methods to analyze the samples, the identities of which would not be revealed until the tests were completed. The results of such a study could help to resolve the issue of whether an HTLV-I relative does contribute to the genesis of multiple sclerosis. "It is an important and interesting finding," says meeting cochairman John Sever of NINCDS about the Koprowski-Gallo findings, "and we need to nail it down."

Koprowski is opposed to the suggested trial, however, partly on practical grounds. He notes that p24 is costly and difficult to obtain in quantities sufficient for such a large-scale study. Moreover, he is concerned that the diagnoses of the patients from whom the samples would be taken may not be accurate because "They are all based on subjective diagnostic criteria by clinical examination."

The clinical features of TSP and multiple sclerosis, for example, show several similarities that make distinguishing the two conditions difficult. Although the brains of multiple sclerosis patients show certain characteristic pathologic changes that can be detected by magnetic resonance imaging, such high-technology diagnostic procedures are not likely to be available in the typically poor regions of the tropics where TSP is endemic. Consequently, Koprowski suggests, many "TSP" patients may actually have multiple sclerosis.

Conversely, the apparent high incidence of multiple sclerosis on Key West is unusual for such a southerly location, and other investigators have suggested that the "multiple sclerosis" there may be misdiagnosed TSP. However, Román, who has reviewed the clinical features of multiple sclerosis patients on Key West, concludes, "From the clinical point of view, the patients on Key West are not TSP by any stretch of the imagination."

In any event, because of the general difficulty of diagnosing chronic neurological diseases, Koprowski proposes that a better way of pinpointing a retroviral involvement in the conditions would be to have a large number of investigators survey patients for evidence of infection. In the current absence of a specific viral probe, a very sensitive test for the p24 core protein would be needed.

The diseases surveyed should not be limited to multiple sclerosis and TSP, Koprowski says, but should also include other degenerative nerve conditions of unknown cause, such as Guillain-Barré syndrome, Alzheimer's disease, and amyotrophic lateral sclerosis (more commonly known as Lou Gehrig's disease). Then if viral traces in any of the patients were found, attempts to correlate them with particular clinical entities could be made.

Another approach that could help clarify matters would be to isolate the putative retrovirus itself, or if that is not possible, to clone the retroviral gene sequences present in cells. If either can be done, it would make available specific probes for detecting evidence of infection by the virus and would thus be another route to determining whether it plays a role in the etiology of multiple sclerosis or other neurological diseases.

The situation with regard to the putative new retrovirus and multiple sclerosis parallels that seen just 4 years ago when Luc Montagnier and his colleagues at the Pasteur Institute were first detecting evidence of infection by a new retrovirus in AIDS patients. At the time, no one knew what the Pasteur findings meant. Only when the virus was isolated by the Gallo and Montagnier groups and specific probes became available could it be confirmed as the cause of the AIDS. It will be interesting to see what the outcome of the current situation will be. ■

JEAN L. MARX

ADDITIONAL READING

R. T. Johnson, "Myelopathies and retroviral infections," *Ann. Neurol.* **21**, 113 (1987).

M. Osame *et al.*, "Chronic progressive myelopathy associated with elevated antibodies to human T-lymphotropic virus type I and adult T-cell leukemialike cells," *ibid.*, p. 117.

G. C. Roman, "Retrovirus-associated myelopathies," *Arch. Neurol.*, in press.

R. Rodgers-Johnson *et al.*, "HTLV-I and HTLV-III antibodies and tropical spastic paraparesis," *Lancet* **1985-II**, 1247 (1985).

J. C. Vernant *et al.*, "Endemic tropical spastic paraparesis associated with human T-lymphotropic virus type I: A clinical and seroepidemiological study of 25 cases," *Ann. Neurol.* **21**, 123 (1987).

The Earliest "Humans" Were More Like Apes

The discovery at Olduvai Gorge of arm and leg bones of the first member of the genus Homo *shows that the creature was much more primitive than had been expected*

"I laughed when I saw it," says Henry McHenry. "It is so tiny." McHenry, an anthropologist at the University of California, Davis, was telling of his initial impressions of a newly discovered "partial skeleton" of a 1.8-million-year-old human ancestor from Olduvai Gorge, Tanzania. "Now we have to go back to the fossil collections and fish out the hominid limb bones that have been misclassified as monkeys."

