picked out 100 percent of the AIDS and lymphadenopathy syndrome [pre-AIDS] patients. There were no false positives and no false negatives. I can tell you it was remarkable." The study was conducted under double-blind conditions. The investigators did not know which samples were which until the antibody analyses were completed and the code was broken on 10 April.

The antibodies detected in the blood of the AIDS patients are directed primarily against the major protein forming the outer envelope of the HTLV-III particle. These antibodies are apparently capable of cross-reacting to some extent with the envelope protein of HTLV-I, which probably explains why roughly one-third of AIDS patients were positive in the earlier study by the Essex group. The antigen actually detected by the Essex assay is a membrane protein, which has a molecular weight of roughly 60,000 and is found on the surfaces of cells infected with HTLV-I. Recent work by the Essex and Gallo groups has shown that this is the precursor of the 46,000-dalton envelope protein of HTLV-1.

Meanwhile, the Pasteur workers have now made nearly a dozen isolates of their virus, which they call lymphadenopathy-associated virus (LAV), from AIDS and pre-AIDS patients. Using samples supplied by the CDC, they have also detected antibodies to LAV in blood from about 90 percent of U.S. AIDS and pre-AIDS patients.

LAV, like the HTLV's, has RNA as its genetic material. It appears to infect the same subpopulation of T cells as the HTLV's. The presumption is that LAV will turn out to be the same as HTLV-III. Gallo plans to collaborate with the Pasteur group to determine whether that is the case. Gallo notes, incidentally, that HTLV-III does not appear to be closely related to the virus that has recently been identified as the cause of an AIDS-like disease of monkeys.

According to Gallo, the nucleic acid studies of HTLV-III suggest that the virus may not be new, as has been speculated. AIDS was just identified in 1981. The nucleic acid data show that the HTLV-III RNA is similar throughout the genome to the RNA's of HTLV-I and -II. "It looks as though there is some kind of common ancestor," Gallo says. "It has probably existed for a long time." The possibility remains, however, that HTLV-III underwent some recent subtle change.

Gallo speculates that the HTLV's originated in Africa. HTLV-I has been detected in Old World monkeys, but not in New World monkeys. AIDS may have emerged only recently as a result of population shifts from rural areas of Africa to the cities where there would be greater chances of contact with foreign visitors who could have carried the agent to new locales, such as the United States or Haiti, which also has a relatively high incidence of the disease. Alternatively, the virus might have been exported directly by an emigrating African. Many of the AIDS cases identified in Europe have links to Central Africa and the condition has been found there as well.

Traditionally, final proof that a particular agent causes a disease usually involves showing that Koch's postulates can be met. One of the postulates requires that the host be injected with the agent to see whether the disease develops. With an illness as deadly as AIDS this will never be possible with human subjects. But showing that HTLV-III can be used to produce an effective vaccine would go a long way to removing whatever doubts might remain about whether it is the AIDS agent.

—JEAN L. MARX

Ancestors Worshiped

Paleoanthropologists have been discussing their agreements and disagreements in the presence of most of the world's hominid fossils

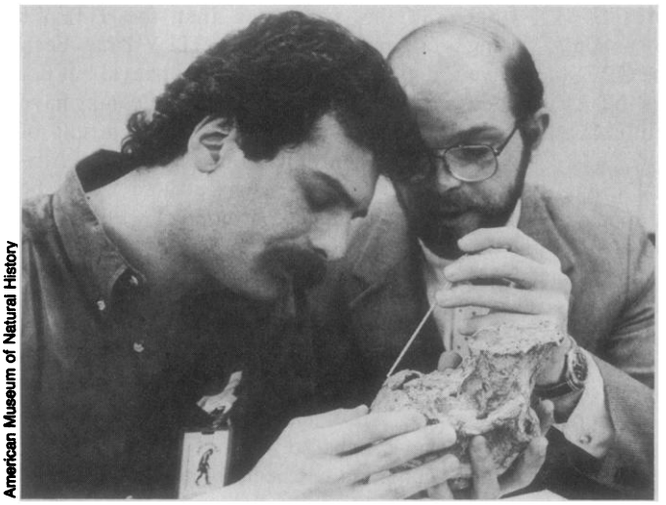
The culmination of 4 years of ambitious planning, wildly fluctuating enthusiasm and, it must be said, occasional dread, the American Museum of Natural History, New York, has finally staged its Ancestors exhibit. It is without doubt an extraordinary event: unprecedented and probably unrepeatable too. Some 40 fossils—original fossils note, *not* casts—representing a great proportion of the most significant evidence of human evolution are to be seen through bullet-proof display panels in the museum's number one gallery.

