# How languages and genetics explain our origins and evolution

While the Chinese inhabitants of Taiwan mostly speak Hokkien – a dialect from Fujian province in mainland China – they swear in the indigenous Austronesian languages of the island.

This is strange, as the Austronesian language family is as distant from Sino-Tibetan Hokkien as the Aboriginal Taiwanese are (genetically) from the more-recently arrived Han peoples of the mainland. Perhaps this cursing quirk reflects a desire to be different from their stay-at-home mainland Chinese cousins – or to cuss at them in secret. Be this as it may, this example also reflects certain intriguing analogies between the development of languages and the evolution of life – and of how modern genetics can tell us so much more of our own human history.

Indeed, the initial evolutionary ideas swirling around in the late 17th and early 18th centuries – and which culminated in the Darwinian theory of natural selection – likely owed as much of their initial impetus to philology (or historical linguistics) as to the haphazard theorising of the era's religiously-minded 'natural historians'.

In the 1780s, for example, philologist and polymath William Jones highlighted the extraordinary similarities between two classical European languages, Latin and Greek, and Sanskrit, the ancient sacred language of Hindu India. Most notably, Jones expressed the opinion that all three languages bore "a stronger affinity … than could possibly have been produced by accident; so strong indeed, that no philologer could examine them all three, without believing them to have sprung from some common source, which, perhaps, no longer exists".

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Sanskrit

Well over half a century later, Charles Darwin was to use the striking 'affinities' between different species as a key argument in claiming a 'common source' for all forms of life on Earth – as captured in the title of his bestselling On the Origin of Species (1859).

But by then philologists (including the 'Brothers Grimm', Jacob and Wilhelm, of fairytale fame) had already added far greater detail to the theories of language change and origins – much of which was directly applicable to Darwin's own developing ideas. The Darwinian concept of 'descent with modification', for example, is clearly analogous with the linguistic observation – now known as Grimm's Law – of systematic historical changes between related languages (for example, the /p/ ? /f/ association between Latinate and Germanic words like 'pater'/'father', 'pisces'/'fish' or 'pedal'/'foot').

Moreover, the notion of genealogical families of languages, branching out from a distant shared ancestor, is another obvious parallel with biology, most especially taxonomy – and here, too, both philogists and early biologists could look to morphology (the structure of words and organisms, respectively) in drawing up their hierarchies of relatedness.

As for attempts to determine the 'common source' of Indo-European languages like Latin, Greek and

Sanskrit, by the mid-18th century much was already known about the ancestral form of this widely-dispersed family, whose members were found to include Icelandic in the north and west, Sri Lankan Sinhalese in the south and east, and hundreds of other tongues (including English) in-between. With natural history, of course, Darwin's genius was in contemplating something similar for the far more diverse profusion of living organisms: "There is grandeur in this view of life," he famously concluded in the Origin, "[that] from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved".

And modern genetics – a field of which Darwin was entirely ignorant but which beautifully complements his dazzling insights – is now adding even greater depth and clarity to this grand, all-encompassing view of life. As illustration, we can here return to Taiwan, albeit via a meandering island-hopping route.

The Malagasy inhabitants of Madagascar, off the coast of Africa, and the Rapa Nui people of Easter Island, off the coast of South America, both speak Austronesian languages. Furthermore, despite being separated by 26,000 km (16,000 miles) of the Earth's surface, these islanders' mother-tongues merely represent the eastern and western tip of a swathe of other languages that all belong to the same sub-group of Austronesian. This sweep includes the Philippines, Indonesia and mainland Malaysia, much of Melanesia, and all Micronesia and Polynesia (including Guam and Hawaii).

But how is this possible?

The answer lies back in Taiwan. Of the ten sub-groups of Austronesian languages, nine of them are found exclusively in Taiwan – the sole exception is the sub-group above, which comprises nearly 1200 different tongues. Given that the differences between separate sub-groups are greater than the differences between languages within the same group, this points to Taiwan as the cradle for this entire family of languages – that is, where diversification must have occurred over the longest period of time.