The new Olduvai fossils, which were discovered last year by Tim White of the University of California, Berkeley, are especially important because in addition to the entire right arm bones, and some leg bones of a single individual, they also include diagnostic parts of the head that allow its species to be identified. "There's no doubt that it is *Homo habilis*," says Donald Johanson of the Institute of Human Origins (IHO), Berkeley, who organized the expedition to Olduvai Gorge in conjunction with the National Museums of Tanzania. "This is the first time that limb bones and cranial material of *Homo habilis* have been found in definite association," he says. "The result is a big surprise."

The surprise is that this *Homo habilis* individual was, as McHenry noted, tiny, standing just 3 feet tall. The famous Lucy skeleton, which was discovered 13 years ago in Ethiopia by Johanson and is over 3 million years old, is about the same size as the new fossil. Lucy belongs to a species called *Australopithecus afarensis*. Both Lucy and the new Olduvai hominid are thought to be females of their species.

"Because *Homo habilis* is considered to be an evolutionary intermediate between the relatively small *Australopithecus afarensis* and the relatively large *Homo erectus*, everyone assumed *habilis* would be of intermediate size," says White. "People have viewed human evolution through the glasses of gradualistic change. Well, this fossil has smashed those glasses. The change was obviously abrupt, with a big modification in body form between *habilis* and *erectus*." Details of the recovery and interpretation of OH 62 are published in the current issue of *Nature*.

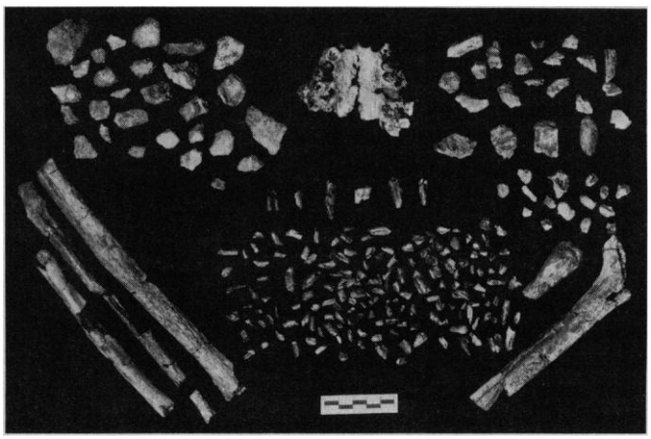
A widely accepted picture of human evolution places *Australopithecus afarensis* as the first known hominid, which is dated from between 3.75 to 3.00 million years ago. *Homo habilis* is thought to be a descendant of *afarensis*, and probably arose a little more

than 2 million years ago, with the latest specimens dating to about 1.8 million years ago. The earliest *Homo erectus* fossils, which most people agree probably derived from *H. habilis*, have been uncovered at 1.6 million years ago, and the species continues until some 200,000 years ago.

The principal anatomical changes through this period of evolution were three: an increase in brain size, from around 450 cubic centimeters in *afarensis* to some 1000 cubic centimeters in *erectus*; the modification of the limb and pelvic bones in adaptation to a fully upright walking—bipedal—locomotion; and a reduction in sexual dimorphism, that is the difference in body size between males and females.

The new Olduvai hominid, which is code named OH 62, highlights two important aspects in these changes. First, the primitive body form that characterized the earliest hominids continued much later in human history than had been expected. And second, the extreme sexual dimorphism seen in *A. afarensis*, in which the males were twice as big as the females, continued unabated through *H. habilis* and diminished only with the advent of *H. erectus*.

The first of these obviously influences the interpretation of the mode of locomotion and the nature of the habitat used by *habilis*. The second has implications for the shape of the social structure in these early human forebears, because different degrees of sexual dimorphism are usually associated with different social systems. Taken together, both these insights—into locomotion and social structure—affect the way anthropologists view this first member of the *Homo* genus: it looks distinctly less "human" than most people have assumed.