"There has not been a more significant event in the museum's past 30 years," said its director, Thomas Nicolson, a few days before the exhibit finally opened to the public. Confronting the anticipated creationist reaction to the exhibit, Nicolson added: "This is a statement about science, an active statement about evolution. We don't seek controversy but we often find ourselves in the midst of it. We insist on the right to learn and on the primacy of the material evidence."

Some 10 days before the exhibit opened, and while final adjustments were being made to the support structures in the display cabinets with high-quality casts serving as temporary surrogates for the real things, the material evidence itself was spread out over five or six tables in an upper room and subjected to treatment that would make even the most hardened fossil jock wince. During a series of study sessions paleoanthropologists from around the world pored over these fragile and priceless relics, comparing, probing, contrasting, disputing—frequently disputing—and sometimes, believe it or not, agreeing.

Although the initial sessions were marked by a palpable tension and unexpressed awe—"It was," says Michael Day of St. Thomas' Hospital Medical School, London, "like discussing theology in a cathedral"—the atmosphere grew more and more relaxed as time went on. The original strict rules of handling and movement about the room, which had been instituted to minimize risk to the fossils, began to break down. Neanderthals made first aquaintance with australopithecines, Miocene apes with *Homo erectus*, and so on: taxonomic, temporal and geographical boundaries were shattered. And the paleoanthropologists occasionally broke ranks too.

Curators held their collective breaths at first as their fragile charges were variously held aloft, angled to the light, and passed from hand to hand, not always with the relative safety of a padded tabletop below. But nothing—repeat, nothing—was broken. "That was a near miracle," observed Milford Wolpoff of the University of Michigan, a man whose frequent global expeditions has brought him into contact with more original fos-



American Museum of Natural History

Look Here

Todd Olson, right, discusses features of the basicranium of a South African specimen of Australopithecus africanus *with William Kimbel. The two have for several years differed in their interpretation of the older fossils, Lucy and her fellows, from Ethiopia. They still disagree.*

sils secured in their home institutions than any other paleoanthropologist can boast.

Like many of the study session participants, Bernard Wood of The Middlesex Hospital Medical School, London, confessed to having been skeptical at the prospect of the fossil fest. "But," he said, "it was much better than I expected. It was an excellent opportunity to quiz people about their specimens." In spite of his familiarity with most of the material Wolpoff affirmed the value of having it all in one place and in company with the people who study it. "Yes, I've seen all these things before, but the great thing was being able to thrash out long-standing points of difference and be sure you were talking about the same thing. You can't do that properly through the literature."

Everyone agreed that study session discussions were more relaxed and open than is typical in this most emotional and trenchant of the sciences. More willingness to listen, more readiness to accept another's interpretation. Although virtually no one came away from these sessions with all their previous notions intact—"It was good to see people change their positions in front of the specimens," noted Christopher Stringer of the British Museum (Natural History)—there were no *major* shifts of opinion, no mea culpa d'un sceptique. "It was a great interaction," observed Wolpoff, "but no one would shift on their deepest beliefs. These are differences in philosophy, and you can't expect to do anything about that."

Although the study sessions were clearly scientific in intent and execution—at the level of eyeballing the fossils rather than clamping calipers all over them at any rate—the event was clearly a visceral experience too. "To be in the same room with all these relics was for many workers an emotional event," offered Stringer. No one demurred, though one sociologist of science was heard to mutter "sounds like ancestor worship to me."

