

into the Americas were Asians, possibly from Siberia. I will briefly review some of the relevant data that support the Asian origins of the Amerindians. This evidence does not preclude the possibility of some small-scale cultural contacts between specific Amerindian societies and Asian or Oceanic seafarers.

The evidence in support of an Asian origin of New World populations can be grouped roughly into four categories: (1) genetic similarities; (2) morphological resemblance in contemporary populations; (3) craniometric affinities; and (4) cultural similarities.

Genetic evidence

The Amerindians resemble Siberian and other Asian populations in the kinds and frequencies of various genetic markers of the blood. For a more complete description of genetic markers and their use in tracing populational affinities and origins, see Crawford (1973)¹. Szathmary (1993) has recently summarized the genetic diversity of North American Indian populations based upon gene frequency distributions. Amerindian and northeastern Siberian populations have similar frequencies of many blood types, forms of serum proteins, red-cell enzymes, distributions of DNA variable numbers of tandem repeats (VNTRs), and haplotypes or haplogroups of mitochondrial DNA. When compared to other geographical populations of the world, on the basis of multivariate statistical analyses of gene frequencies, the Siberian or Asian populations tend to cluster together with those of the New World (see Fig. 1).

Cavalli-Sforza *et al.* (1988) used an average linkage analysis of Nei's genetic distances to construct a genetic tree based upon 120 alleles from 42 world populations. A bootstrap method (a resampling technique for obtaining standard errors) was utilized to test the reproducibility of the sequence of the splits in the phylogenetic tree (dendrogram). This tree shows two main branches, the African and non-African. The North Eurasian branch divides into Europeans (Caucasians) and Northeast Asians, including the Amerindians. Thus, this multivariate approach to population affinities reveals a close genetic relationship between Amerindian and Asian groups (see Fig. 1).

Some genetic markers occur only in New World and Asian populations. These include the following: the Diego allele, DI*A; gamma globulin allotypes, GM*A T; Factor 13B*3; transferrin, TF*C4; and complement, C6*B2 alleles. Szathmary (1993) adds SGOT*2 (glutamic oxaloacetic transaminase), TF*D, GC*TK1 (GC 1A9) and GC*N (GC 1A3), to a list of markers that indicate an Asian connection. Although the Diego DI*A gene is not always present in all Amerindian groups, when it is

¹ The term genetic marker will be restricted here to discrete, segregating, genetic traits that characterize populations by virtue of their presence, absence or high frequency in some populations in contrast to others (Crawford, 1973).

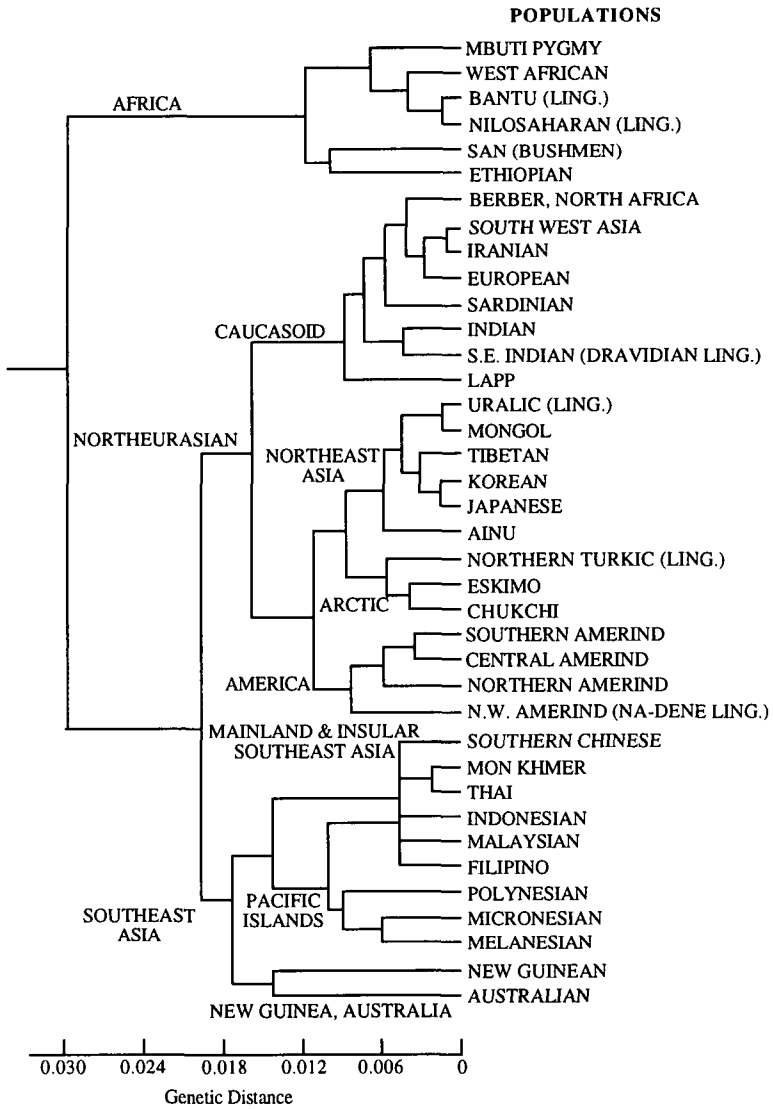


FIGURE 1 A genetic tree based on 120 alleles from 42 world populations. Average linkage analysis of Nei's genetic distance and a bootstrap resampling procedure was used by Cavalli-Sforza *et al.* (1988) to test the reproducibility of the sequence splits in this dendrogram.

