

Supporting Information

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SI Results and Discussion

Sample Information. For this study we genotyped 1,375 dogs and 19 wolves on the dog genome-wide SNP array. [Table S1](#) lists the sample size of each of the 35 breeds included in this study, as well as the sample sizes of breeds from two previous studies (1, 2).

Survey of Archeological Dogs. As discussed in the main text, the identification and dating of early dog remains can be difficult. To establish a record of the timing of the first appearance of dogs in the archeological record, we have adopted a conservative approach. [Table S2](#) lists those remains that were considered but not included in [Table S3](#), which lists the earliest dog remains from each region, the status and dating of which are well supported. The most common reason for including a specific dog in [Table S3](#) was not because the original claim was controversial, but because earlier remains from the same region have been reported and are included in [Table S2](#).

The literature contains numerous claims of early domestic dogs, but many of those claims have since been questioned for a variety of reasons. First, as discussed in the main text, a lack of secure dating has led to a revision of the antiquity of some early dog remains. Second, fragmented remains often lack diagnostic characters to confidently exclude the possibility that they derive from local wild canid species. In those cases where other species can be eliminated, differentiating between dogs and wolves, especially during the early stages of domestication, is problematic. By listing these ambiguous samples on [Table S2](#), and by not including them in the data depicted in Fig. 2, we are not claiming that the remains are not domestic dogs. They may well be. To apply a consistent standard of acceptance, however, we biased our selection to only include those claims that have been robustly argued. We are aware that deciding whether or not to include a controversial claim is itself controversial, but we are confident that the inclusion or exclusion of specific claims has no effect on either the overall temporal and geographic pattern of global dog domestication, or the conclusions derived from the data.

Supplementary Tables. [Table S1](#) lists the 35 breeds included in this study, as well as all breeds investigated in two previous studies (1, 2). The cells in which the breeds are listed are colored according to the colored clades in Fig. 1 and represent breeds that retain a basal signature (red), non-European breeds that are not basal (blue), and European breeds that have deep histories but do not sit in basal positions on phylogenetic trees (brown). Numbers beneath in the publication headings columns represent the number of samples in each study. The regional origin column lists the suspected geographic origin of each breed, although in many cases the precise origins are unknown. The word “Europe” in parentheses indicates that although that breed is known to have spent time in

a different region, it was either imported from or admixed with breeds from Europe. The breed notes column gives succinct breed information gleaned from several encyclopedic entries (3–6).

[Table S2](#) lists those samples that were considered but not used to create Fig. 2. This table lists: the country, site, dates (reported in calibrated years before present), the elements reported in the publication, a reference that discusses the remains, and the reference from which information about the dating was gleaned. The column labeled “notes” possesses pertinent information about the remains, and the final column lists a rationale for excluding the sample from being included in [Table S3](#).

[Table S3](#) lists those samples that were used to create Fig. 2. The table lists the general location where the pie charts in Fig. 2 were placed, followed by the country, site, dates (reported in calibrated years before present), the elements reported in the publication, a reference that discusses the remains, and the reference from which information about the dating was gleaned. The final column lists additional information in support of the status determinations. Outlined boxes in each region correspond to a single pie chart in Fig. 2.

[Table S4](#) lists the wolf samples analyzed in this study. C.V. provided the DNA extracts and the sample codes are his.

Note on Biogeography and Basal Breeds. A possible exception to the general rule that domestic dog remains found south of the natural distribution of wolves are only found in association with an agricultural package may be southern China. Although the presence of wolves in this region is questionable, preliminary results suggest that dogs may have been present in late hunter-gatherer sites before the introduction of agriculture (7) (but see [Table S2](#)).

More generally, the pattern of significantly earlier dates in the Northern Hemisphere than in the Southern Hemisphere supports Diamond’s (8) observation that human movement along latitudes is far simpler than along longitudes. People and dogs migrated more easily east and west not only because doing so required less of an adjustment to shifting climatic and daylight patterns, but also because landscape features (e.g., rainforests, mountains, and deserts) in South America, Central and East Asia, and Africa presented significant geographical barriers to north-south movement.

Because three of the basal breeds (Basenjis, Dingoes, and New Guinea Singing Dogs) are found beyond the natural wolf range, the implication is that these dogs would have had numerous opportunities to interbreed with a wide variety of dogs and wolves before moving south. The relatively late dates for the appearance of dogs in these regions, combined with the long history of probable hybridization before their arrival, suggests these dogs are not directly descended from the first domestic populations despite their genetic distinctiveness.

1. Vonholdt BM, et al. (2010) Genome-wide SNP and haplotype analyses reveal a rich history underlying dog domestication. *Nature* 464:898–902.
2. Parker HG, et al. (2004) Genetic structure of the purebred domestic dog. *Science* 304: 1160–1164.
3. Morris D (2002) *Dogs: The Ultimate Dictionary of Over 1,000 Dog Breeds* (Trafalgar Square, North Pomfret, VT).
4. American Kennel Club (2006) *The Complete Dog Book* (Ballantine, New York), 20th Ed.

5. Wilcox B, Walkowicz C (1993) *Atlas of Dog Breeds of the World* (TFH Publications, Neptune, NJ), 4th Ed.
6. Clark AR, Brace A, eds (1995) *The International Encyclopedia of Dogs* (Howell Book House, New York).
7. Zhang C, Hung H-C (2012) Later hunter-gatherers in southern China, 18000–3000 BC. *Antiquity* 86:11–29.
8. Diamond J (2002) Evolution, consequences and future of plant and animal domestication. *Nature* 418:700–707.

Other Supporting Information Files

[Table S1 \(DOCX\)](#)

[Table S2 \(DOCX\)](#)

[Table S3 \(DOCX\)](#)

[Table S4 \(DOCX\)](#)