children. Clinicians are watching these children to see if their conditions worsen and become full-blown AIDS.

The presence of AIDS symptoms in three daughters of the same mother might suggest an inherited immune defect. However, they had different fathers and it is unlikely that all would inherit the disease unless the defective gene were dominant, which is not the case for the known congenital immunodeficiencies. Alternatively and more probably, the three children might have been exposed to an infectious agent for AIDS, although it is still possible that they might have inherited an increased susceptibility to that agent. Evidence for genetic susceptibility has been found in adult AIDS patients.

AIDS resembles hepatitis B in the groups affected, especially the male homosexuals and intravenous drugs users, and in the apparent mode of transmission through intimate contact and through blood products.

The evidence for transmission to hemophiliacs is now clear-cut, CDC officials say. Altogether there are seven confirmed cases in heterosexual male hemophiliacs, two of whom were less than 10 years old, plus one in a homosexual male.

No common lot of clotting factor, which might have been the source of an infectious agent, has been identified as being used by the patients. The seven patients received clotting factor preparation containing material from the blood of many individuals, which makes tracking down any AIDS patient among the donors very difficult.

The one AIDS case in which an AIDS victim has been identified among blood donors was that of an infant boy who was in the group of children studied by Arthur Ammann and his colleagues at the University of California Medical Center in San Francisco. The infant did not have any close contacts with AIDS victims. In the month after his birth, he had received numerous transfusions of whole blood and subfractions of blood, including packed cells and platelets, to treat Rh disease, which is caused by an incompatibility between the baby's blood type and his mother's. A total of 19 donors contributed the blood products. One of them, CDC investigators learned, was a man who developed AIDS some 8 months after he had donated blood. If the infant did contract AIDS because he was infected by an agent in the man's blood, the case has serious implications for the use of blood products. The agent must have been present and infectious for several months before it caused obvious symptoms.

The CDC is currently investigating the cases of two adult AIDS patients who do not have any of the common risk factors, but who did receive blood transfusions, to see if any of the donors might have developed AIDS.

Because of the serious nature of AIDS, its immediate threat to hemophiliacs who must have clotting factor, and its potential threat to a much wider population if it proves to be generally transmissible in blood products, Edward Brandt, assistant secretary for health in the U.S. Department of Health and Human Services, has called for an advisory committee to consider the current situation and determine what preventive steps ought to be taken regarding the collection of blood and its use. The committee meets on Tuesday, 4 January (2 weeks after this issue of *Science* went to press). The possibility that there may be a long latent period between the time of infection, by an as yet unidentified agent, and the emergence of AIDS symptoms will not make their task any easier.

—JEAN L. MARX

Fossil Lucy Grows Younger, Again

A combination of a chemical "fingerprint" and a comparison between dated fossils shows the Hadar hominids to be younger than previously thought

Dates are important to the story of paleoanthropology, but, as history repeatedly shows, they have a habit of shifting around before finally settling at a consensus. Two papers in a recent issue of *Nature** address the age of the rich array of hominid fossils, including the famous "Lucy," from the Hadar region of Ethiopia. According to the papers, one of which rests on geological methods while the other uses correlations with dated fossils from elsewhere, the Hadar hominids are around 0.5 million years younger than previously supposed.

Lucy may be just 2.9 million years old, and the "first family," a large collection of fragments from many individuals at one site, may be a little less than 3.2 million years old.

Does this redating affect the tale told by the bones? Inevitably, the answer depends on who is asked.

No, says Donald Johanson of the Institute of Human Origins, Berkeley. "The important thing is the comparison of their morphology with that of fossils elsewhere. Redating does not affect our inference made from that comparison." In January 1979, Johanson, then at the Cleveland Museum, published a landmark paper with Tim White, at the University of California, Berkeley, describing the Hadar fossils as a new species of hominid, *Australopithecus afarensis*, which they suggested was ancestral to all later hominids.

