

# EARLY NILE VALLEY FARMERS FROM EL-BADARI Aboriginals or “European” Agro- Nostratic Immigrants? Craniometric Affinities Considered With Other Data

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Male Badarian crania were analyzed using the generalized distance of Mahalanobis in a comparative analysis with other African and European series from the Howells's database. The study was carried out to examine the affinities of the Badarians to evaluate, in preliminary fashion, a demic diffusion hypothesis that postulates that horticulture and the Afro-Asiatic language family were brought ultimately from southern Europe. (The assumption was made that the southern Europeans would be more similar to the central and northern Europeans than to any indigenous African populations.) The Badarians show a greater affinity to indigenous Africans while not being identical. This suggests that the Badarians were more affiliated with local and an indigenous African population than with Europeans. It is more likely that Near Eastern/southern European domesticated animals and plants were adopted by indigenous Nile Valley people without a major immigration of non-Africans. There was more of cultural transfer.

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**Generally, less emphasis is now placed** on substantial population migration or replacement as an explanation for culture change in

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prehistory. One notable exception to this development is to be found in theories addressing the spread of agriculture, especially in Europe (see demic diffusion in Ammerman & Cavalli-Sforza, 1984; Sokal, Oden, & Wilson, 1991). Similarly, it has also been suggested that migrants from southern Europe (Anatolia) spread farming, along with a Nostratic language branch (ancestral Afro-Asiatic), into the Nile Valley (Barbujani & Pilastro, 1993). This view can be called the agro-Nostratic hypothesis. *Nostratic* is the name given to any of several versions of a hypothetical genetic linguistic macrogrouping made up of several well-accepted language families (see Ruhlen, 1991). Extensive European or Near Eastern colonization of, or migration into, northwest Africa, the Nile Valley, and greater northeastern Africa in the late Pleistocene or early Holocene was once suggested by biological anthropologists (see, e.g., Coon, 1965; Seligman, 1930). It is implied in much genetic and nonspecialist work in which supra-Saharan Africa is somehow transported to Eurasia; such a perspective denies indigenous in situ evolution and culture to supra-Saharan and Saharan Africa. It, in effect, de-Africanizes a part of Africa due to outmoded non-evolutionary theories.

There are two reasons, both based on archaeological evidence, for considering mass migration as a factor in explaining the appearance of food production in the Nile Valley. First, the emergence of agriculture in the Nile Valley does occur nearly 2,000 years after its establishment in Europe and the Near East (Hassan, 1988). Second, the core domesticates found in the Nile Valley are the same as in Europe and the Near East: wheat, barley, ovacaprines, and cattle; these are not generally believed to have had the appropriate wild progenitors in Africa, with the exception of cattle as described in Wendorf, Close, and Schild (1987) and Wendorf and Schild (1994; but see Clutton-Brock, 1989, for a different view on cattle). The geographical pattern of early horticulture in the Nile Valley is consistent with this migration thesis. The oldest documented

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food production sites are in northern (lower) Egypt and date from 5,200 BCE to 4,600 BCE (Hassan, 1988; Kobusiewicz, 1992; Wetterstrom, 1993). Evidence for agriculture is next attested further south, in el-Badari, a district in northern upper Egypt (see Figure 1), and dates to approximately 4,400-4,000 BCE; the associated lithics, pottery, and other artifacts make up the Badarian, the first defined unit in the predynastic cultural sequence that shows continuity with dynastic Egypt (Arkell & Ucko, 1965; Hassan, 1988; Hoffman, 1988).

One approach, although limited, with which to explore the possibility of migration in earlier times, is through analysis of cranio-metric affinities. Previous studies have not specifically addressed the immigration of farmers from Europe into the Nile Valley. However, Brace et al. (1993) find that a series of upper Egyptian/Nubian epipalaeolithic crania affiliate by cluster analysis with groups they designate "sub-Saharan African" or just simply "African" (from which they incorrectly exclude the Maghreb, Sudan, and the Horn of Africa), whereas post-Badarian southern predynastic and a late dynastic northern series (called "E" or Gizeh) cluster together, and secondarily with Europeans. In the primary cluster with the Egyptian groups are also remains representing populations from the ancient Sudan and recent Somalia. Brace et al. (1993) seemingly interpret these results as indicating a population relationship from Scandinavia to the Horn of Africa, although the mechanism for this is not clearly stated; they also state that the Egyptians had no relationship with sub-Saharan Africans, a group that they nearly treat (incorrectly) as monolithic, although sometimes seemingly including Somalia, which directly undermines aspects of their claims. Sub-Saharan Africa does not define/delimit authentic Africanity.

