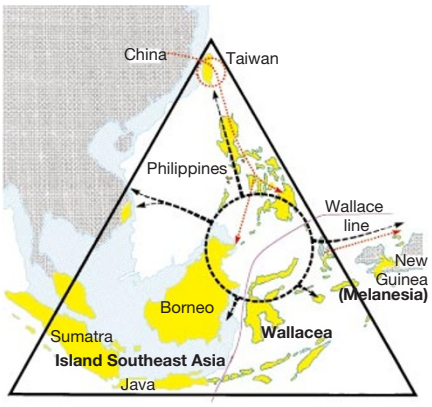

Figure 1 Map showing the two main alternative views of Austronesian origins. The oldest view represented by Meacham[10] (triangle) and Solheim[11] (dashed black lines and circle) argues for an Island Southeast Asian homeland (before 5000 BC). Bellwood's[5] and Diamond's[1] view of a recent rapid migration out of China (3000–4000 BC), spreading to replace all the older populations of Indonesia after 2000 BC is shown as a red dotted line. This is not supported by an ancient mitochondrial sequence haplotype, the 'Polynesian motif', found only to the east of Wallace's line (pink). Blue shading represents the continental shelf; yellow, areas where Austronesian languages are spoken.

Several genetic marker systems point to a primarily insular Southeast Asian ancestry for Polynesians. Much has been made of a hallmark maternal genetic marker known as the 'Polynesian motif'. This unique suite of four single-nucleotide polymorphisms in the control region of mitochondrial DNA identifies a subgroup within a widespread East Asian cluster of mitochondrial DNA lineages, haplogroup B, characterized by an intergenic 9-base-pair deletion[2–4]. The Polynesian motif, so called because it reaches very high frequencies in Polynesian populations, is the main Oceanic variant of haplogroup B.

The Polynesian motif is also distributed throughout the lowland populations of coastal Melanesia and the biogeographic zone of Wallacea (Fig. 1)[2,3]. More important, it is almost absent to the west of Wallace's line. It is not found in the Philippines, Taiwan or China — all key stations along the 'express train' route. Instead, in these regions its immediate ancestor is found with only three of the four polymorphisms, apparently breaking the train ride somewhere around Wallacea, where the final mutation in the motif, at nucleotide position 16,247, evidently occurred. This suggests that Wallacea, long believed to be an admixed buffer zone between Southeast Asia and New Guinea/Melanesia, might have harboured an ancient, indigenous population (of ultimately Asian origin) from which the Polynesian colonists emerged.

We looked into this possibility — that the final mutation did not occur en route in the express train, but earlier — by using the diversity accumulated by the motif to estimate its age using the molecular clock. The motif dates back in Wallacea to roughly 17,000 years before present (95% credible region: 5,500–34,500 years)[4]. But archaeological evidence, mainly from using red-slipped pottery as a marker, argues for a tightly constrained arrival and departure of the express train from Wallacea around 2000 BC (ref. 5), suggesting that the motif originated before an express train carrying Taiwanese farmers could have arrived in Wallacea.

A report describing Y-chromosome variation in the region reaches a similar conclusion[6], and earlier autosomal studies[7,8] and physical anthropology[9] also indicate ancient differentiation between mainland Asia, Taiwan, Island Southeast Asia and Melanesia. It is difficult to reconcile this evidence with the express train view — it seems to be more consistent with Austronesian origins within tropical Island Southeast Asia, as proposed earlier by other archaeologists[10,11]. In particular, it points more to Polynesian origins between insular Southeast Asia and Melanesia, perhaps in the Pleistocene 'voyaging corridor'[12].

Diamond highlights evidence of linguistic diversity to support a Taiwanese origin for Austronesian languages, which identifies ten primary branches in Austronesian, nine of which are spoken only in Taiwan[13]. But the lack of an origin for the tenth branch in Taiwan weakens the case for a Taiwanese origin. The lack of equivalent deep-branch diversity in parts of Southeast Asia such as the Philippines may instead have resulted from the linguistic phenomenon of 'levelling'. If Taiwan had simply been an Austronesian backwater, as argued on the basis of archaeological evidence[10], earlier levels of diversity might well have survived. Maybe the pre-Oceanic distribution of the Austronesian language family — its 'homeland' — was "… the broad triangular area formed by Taiwan, Sumatra, and Timor, where the reputedly oldest Malayo–Polynesian languages are found and where no other languages are spoken today"[10].

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Diamond replies — Until about 4000 BC, there were no domestic animals, farming, Neolithic tools, or pottery anywhere in Island Southeast Asia and the Pacific, except for Neolithic agriculture in the New Guinea highlands. Around 4000 BC, all of these things appeared in Taiwan and then spread eastwards in archaeologically well-dated stages through the rest of Island Southeast Asia out into Polynesia. Apart from some peoples of New Guinea and some adjacent islands, all those in this vast realm now speak Austronesian languages.

Where did this Austronesian expansion ultimately originate? The archaeological, linguistic, zoological and botanical evidence points overwhelmingly to China, where all of the Austronesians' domestic animals, their pottery styles, their Neolithic tools, their irrigation and fishing technology, and many of their crops and artistic motifs originated. The spread south from China into Mainland Southeast Asia of all four of the other major Southeast Asian language families also correlates with archaeologically attested expansions.

Oppenheimer and Richards downplay this body of evidence, favouring instead an Austronesian origin in Island Southeast Asia itself, specifically in the triangle formed by Taiwan, Sumatra and Timor. But they overlook the fact that modern Austronesian peoples predominantly resemble Asian Mainland peoples in their genes, appearance and physical anthropology, whereas the original inhabitants of Island Southeast Asia (still attested by many relict populations today) resembled modern New Guineans and Aboriginal Australians.

Oppenheimer and Richards cite genetic evidence (for example, the Polynesian marker whose age they calculate), but if genetic evidence is to be useful in reconstructing human population movements, it must be based on many loci and integrated with other types of evidence; calculations of marker ages with extremely wide confidence limits must be viewed with caution. Nobody doubts that Melanesians and other original island peoples did make some minor contribution to the gene pool of the Austronesians as they expanded eastwards through the islands into Polynesia. The Polynesian marker, in combination with other genetic markers and other evidence, should eventually prove useful in illuminating where, when and how, among the hundreds of Austronesian peoples, the Polynesians themselves arose and received that minor contribution. But the marker cannot alter the main conclusions about the Austronesian expansion.

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