

World Linguistic Diversity

The ancestor of each language was taken to its current territory by pioneers, farmers, traders or a conquering elite. Multidisciplinary studies are clarifying their respective roles

by Colin Renfrew

The Greek historian Herodotus reports that Psamitik, a seventh-century pharaoh of Egypt, arranged that two newborn babies should be reared in isolation until their first words together could be heard. Their first recorded utterance was *bekos*. This the pharaoh's scribes discovered to be the word for bread in Phrygian, a language of Anatolia. They concluded that Phrygian was the original language of the earth. Unfortunately, this fanciful experiment seems to have set the standard for later inquiries. By the 19th century speculation on the origin of language had become so vacuous that the Société de Linguistique de Paris banned the subject from its discussions.

Today, at last, advances in archaeology, genetics and linguistics itself are opening a way to a plausible account of the diversity of the world's languages. Many aspects of the problem are still highly controversial, and any attempt at a synthesis can be merely tentative, but the broad features of the process by which languages evolve have begun to be discernible.

History provides a secure foundation for the creation of a reasonable hypothesis. For more than 200 years, linguists have recognized that some languages have such similarities in vocabulary, grammar, the formation of words and the use of sounds that they must stem from a common ancestor. These ancestral alliances they termed language families. The most famous early classifica-

tion of this kind was undertaken in 1786 by Sir William Jones, a British judge at the High Court in Calcutta, who observed relationships between Sanskrit, Greek, Latin, Gothic and Persian. Common words and grammatical features suggested to Jones that the languages had "sprung from some common source." This family is now known as Indo-European.

Subsequent generations have refined and elaborated the analytical methods that Jones employed. At present, the discipline of historical linguistics to which Indo-European research has given rise systematically compares the languages that belong to a family. The comparison enables workers to reconstruct a hypothetical ancestor tongue, called a protolanguage.

This problem of inferring patterns of descent from data observed in the present is also found in evolutionary biology. Biologists have traditionally attempted to reconstruct the genetic relationships among species by studying anatomic and physiological evidence. In recent decades the search has extended to the molecular level. There investigators decipher the line of descent of specific nucleotide sequences in DNA. In each case, the systematic study produces a classification, or taxonomy, entirely based on information currently observable. Such classification is phenetic, or based on overall appearances.

Often the relative similarity of taxonomic units can be diagrammed in the form of a tree. Since Charles Darwin, most workers in historical disciplines, including historical linguistics and paleontology, have tended to equate such a tree with the evolutionary process that led to the current situation. In other words, they have equated the phenetic tree with the phylogenetic tree.

This conflation rests on the strength of several central assumptions. The most important of them is that evolutionary change occurs at a steady, constant rate. As time passes, forms that

had become separated steadily diverge from one another, and innovations in vocabulary arise.

The assumption of a relatively steady rate of change is crucial because differential change obscures the branching pattern. Imagine, for instance, that Danish split off from English and German before those two languages themselves diverged. The true phylogeny would then place English and German on one branch and Danish on another. If German and Danish, however, have altered little, whereas English has changed a lot, a linguist without other points of comparison might mistakenly place German and Danish together, apart from English.

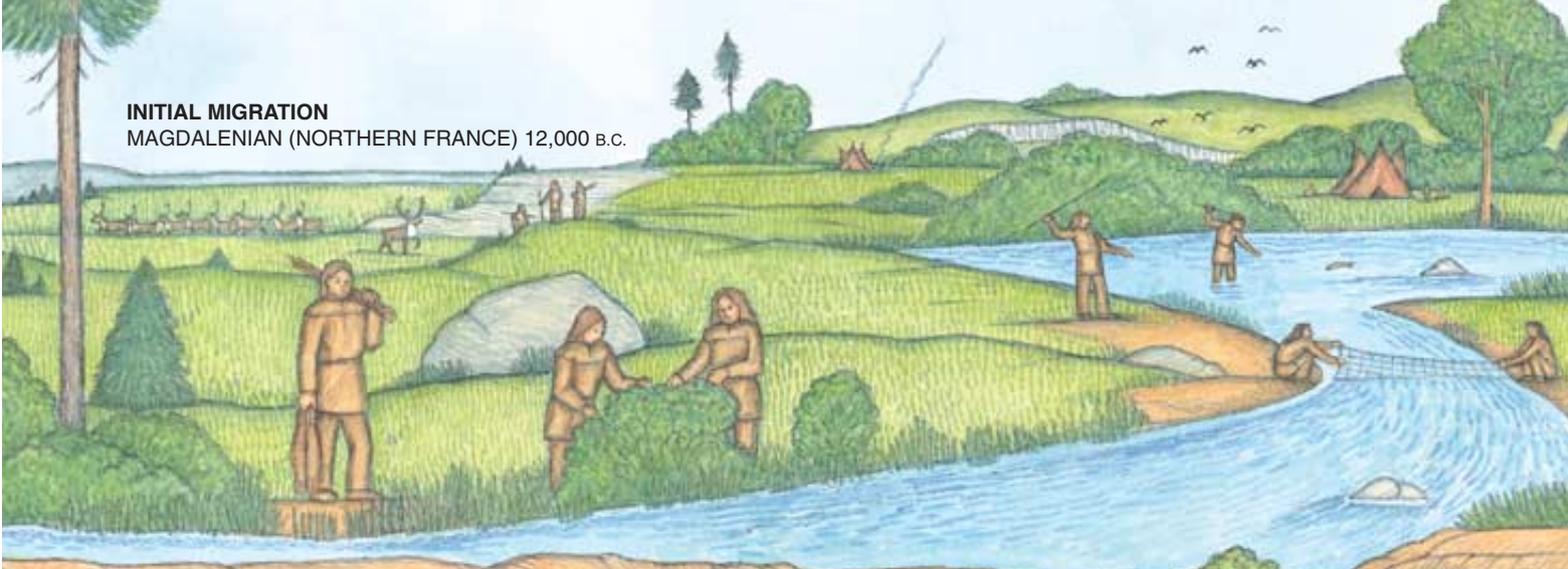
Another assumption is that shared descent, not independent factors that force convergence, accounts for the similarities. In the linguistic context, convergence occurs when contemporaneous languages influence one another through the borrowing of words, phrases and grammatical forms. The almost universal use of the American idiom "O.K." in northern Europe is an example of convergence. Because borrowing rarely affects the most basic elements of a language, workers can usually recognize it. The problem in doing so consists in establishing standards of proof.