The later dates, specific domesticates, and lack of local wild antecedents make a case for food production having been largely (but not wholly) derivative in the Nile Valley from the Near East; these observations, coupled with the interpretations found in some linguistic and human biological studies, allow for considering the possibility of large-scale migration into the Nile Valley in the immediate post-Epipalaeolithic period. Here, I present a narrowly focused study of early Badarian crania, designed to explore the

**TABLE 1**  
**Cranial Series Used**

| <i>Designation</i> | <i>Locale</i>   | <i>Number</i> |
|--------------------|-----------------|---------------|
| Berg               | Hungary         | 56            |
| Bushman            | Southern Africa | 41            |
| Dogon              | Mali            | 47            |
| Norse              | Norway          | 55            |
| Teita              | Kenya           | 33            |
| Zalavar            | Hungary         | 53            |
| Zulu               | South Africa    | 55            |
| Badarian           | Upper Egypt     | 25            |

question of Nostratic population replacement, or migration into the Nile Valley consonant with the time of the earliest agriculture attested in upper Egypt. European series are used as the Nostratic representatives, given Europe's proximity to Egypt. The results of the analyses are discussed with findings from archaeology and linguistics to assess the likelihood of the agro-Nostratic hypothesis for the Nile Valley.

#### MATERIALS AND METHOD

Eight series were used in this analysis, including three from Europe and four from tropical Africa (see Table 1). European and non-Nile Valley African groups are used as comparative material based on Brace et al.'s (1993) comments on the affinities of an upper Egyptian/Nubian epipalaeolithic series. Twenty-five male Badarian crania were culled from a larger series ( $n \sim 60$ ) housed at the Duckworth laboratory, Cambridge University. The sample size was optimized using reasonable estimation techniques as described in Howells (1973).

The subject was approached from an exploratory perspective, using different variable sets and techniques to examine the structure of the data. Analyses were carried out using 15 and 11 metric variables (see Table 2). Anatomically, the variables were chosen to represent the major embryological areas of the skull, in a balanced

**TABLE 2**  
**Variables**

| <i>15 Set</i>             | <i>11 Set</i> |
|---------------------------|---------------|
| Glabello-occipital length | same          |
| Basinasion length         | same          |
| Basibregma height         | —             |
| Maximum cranial breadth   | same          |
| Bizygomatic breadth       | same          |
| Biauricular breadth       | same          |
| Minimum cranial breadth   | —             |
| Basion-prosthion length   | same          |
| Upper facial height       | same          |
| Nasal height              | same          |
| Orbit height              | —             |
| Orbit breadth             | —             |
| Nasal breadth             | same          |
| Bimaxillary breadth       | same          |
| Cheek height              | same          |

fashion, and for their likely genetic basis (see Keita, 1988). The smaller set eliminates measurements that cross the major developmental regions of the cranium and/or that have less demonstrated heritability. The number of variables was selected to maximize biostatistical validity and conforms to findings that indicate that this is likely best achieved when the variable set is numerically smaller than the number of cases (individuals) in the smallest sample (see Corruccini, 1978; Sjøvold, 1975; Van Vark, 1976). Also, no ratios, proportions, or indices were used to be consistent with the best practice advocated by biostatisticians. The Mahalanobis distance technique only makes use of the unique contribution of each variable because it, in effect, eliminates correlations between variables, unlike Penrose or Euclidean distances.

Mahalanobis distances were calculated using the SAS statistical package (SAS Institute, 1992). The resulting matrices were manipulated to explore the place of the Badarian series in relationship to the others. This was carried out in two ways. A sequential display, called a distance hierarchy (Keita, 1983), was constructed by placing, in order of progressive dissimilarity, all other series from each one of the groups. This summation device facilitates the assess-

ment of samples' relative similarities to each other and provides one view of the overall structure of the taxonomic matrix. It facilitates seeing the most similar pairs of series. Cluster analyses were also performed using algorithms for the unweighted pair group method using arithmetic means (UPGMA) and neighbor joining (NJ) methods (Kumar, Tamura, Jacobsen, & Masatoshi, 2001). Both approaches are used because different clustering techniques are notorious for yielding different results using the same data. An exploration using multiple approaches is more likely to lead to useful conclusions and the generation of new hypotheses.

