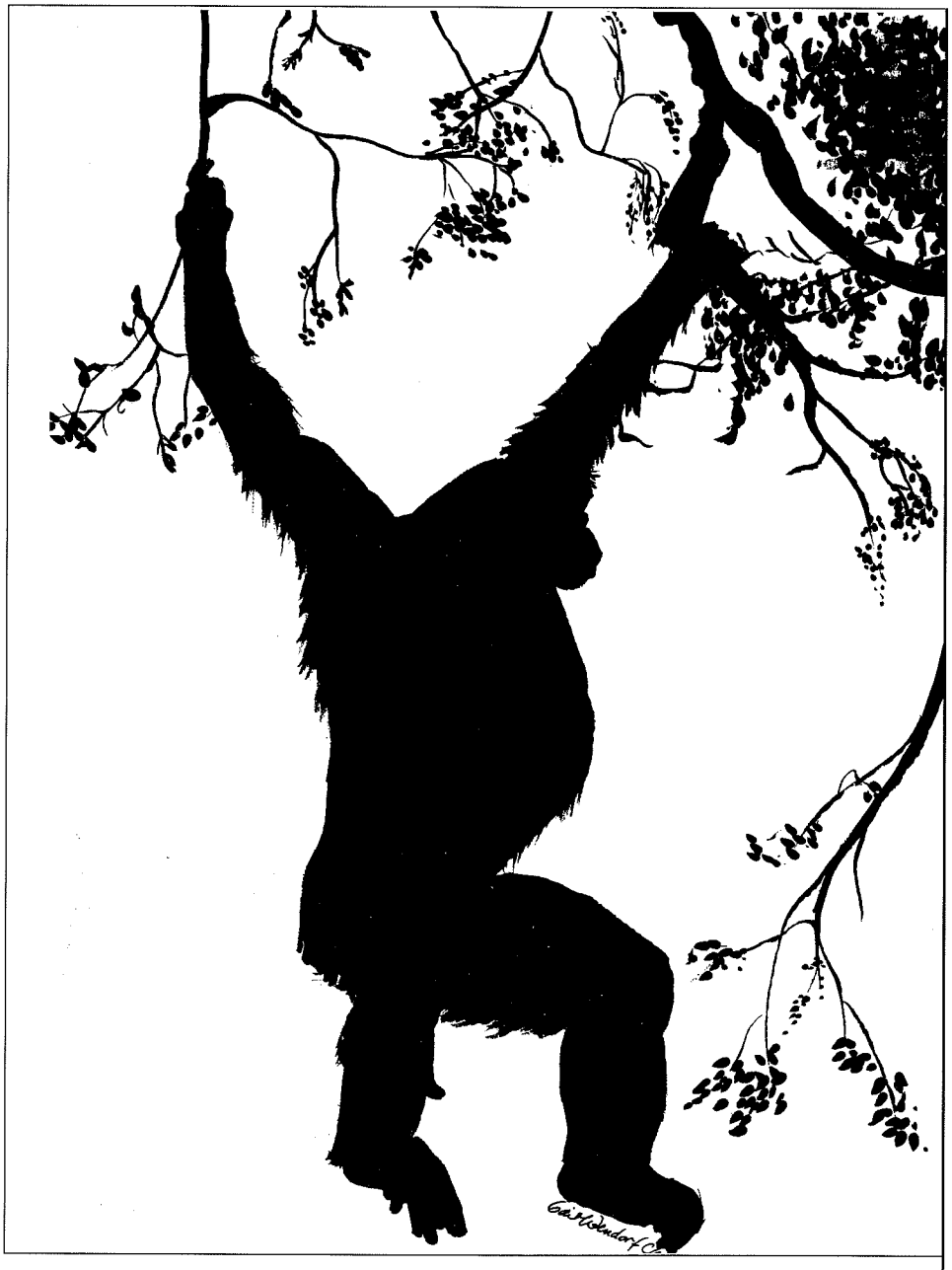
AnthroQuest

Research Related to Human Origins, Behaviour and Survival

In This Issue:



Number 47 **The L.S.B. Leakey Foundation** Spring 1993

The L.S.B. Leakey Foundation was established in 1968 by a group of eminent scientists and informed lay people who recognized a critical need to strengthen financial support for new multidisciplinary research into human origins, our evolving nature and environmental future. It was named in honor of the man who has become known as the "Darwin of pre-history," Dr. Louis S.B. Leakey. The Foundation sponsors:

- International research programs related to the biological and cultural development of humankind.
- Long-term primate studies which may help us understand how we evolved as a species.
- Scientific conferences, publications and educational programs designed to disseminate knowledge about our changing views of humanity's place in nature.
- Advanced training and education of students in all of these fields.

The L.S.B. Leakey Foundation is a public foundation. All contributions are tax deductible as provided by law. AnthroQuest is published by the Foundation as a service to its members.

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77 Jack London Square, Ste. M
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President's Message •

It is always gratifying to be reminded how very important the L.S.B. Leakey Foundation continues to be in fostering research on hominid origins and evolution.