Within the discipline of linguistics, enthusiasm for a universal view of the evolution of language is far from unanimous. For many years, it has been possible to recognize two opposing schools of thought among scholars in the field: the "splitters" and the "lumpers." The splitters tend to emphasize the differences that make languages seem unrelated and to split the classification into small, independent units. In their efforts to rule out spurious relationships, split-

LANGUAGES WERE SPREAD by four processes (from top to bottom): initial migrations, demographic expansions of farmers, late incursions into the subarctic, and wide-ranging conquest.

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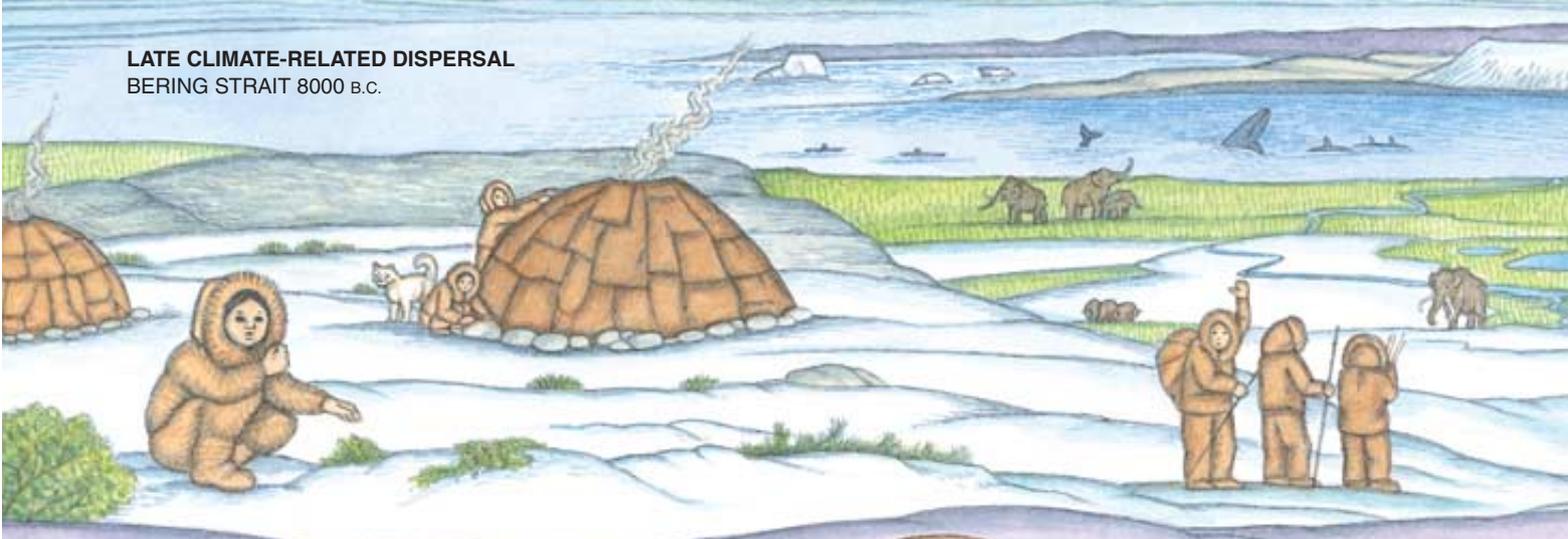
INITIAL MIGRATION
MAGDALENIAN (NORTHERN FRANCE) 12,000 B.C.