## RESULTS

The Mahalanobis distances between all of the series were unlikely to be due to chance at the 5% level, with nearly all having even lower probability values (usually  $p < .001$ ). An examination of the distance hierarchies reveals the Badarian series to be more similar to the Teita in both analyses and always more similar to all of the African series than to the Norse and Berg groups (see Tables 3A & 3B and Figure 2). Essentially equal similarity is found with the Zalavar and Dogon series in the 11-variable analysis and with these and the Bushman in the one using 15 variables.

The Badarian series clusters with the tropical African groups no matter which algorithm is employed (see Figures 3 and 4). The clustering with the Bushman can be understood as an artifact of grouping algorithms; it is well known that a series may group into a cluster that does not contain the series to which it is most similar (has the lowest distance value). An additional 20 dendrograms were generated using the minimum evolution algorithm provided by MEGA (not shown). In none of them did the Badarian sample affiliate with the European series. In additional analyses, the Bushman series was left out; the results were the same (not shown).

It is interesting that the distance hierarchies and cluster analyses show the European series to always be closer to each other than any is to any one of the African series and to have generally lower distance values between themselves than did the African groups. Also,



FIGURE 1 Map of Badari

TABLE 3A  
D<sup>2</sup> Matrix: 11 Variables

| From POP | Berg     | Bushman  | Dogon    | Norse    | Taita    | Zalavar  | Zulu    | Badarian |
|----------|----------|----------|----------|----------|----------|----------|---------|----------|
| Berg     | 0        |          |          |          |          |          |         |          |
| Bushman  | 23.59377 | 0        |          |          |          |          |         |          |
| Dogon    | 19.48910 | 8.17140  | 0        |          |          |          |         |          |
| Norse    | 5.15374  | 18.18366 | 18.21260 | 0        |          |          |         |          |
| Taita    | 23.52637 | 11.20639 | 8.65231  | 13.49573 | 0        |          |         |          |
| Zalavar  | 3.99291  | 15.33975 | 13.78928 | 0.90011  | 10.78592 | 0        |         |          |
| Zulu     | 23.24636 | 10.64561 | 3.94152  | 15.41540 | 3.78664  | 12.26495 | 0       |          |
| Badarian | 21.69216 | 6.13146  | 9.88218  | 13.27768 | 6.00010  | 9.68540  | 7.60615 | 0        |

TABLE 3B  
D<sup>2</sup> Matrix: 15 Variables

| From POP | Berg     | Bushman  | Dogon    | Norse    | Taita    | Zalavar  | Zulu     | Badarian |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Berg     | 0        |          |          |          |          |          |          |          |
| Bushman  | 36.74497 | 0        |          |          |          |          |          |          |
| Dogon    | 38.28162 | 19.26284 | 0        |          |          |          |          |          |
| Norse    | 10.78136 | 29.98679 | 33.56878 | 0        |          |          |          |          |
| Taita    | 34.78863 | 17.64547 | 12.55126 | 18.67868 | 0        |          |          |          |
| Zalavar  | 9.37956  | 28.01987 | 28.56992 | 5.13509  | 19.00213 | 0        |          |          |
| Zulu     | 44.92925 | 21.57363 | 8.90087  | 31.64631 | 9.43921  | 23.68180 | 0        |          |
| Badarian | 28.72911 | 12.51195 | 12.85704 | 18.79617 | 8.33989  | 13.19330 | 10.47652 | 0        |

## 11 Variables

Badarian: Teita, Bushman<Zulu<Zalavar, Dogon<Norse<Berg  
 Berg: Zalavar<Norse<Dogon<Badarian<Zulu, Teita, Bushman  
 Bushman: Badarian<Dogon<Zulu<Teita<Zalavar<Norse<Berg  
 Dogon: Zulu<Bushman, Teita<Badarian<Zalavar<Norse<Berg  
 Norse: Zalavar<Berg<Badarian, Teita<Zulu<Bushman, Dogon  
 Teita: Zulu<Badarian<Dogon<Zalavar<Bushman<Norse<Berg  
 Zalavar: Norse<Berg<Badarian<Teita<Zulu<Dogon<Bushman  
 Zulu: Teita, Dogon<Badarian<Bushman<Zalavar<Norse<Berg