Noel Boaz, an anthropologist at New York University, is coauthor with Monte McCrossin, also at NYU, and Clark Howell, at Berkeley, of the *Nature* paper on faunal correlations. Boaz contends that the new date for the Hadar material should make one rethink their interpretation. "This new date puts the Hadar fossils very close in age to some of the South African *Australopithecus africanus* specimens, to which *afarensis* is supposed to have given rise," he says. This would clearly present a difficulty, if correct.

"In any case, there is a strong argument for saying that the Hadar fossils are not a new species at all, but are in fact *africanus*," says Boaz. Part of Johanson and White's inference of a new species rests on the primitive nature of the teeth, particularly the canines and premolars. Boaz suggests these primitive features are also apparent in the South African material but that the relatively small size of the sample makes it less obvious.

One of the outstanding points of contention about the Hadar hominids is whether indeed they represent just one species, as Johanson and White argue, or several species, as suggested by others, including Yves Coppens of the Musée de l'Homme in Paris. Redating does not affect this issue, but it does have some

*N. T. Boaz, F. C. Howell, M. L. McCrossin, *Nature (London)* **300**, 633 (1982); F. H. Brown, *ibid.*, p. 631.

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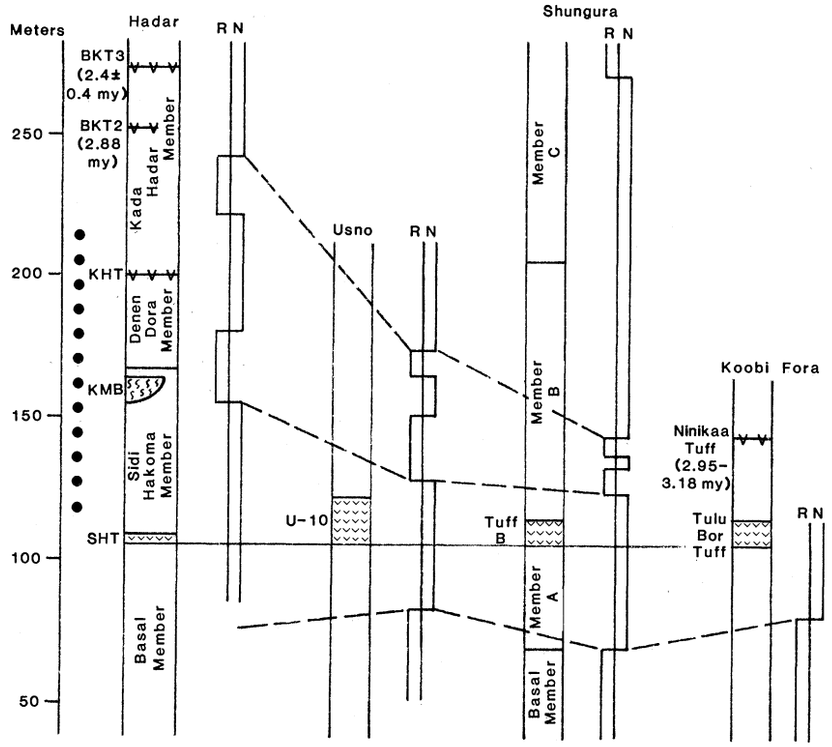

Geological correlations across four fossil localities in East Africa

With the four tuffs from the same 3.2-million-years-ago event lined up as shown, the paleomagnetic data fit well (R and N stand for reverse and normal). The Hadar hominids, denoted by dots, have been found above and below the Kadada Moumou Basalt (KMB).

impact on two other, related key points.

The first concerns the somewhat technical issue of Johanson and White's designation of the new species' name, *Australopithecus afarensis*. In describing the species, the Berkeley team included specimens from their Hadar collection and those discovered 1000 miles south at Laetoli in Tanzania, Mary Leakey's site. The linking together of these geographically widely separated sets of fossils raised a few eyebrows in the world of paleoanthropology, but the ages seemed to be roughly equivalent and so this bold stroke was allowed to pass. However, many evolutionary biologists interested in speciation continued to dislike this forced association across vast distance. If upward of a million years also separates the Laetoli and Hadar hominids, as the *Nature* papers imply, then this objection is redoubled.