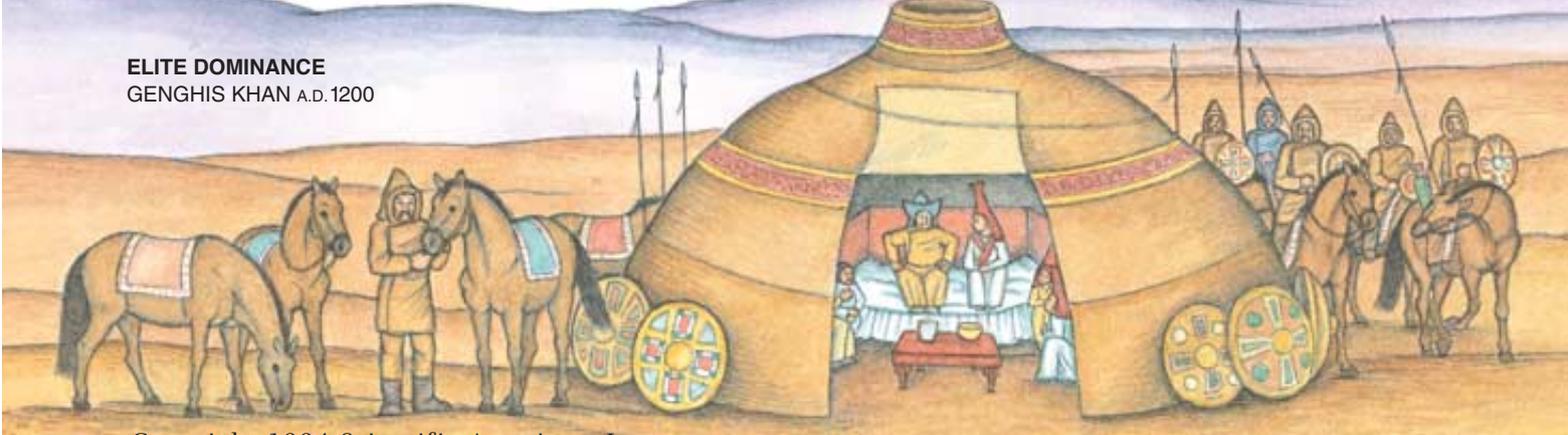
FARMING DISPERSAL
LEVANT 7500 B.C.



LATE CLIMATE-RELATED DISPERSAL
BERING STRAIT 8000 B.C.



ELITE DOMINANCE
GENGHIS KHAN A.D. 1200



ters demand that no group of languages be classed as a family until a series of similarities and affinities has been shown to exist between them. They insist also that these correspondences be used to reconstruct the protolanguage from which the putative family derives. Lumpers, on the other hand, accept criteria that would allow them to lump many languages together into a few families. Although some lumpers also reconstruct protolanguages, others regard this step as superfluous.

Various language families have nonetheless won wide acceptance, among them the Indo-European family; the Afro-Asiatic family (formerly called Hamito-Semitic), which comprises the Semitic languages and most of the languages of North Africa; and the Uralic family, which includes Finnish and Hungarian. The legitimacy of other groupings, however, is far less clear.

In 1963 the American linguist Joseph H. Greenberg of Stanford University took a significant step toward a unified view by classifying the languages of Africa into just four dominant macrofamilies: the Afro-Asiatic, the Khoisan, the Niger-Kordofanian and the Nilo-Saharan. In fact, he did not undertake the historical reconstruction by means of the comparative method, which many linguists would prefer; instead he operated by a system of multilateral analysis. This method simultaneously examines a number of words in many languages rather than comparing words in just a pair of languages.

Despite the reservations of the splitters, Greenberg's classification for Africa has been followed by many scholars. More recently, he has applied the same procedure to the languages of the Americas, identifying three important families or macrofamilies [see "Linguistic Origins of Native Americans," by Joseph H. Greenberg and Merritt Ruhlen; *SCIENTIFIC AMERICAN*, November 1992]. Two of them, the Eskimo-Aleut and the Na-Dene, have found broad support, although his residual category, "Amerind," which incorporates most of the native languages of the Americas into a single macrofamily, has been widely criticized in what has at times been a sharp, even excoriating, debate.

As an archaeologist, I prefer initially to withhold judgment regarding the validity of these macrofamilies, as well as a number of others that the independent linguist Merritt Ruhlen, an undoubted lumper, has advocated. Instead I simply place quotation marks around the controversial ones [see map on opposite page], leaving the question of their nature open while attempting to

solve a more concrete puzzle: How did this distribution come about?

In recent years, suggestions of an answer have come from two archaeological advances, one bearing on the evolution of our species, the other on the evolution of our culture.

The early hominids are now much better understood than they were 20 years ago. No one doubts that it was in Africa, some four or five million years ago, that *Australopithecus* emerged. In Africa, too, some 1.6 million years ago, there developed the ancestor of us all, *Homo erectus*, who dispersed to Asia and Europe and whose fossils and artifacts have been found on both continents. Our own species, *H. sapiens*, certainly split off from *H. erectus* and reached its present form—*H. sapiens sapiens*—more than 100,000 years ago.