## 15 Variables

Badarian: Teita<Zulu<Zalavar, Dogon, Bushman<Norse<Berg  
 Berg: Zalavar<Norse<Dogon<Bushman, Badarian<Zulu<Teita  
 Bushman: Badarian<Dogon<Zulu<Teita<Zalavar<Norse<Berg  
 Dogon: Zulu<Teita<Badarian<Bushman<Zalavar<Norse<Berg  
 Norse: Zalavar<Berg<Teita<Badarian<Zulu<Bushman<Dogon  
 Teita: Zulu<Badarian<Dogon<Norse, Zalavar<Bushman<Berg  
 Zalavar: Norse<Berg<Badarian<Zulu<Teita<Dogon<Bushman  
 Zulu: Dogon<Teita<Badarian<Zalavar<Bushman<Norse<Berg

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**FIGURE 2** Distance Hierarchies

the individual European series are not consistently found to be more similar to one particular African series or similar in the same order.

## DISCUSSION

The results are not supportive of European agriculturalists colonizing el-Badari in the early- to mid-Holocene. The Badarian series evinces greater phenetic affinity with the tropical African comparative groups and, notably, the east African Teita. This affinity is relative and not to be taken as indicating identity. This finding can only be interpreted as showing a particular broad similarity in the morphometric space circumscribed by the particular groups used. The Badarians were a local Saharo-Nile Valley population, based on archaeological and other data (see below). Phenetic affinity assessed in the exploration of historical questions is best placed

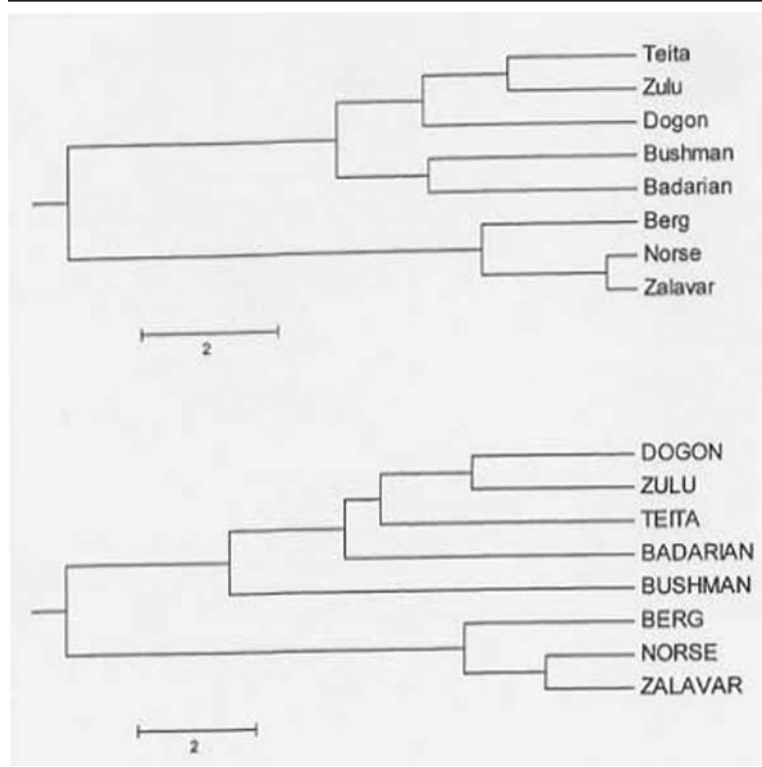


FIGURE 3 UPGMA Dendrograms: 11 and 15 Variables

in context with other information that in toto indicates the likely probabilities of a bonafide historical connection (see Dutta, 1984; Harrison, 1984; Rouse, 1986). Chance resemblance, parallelism, and microconvergence may also be possible explanations for biological similarity.

In other analyses, these early crania from el-Badari have shown a greater resemblance to southern Nile Valley series and some from tropical Africa (including the Horn) than to northern dynastic Egyptians (see, e.g., Keita, 1983, 1993; Mukherjee, Rao, & Trevor, 1955). However, these studies were not designed to examine the question of European (as Nostratic representatives) migration as the source of early Nile Valley farmers. At another level, the morphometric patterns of Egyptian crania in general, although highly vari-