At our May Board of Trustees meeting, Dr. D. Karla Savage, Program and Grants Officer, reported on the second annual meeting of the "Paleoanthropology Society" in Toronto, April 13-14. The society was formed to bring together archeologists, paleontologists, primatologists, and others on topics of mutual interest (such scholars are usually scattered among national meetings of their subdisciplines). At this meeting, 39 papers were presented; 20 of these, or **50%, reported on projects directly funded by the Leakey Foundation!** Of the 66 scholars represented in these papers (many were co-authored), **the Leakey Foundation had provided support for 33.**

Although most of our grants are modest, in the range of $3,000 to $6,000, they have often provided the essential seed money -- to contact a new hunter-gatherer group, extend studies at a new great ape study site, develop a new lab technique -- that has then enabled the scientist to secure a larger, sustaining grant from another foundation, such as the National Science Foundation. In other instances, we have been able to provide the funds to keep a key project going during a hiatus in major funding; our support of Christophe and Hedwige Boesch's research on the tool-using chimpanzees of the Tai Reserve is one example.

Our largest award at the May meeting went to Dietrich Mania to sustain the long term excavations at his Middle Pleistocene site of Bilzingsleben (formerly GDR). This site has not only yielded the remains of Homo erectus, but has an astonishing array of preserved artifacts in stone, wood, bone and antler -- this may well be the most perfectly preserved "living site" of Homo erectus ever discovered.

Financial support by the Leakey Foundation for human origins research grows more critical every year. The increased demand for grant money is, in part, a result of the availability of new research locations - new sites are being excavated in Eastern Europe and Asia, and new great ape sites discovered in Africa and Southeast Asia. A slow decrease in the amount of grant support from the major federal funding agency, the National Science Foundation, has also put a tangible squeeze on available funding resources. NSF has had flat budgets for at least the last five years. When these budgets are corrected for inflation, the real amount of money available for research into human origins is actually declining. The Leakey Foundation is uniquely positioned to respond to the forces of increased demand for grant monies and decreased availability of that support.

New opportunities for scholarly exchange with China have opened up exciting possibilities and a major fundraising challenge. We have known for some time that sites in China and Southeast Asia will be critical for resolving the important issue in recent human evolution: Did modern Homo sapiens evolve from more archaic hominids everywhere in the Old World, or just in Africa?

Some of the most important areas for understanding early hominid evolution have been closed to the outside world since 1939. Two generations of Chinese archeologists and paleontologists have been cut off from contact with colleagues in Europe and North America. These scholars are eager to study abroad, and to adapt modern techniques and interpretation to the rich sites of their homeland.

The Leakey Foundation board has decided to take the initiative in setting up an "Asian Scholars Program", modeled after our very successful Franklin M. Baldwin Fellowship program for young African scholars. The board's goal is to seek an endowed scholarship fund of $2,000,000 to meet this exciting challenge. We look forward to working with Foundation members and donors to reach this ambitious goal.

Kay Woods

Mrs. Frank M. Woods

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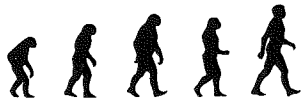

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The Mosaic Lifeway of our Australopithecine Ancestors: Piecing in Some Fragments From The World of The Chimpanzee

Kevin D. Hunt, Indiana University

October 7, 1986 began as a sunny, pleasant day, though the dark horizon hinted that rain was a possibility. I had set off at dawn to find chimpanzees in the hills above my small house on the shores of Lake Tanganyika, Tanzania. At midmorning I sat near a small tree watching Chausiku, an adult female who was to become one of my favorite chimpanzees at Mahale.

In this early part of my study I was still mesmerized by nearly everything the chimpanzees did, and Chausiku was being especially interesting this day, moving gracefully among the tiny twigs at the outer reaches of the Garcinia tree. She was eating the small cherry-tomato-like Garcinia fruits, and she was going about it in a very business-like way. Half hanging from an overhead twig and half standing on a lower branch, she popped the juicy flesh of one fruit after another into her mouth, dropping the empty skins onto what was becoming a carpet of detritus under the tree. Nearby her infant Chopin killed time by alternately capering among the small branches of the fruit tree and studying Chausiku's movements, mostly concentrating on shirking the chore of gathering his own fruit. He was still young enough that he knew he could count on mother's breast to complete his meal. Another chimpanzee arrived and began gathering fruit by reaching into the lower branches of the tree from the ground. As I sat on the grass near the Garcinia for an hour and a half, a number of chimps came and went, feeding either from the ground or, like Chausiku, in the tree. After a while it began to rain. For the next two hours, as I sat shivering with Chausiku and Chopin, huddled against the persistent downpour, in my mind I replayed the image of Chausiku's seemingly oversized figure weighing down the tiny fruit tree, and of how gracefully she moved among the dangerously small twigs as she fed. Yet I had no idea that what I had seen was in any way important; it was the beauty of it that had caught my attention.

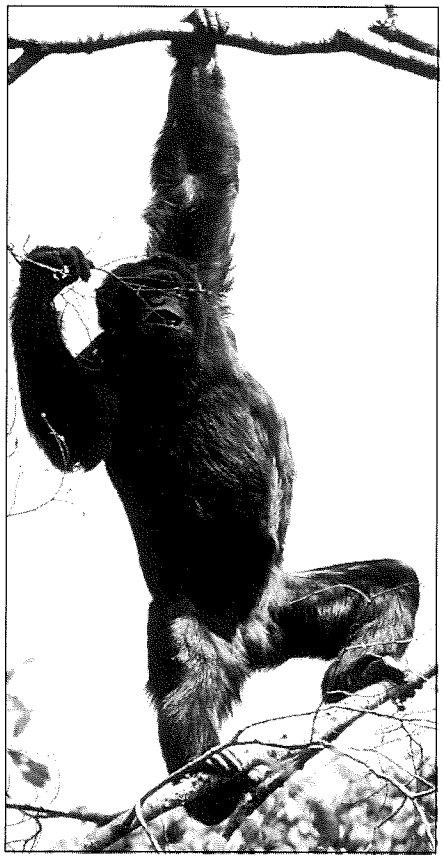


Figure 1

It was only two years later, as I poured over a printout that was a distillation of my year of observation that I realized the significance of Chausiku's bipedalism. Chausiku's behavior, sieved through the filter of my scratchy field notes and neatly typed out in a computer summary, turned out to be an important clue to the way of life of our australopithecine ancestors -- indeed, to the very origin of humanity.