Perhaps it was because of the location of this unique get-together, perhaps it was because of the direction paleoanthropology is going these days, but in any case there was at this meeting more than any other a heavy emphasis on what the various specimens were rather than how they once lived, an emphasis on taxonomy rather than behavior. And more than that, there was a heavy emphasis on one particular method of approach to such classification: cladistics.

The American Museum is of course the temple of the type of systematics known as cladistics, which is meant to reveal taxonomic relationships between specimens through the identification and grouping of certain discrete traits as either primitive or derived. Proponents of the methodology say it is the only rigorous and objective method for doing systematics. Others object to this and say that by atomizing a specimen into discrete traits one loses touch with an essentially integrated essence of the organism—the total morphological pattern, as a distinguished British anatomist once put it—without which one cannot make reasonable biological assessments of evolutionary relatedness between species. "We are not stamp collectors, we are biologists," was the pithy comment from Yves Coppens of Le Musée de l'Homme, Paris.

"The problem of classification came up time and time again," said Stringer, whose own home institution, the British Museum, is somewhat of a bastion of cladistics in that part of the world. Wood's observation on the matter crystalizes the problem: "Those of us who are cladists—overt or otherwise—tend to emphasize the differences." Those who are not tend to discount a lot of the differences as merely a manifestation of normal variation within populations. How to cope with variation is clearly a headache for any science that is both blessed with samples of such meagre magnitude as is typical in paleoanthropology and has a tradition of seeking significance in every lump and bump of every new specimen.

Recent years have seen a tendency for people to concentrate on particular aspects of anatomy—on dentition, facial features, postcranium, and so on—rather than on a fossil collection as a whole. Being in a room full of fossils and other paleoanthropologists of different interests allowed such experts to give others the benefit of their specialized experience, but more important it forced them to take note of the rest of the organism. Perhaps the most salient recognition such an experience brought was that even when one's own anatomical feature of study failed to change through a particular stretch of time, others did; and vice versa. "We rediscovered mosaic evolution," said Wood.

What also emerged from all this was a new spotlight on the base of the cranium as being especially diagnostic of important evolutionary change, a kind of paleoanthropologist's version of upside down phrenology. Alas, packed with information it might be, but it is also extremely fragile and rarely survives fossilization. For one participant, Bill Kimbel of the Cleveland Museum of Natural History, what he came to see in this anatomical region in some of the earliest hominid specimens through discussing with others at the study sessions persuaded him to consider readjusting his perception of the human family tree.

Previously Kimbel, together with Donald Johanson of the Institute of Human Origins, Berkeley, and Timothy White of the University of California, Berkeley, had thought that the ancient species *Australopithecus afarensis* was the last common ancestor between the *Homo* line on the one hand and the *Australopithecus* line (specifically *A. africanus* and *A. robustus/boisei* on the other). "If I got something from the study sessions it was that the cranial base of *africanus* is in part derived in the direction of all later hominids," he said, which would make *africanus*, not *afarensis*, the last common ancestor in the hominid tree. He would, however, like to see an *africanus*-type specimen retrieved from 2.5- to 3.0-million-year-old deposits before being anything like sure about this.

The evidence from the early stages of human evolution—between 4 and 1 million years ago, has always been sparser and the focus of more obvious contention than that for the later period. And Todd Olson of the City College of New York, whose interest is firmly in the beginning stages, thought that this was clearly reflected in the study sessions. From Stringer's perspective, which is from the later stage, this is far from the case. "Yes, we have more material, but there are just as many disagreements," he said. "We are just less vocal about them, that's all." One can speculate endlessly on why this might be the case, why passion is more readily generated about the emergence of the hominid line rather than its later refinement. Perhaps there is something in ancestor worship after all.

For those whose normal business is in, for instance, the origin and fate of the Neanderthals, the physical attributes of the earlier members of the human family looked most unprepossessing. "Like microcephalics with big teeth," was one comment. "Funny looking apes," was another.

Once the study sessions were at an end the numbers of paleoanthropologists and fellow travellers in the museum swelled, and a 5-day symposium ensued, a 5-day sweep through 30 million years of ape and human evolution. With this change of pace in the proceedings, this shift to public rather than private exchange, there returned "business as usual," commented one participant. "Back to the politicking and preening and so on."