Hominid in pieces. *Although the OH 62 fossil was very hard, it was fragmented into more than 300 pieces. Top center is the palate and associated areas; bottom left are the upper and lower arm bones; bottom right are parts of the femur and shin bones. Fragments of teeth, cranium, lower jaw and face are placed in the center, top right and top left.*

The question of locomotion in early hominids has been hotly debated during recent years, and the discovery of OH 62 is certain to extend that debate. Although Lucy and her fellows clearly walked about on two legs, they had many distinct apelike features in their skeleton, including long arms in relation to their legs and curved bones in their hands and feet.

Some anthropologists, specifically Randall Susman, Jack Stern, and Bill Jungers of the State University of New York at Stony Brook, interpret these apelike features as indicating a significant amount of tree climbing in the daily lives of *A. afarensis*. Others, including Johanson, White, and Owen Lovejoy of Kent State University, argue against this arboreal interpretation, suggesting that the primitive features could equally be genetic baggage carried over from an apelike ancestry, or be an adaptation to behaviors other than habitual tree climbing.

Whatever is the case, "OH 62 shows that this suite of primitive skeletal characters was not an unstable adaptation," says White. "*A. afarensis* was not poised on a razor edge between apes and humans, because this adaptation lasted at least 2 million years, right up to the origin of *erectus*."

Susman is delighted with the new Olduvai fossil, partly because he sees it as being in line with his views on *afarensis*, but mostly because it seems to confirm what he and Stern concluded from an earlier study on a different set of *H. habilis* fossils. According to their analysis on foot, leg, and hand fossils that had been uncovered by Louis and Mary Leakey at Olduvai Gorge in 1960, Stern and Susman concluded in the 3 September 1982 issue of *Science* that *H. habilis* "represents a mosaic of primitive and derived features, indicating an early hominid which walked bipedally . . . but also retained the generalized hominoid capacity to climb trees."

This suggestion was met with a good deal of skepticism, partly because some authorities question whether the hand and the foot belong to the same individual, as the Stony Brook workers claim. If Stern and Susman are correct about the foot and hand fossils being from a single individual, then the bones represent another good association between body and head parts of *H. habilis*, because two fragments of the cranium were recovered from the same location.

"People said we were crazy," recalls Susman. "But now look at OH 62. It's wonderful. The very long arms go perfectly with what we've said about the hands." Chimpanzees, who are adept tree climbers, have an upper arm, or humerus, about as long as their thigh bone, or femur. In humans, the length of the humerus is only 70% of the femur. In both Lucy and OH 62 that figure is close to 95%, which is closer to apes than it is to humans.

View from afar. *The fragments of OH 62 were found scattered over a wide area, not far from where Mary Leakey found the famous* Zinjanthropus *cranium in 1959. This shows an aerial view of the site during collection.*

Although Susman is happy to see continuity of an overall primitive apelike skeleton between *A. afarensis* and *H. habilis*, he does see signs of modification of the foot in the human direction between the two species. "There is a tremendous difference between *afarensis* and *habilis*," he notes. "Lucy's foot is more primitive, more mobile, whereas the [*habilis*] foot is more human-like." In the overall anatomy Susman therefore sees a mosaic of stability and change, which incorporates a gradual transition from ape to human.

White and his colleagues disagree. "There's no substantial functional difference between the foot of *afarensis* and *habilis*," says White. "Their interpretation is influenced by the fact that they continually compare fossils against modern humans and modern apes. This leads them to overemphasize the 'apeness' of the *afarensis* foot and the 'humanness' of the *habilis* foot." As a counter, Susman argues that White and his colleagues overemphasize the "humanness" in the fossils from the beginning, starting with Lucy. Having done that, the lack of significant change in the *H. habilis* foot is an inevitable component of the Berkeley argument, says Susman.