Background

With the aid of a Leakey Foundation grant, I went to Tanzania in August of 1986 to study chimpanzees at the Mahale Mountains and Gombe Stream National Parks. My aim was to follow chimps for a year, recording their locomotion and posture (together referred to as "positional behavior"). Although chimpanzee anatomy is well known, until a colleague of mine, Diane Doran, and I began our studies, no long term study had quantified their positional behavior. Such data is necessary to explain why chimps have such peculiar bodies -- and their bodies <u>are</u> peculiar. Chimps are a patchwork of parts seemingly borrowed from several animals. They have long arms, long curved fingers and rather mobile hips, traits otherwise found only among fellow apes. They resemble humans and other apes in having a broad short chest, mobile wrists, mobile shoulders and no tail. Monkeys look rather like dogs with hands instead of paws; they have deep, narrow chests, long torsos, and approximately equal fore- and hindlimb lengths. As most

primates do, chimps have a grasping foot and rather short hindlimbs. The combination of traits make apes look rather like long-fingered humans with absurdly short legs with hands at the ends of them.

Locomotor and Postural Study

The study of locomotion and posture in primates may seem abstruse, but in fact it has a long history. Since the late 19th century, anthropologists have been furtively creeping around Africa spying on the apes in hopes of understanding their unusual shape. Sir Arthur Keith believed that ape anatomical peculiarities were due to their unique brachiating adaptation, that is, their propensity to get around using hand-over-hand swinging underneath branches. A drawer full of scientific publications documented the elegant adaptations of the apes to brachiation: Their internal organs sat on a bowl-like pelvis instead of being suspended from the spine; their mobile shoulders allowed them to orient their arms above their heads; their mobile wrists allowed first one and then the other hand to be fixed on a branch while the body rotated underneath it; their arms were elongated in response to their increased locomotor responsibilities; their spine was short because their arms, not their back, propelled them; their chest was flattened to give the arms better clearance of the thorax; and their scapulae (shoulder blades) were long to help lever up the arm when reaching during brachiation. Even though a few chimpanzee specializations, such as their narrow-shouldered, hunched appearance and their cone-shaped torso, were unexplained, such details were not a cause for concern. They were merely loose ends to be tied up later.

To the consternation of anatomists, studies of wild apes stubbornly refused to yield data that fit with this elegant theory. Brachiation was found to be rare among the larger apes. Some scholars reacted by liberalizing the scope of the term brachiation to include behaviors that had similar movements. Other researchers took a different tack. They pointed out that whereas brachiation was uncommon in many apes, there was one thing that all apes did -- climb. Matt Cartmill and others proposed that long arms (and fingers) might be useful for reaching around large vertical trunks during climbing, and that mobile wrists might be useful in orienting the hand around oddly angled branches and among twigs at the edges of trees. Mobile shoulders might be necessary for reaching up to grasp a new handhold while climbing. A short back might be an adaptation to stabilize the spine against the forces of the powerful hindlimbs pushing the body upwards.

In confirmation of this new hypothesis, laboratory studies of muscle activity (electromyography or EMG) revealed that muscles that were large in apes were typically more active during vertical climbing than during brachiation. The climbing hypothesis seemed even more elegant and seamless than the brachiation hypothesis -- except for one annoying glitch. While it is true that all apes climbed, climbing had not been very rigorously defined. It was really catch-all locomotor category consisting of not only vertical climbing but a number of behaviors that were nothing like what we do when, for instance, we climb a ladder. Even regular