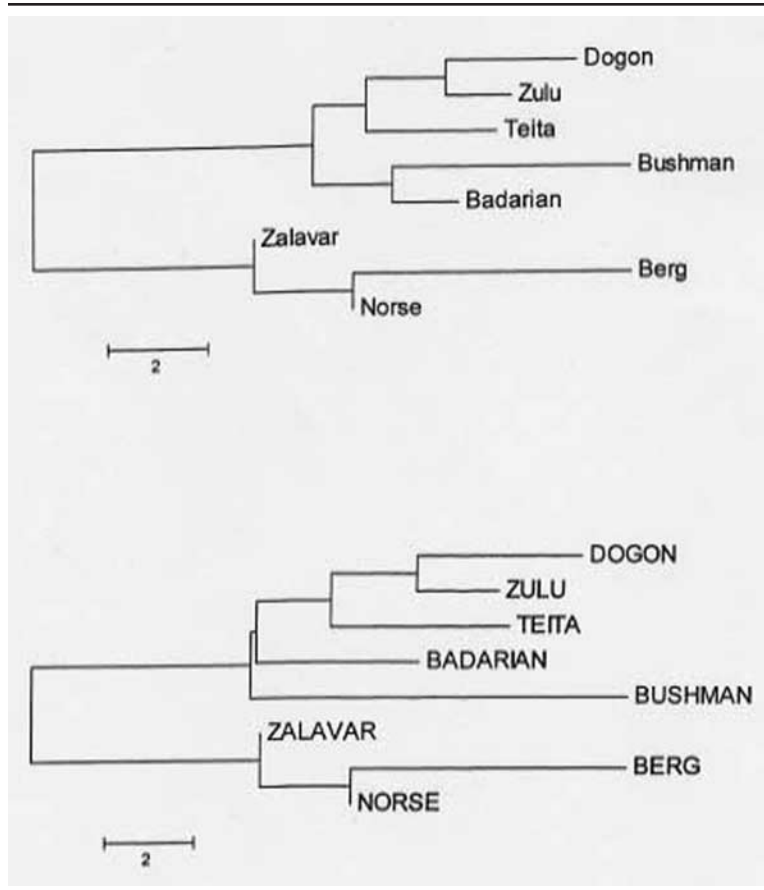


FIGURE 4 Neighbor Joining Dendrograms: 11 and 15 Variables

able, exhibit a position intermediate to stereotypical tropical Africans and Europeans in multivariate analyses (see review in Keita, 1993). In one study by Howells (1973), the previously mentioned late dynastic northern Gizeh series, which dates to and after the period of historically known incursions from Europe, clusters with either Africans or Europeans (the same series used here) depending on method. The matrix of Mahalanobis distances (organized into a distance hierarchy) indicates that this series (Gizeh) in Howells's study was not exclusively more similar to various European or African series for the traits used. A careful consideration of these

results leads one to consider the issue of variation in Africa, beyond stereotypical raciotypological models and geographical typological thinking (see Hiernaux, 1975; Keita, 1993; Keita & Kittles, 1997; Kittles & Keita, 1999).

Simulation studies can also help in assessing the likely probability of ongoing significant migration into the region. Harrison (1984) reports on a model positing a linear array of 20 populations and for which only sequential migration is allowed; he finds that it would take a neutral gene 500 generations (~ 10,000 years) at a migration rate of 50% (per generation) to reach equilibrium in the populations, thereby rendering them similar. In this simulation, movement was modeled as bidirectional in all but the terminal groups. If polygenic craniometric traits are considered and treated as neutral (or "trivially adaptive") at more realistic rates, with only unidirectional movement, it would take considerably longer to achieve equilibrium, unless there was direct migration to the terminal locale under consideration. Ten thousand years does not separate the epipalaeolithic from the Badarian, or the latter from the subsequent periods in the Nile Valley (and there is no evidence for direct migration). Also, there would be more than 20 local populations to be considered. Harrison's (1984) simulation results indirectly support the findings here and also the view that Nile Valley craniofacial variation, along with that of Sudan and the Horn of Africa, likely owes more to indigenous microevolution. Brace et al's (1993) findings of a relative northeast African quadrant-European craniometric similarity more likely reflect various processes and biohistories more ancient than wholesale Holocene migration from Europe/Anatolia via a Nostratic-speaking group. This comment would also apply to the broad similarity in molecular genetics of a subset of Nostratic-speaking populations observed by Barbujani and Pilastro (1993). The dendrograms of Brace et al. (1993) would seem to illustrate in the main a facet of indigenous African diversity observed elsewhere: a subset of African series evincing similarity to non-African groups not primarily due to gene flow, analogous to individual Africans (even with the socially constructed stereotypical African morphophenotype) being found throughout mtDNA of trees of world samples, in some analyses. A

synthesis of molecular, palaeontological, and ecological evidence indicates that indigenous continent-wide African biogeographical variation should be tremendous (Keita & Kittles, 1997; Kittles & Keita, 1999).