At some point, a single Taiwanese group must have then migrated further south, carrying their Austronesian mother-tongue with them – first to the island archipelagos of the Philippines and Indonesia, and hence (over several millennia) far out to the Pacific islands in the west and across the Indian Ocean to Madagascar in the east. Over such time and distance, too, the original language would have diversified into the hundreds of different tongues spoken today.

In addition, the reasoning that takes Taiwan to be the cradle of Austronesian – due to its greater language diversity – is the same as that that posits Africa as the cradle of humankind; in the later case, based on the sheer genetic diversity of modern African peoples compared to non-Africans elsewhere in the world.

Staying with genetics, recent DNA evidence also has bolstered the language-based hypothesis of ancestral migration from Taiwan, though with a number of thought-provoking twists. For instance, the latest cutting edge research is adding fascinating nuance to our understanding of the human habitation of the extremes of the Austronesian range, in Madagascar and in Polynesia.

To begin in the east, the Malagasy – as the inhabitants of Madagascar are known – all speak an Austronesian language most closely related to one spoken in southeast Borneo, with genetic evidence also demonstrating a link between the Asian island and the African one. However, the DNA data also hint at human migrations to Madagascar that pre-date the main Austronesian settlement of the islands roughly 1,500 years ago. While much is yet unclear, this suggests that human voyaging across the Indian Ocean may have been much earlier and more extensive than previously recognised; importantly, the genetic evidence also adds details that would otherwise elude traditional linguistic and archaeological research.



Half a planet away to the west, the human presence on most of the remote Pacific islands is a testament to the tenacity and skill of early Polynesian navigators and migrants; discerning these peoples' ultimate origins is equally a demonstration of the persistence and expertise of linguists and archaeologists – and, more recently, geneticists. And despite far-fetched theories of a South American homeland for the Polynesians – epitomised by explorer Thor Heyerdahl's 1947 'Kon Tiki Expedition' – the historical and linguistic trail (as described above) points directly towards island southeast Asia.

More modern DNA evidence, however, shows that the full story of the colonisation of Remote Oceania was much more complex. For example, according to genetic analysis of ancient remains in Vanuatu (c. 3kya) and Tonga (c. 2.5kya), the first human inhabitants of these islands were indeed of East Asian origin (as also attested by the Austronesian languages still spoken there). Intriguingly, however, the DNA of modern Austronesian-speaking Vanuatuans is overwhelmingly of Papuan origin, indicating ancestry in non-Austronesian New Guinea; similarly, modern Tongans also harbor a mixture of Papuan genes not found in the ancestral population of the so-called 'Friendly Islands'.

This recent research, then, suggests subsequent westward migrations by Papuan peoples after the Pacific islands had already been colonised by Austronesians – in turn, raising further questions of how, why and when this occurred. There is, for instance, a seeming gender divide evident in the DNA, one that implies that later-arriving Papuan men intermarried with established Austronesian women (and in the process erased the original male Austronesian lineage).

On a much wider scale, this highlights the role that genetics now has in fleshing out the details of historical human expansion across the planet. Indeed, as well as complementing (or sometimes contradicting) the traditional sources of historical understanding, modern genetics can also illuminate previously obscure questions, such as the relationship between the spread of genes and the spread of culture. The phrase 'pots not people', for instance, captures a long-held archaeological belief that observed cultural changes (e.g., in pottery styles) more likely indicates the arrival of new ideas but not necessarily new peoples. In the case of Austronesian-speaking Vanuatu, say, where the people changed but the culture remained, this belief appears vindicated; in Europe, however, contemporary ancient-DNA work points to a different conclusion – that it was pots and people that transformed over time.

As for Austronesian in today's Taiwan, a further analogy with biology is sadly evident – that just as lineages can go extinct, so too can languages. Over a third of the island's Aboriginal tongues have already been lost, with many of the rest either moribund or endangered. As with nature conservation, urgent action is needed if these languages are to survive – indeed, perhaps the Chinese-speaking Taiwanese should swear to do so.

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