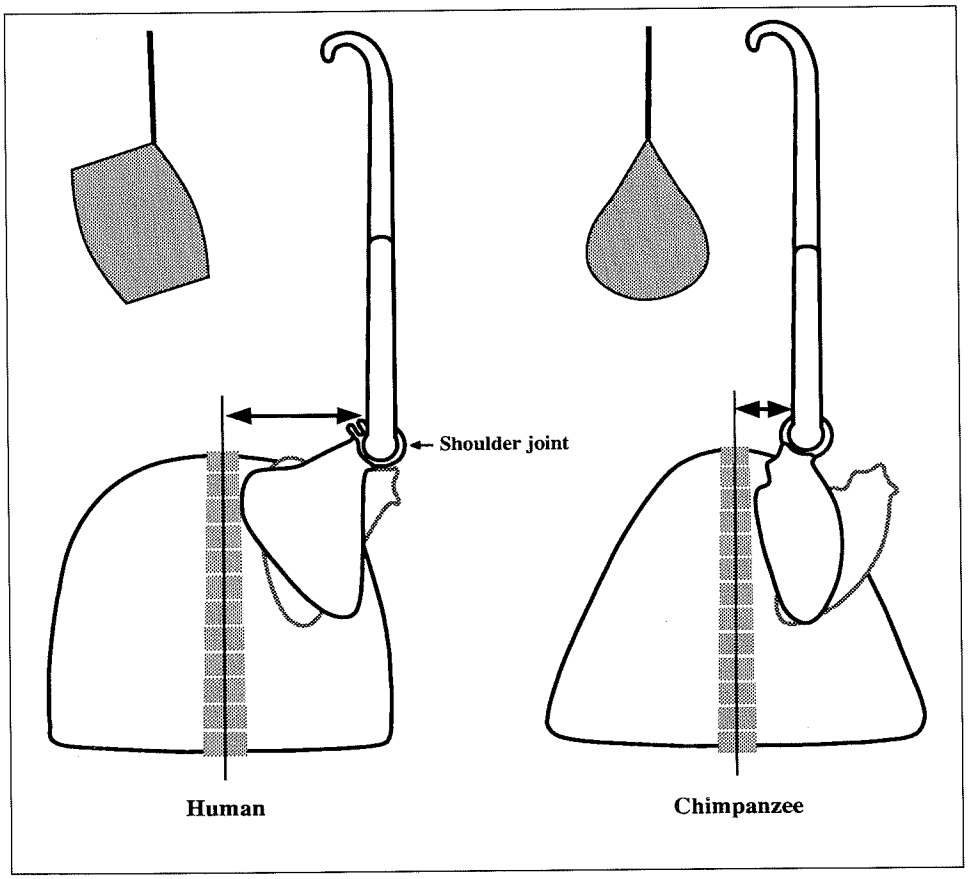


Figure 2

monkey four-footed walking on inclined branches was called climbing.

Chimpanzee Positional Behavior and Morphology

The results from my study showed that 90% of what chimps did could not account for their specializations either because the behaviors were unstressful or they were too much like those of monkeys. This meant that the remaining 10% of chimpanzee positional behavior must be responsible for all of the substantial ape-monkey differences. In such a small piece of pie, a sliver can mean a lot. Still, brachiation seemed too rare (0.1%) to have caused chimp anatomical specializations. Climbing (ascents or descents on surfaces >= 45 degrees) made up 0.9% of all behavior, but that's not very different from baboons (0.5%). Unimanual arm-hanging made up by far the largest proportion of that important remaining 10% (4.4%), and it was also extremely rare in baboons (<0.5%).

Hanging by one arm presents some difficult and unique physical problems. The torso of the typical primate is rather barrel-shaped, with the arm attached far to one side. One-armed hanging causes stresses like those in a barrel that is lifted by a single point on its rim. When the barrel is lifted stresses are very high in some places (and likely therefore to fail there) and low in others (so that the strength there isn't being used). If it were suspended from a hook in the center of its top, stresses would be nearly the same on every stave, and lower on the most stressed. An arm-hanging primate, therefore, might be expected to suspend its "barrel" from a center point, but how can they? Primates are more or less laterally symmetric, and they have a midline that is already occupied by a can't-do-without-it head. Never underestimate evolution. Chimpanzees evolved narrow shoulder blades (scapula) to help reduce such stresses. In humans the scapula runs into the spine before it can rotate far enough to allow the shoulder joint to move to the midline, but the narrow scapula of the chimpanzee allow it to swing far up, so far that when an arm-hanging chimpanzee is viewed from the front, the shoulder has all but disappeared behind the neck (Figure 1). To make arm-hanging still more comfortable, the chimpanzee shoulder joint is tilted up. Humans, in contrast, have a socket for the humerus (the upper arm bone) that faces sideways (Figure 2).

There is still stress that wants to make the top and the sides of the barrel one smooth line, more like a cone. In other words, a cone shaped object lifted by a hook at its apex has its stresses distributed more evenly than a barrel. One might take this to its logical extreme by imagining an object hanging from a single point that has all of the stress distributed perfectly evenly. Nature provides us with an example of this in a water droplet, which settles into its shape by a balance between surface tension and gravity. Stress is exactly equal on all parts, and the result is a distinctive teardrop shape. A chimpanzee thorax resembles a teardrop, cone-shaped at the top and bulging at the bottom, more like a water droplet than a barrel (Figure 3).

Australopithecine Anatomy

What does the anatomy of the celebrated Lucy fossils look like? Jack Stern, Randall Sussman and William Jungers of SUNY Stony Brook, Russ Tuttle of the University of Chicago, and Bruce Latimer and C. Owen Lovejoy of the Cleveland Museum of Natural History and their colleagues have given us a good idea. The torso is cone-shaped and the shoulder joint points upward, like the chimpanzee. The arms are long in relation to the legs, mostly because her legs were very short. Lucy's hips, unlike what would be expected of efficient walkers and runners, are extremely wide. Bill Jungers showed that compared to humans, Lucy's joints are systematically smaller below the waist, and larger