Johanson and White's response is to invoke what they see as closely matching morphology and to point out that even a million years is not an especially long period of stasis for a vertebrate species. "We do not see any problem in continuing to see these specimens as members of the same species, even spread over large geographical and temporal distances," says Johanson.

The second issue is even less tangible and relates to the point in time at which humans and great apes last shared a common ancestor. According to data from molecular biology, that split might have occurred as recently as 4.5 million years ago. Fossil evidence, meanwhile, can be interpreted as indicating a division between 6 and 10 million years ago. If *afarensis* is indeed ancestral to all later hominids, then it must represent either the first hominid to have arisen at the split from the apes, or be a descendent of another ancestral hominid.

If *afarensis* were the first hominid, it would have to stretch back from around 3.0 million years (as at Hadar) to hominid speciation at 4.5 million years ago (the molecular date) or even as far as 10 million years ago (the fossil date). Stasis would be able to accommodate the shorter span, contends Johanson, but not the longer. "But we really can't say much about what preceded *afarensis* until earlier fossils are found."

The history of dating the sediments at the Hadar has turned out to be cyclical. Initially, the basalt layer above and below which the hominids are distributed was said to be perhaps 3.12 million years ago. But early in 1982 a new date of 3.6 million years was reported for the basalt, a revision that brought Laetoli and the Hadar pleasingly close together in time. Francis Brown, a geologist at the University of Utah, became interested in the Hadar dating because of certain inconsistencies he found in Johanson's book *Lucy*. Brown's subsequent calculations bring the date back close to 3.1 million.

Brown has spent some years analyzing the many volcanic tuffs that layer the deep sediments in East Africa. "Fingerprinting" from chemical composition separates one of them as quite distinct from the rest, specifically for its very low iron content. The tuff, which is named Tulu Bor in northern Kenya, Tuff B at the Shungura Formation in southern Ethiopia, and Tuff U-10 of the Usno Formation also in southern Ethiopia, represents a massive volcanic eruption some 3.2 million years ago, as indicated by several dating techniques.

In his post-*Lucy* investigations, Brown found data showing a tuff in the Hadar Formation that closely matched the Tulu Bor. He quickly obtained a sample of the tuff from Robert Walter at the University of Toronto, and confirmed the telltale composition of the Tulu Bor. It thus appeared as if the ash from that eruption 3.2 million years ago had traveled even further, distributed in part through the Awash drainage system.

Brown's discovery presented a problem because the tuff, which is named Sidi Hakoma in the Hadar Formation, lay beneath the basalt that was reported to be 3.6 million years old. One or the other must be wrong. Brown concludes that the basalt, a difficult material to date accurately in this case, must be wrongly reported, for three reasons.

First, the date for the Tulu Bor and related tuffs seems secure, and there is little doubt that the Sidi Hakoma Tuff is part of the same event. Second, the pattern of magnetic reversals fits more snugly with the younger date. And third, the fauna appear to be congruent with those of the younger age, as demonstrated by Boaz and his colleagues.

Brown acknowledges the possibility of two distinct eruptions from the same volcano producing virtually identical ash. Indeed, he has evidence of such events, very closely spaced in time, in deposits in northern Kenya. But, he notes, this is unusual and in any case he finds no evidence in northern Kenya at 3.6 million years of a tuff with the composition of the Tulu Bor, a requirement for the earlier date for the basalt.

White welcomes these efforts to tie the important fossil sites together with a well-recognized time horizon. He hopes that the data might be extended to the slightly older deposits in the Middle Awash, south of the Hadar. With a dating framework securely fixed, comparison of important fossils from different localities will be much less contentious.

—ROGER LEWIN