)

Hartmann and colleagues first investigated the origins and spread of the Tai through the prism of irrigated rice agriculture and engineering.

"We created a list of about 400 words, beginning exclusively with rice agriculture-related words like 'dike' and 'dam.' Other words of interest to us included those describing aquatic life, such as fish species or frogs, the rice plant's anatomy, and any tools associated with rice agriculture," Hartmann said.

"Focusing on 21 words, we examined pronunciation differences at varying locations. We used the SEDAC's China Dimensions data, which provided us with background on regional land use and environmental and socioeconomic information. These data allowed us to identify the names and x- and y-coordinates for each of the linguistic sites Dr. Hartmann selected and studied," said Luo.



Tai Lue farmers construct a traditional diversion dam in Sipsongpanna, Yunnan Province, Muang Long. (Images courtesy of John Hartmann.)

Sysamouth traveled to China with Hartmann and Edmondson to help interview rice farmers. After making audio recordings, the researchers classified and ranked varying pronunciations to identify differences in the dialects.

"We used a scale of 1 to 3," said Sysamouth. "Words with the greatest similarity to the prototype form were assigned a score of 1, while the most significantly changed pronunciations were assigned a score of 3."

The researchers also examined the relationship between Tai settlement patterns and the natural environment and water resource availability. They knew Tai people tended to settle in lowland areas near water in order to grow rice.

"The ideal landscape for wet-rice agriculture is low elevation with little slope. Using digital elevation data from the EDC and population data from SEDAC, we

plotted county population against each county's mean elevation and land surface slope, finding high concentrations of Tai-speaking ethnic groups in places with both low elevation and slope," Luo said.

Next, by averaging scores for the set of 21 words at each assigned location, Sysamouth and Luo created a contour map of pronunciation changes. The color-coded map (see graphic at right) displays an overall pattern of change and illustrates Tai migration routes relative to where the language originated.

"The map reveals two high-value regions — one at the southeastern Yunnan-Vietnam border and the other at the Guangxi-Guizhou border," Luo said. "The primary candidate of origin lies in the border region of Guangxi and Guizhou, and we believe the general direction of population migration is from the Guangxi-Guizhou border southwestward toward Vietnam and Thailand."

"Prior to our study, no one had given precise geographic locations that identified various language dialects spoken in particular areas. We ended up looking at about 12 locations in Guangxi and Guizhou to identify regional dialects," Hartmann said.

By combining historical records with comparative linguistics, based on the degree and direction of pronunciation change, Hartmann and his colleagues found that proto-Tai likely originated in the Guangxi and Guizhou provinces, which border northern Vietnam. Notably, many Tai groups still dominate this region today.

Demonstrating language patterns, the study offers a rich history of politics and human geography. Over time, the pronunciation of words changes, resulting in shifts and extensions of meaning that have both social and political implications.

An example is the Tai word *muang*, which Hartmann says originally meant "rice-growing basin." It later evolved to indicate a political principality or kingdom. Today, it means "country" — as in *Muang Thai*, or Thailand.

"By its very complexity, the Tai's irrigation system required a cooperative political system that brings new people into the system," Hartmann said. "So, it has always been possible to become Tai. It's an acquired set of features — you grow irrigated rice, live along riverbanks, and have a cooperative type of social organization.

"The genius of the Tai was to combine skilled rice growing with astute political skills, through which they succeeded in populating much of Southeast Asia," said Hartmann.

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