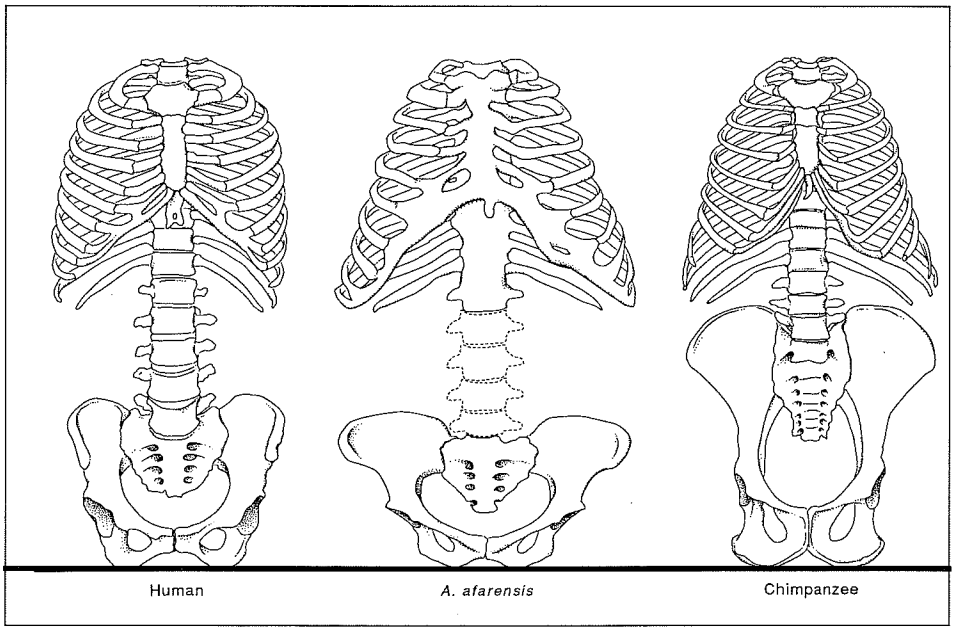


Figure 3

from the waist up, similar to apes. A.afarensis toes are curved and longer than those in modern humans. Long, curved digits like these are found among animals that rely on strong gripping. Joint shape and toe proportions suggest rudimentary gripping abilities. In contrast, Lovejoy and Latimer have shown that aside from width, the hip bones of Lucy are almost modern in shape. The foot (except the toes and big toe joint), knee joints and ankle joints are strikingly similar to those of modern humans.

These features suggest a creature rather ape-like from the waist up, and fully bipedal from the waist down, but her bipedality seems to have chimp-like edges here and there, seemingly wherever it does not compromise the bipedalism too much. How can this be? Could an animal that spends time in a tree stride bipedally like ourselves? You cannot walk in a tree, not like we do, so bipedalism must mean terrestriality. How can one part of the body clearly indicate arboreal arm-hanging when the other part is so clearly adapted to bipedality? If Lucy was adapted to the ground-living, why would she retain so many features from her more ape-like ancestors, especially those features that make striding bipedalism inefficient, such as short legs, long toes, wide hips and small hindlimb joints?

Why Are We Bipedal?

I have sometimes imagined how wonderful it would be to follow an australopithecine, just for a single day. When I think of the curious mixture of human-like intelligence I saw in chimpanzees (their social skills were uncanny) and animal dumbness (they certainly don't have engineering minds), I can only imagine how intriguing the mix would be in australopithecines.

Alas, watching living primates is the closest we can come to watching Lucy. Perhaps not surprisingly, many hypotheses about bipedalism come from primate watchers. Russell Tuttle postulated that our ancestors were preadapted to bipedal locomotion by a long history of arboreal bipedal feeding postures and bipedal locomotion on large branches, an exaggeration of gibbon behavior. Clifford Jolly and Michael Rose pointed out primates are bipedal most often when feeding, especially when collecting plentiful small food items found in bushes. Richard Wrangham added that a bipedalist would not have to spend extra energy to raise and lower the torso when alternating feeding and walking. But if australopithecines are arboreally adapted, how did their bipedalism become so well refined? If australopithecines had a bipedal **locomotor** adaptation, why did their locomotion remain so inefficient? And if bipedalism evolved **as a posture** to aid in terrestrial gathering, why the arboreal adaptations?

Chimpanzee Bipedalism

My data clearly supported a feeding hypothesis. 85% of the time chimps were bipedal was while eating or gathering food. On the ground, most observations of bipedality were made when they fed from two rather short trees, one merely a large bush. Both had small fruits. This finding was quite exciting, since it closely conformed to the Jolly/Rose terrestrial feeding hypothesis. But that could not be the whole story, because more than half of my bipedal observations were arboreal, as expected by Tuttle's hypothesis. When I looked at the list of trees chimpanzees fed from arboreally with bipedal postures, I found that two of the three most common species were the same trees they fed from on the ground.

The third common tree, it turned out, was even more exciting, because it was Garcinia huillensis. The vivid memory I had of Chausiku feeding in a tiny Garcinia tree came rushing back. It was important because I had seen a number of other chimpanzees feeding on the fruits of this tree from the ground (my data collection protocol, however, only allowed observations of Chausiku to be used in analysis). Chimps tended to feed bipedally both from the ground and up in the tree -- in the very same trees! Terrestrially, chimpanzees ate fruits by standing bipedally and working their way around the periphery of the tree, sometimes holding onto a branch to stabilize their lower body, but most of the time using both hands to harvest fruits. Sometimes they reached high into the tree, grasped a branch and fed in an arm-hanging/standing posture. Bipedalism and arm-hanging seemed closely associated since chimps often harvested fruits using bipedal postures that involved partial suspension from a forelimb.

Australopithecus afarensis Bipedalism

Might our earliest ancestors have harvested fruit in a similar manner? This might explain how A. afarensis upper bodies could have been adapted for arm-hanging, while their lower bodies are more like ours. If the original function of bipedalism was as a feeding **posture**, the imputed inefficiency of bipedal **locomotion** in A.afarensis suddenly fits perfectly. Although Lucy's short legs and delicate joints seem poorly suited to the wear and tear of heavy carrying or long distance travel, her anatomy **was** well suited for short-distance locomotion and efficient arboreal and terrestrial postural feeding. Compared to humans, australopithecines were **postural bipeds**.