Most archaeologists now agree that this process of emergence took place exclusively in Africa. An alternative theory holds that the process of transition from *H. erectus* to *H. sapiens* was not restricted to Africa; rather it took place over a greater area, including Asia and perhaps Europe. But the genetic evidence favors at present the "out of Africa" theory. Following this concept, then, we can envisage the emergence of *H. sapiens sapiens* in Africa about 100,000 years ago and the gradual dispersal of our species through the Old World. By 40,000 years ago modern people had colonized the Levant, southern Asia, Europe, central and eastern Asia, New Guinea and Australia. By perhaps as early as 37,000 years ago—and no later than 16,000 years ago—Asian pioneers had crossed the Bering Strait, beginning the settlement of the New World. We must assume that all these people were speaking a language or languages, even if we may have no clear idea what these languages were like.

The second recent archaeological development of relevance is the emphasis on the mechanisms of cultural change. In particular, archaeologists are no longer willing to explain every alteration in early human culture as the result of some ill-defined migration. They have abandoned the simplistic equation between a language, a culture and a "people." If a migration is to be used as an explanation for a change in decorative art, the appearance of a new religious system or the emergence of a new language, there must be some evidence for the relationship and some understanding of the economic and social processes that gave rise to it.

Four principal processes exist by which a language can come to be spoken in a given territory: initial coloniza-

How Languages Spread

INITIAL MIGRATION

Early humans appear to have spread from Africa to much of the rest of the world beginning about 100,000 years ago. Surviving linguistic traces of this migration include Basque, Caucasian, Khoisan, Australian, "Indo-Pacific" and "Amerind."

FARMING DISPERSAL

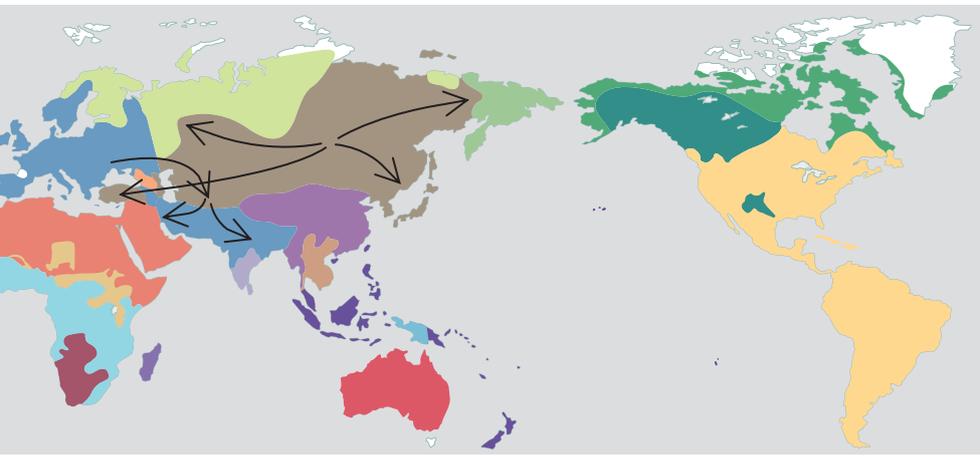
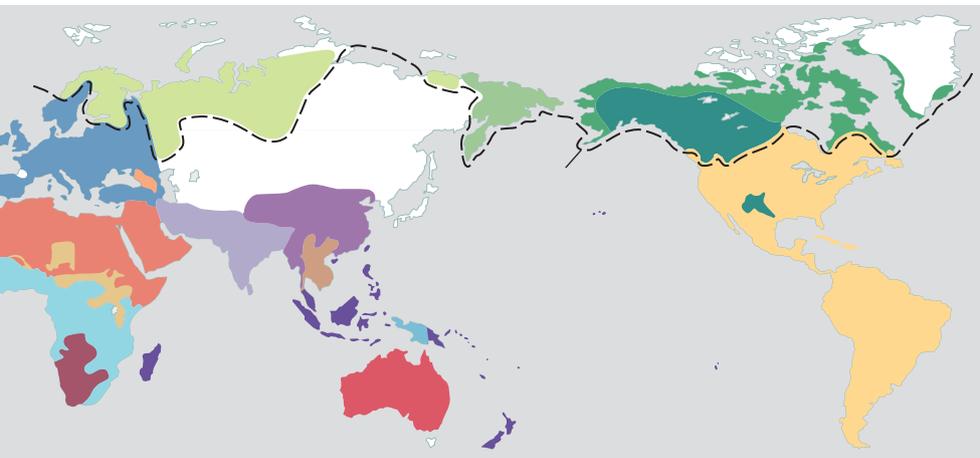
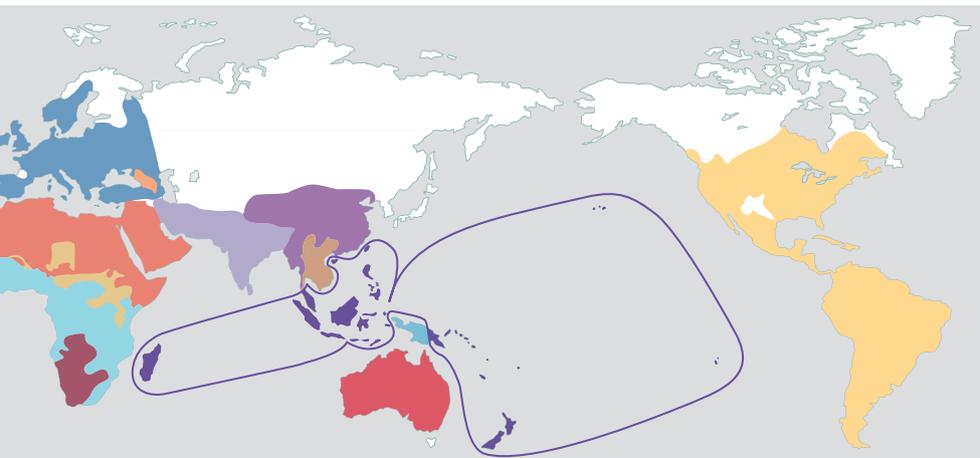
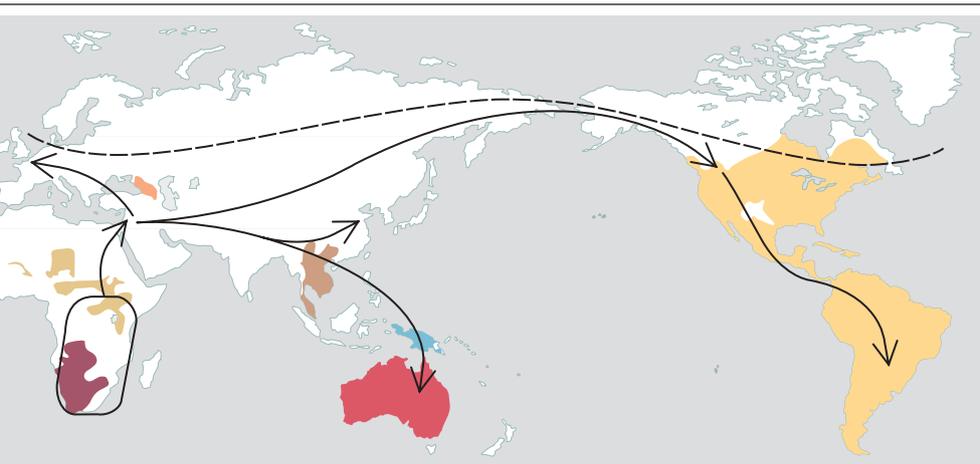
The invention of farming in several places caused populations there to expand. The original farmers' languages therefore spread and differentiated to form such major families as Indo-European, Sino-Tibetan, Austronesian and Afro-Asiatic.

