

**The following resources related to this article are available online at [www.sciencemag.org](http://www.sciencemag.org) (this information is current as of November 16, 2009):**

**Updated information and services**, including high-resolution figures, can be found in the online version of this article at:

<http://www.sciencemag.org/cgi/content/full/312/5782/1875a>

A list of selected additional articles on the Science Web sites **related to this article** can be found at:

<http://www.sciencemag.org/cgi/content/full/312/5782/1875a#related-content>

This article **cites 4 articles**, 1 of which can be accessed for free:

<http://www.sciencemag.org/cgi/content/full/312/5782/1875a#otherarticles>

This article appears in the following **subject collections**:

Technical Comments

[http://www.sciencemag.org/cgi/collection/tech\\_comment](http://www.sciencemag.org/cgi/collection/tech_comment)

Information about obtaining **reprints** of this article or about obtaining **permission to reproduce this article** in whole or in part can be found at:

<http://www.sciencemag.org/about/permissions.dtl>

# Comment on “Ancient DNA from the First European Farmers in 7500-Year-Old Neolithic Sites”

Albert J. Ammerman,<sup>1\*</sup> Ron Pinhasi,<sup>2</sup> Eszter Bánffy<sup>3</sup>

On the basis of analysis of ancient DNA from early European farmers, Haak *et al.* (Reports, 11 November 2005, p. 1016) argued for the Paleolithic ancestry of modern Europeans. We stress that the study is more limited in scope than the authors claim, in part because not all of the skeletal samples date to the time of the Neolithic transition in a given area of Europe.

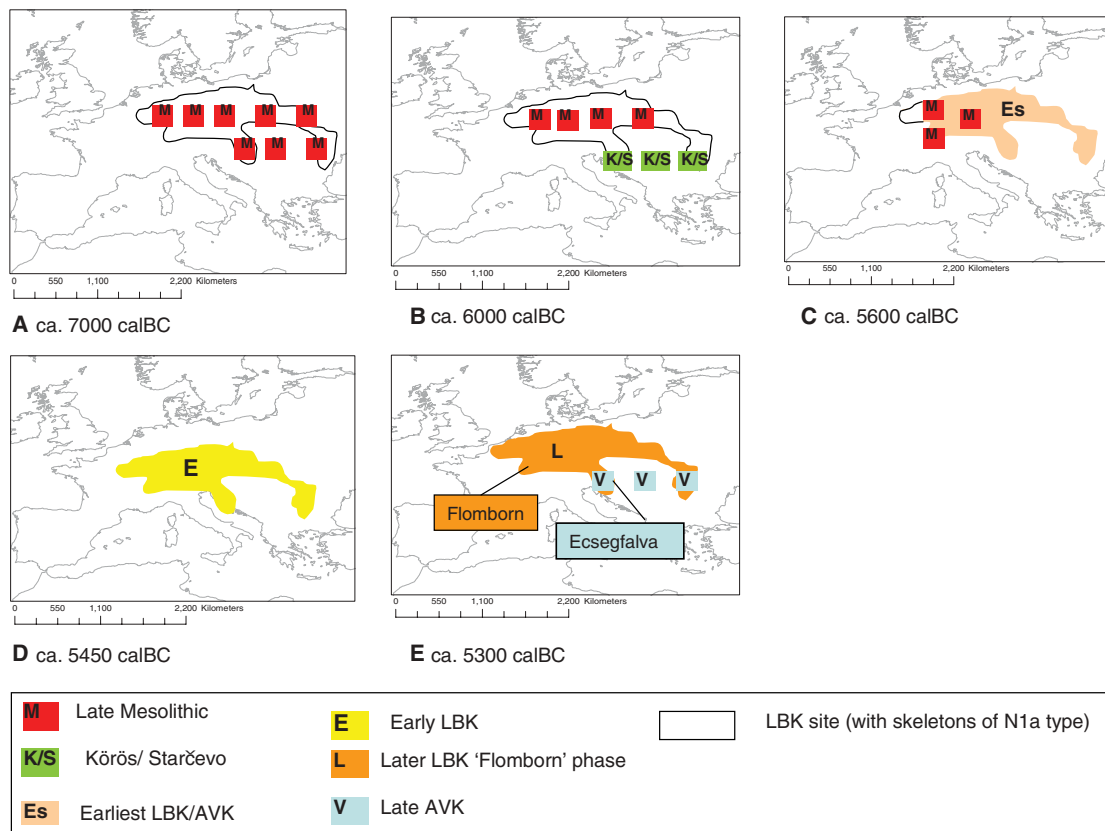
Haak *et al.* (1) recently put forward an argument for the Paleolithic ancestry of modern Europeans based on the idea that a single genetic type (N1a), which is sup-