So it seems ape study has left us with a clearer picture of our ancestors. As Louis Leakey predicted, we can see them better peering over the fuzzy shoulders of chimpanzees. They were not spear carrying hunters striding across grassy savannahs, fixing skittish mammals with a steely hunter's eye, but fruit eaters, spending much of their day standing and gathering rather than striding. Our ancestors were frugivorous, bipedal apes.

Epilogue

Science has its price. Among African primates I felt a little closer to our ancestors, but it did little to emphasize my humanity. After a year among apes, my wife complained that I had become nearly as silent as the animals I had studied. My temporary reticence was a small price to pay, for speechless as they are, my chimp friends Chopin and Chausiku had something to say which I found fascinating, even if it was a little gossip about the lifestyle of a relative - - Lucy.

Acknowledgements C.L. Brace and R.W. Wrangham inspired much of this work. T. Nishida and J. Goodall generously welcomed me at their field sites. Research was aided by the L.S.B. Leakey Foundation, the University of Michigan Museum of Anthropology, Rachkam Graduate School (U.M.), National Science Foundation grant BNS 86-09869 and a Harvard University Postdoctoral Fellowship. R.W. Wrangham provided additional financial support an encouragement. I am grateful to each.

Leakey Foundation Annual Meeting

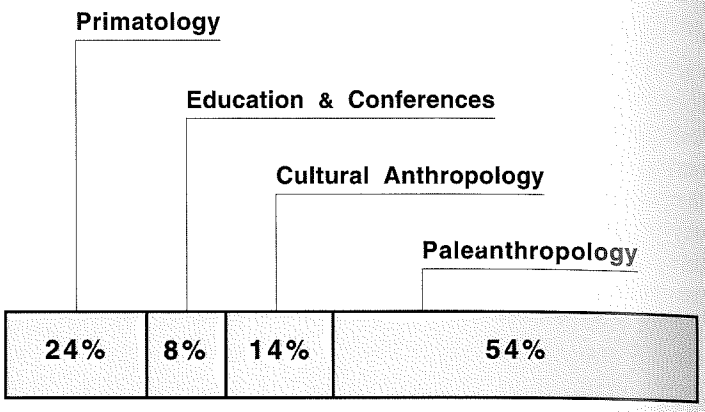
LEAKEY FOUNDATION ANNUAL MEETING: The Foundation held its annual Board of Trustees meeting at SUNY - Stony Brook in October 1992. One of the weekends entertainers was Dr. Jack Stern, Chair of the Deptartment of Anatomical Sciences at SUNY - Stony Brook (pictured at left), who demonstrated his insight as a researcher as well as his natural abilities as a stand-up comedian. Leakey Foundation Chairman of the Board Gordon Getty is pictured at right enjoying the evenings festivities. Photos courtesy of Mr. Noel Rowe.

Grants •

Total Grants Fall 1992 & Winter 1993

By Granting Sessions and by Designated Gifts

$219,928



Cultural Anthropology

Bird, Douglas (UC-Davis) $9,972
Bliege, Rebecca Australia
Children's Foraging in Torres Strait, Australia

FORAGING FELLOWSHIP

Dounias, Edmond (U Miami) $20,000
Demography of Wild Yams: Effects of Exploitation and Management by the Baka Pygmies in Southeastern Cameroon — Cameroon

Paleoanthropology

Bar-Yosef, Ofer (Harvard U) $6,930
Plio-Pleistocene Geology and Archaeology in the Republic of Georgia — Republic of Georgia

Bernor, Ray (Howard U) $9,000
Kordos, Laszlo (Hungarian Geological Inst)
Multidisciplinary Research at Rudabanya: Support for Excavations at Site II — Hungary

Bromage, Timothy (CUNY-Hunter) $12,647
Vertebrate Paleontological and Archaeological Survey of Pliocene Southeast Africa — Malawi, Tanzania

Ciochon, Russell (U Iowa) $16,000
Paleoanthropological and Geochronological Investigations of Lang Trang Caves, northern Vietnam — Vietnam

Conard, Nicholas (U Connecticut) $9,333
Excavations at the Middle Paleolithic Site of Wallertheim in the Rhine Valley — Germany

Harris, Jack (Rutgers U) $10,100
Semaw, Sileshi (Rutgers U) Ethiopia
Late Pliocene Paleoanthropological Studies in the Gona Deposits

Huh, Chih-An (Oregon State U) $5,796
Toward a Precise Chronology of the Peking Man Site — USA

Jurmain, Robert (San Jose State U) $4,000
Kilgore, Lynn (San Jose State U) England, Belgium
Pathological Conditions of the Skeleton in Free-Ranging Pongids: Evolutionary Implications

Kimbel, William (IHO) $10,600
Continued Paleoanthropological and Geochronological Research at the Hadar Site, Ethiopia — Ethiopia

Milo, Richard (U Chicago) $6,900
Middle and Later Stone Age Butchering: An Assemblage-Level Comparison — South Africa

Rak, Yoel (Tel Aviv U) $9,750
Hovers, Erella (Hebrew U) Israel
Kimbel, William (IHO)
Human Adaptations at the Neanderthal Site of Amud Cave, Israel

Ravosa, Matthew (Northwestern U) $5,000
Mandibular Form and Function in American and European Adapidae and Omomyidae — Various Museums