Nonbiological data can profitably be included in this discussion, although biology, language family, and culture are not intrinsically linked or causally related. Information from each category can provide evidence for population movement and contact in selected circumstances—collectively, if broadly congruent data from multiple disciplines can more convincingly make a case for migration (Rouse, 1986). The time framework for postulated movement, however, will clearly influence how these different sources of evidence are to be used and the level of specificity. Given the agro-Nostratic hypothesis, it is of interest to review the results of linguistic studies.

Although it is known that languages can be spread by relatively small groups and that communities will sometimes change languages easily (Nichols, 1997), language family distributions that date to before expansionist states, empires, or ideologies likely reflect more than trivial population movement in relationship to population density. Recent studies in historical linguistics do not support an agro-Nostratic hypothesis that postulates Afro-Asiatic-speaking farmers coming into the Nile Valley from Europe. There are several reasons. The date of ancestral Afro-Asiatic is likely to be as much as 15,000 BP and possibly more (Ehret, 1979, 1984, personal communication; Fleming, 1974, personal communication). Conservative estimates place the date at 12,000 BP. There is no archaeological evidence for agriculture in Africa, Europe, or Asia consonant with these dates. More important, reconstruction of ancestral Afro-Asiatic (irrespective of its date) using all of the family's members does not reveal terms for plant or animal domestication (Ehret, 1979, 1984, 1995, personal communication). In other words, speakers of Common or proto-Afro-Asiatic cannot be shown to have been food producers but were apparently intensive users of wild grasses. The dates and reconstructions fit with the archaeological findings of intensive plant use in the upper Nile Valley (see Wetterstrom, 1993).

The evidence is also consistent with Africa being Afro-Asiatic's place of historical differentiation and source of spread (see Bender, 1975; Blench, 1993; Diakonoff, 1981; Ehret, 1984; Greenberg, 1966, 1973; Ruhlen, 1991). The location of ancestral Afro-Asiatic was likely in the northeast quadrant of Africa, in or near the Horn, but also possibly the Sahara, based on the principles of greatest diversity and least moves (cf. Bender, 1975; Ehret, 1984; Nichols, 1997). Five of the six branches of this family are only found in Africa (Omotic, ancient Egyptian, Chadic, Cushitic, and Berber). Semitic alone is found in Asia (Diakonoff, 1981; Greenberg, 1973). Omotic, found only in Ethiopia, has characteristics likely to be relatively similar to those in ancestral Afro-Asiatic. At a time before postulated movement into Africa (of a Nostratic branch), there is evidence for substantial movement out of Africa, specifically the northern Nile Valley, into the Levant (Bar-Yosef, 1987). (This archaeological "signal" may connote the movement of preproto-Semitic speakers into the Near East; however, caution is in order when looking for such correspondences.)

Culture history based on linguistics is also not consistent with simple migration and colonization, given the later dates for agriculture in the Nile Valley. It is substantively significant that the words for the foreign major domesticates in Old Egyptian are not loans from Indo-European (or even Semitic or Sumerian; Baines, personal communication). Even in early Semitic-speaking Mesopotamian cultures (for which we have written records), some of the words for important domesticates were apparently Sumerian loans (Diakonoff, 1981).

The agro-Nostratic hypothesis is also undermined taxonomically in linguistic terms. The evidence better supports Afro-Asiatic being a sister, not daughter, of Nostratic (Ruhlen, 1991). Dates given for common Nostratic are the same or younger than those assigned to common Afro-Asiatic, making the sibling relationship more plausible if any of these chronologies are valid (cf. Barbujani & Pilastro, 1993; Blench, 1993; Ehret, 1984). Another issue beyond the scope of this article is the question of the basic validity of the Nostratic construct, which has not won wide acceptance among historical linguists, due to the problems inherent in linguistic re-

constructions of such implied time depths (see Nichols, 1997; Ruhlen, 1991).