<sup>1</sup>Department of Classics, Colgate University, Hamilton, New York, USA. <sup>2</sup>School of Human and Life Sciences, Whitelands College, Roehampton University, London, UK. <sup>3</sup>Archaeological Institute, Hungarian Academy of Sciences, Budapest, Hungary. \*Corresponding author. E-mail: Ammerman@mail.colgate.edu

posed to be common among early Neolithic women in Europe, is rarely seen in populations today. In our view, their study fails to acknowledge the appropriate caveats, which we outline here: (i) Haak *et al.* (1) present their argument as if it holds for all of Europe. However, the human skeletons they analyzed came only from Central Europe, making any claim with respect to Europe as a whole premature. (ii) The study of mitochondrial DNA permits inferences to be

made for only one sex. In short, the scenario Haak *et al.* present may pertain to the first farmers’ wives and daughters but not necessarily to the first farmers themselves. An alternative way to explain the cases of the N1a type is by means of marriage patterns, that is, some early Neolithic farmers taking Mesolithic (hunter-gatherer) wives (2, 3). (iii) The sample size in the original study (1) is very small; only 24 cases gave positive results for mitochondrial DNA, of which 6 had the special type. It is therefore too early to make the claim that “this type formerly was widespread among Neolithic farmers in Central Europe” on the basis of so few cases. To make a reliable claim of this kind, one needs a sample size that is much larger. (iv) Basing an argument on a single trait or genetic type is often risky in human population biology. Here again, the authors do not voice due caution. Greater use should be made of the full ensemble of genetic evidence to bolster the argument. In addition, morphometric studies can provide useful information on patterns of variability among populations at the time of the Neolithic transition (4).

There is a less obvious and yet even more serious archaeological problem with the Haak *et al.* study. Not all of the skeletons analyzed are actually those of the first farmers in Europe. In the eastern part of Central Europe, the Linear pottery culture (*Linearbandkeramik* or LBK) (5500 to 5000 cal B.C.) arose after the Neolithic transition, which took place in the context of the Körös, Starčevo, and Çris cultures (starting ~6000 cal B.C.) (5–7). By the time of the relatively late Alföld linear pottery culture (AVK) at Ecsegfalva in eastern Hungary [represented by one N1a individual in (1)], some 700 years had elapsed since the first appearance of farming in the region (8) (Fig. 1). In addition, Flomborn, another site represented by an N1a individual, dates to a fairly recent phase of the LBK. This chronological disparity (9) was not acknowledged in (1). In effect, the samples analyzed represent both the first farmers and more recent farmers (as many as 28 human generations later in the case of Ecsegfalva).



**Fig. 1.** Archaeological sequence of pre-LBK and LBK/AVK Neolithic cultures in Hungary and Central Europe. (A to E) The five schematic maps in time series illustrate the temporal position of the site of Ecsegfalva, from which one N1a type individual was identified in (1). The first farmers of Eastern Hungary make their appearance in the context of the Körös culture [right side of (B)], whereas the site of Ecsegfalva occurs in the much more recent context of the LBK Alföld culture [right side of (E), where the site of Flomborn is also shown].

According to the argument set forth by Haak *et al.*, the N1a type should have already disappeared among more recent farmers, ostensibly due to swamping by the indigenist Mesolithic population at the time of the Neolithic transition. Thus, their claim that the first farmers did not leave a lasting genetic mark is contradicted by their own data, namely the long-term persistence of the N1a type at Ecsegfalva. This chronologically mixed picture is not taken into account in their simulation study of genetic drift.

Haak *et al.* (1) report findings on mitochondrial DNA that are of interest, and such work needs to be encouraged. However, the argument they set forth with respect to the ancestry of modern Europeans rests on two working as-

sumptions: (i) that the occurrence of the N1a type among the first farmwomen of Central Europe has its source in the first farmwomen of southeastern Europe (who spread to Central Europe as part of the Neolithic transition) and (ii) that N1a is not present in the local Mesolithic (late hunter-gatherer) populations of Central Europe. Empirical studies have yet to be carried out in either case. More work remains to be done before definite conclusions can be drawn about European ancestry as a whole.

#### References

1. W. Haak *et al.*, *Science* **310**, 1016 (2005).
2. A. J. Ammerman, L. L. Cavalli-Sforza, *The Neolithic Transition and the Genetics of Human Populations in Europe* (Princeton Univ., Princeton, NJ, 1984).
3. L. L. Cavalli-Sforza, *The Widening Harvest*, A. J. Ammerman, P. Biagi, Eds. (Archaeological Institute of America, Boston, 2003), pp. 297–313.
4. R. Pinhasi, M. Pluciennik, *Curr. Anthropol.* **45** (suppl.), S59 (2004).
5. E. Bánffy, in *LBK Dialogues: Studies in the Formation of the Linear Pottery Culture*, A. Lukes, M. Zvelebil, Eds. (BAR S1304, Oxford, 2004), pp. 49–70.
6. E. Bánffy, *The 6th Millennium BC Boundary in Western Transdanubia and its Role in the Central European Transition (The Szentgyörgyvölgy-Pityerdomb Settlement)* (Varia Arch. Hung. 15, Budapest, 2004).
7. P. Biagi, S. Shennan, M. Spataro, *Rep. Prehist. Res. Proj.* **6-7**, 41 (2005).
8. A. Whittle, *Antiquity* **74**, 13 (2000).
9. T. D. Price *et al.*, *Antiquity* **75**, 593 (2001).

16 December 2005; accepted 30 May 2006  
10.1126/science.1123936