Scott, Katharine (U Oxford U) $3,000
Excavation of Mid-Pleistocene Channel Deposits at Stanton Harcourt, Oxfordshire, England — England

Spencer, Lillian (SUNY-Stony Brook) $2,000
Antelopes and Grasslands: Reconstructing African Hominid Environments — Various Museums

Thewissen, Johannes (Duke U Med Schl) **$3,500**
The Search for Anthropoids in the Eo-Oligocene of the Himalayas in Pakistan — Pakistan

Winkler, Alisa (S Methodist U) $5,000
Small Mammals from Kenya: Implications for Mammalian Paleobiogeography — Kenya

Primatology

Grieser, Bettina (U College London) $2,000
Tests of Current Socio-Ecological Hypotheses and the Possible Impact of Tourists on Chimpanzees in the Kibale Forest, West Uganda — Uganda

Johnson, Christine (UC-San Diego) $3,500
The Use and Monitoring of Eye Gaze in Pygmy Chimpanzees — San Diego Zoo

Kubzdela, Katarzyna (U Chicago) $5,000
Demography, Behavior, and Reproduction of Malagasy *Propithecus verreauxi* — Madagascar

Lehman, Shawn (Washington U) $2,000
A Study of the Diet and Positional Behavior of Venezuelan Black-Headed Uakaris (*Cacajao melanocephalus melanocephalus*). — Venezuela

Maestripieri, Dario (Emory U) $5,000
Social Influences on Mother-Infant Relationships in Three Species of Macaques (*M. mulatta, M. nemestrina, M. arctoides*) Yerkes Regional Primate Center — USA

Vasey, Natalia (Washington U) $5,000
Positional Behavior and Functional Anatomy of Lowland Rainforest Lemurs — Madagascar

GREAT APE FELLOWSHIP

Doran, Diane (Duke U) $30,000
Niche Separation of Western Lowland Gorillas and Chimpanzees in Northern Congo — Congo

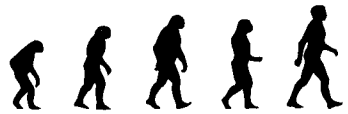
Education and Conferences

Hartwig, Walter (UC-Berkeley) $1,500
Symposium on Image Acquisition, Analysis and Archiving: New Research Directions in Physical Anthropology — AAPA Canada

Howell, Clark (UC-Berkeley) $1,400
Conference Attendance at Bilzingsleben, Germany, Location of Well-Preserved Middle Paleolithic Site — Germany

Magori, C.C. (U Dar es Salaam) $10,000
Conference: Four Million Years of Hominid Evolution--Tribute to Mary Leakey — Tanzania

Peng, Nanlin (Indiana U) $5,000
Support for One Semester Towards a PhD at Indiana University — Indiana, USA



Leakey Foundation Trustee Honored

Fleur Cowles, a long time Trustee of the Leakey Foundation, USA, and President of the Leakey Trust in Europe, noted publisher, writer and painter, was honored recently by the University of Texas, Austin.

The Harry Ransom Humanities Research Center at the University recently announced the establishment of the Fleur Cowles Room at the Ransom Center and the inauguration of the important global Fleur Cowles Fellowships; they will provide support for fellowships, internships, symposia and lectures in the humanities.

The Center is one of the world's preeminent institutions for literary and cultural research, boasting an unparalleled collection of twentieth-century British, American and French literature.

What's Behind the Human Mind?

by Blake Edgar

Trying to give an identity to old bones is a tough enough task for those who study human origins. It's even harder to infer our ancestors' behavior from bones, stones, and other bits of evidence. Attempting to figure out how and why the human mind evolved might seem like a quixotic chore. Yet that's just what a husband-and-wife team of scientists has set out to do.

At the Leakey Foundation's annual Allen O'Brien Memorial Lecture last November, Leda Cosmides and John Tooby discussed, "The Evolution of Human Reasoning Instincts" before a capacity crowd at the California Academy of Sciences. Cosmides and Tooby are professors of psychology and anthropology, respectively, at the University of California, Santa Barbara and co-editors of The Adapted Mind, published last year by Oxford University Press.

In the lecture, they asserted that humans are still learning how to deal with a brain that came of age in the Pleistocene. Consider their carefully chosen title. What does reasoning have to do with instinct? Instinct involves rigid, inflexible behavior, whereas reason is a capacity that we value as distinctly human. Cosmides and Tooby suggested that instinct lies at the root of our reason. The human brain contains a complex set of "reasoning instincts" designed specifically to process information, just as other kinds of instincts drive a spider to spin its web or a beaver to build its dam.

Because modern humans have spent most of their existence as hunter-gatherers, the lecturers said that if the human brain contained reasoning instincts, they would have evolved to solve the day-to-day Pleistocene problems that our ancestors encountered. They were preoccupied with basic tasks such as finding food and mates, parenting, and engaging in a system of social exchange. Special information-processing circuits that became built into the human brain could have helped early humans to compete and cooperate and maintain an evolutionary edge.

Could similar circuits govern how we think and reason today? Cosmides and Tooby believe so, and they consider human reasoning instincts to have been the driving force behind all modern human culture and society. If they are right, then studies of living hunter-gatherers offer an opportunity to glimpse how our ancestors thought to survive, and studies of city-dwellers likewise could reveal aspects of our deep past that have not been forgotten. For instance, Tooby said that about sixty percent of Chicago schoolchildren cite wild animals as their greatest fear, even though these children are not likely encounter threatening animals.