LATE CLIMATE-RELATED DISPERSAL

Global warming several thousand years ago opened regions north of the 54th parallel to pioneers whose languages developed into the families known as Uralic-Yukaghir, Chukchi-Kamchatkan, Eskimo-Aleut and Na-Dene.

ELITE DOMINANCE

The development of complex societies enabled incoming minorities to conquer other populations and to impose their languages on them. The Altaic family spread in this fashion, as did individual members of such previously existing families as Indo-European and Sino-Tibetan.



tion of an unoccupied region; divergence (as discussed earlier); convergence (also discussed earlier); and language replacement, whereby one language is replaced by another incoming language.

If replacement had never occurred, divergence would represent the primary cause of change, and the linguistic map of the world might take the form of a mosaic of small language units. Each language would differ markedly from its neighbors, ranking as a separate family or, more accurately, as a language isolate. This mosaic, in fact, is apparent in the aboriginal languages of northern Australia, where a large number of language families occupy a small area. (Farther south in Australia there is a single, embracing language family, Pama-Nyungan. The explanation for its extraordinarily wide distribution is not clear.) This type of mosaic pattern is found among the horticulturalists of New Guinea. And when one studies the aboriginal language maps of California and of parts of South America (while still, for the present, avoiding Greenberg's "Amerind" classification), one sometimes has a similar impression. So, too, in the Caucasus.

But much of the world map is quite different. Large areas of the globe are occupied by single language families, of the kind that could have arisen only

INITIAL MIGRATION

- KHOISAN
- NILO-SAHARAN
- CAUCASIAN
- AUSTRIC (DAIC AND AUSTRO-ASIATIC)
- "INDO-PACIFIC"
- AUSTRALIAN
- "AMERIND"

FARMING DISPERSAL

- NIGER-KORDOFANIAN
- AFRO-ASIATIC
- INDO-EUROPEAN
- ELAMO-DRAVIDIAN
- SINO-TIBETAN
- AUSTRONESIAN

LATE CLIMATE-RELATED DISPERSAL

- URALIC-YUKAGHIR
- CHUKCHI-KAMCHATKAN
- ESKIMO-ALEUT
- NA-DENE

ELITE DOMINANCE

- ALTAIC

through a process of replacement. I suggest three simple reasons for this pattern.