Nevertheless, it was an impressive display of progress through the years against odds that do not seem to get much kinder. And it was a particularly apposite encapsulation of all that paleoanthropology has achieved in the 60 years since the first australopithecine was discovered—the Taung child, *Australopithecus africanus*—because occupying the same front row seat throughout the proceedings was Raymond Dart, who recognized the small fossilized skull and brain cast as that of a hominid and not just another ape as virtually everyone else insisted it was.

Perhaps it was because the symposium was entitled "Paleoanthropology: The hard evidence" that molecular biology hardly got a mention. Understandable, but a pity, because of its major impact on the science in recent years, primarily through forcing a reassessment of the timing of key evolutionary events, such as the divergence between apes and humans. Ironically, its only mention came from Jeffrey Schwartz of the University of Pittsburgh, who argued that this and morphological evidence suggest to him that humans are more closely related to orangutans than to the African great apes, which is contrary to what most everyone else, whether paleoanthropologist or molecular biologist, believes.

Margot Crabtree, *Science* '84

The Taung child

Raymond Dart recognized this infant specimen as a hominid in December 1924, the first australopithecine to be found. He was disbelieved and virtually ignored for more than a decade by most anthropologists.

The idea for the Ancestors event was conceived almost 4 years ago when John Van Couvering of the American Museum thought "How fantastic it would be just to bring all these things together." Ian Tattersall and Eric Delson, also of the museum, acted as midwives. The most ambitious plan was to have every major fossil pertaining to human evolution in the exhibition. But this discipline is subject not only to personal squabbles, which can be disruptive enough, but also to political perturbation on a broader and more significant scale. So, the initial ambitious plan was never likely to be fulfilled in reality. There are, for instance, no Tanzanian fossils in the exhibit, although they had been promised up until the last minute. No official reason was given, but it was generally understood that participation in the events by South African nationals caused the Tanzanian president to overturn the original agreement. As it happens, the South Africans involved are well known for their vigorous antiapartheid activities.

> "My fears and worries have been allayed, not only by the stringent security steps taken by the museum but also by the scientific gains."

The Chinese also declined at the last minute to send any material, which is not surprising, given the catastrophic loss of most of the Peking Man fossils when they were being shipped to America in the last war and the damage to a recently discovered cranium that was loaned to Japan for an exhibition. Objections by Australian aborigines meant that Alan Thorne of the Australian National University arrived empty handed.

The largest fossil gap, however, was caused by the absence of any Ethiopian and Kenyan specimens. It was never very likely that Lucy and her fellows from the Hadar region of Ethiopia would come to New York, as that country is still trying to establish proper ground rules for interacting with foreign research teams in paleoanthropology. And Richard Leakey declined to risk damage to the Kenyan collection through shipping it halfway across the world. For the study sessions it was therefore doubly important that the South African specimens were present, as they represent at least some of the same time period and taxonomy. And for the exhibition, casts of Lucy and the famous 1470 skull from Kenya fill in the gaps.

Was it all worth it, this half million dollar extravaganza? "There is a mystique in having them all in one place," said Elwyn Simons of Duke University. "They have been found only to enlighten: to do that they have to reach the widest possible audience." Mary Leakey considered that the risk of damage—both accidental and deliberate—to the fossils is so great that it should have discouraged the enterprise. "High quality casts would have been nearly as good, both for the study sessions and exhibition to the public." She did stress, however, that while she objected to the principle of the whole venture, the procedure adopted by the museum for security was beyond reproach.

Phillip Tobias, who occupies Dart's chair in the Department of Anatomy at the University of the Witwatersrand, South Africa, described the fossil assemblage as "a world treasure" and the study of human evolution as "a world problem." "My fears and worries have been allayed, not only by the stringent security steps taken by the museum but also by the scientific gains." He urged everyone, scientist and nonscientist, to go and view this great exhibit.

This is good advice because in the words of the instigator of it all, John Van Couvering, "It will probably never happen again." —**Roger Lewin**

The Ancestors exhibit at the American Museum of Natural History, New York, will be open through 9 September 1984.