The evolutionary transition between *H. habilis* and *H. erectus* appears to have occurred in the narrow window of time between 1.8 and 1.6 million years ago. "Given the primitiveness we see in *habilis* and the advanced characteristics in *erectus*, it's clear that the transition was much more abrupt than has been appreciated," says White. Brain size increased further during that event, and the anatomical adaptation to upright walking became enhanced. Although the degrees of change in these two features across the *habilis/erectus* transition were substantial, they can be seen as the continuation of trends already established. The dramatic diminution of sexual dimorphism in body size was, however, something new in human history.

Exactly what is implied by the shift from a situation in which males were twice as big as females to one in which the ratio was about the same as in modern chimpanzees and humans is difficult to determine. For instance, a large sexual dimorphism in modern large primates is associated with a "harem" structure in one case (gorillas) and with a very loose, almost solitary social system in another (orangutans). In both cases, however, there is a sharp element of competition between males for access to females, which is responsible for the exaggerated size of the males compared with the females. The dramatic reduction in sexual dimorphism in *H. erectus* might therefore have been associated with an equal reduction in competition and an increase in cooperation between males.

It may be no coincidence that in addition to the apparent adoption of a new social structure for hominids, the origin of *H. erectus* was also accompanied by the inclusion of meat as an important component of the diet, and by a dramatic extension of the hominid range, which expanded out of Africa about a million years ago.

Louis and Mary Leakey worked for more than three decades at Olduvai Gorge, and many people assumed that when Mary Leakey folded up her camp there in 1984, little new remained to be recovered. Johanson, who led the first IHO expedition there in 1985, says that the discovery of OH 62, and its impact on the interpretation of human history, "justifies the continued exploration at Olduvai Gorge." ■

ROGER LEWIN

An Oxygen Key to the New Superconductors

First it was the physicists, then the chemists, and most recently the materials scientists and ceramists who have hastily included in their annual meetings symposia on the new high-temperature, ceramic superconductors. Below are briefings from the 1987 Spring Meeting of the Materials Research Society (MRS) that was held in Anaheim, California, from 21 to 24 April, 1 week before the American Ceramics Society's conclave in Pittsburgh.

With the initial wave of euphoria now past, the atmosphere in Anaheim was decidedly more professional than that of the now fabled "Woodstock of Physics" that was part of the American Physical Society's March Meeting in New York City only 5 weeks before. Nonetheless, perhaps 1500 materials researchers listened to 69 scheduled papers and several late walk-ons that were crammed into a 2-day symposium. With a martial strictness, cochairs Michael Schlüter of AT&T Bell Laboratories and Donald Gubser of the Naval Research Laboratory kept the talks to the allotted 10 minutes each.

Except for an impassioned presentation by Juei-Teng Chen of Wayne State University, who sought to convince listeners that a group there had seen clear signs of superconductivity at 240 K, which is ambient temperature during a cold night on the northern plains, no significant indications of room-temperature superconductivity were reported. The most skeptical view was that of Theodore Geballe of Stanford University, who suggested that some of the unreproducible signs seen in several laboratories could be due to something other than superconductivity, as similar effects disappeared in Stanford samples with repeated cycling between room and liquid-nitrogen temperature.

If there was one theme at the symposium, it was that oxygen is the key to the family of rare-earth–based ceramic materials now in hand that remain superconducting up to about 100 K.

Where the Oxygen Vacancies Are

It was already apparent at the American Physical Society's March Meeting in New York that the new superconductors are members of a family of compounds having the generic composition $RBa_2Cu_3O_{7-x}$. R stands for yttrium or one of the lanthanide rare earths, and x is a number less than 1 whose value depends on the method used to prepare the material. Researchers also agreed that the structure of the compounds is something called a triple-layer perovskite with some oxygen sites vacant, but they disagreed on which sites.

Now, with the aid of neutron and x-ray diffraction and high-resolution electron microscopy, investigators are converging on a common interpretation that indicates the simultaneous presence of two- and one-dimensional characters in the electrical properties. The figures (page 1065) show the triple-layer structure derived from neutron diffraction studies at Argonne National Laboratory by researchers from Argonne, the Illinois Institute of Technology, and Western Michigan University. At least five other groups in Canada, France, Japan, the United Kingdom, and the United States have reached the same conclusions from independent neutron experiments. Neutrons are