First, a few families have attained their present extent through the influence of elite dominance. In this model, an incoming minority seizes control of the levers of power and sets itself up as an aristocracy, lending such prestige to its language as to induce the native people to adopt it in preference to their own tongues. Because such minority takeovers imply that the incoming group has some centralized organization, such a hypothesis can apply only in later prehistoric or in historic times, when highly ranked societies had come into existence.

For example, in southern China the Chinese language was adopted only in historical times, through the military expansion of the Chinese empire. The spread of Latin throughout much of Europe also conforms to the principle. So does the diffusion of Indo-European languages through Iran, northern India and Pakistan, which may be attributed to the rise of nomad pastoralism in the second millennium B.C. The Altaic languages became dominant in central Asia in medieval times, when mounted warfare swept that region.

Most large-area language families, however, may be regarded as the product of population dispersals of two different kinds, although these, too, occurred after the end of the last ice age, some 10,000 years ago. The dispersals involved the introduction of farming, on the one hand, and the penetration

of uninhabited areas because of climate changes, on the other.

The recent climate-related dispersals tended to populate empty territories north of the 54th parallel, which had not been habitable during the last cold phase of the Pleistocene. The regions now inhabited by speakers of the Eskimo-Aleut languages were probably first occupied only in the past few thousand years. The Uralic-Yukaghir and Chukchi-Kamchatkan languages would have taken up their present territories earlier than this.

The case of the Na-Dene languages seems more complicated. As Greenberg has suggested, they probably came to North America before the Eskimo-Aleut speakers yet long after the initial colonization of the Americas. Their way of life represented, I believe, an early adaptation to the tundra environment. Later, when climate or ecological factors rendered the area less hospitable to them, they moved south. Some speakers of Proto-Na-Dene penetrated as far as Arizona and New Mexico. Elite dominance, amplified by horseback riding, accounts for the presence of the cultures related to this language group throughout much of the continent.

The most important single factor in the development of the large-area language families seems to have been replacement by means of farming dispersal. According to this theory, a language family begins its career as a single tongue spoken by foragers who live in an ecosystem that con-

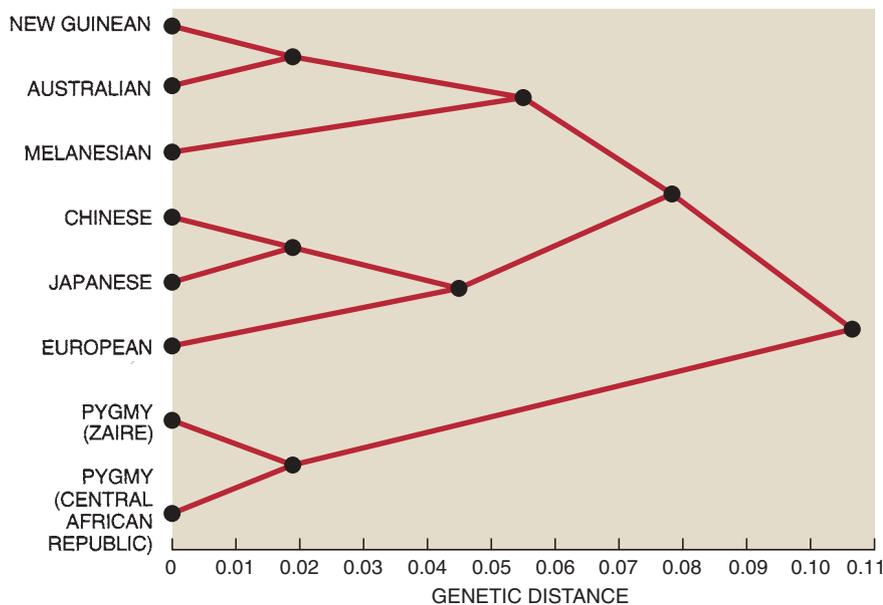
tains plants (and perhaps animals) amenable to domestication. The foragers develop a farming culture that supports them in sedentary habitation, which favors an increased rate of birth, a reduced rate of infant mortality and a greater intensity of food production. The population density increases, assuring the local predominance of the farmers and of their language.

In some instances, the presumption can be made that the domesticated crops and herds, together with the techniques by which they are managed, would prove suitable for transplantation into new ecological niches. In such circumstances, the language or languages of the nuclear area will be transmitted along with the plant and animal domesticates. The languages would move as the farming population expands slowly in a wave of advance, known as demic diffusion. Alternatively, the farmers' language, together with the new agricultural economy, can be adopted by neighboring hunter-gatherer groups through acculturation. The genetic effects of the two mechanisms are significantly different.

It is now accepted by and large that the spread of the Bantu languages of Africa (within the Niger-Kordofanian family) was sustained by demic diffusion. Peter Bellwood of the Australian National University has made the same argument not simply for the Polynesian languages but for the Austronesian languages in general [see "The Austronesian Dispersal and the Origin of Languages," by Peter Bellwood; *SCIENTIFIC AMERICAN*, July 1991].