detected DI*A occurs only in American Indians or Asians. The frequency of the immunoglobulin haplotype GM*A T in Asian populations reaches 50% in central Mongolia but is at a lower frequency in North American Indian groups. Similarly, GM*A G is found at frequencies varying between 86% in the Chukchi of Siberia (Schanfield *et al.*, 1990) to 56% among the Ainu of Japan (Matsumoto and Miyazaki, 1972). In North American Amerindian populations, this GM marker varies from 98% among the Northern Cree to 47% in a mixed Alaskan group (Schanfield *et al.*, 1990). Less is known about the geographic distribution of the complement B2 allele and Factor 13B*3; however, preliminary analysis suggests that these alleles occur at high frequencies in both the Amerindian and Asian groups (a more complete discussion of genetic markers is contained in chapter 4 of this volume).

In many of the other genetic systems, e.g. the human leukocyte antigen (HLA) system, the various blood groups, and even the mitochondrial DNA (mt-DNA) Asian haplotypes, most of the forms occur in some other populations of the world, but at different frequencies. Amerindians share the four major haplogroups (A–D) with Asian populations (Torroni and Wallace, 1995). In addition, Siberian and Amerindian populations share two identical mitochondrial DNA (mtDNA) haplotypes, namely S26 (AM43) and S13 (AM88). The S and AM designations represent the same haplotypes, defined by the presence or absence of the specific restriction sites, in Siberian and Amerindian populations. From these two haplotypes, Torroni *et al.* (1993a) have attempted to reconstruct the time of divergence of the Asian and New World mitochondrial DNA variation. These differences in the frequencies of some of the genetic markers are not surprising: the contemporary Amerindian populations are the result of small founding groups, unique historical events and possibly the action of natural selection over a span of 15 000 to possibly 40 000 years.

New World and Asian populations both exhibit a high incidence of dry or brittle earwax (cerumen) instead of the sticky or wet variety that is commonly present in most other populations of the world. Apparently, the presence or absence of a dry cerumen phenotype is under the genetic control of a single locus with two alleles (Matsunaga, 1962). This form of cerumen has been linked with an increased risk of otitis media (middle ear infection), which is particularly common throughout the indigenous populations of the Arctic on both sides of the Bering Strait (Pawson and Milan, 1974). McCullough and Giles (1970) demonstrated the existence of a statistical association between mean midwinter dew point temperature and the prevalence of wet-type cerumen. They have proposed a possible selective advantage for the high prevalence of the wet cerumen type in hot climates, and suggest that health complications are associated with the cerumen polymorphism.

During field investigations in Alaska and Siberia, I observed numerous cases of middle ear infections and was informed by the Public Health medical officers that

otitis media was one of the leading diseases in that region. According to the Indian Health Services (IHS) report in 1989, the most common diagnosis for outpatient visits by males to IHS clinics or hospitals in 1988 was otitis media, with a total of 109 124 cases reported in the United States. Thus, it appears that both Amerindian and Siberian populations share a genetic predisposition to otitis media.

Morphological resemblances

Asians and Amerindians have a number of superficial morphological characteristics in common. These include: straight black hair; relatively glabrous, i.e. sparse, beards and bodily hair (with the exception of the Ainu of Hokkaido, who often exhibit beards); Mongoloid sacral spot; small brow ridges; and broad zygomatic arches, giving a high-cheek-bone appearance. The face is relatively flat, and some American Indians and most Asians exhibit an eye fold that covers at least the inner corner (canthus) and often the whole free margin of the upper eyelid (see Fig. 2). These epicanthic folds give the eye a distinctive appearance. There is considerable individual variation in all of these traits in both Amerindian and Siberian populations (see chapter 6 for a discussion of morphological variation).

The dental evidence strongly supports an Asian origin of the Amerindians and Eskimos. The shovel shape of the incisors of Northeast Asians and the New World populations occurs in 50–100% of subjects, in contrast to European and Asian groups where this dental trait is extremely rare (Turner, 1987). The incidence of shovel-shaped incisors varies between 0–10% in Africa and Europe and 20–40% in southern Asia. In addition, Turner has described the presence of three-rooted lower first molars in Asian, Eskimo and Amerindian groups at frequencies from 6% to 41% (Turner, 1971). The highest incidence of three-rooted molars is among Aleut–Eskimo samples (27–41%); the lowest is in some of the North and South Amerindians (6–11%). Thus, the dental evidence also strongly supports the hypothesis of an Asian origin of Amerindians (see Chapter 6).

Craniometric affinities

In multivariate comparisons of measurements of samples of crania collected from 26 or 28 different geographic sites, Howells (1989) noted close genetic affinities between Siberian, Asian and New World populations. He made a total of 57 measurements from each of the cranial samples (males and females were analyzed separately) representing human variation in the world prior to the European expansion of 1492. The New World was represented by samples from the Arikara (South Dakota), Santa Cruz Island (California) and Yauos District (Peru). Siberia was represented by only the