The archaeology of neolithic and predynastic Egypt does not support mass migration from outside of Africa. The earliest evidence for farming in the Nile Valley indicates that local people incorporated Near Eastern domesticates into an indigenous foraging subsistence strategy (Wetterstrom, 1993) that, over time, developed into more reliance on farming. This is not consistent with a Neolithic revolution that would have occurred if there had been mass settlement by farmers! Settlement patterns and artifacts do not suggest the wholesale settler colonization of the Nile Valley by a community of alien origin. In northern Egypt, the earliest sites evincing food production at Fayum and Merimde show some Near Eastern, but not European, influence during the earlier part of the neolithic; chronologically later neolithic artifacts from the same sites indicate a strong regional African (Saharan/Western Desert) influence (Kobusiewicz, 1992). The Badarian, in upper Egypt, is culturally interpretable primarily as a synthesis of indigenous Saharan and Nilotic traditions that incorporated some Near Eastern domesticates perhaps adopted from northern Egypt (Hassan, 1988; Hoffman, 1979) and apparently did not have a single simple antecedent (Holmes, 1989).

Additional analyses using 22 variables and including additional material from Sudan, late dynastic northern Egypt (Gizeh), Somalia, Asia, and the Pacific islands, show the Badarian series to be most similar to a series from the northeast quadrant of Africa and then to other Africans.

In summary, and viewed holistically, the evidence gleaned from linguistic, archaeological, and biological research does not support the migration of Nostratic farmers from Europe to explain either the emergence of agriculture in the Nile Valley, at least in upper Egypt, or the presence of the Afro-Asiatic language family in the Nile Valley and greater Africa. The evidence indicates early Egypt to foundationally belong to a northeast African biocultural descendant community. Future work will help further clarify issues relevant to the exploration of this subject. These issues include the range of indigenous human variation in the early and mid-

Holocene Nile Valley and surrounding regions, the archaeological correlates of migration, the emergence and development of Afro-Asiatic in the Nile Valley, and the issue of linguistic taxonomy and language contact, given that not all of the language families are as well attested.

### REFERENCES

- Ammerman, A. J., & Cavalli-Sforza, L. L. (1984). *The Neolithic transition and the genetics of populations in Europe*. Princeton, NJ: Princeton University Press.
- Arkell, A. J., & Ucko, P. (1965). Review of predynastic development in the Nile Valley. *Current Anthropology*, 6, 145-166.
- Barbujani, G., & Pilastro, A. (1993). Genetic evidence on the origin and dispersal of human populations speaking languages of the Nostratic macrofamily. *Proceedings of the National Academy of Science*, 90, 4670-4673.
- Bar-Yosef, O. (1987). Pleistocene connexions between Africa and southwest Asia. *African Archaeological Review*, 5, 29-30.
- Bender, M. L. (1975). *Omotic: A new Afro-Asiatic language family*. Carbondale: University Museum, Southern Illinois University.
- Blench, R. (1993). Recent developments in African language classification and their implications for prehistory. In T. Shaw, P. Sinclair, B. Andah, & A. Okpoko (Eds.), *The archaeology of Africa* (pp. 126-138). London: Routledge.
- Brace, C. L., Tracer, D., Yaroch, L. A., Robb, J., Brandt, K., & Nelson, A. R. (1993). Clines and clusters versus "race": A test in ancient Egypt and the case of a death on the Nile. *Yearbook of Physical Anthropology*, 36, 1-36.
- Clutton-Brock, J. (1989). Cattle in ancient North Africa. In J. Clutton-Brock (Ed.), *The walking larder: Patterns of domestication, pastoralism and predation* (pp. 200-206). London: Unwin Hyman.
- Coon, C. (1965). *The living races of man*. New York: Knopf.
- Corruccini, R. (1978). Morphometric analysis: Uses and abuses. *Yearbook of Physical Anthropology*, 21, 134-150.
- Diakonoff, I. M. (1981). Earliest Semites in Asia. *Altorientalische Forschungen*, 8, 23-74.
- Dutta, P. C. (1984). Biological anthropology of Bronze Age Harappans: New perspectives. In J. R. Lukacs (Ed.), *The people of South Asia* (pp. 59-76). New York: Plenum.
- Ehret, C. (1979). On the antiquity of agriculture in Ethiopia. *Journal of African History*, 20, 161-177.
- Ehret, C. (1984). Historical/linguistic evidence for early African food production. In J. D. Clark & S. Brandt (Eds.), *From hunters to farmers* (pp. 26-36). Berkeley: University of California Press.
- Ehret, C. (1995). *Reconstructing proto-Afroasiatic (proto-Afrasian): Vowels, tone, consonants, and vocabulary*. Berkeley: University of California Press.
- Fleming, H. (1974). Omotic as an Afroasiatic family. *Studies in African Linguistics*, 5(Suppl.), 81-94.