I have argued this case in some detail for the Indo-European languages of Europe [see "The Origins of Indo-European Languages," by Colin Renfrew; *SCIENTIFIC AMERICAN*, October 1989]. Some authors have argued that in northwestern Europe the process was less one of population movement than of acculturation, yet if that is so, the linguistic effects may have been ultimately the same. Precisely analogous arguments can be advanced for the Afro-Asiatic languages, perhaps for the Elamo-Dravidian languages as well, and for the initial spread of the Altaic languages within Asia. Of course, these languages, especially the Turkic ones, were later carried much farther by the elite dominance of horseback-riding, nomadic pastoralists.

C. F. W. Higham of the University of Otago has recently suggested that comparable arguments would apply to the Austro-Asiatic languages of Southeast Asia (Munda and Mon-Khmer). This group is associated with a Southeast Asian focus on the domestication of rice.



FAMILY TREES derived from gene frequencies constructed for various populations of the world constitute an independent body of evidence with which to compare linguistic, archaeological and anthropological models of prehistory. This tree is based on work done by Joanna L. Mountain and her colleagues at Stanford University.

The Method of Multilateral Comparison

A simple comparison of basic vocabulary reveals such major linguistic groupings as the Germanic, Italic and Slavic branches of Indo-European, Uralic-Yukaghir and Basque.

LINGUISTIC GROUP	LANGUAGE	ONE	TWO	THREE	HEAD	EYE	NOSE	MOUTH
GERMANIC	SWEDISH	en	tvo	tre	hyvud	oga	næsa	mun
	DUTCH	ēn	tve	dri	hōft	ōx	nēs	mont
	ENGLISH	wən	tuw	thrij	hed	aj	nowz	mawth
	GERMAN	ajns	tsvaj	draj	kopf	auge	nāze	munt
ITALIC	FRENCH	œ/ə	dø	tRwa	tet	œj	ne	buš
	ITALIAN	uno	due	tre	trsta	okjo	naso	boka
	SPANISH	uno	dos	tres	kabesa	oxo	naso	boka
	RUMANIAN	un	doj	trej	kap	okj	nas	gura
SLAVIC	POLISH	jeden	dva	tři	glova	oko	nos	usta
	RUSSIAN	adin	dva	tri	galava	oko	nos	rot
	BULGARIAN	edin	dva	tri	glava	oko	nos	usta
URALIC-YUKAGHIR	FINNISH	yksi	kaksi	kolme	pää	silmä	nenä	suu
	ESTONIAN	yks	kaks	kolm	pea	silm	nina	suu
BASQUE	BASQUE	bat	bi	hiryr	byry	begi	sydyr	aho

SOURCE: Merrit Ruhlen

The spread of the Sino-Tibetan languages seems initially to have been associated with the domestication of millet and other cereals in the valley of the Yellow River and only later with that of rice.

Naturally, the case for an agricultural expansion of this kind has to be made in detail in each instance. Such inquiries are well within the competence of contemporary archaeology. It is, in fact, generally possible to determine the homeland area of the specific plant or animal domesticates in question and to establish the approximate date of domestication, as well as to document the material record of the dispersal process. The linguistic consequences are of course a matter of inference: prehistoric languages have left no traces in the archaeological record.

The dates for these farming dispersals, increasingly well established by radiocarbon dating, are generally rather earlier than those that linguists have tended to assign for the early phase of the language families in question. Yet the logical basis for the linguistic dating has never been established clearly: no reliable system exists for independently dating protolanguages.

And what of the language families that could not have been spread by people acting on a relatively recent change in climate, a revolution in agriculture or a wave of conquest? Such residual tongues, scattered in bits and pieces throughout the world map, must have arrived in their current ranges

long ago, during the initial dispersal of modern humans. Among these families are the Khoisan and Nilo-Saharan languages of Africa; the northern and southern Caucasian languages; Basque; the Australian languages; the mosaic of perhaps mutually unrelated languages in New Guinea ("Indo-Pacific"); and the pre-Na-Dene languages of the Americas. This last category is so vast that it without doubt embraces several sub-families whose distributions have been for the most part determined by subsequent processes, including agricultural dispersal.

Molecular genetics can test at least some elements of this overall account of the distribution of languages on the earth. One approach with this method is to compare gene frequencies in various populations and convert these data into a tree, the branches of which represent genetic distance. One can then see to what extent the genetic relationships confirm predictions arising from the above account. Already the out-of-Africa theory for the origin of our own species receives strong confirmation from the family tree based on a sampling of nuclear DNA from a number of living populations [see diagram on preceding page].

Initial dispersals of population into uninhabited territory obviously entail total gene transfer. Agricultural dispersals will involve significant gene flow

only when they proceed through demic diffusion; those that propagate by a process of acculturation will leave fainter genetic traces. Language replacement by elite dominance also involves gene flow on only a very limited scale: usually in such cases, it is the males who travel, so that the effects on mitochondrial DNA (inherited only through the female line) will be minimal.

The most carefully studied case is the coming of farming to Europe, the map of which shows geographic distribution of gene frequencies along a clear gradient from southeast to northwest. Recent statistical work by Robert R. Sokal of the State University of New York at Stony Brook and his colleagues has provided good evidence for associating a significant part of this gradient to the spread of agriculture from Anatolia. Although this correlation supports the view that an expanding population of farmers brought agriculture into new territories, it does not prove that those farmers spoke some of the original Indo-European dialects.