- Greenberg, J. (1966). *The languages of Africa*. Bloomington: Indiana University Press.
- Greenberg, J. H. (1973). African languages. In E. P. Skinner (Ed.), *Peoples and cultures of Africa* (pp. 34-58). Garden City, NY: Doubleday Natural History Press.
- Harrison, G. A. (1984). Migration and population affinities. In A. J. Boyce (Ed.), *Migration and mobility: Society for the Study of Human Biology Symposium 23* (pp. 57-67). Oxford, UK: Oxford University Press.
- Hassan, F. (1988). The predynastic of Egypt. *Journal of World Prehistory*, 2, 135-185.
- Hiernaux, J. (1975). *The people of Africa*. New York: Scribner.
- Hoffman, M. (1979). *Egypt before the pharaohs*. New York: Knopf.
- Hoffman, M. (1988). Prelude to civilization: The predynastic period in Egypt. In F. Willoughby & K. Stanton (Eds.), *The first Egyptians* (pp. 33-46). Columbia: University of South Carolina, McKissick Museum.
- Holmes, D. (1989). *The predynastic lithic industries of upper Egypt* (Cambridge Monographs in Archaeology 33. BAR International Series 469 [I]). Oxford, UK: Archaeological Research Institute.
- Howells, W. W. (1973). *Cranial variation in man*. Cambridge, MA: Harvard University Press.
- Keita, S.O.Y. (1983). *A craniometric study of some ancient northern African populations*. MSc thesis, University of Oxford.
- Keita, S.O.Y. (1988). An analysis of crania from Tell-Duweir using multiple discriminant functions. *American Journal Physical Anthropology*, 75, 375-390.
- Keita, S.O.Y. (1993). Studies and comments on Ancient Egyptian biological relationships. *History in Africa*, 20, 129-154.
- Keita, S.O.Y., & Kittles, R. (1997). The persistence of racial thinking and the myth of racial divergence. *American Anthropologist*, 99, 534-544.
- Kittles, R., & Keita, S.O.Y. (1999). Interpreting African genetic diversity. *African Archaeological Review*, 16, 87-91.
- Kobusiewicz, M. (1992). Neolithic and predynastic development in the Nile Valley. In F. Kees & R. Kuper (Eds.), *New light on the northeast African past* (pp. 25-32). Cologne, Germany: Heinrich Barth Institut.
- Kumar, S., Tamura, K., Jacobsen, I., & Masatoshi, N. (2001). *MEGA2: Molecular evolutionary genetics software*. Tempe: Arizona State University.
- Mukherjee, R., Rao, C., & Trevor, J. (1955). *The ancient inhabitants of Jebel Moya (Sudan)*. Cambridge, UK: Cambridge University Press.
- Nichols, J. (1997). Modeling ancient population structures and movement in linguistics. *Annual Review of Anthropology*, 26, 359-384.
- Rouse, I. (1986). *Migrations in prehistory*. New Haven, CT: Yale University Press.
- Ruhlen, M. (1991). *A guide to the world's languages. Volume 1. Classification*. Stanford, CA: Stanford University Press.
- SAS Institute. (1992). *SAS/STAT user's guide. Volume 1*. Cary, NC: Author.
- Seligman, C. G. (1930). *The races of Africa*. London: Oxford University Press.
- Sjovold, T. (1975). Some notes on the distribution and certain modifications of Mahalanobis generalized distance ( $D^2$ ). *Journal of Human Evolution*, 4, 549-558.
- Sokal, R., Oden, N., & Wilson, C. (1991). Genetic evidence for the spread of agriculture in Europe by demic diffusion. *Nature*, 351, 143-145.
- Van Vark, G. N. (1976). A critical evaluation of the application of multivariate statistical methods to the study of human populations from their skeletal remains. *Homo*, 27, 94-114.

- Wendorf, F., Close, A. E., & Schild, R. (1987). Early domestic cattle in the eastern Sahara. In J. A. Coetzee (Ed.), *Palaeoecology of Africa and the surrounding islands* (pp. 441-448). Rotterdam, the Netherlands: Balkema.
- Wendorf, F., & Schild, R. (1994). Are the early Holocene cattle in the eastern Sahara domestic or wild? *Journal Anthropological Archaeology*, 3(4), 118-128.
- Wetterstrom, W. (1993). Foraging and farming in Egypt, the transition from hunting and gathering to horticulture in the Nile Valley. In T. Shaw, P. Sinclair, B. Andah, & A. Okpoko (Eds.), *The archaeology of Africa* (pp. 165-226). New York: Routledge.

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