Recently the statistician Guido Barbujani of the University of Padua has conducted a comparable analysis for the other language families whose distribution may be explained by agricultural dispersal from the Levant (such as Afro-Asiatic, Elamo-Dravidian and early Altaic) and has found a similar correspondence. Even more persuasive studies have been carried out in the Pacific, where the spread of the Polynesian lan-

guages correlates impressively with the genetic evidence. In this case, however, the correlation is not surprising, because the Polynesians were occupying uninhabited islands. Therefore, their movement qualifies both as an agricultural dispersal and as an initial dispersal.

Additional supporting evidence from Africa comes from the work of Laurent Excoffier of the University of Geneva and his colleagues. They find a high correspondence between the varieties of gamma globulin in blood samples and the language family of the speakers in question. This is particularly marked for the Afro-Asiatic languages and lends support to the picture outlined here.

The most consistent advocate of the correlation between genetic and linguistic data, however, has been Luigi Luca Cavalli-Sforza of the Stanford University School of Medicine [see "Genes, Peoples and Languages," by Luigi Luca Cavalli-Sforza; *SCIENTIFIC AMERICAN*, November 1991]. In an ambitious exercise he has compared the family tree obtained from molecular genetic data at a world level with a family tree established using only linguistic data. His study indicates a fair degree of overlap.

So far I have adduced no linguistic relationships older than about 10,000 years. Although even this time depth is greater than most linguists would choose to examine, I have justified it not so much by means of new classifications as by proposing unconventionally early dates for well-established language families. Now it is appropriate to go a little further down the path of the lumpers, to note the hypothetical existence of more embracing macrofamilies, such as Amerind and Indo-Pacific. Their origins, presuming in each case a single protolanguage, would probably lie well beyond 20,000 years ago.

Perhaps the best-known macrofamily was worked out by two Russian scholars, the late Vladislav M. Illich-Svitych and Aharon B. Dolgopolsky of the University of Haifa. They have argued that Indo-European, Afro-Asiatic, Dravidian, Altaic and Uralic can be classified together within a single macrofamily they called Nostratic (from the Latin *nostras*, "our countryman"), which is itself derived from a Proto-Nostratic language supposedly spoken in the Middle East some 15,000 years ago. (Greenberg has defined a similar macrofamily, "Eurasianic," which differs by excluding Dra-



DIRECT EVIDENCE of ancient languages begins only some 5,000 years ago, with earliest written records, such as this pictograph inscription from Uruk.

vidian and Afro-Asiatic and including Eskimo-Aleut and Chukchi-Kamchatkan.) Strikingly, these macrofamilies also show a good correlation with the genetic evidence, as marshaled by Cavalli-Sforza, and indeed with some of the archaeological evidence for agricultural dispersals.

Linguistic lumpers have not yet carried the majority of their specialist colleagues with them. Nevertheless, the multilateral analysis method of Greenberg draws on a battery of lexical evidence that is certainly impressive to the nonspecialist. And the Nostratic school does set out to use the comparative method of historical reconstruction, for whose omission Greenberg is so severely criticized by his colleagues. The archaeological and genetic arguments, in fact, harmonize well with some conclusions of the lumpers. The success of the rationales indicates that additional work in this direction will be worthwhile.

Some scholars, notably Ruhlen, have even suggested the existence of much wider underlying affinities between macrofamilies—for instance, between Amerind and Eurasianic. Such a hypothesis holds that some modern word forms demonstrably derive from the single and ultimate protolanguage spoken by our remote African ancestors in their homeland. A claim of this kind is difficult to test and will be rejected by most linguists. Still, linguistic arguments for monogenesis do not contradict the evidence from archaeology, bioanthropology and molecular genetics for an out-of-Africa origin for our species.

These are deep waters. They appear,

however, to convey a glimmer of real historical processes. This assumption is supported by the work of linguists such as Johanna Nichols of the University of California at Berkeley, who analyzes languages according to structural features that may have no genealogical significance. Her interesting recent analysis of structural typology in a large sample of the world's languages has led her to put forth three stages for the origins of the world's languages that could harmonize with the sequence I have suggested here.

She notes the existence of two kinds of language areas. "Spread zones" are large areas occupied by just one or two language families; examples include Europe (with the Indo-European languages) and North Africa (with the Afro-Asiatic languages). "Residual zones" are smaller, although each one harbors a number of long-established language families; examples are provided by the Caucasus and New Guinea. Nichols also sees the spread zones as the result of events that followed the end of the last glaciation; the residual zones are by and large the relics of earlier initial dispersals.

Much more work remains to be done. Nevertheless, a clear convergence is emerging between the archaeological evidence, the genetic evidence and at least some of the linguistic evidence. It would seem, then, that the broad outlines for a major new synthesis are now visible, one that in the coming decade can be expected to clarify not only the diversity of language but also that of genes and cultures.

FURTHER READING

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