Traditionally, social anthropologists have viewed human culture as inscrutable to the scientific methods of biology and psychology. The wide differences among cultures around the world has been interpreted as evidence that human behavior has little or no instinctual input.

Cosmides and Tooby believe that the traditional separation of culture from biology will only confound efforts to reach a unified theory of human nature and evolution. As they assert in The Adapted Mind, "Human minds, human behavior, human artifacts, and human culture are all biological phenomena." It's true, they said, that human beings belong to a highly variable species. However, most of our genetic and physical differences occur within human populations rather than between them. In other words, the most remarkable thing about us is how similar we all are. If we are so similar biologically, Cosmides and Tooby said, then we must share the same array of adaptations. The best example of a human feature that has been fine-tuned by evolution is the brain, so human nature should be viewed as a universal phenomena.

The rich variety of human culture and behavior today, according to Cosmides and Tooby, stems from this universal human nature which they characterize as a complex and intricate set of psychological programs that collect and process information about the world. "There may be a single human culture and not hundreds of cultures," said Tooby. "At some level there is a universal human nature."

Digit Fund Changes its Name

In honor of the 25th anniversary of the founding of Karisoke Research Center by Dr. Dian Fossey, the Board of Trustees of the Digit Fund announces a name change to the Dian Fossey Gorilla Fund. Reaffirming its mission to protect the gorilla, the Fund urges all interested in helping to preserve the gorilla population to contact them at: 45 Inverness Drive East, Suite B, Englewood, CO 80112-5480.

One long-held historical metaphor likens the human mind to a blank slate that received information from the senses. Another metaphor equates the mind with a computer which processes information and solves problems. Cosmides and Tooby offered a new metaphor of the mind as a Swiss army knife -- a collection of functionally specialized devices that perform certain tasks. The mind is a set of specialized computers, each designed to perform a specific task well. We are more diverse and flexible in behavior and thought than other animals, Cosmides said, because "Humans have one of those whopping big Swiss army knives, rather than one with just two blades in it."

Most traditional views of the mind have downplayed the role of instinct in favor of reason. Cosmides and Tooby credited William James, an early American experimental psychologist, for first suggesting that humans' successful intelligence and adaptation derived from the fact that our ancestors had more instincts at their disposal. These instincts work so well and process information so naturally, the lecturers said, that we are unaware of them even as we unknowingly depend on their presence.

Tooby said that since reason has most often been considered the main mechanism behind the mind, it made an obvious choice to test their ideas. If reason itself relied on instinct in the form of complex circuitry for processing information and performing tasks, then the same should be true for all aspects of the mind.

To determine what kind of reasoning instincts would have evolved in prehistoric humans, Cosmides and Tooby conducted a series of logical inference, including the sort of deductive reasoning employed by Sherlock Holmes. The couple discovered, however, that the circuitry of the human mind is not specially wired for logical reasoning. Our brains never evolved a specific "Sherlock Holmes circuit".

The human mind, however, does seem especially good at detecting cheating. Such a skill would come in handy for maintaining social exchange systems, the sort of "I'll scratch your back if you scratch mine" arrangements that any primate could appreciate. Social exchange may have been a central part of human social life for as long as our genus has existed, and it is based on the idea of mutual benefits. Individuals may provide benefits to others that are not genetically related if there is some chance of receiving benefits in the future, but as Cosmides said, "If I'm always giving and you're receiving, the circuits that are causing me to do that will be selected out." She said that people are not very good at detecting altruistic behavior, suggesting that good samaritans may have always been a rare breed in human evolution. Instead, according to Cosmides, "It turns out that men and women are equally good -- sometimes women are even better -- at detecting double-crossing."

Cosmides and Tooby don't claim to comprehend even a fraction of the network of programs that make up the mind. They admit that the mind probably contains hundreds or thousands of specific mechanisms about which we know next to nothing. Although the 1990s have been named the decade of the brain, we are still decades away from having a thorough model of the human mind. In The Adapted Mind, Tooby and Cosmides concede that even if we finally understand our mind's complex mechanisms, we may still be in no better position to improve the human condition. "But if that is the case," they write, "it will be the first time in history that major sets of new discoveries turned out to be useless."

Blake Edgar is the Assistant Editor of Pacific Discovery magazine.

American Museum of Natural History Opens Hall of Evolution

On April 23, the American Museum of Natural History opened its Hall of Human Biology and Evolution. The new hall includes four life sized dioramas depicting a day in the life of our ancient ancestors, from Australopithecus afarensis to Homo erectus. At a total cost of $6.7 million, the new exhibition covers human biology and anatomy, the path of human evolution and the origins of human creativity. For more information, contact Elizabeth Chapman, (212) 769-5762.

Fragments • Flakes • Sherds

Update on Rudabanya, Hungary

Dr. Ray Bernor, Howard University, received grant funds from the Leakey Foundation in 1992 to initiate a multidisciplinary research program at Rudabanya, Hungary. Rudabanya is an important late Miocene vertebrate locality, notable for its abundance of catarrhine primates (including Rudapithecus hungaricus and Anapithecus hernyaki) and accompanying diversity of vertebrate fauna and paleoflora. The research team, led by Dr. Bernor and his Hungarian collaborator Dr. Laszlo Kordos, included 18 scientists, technicians and students from Hungary, the United States, England, Germany and Australia. The goals of the 1992 field season included: initiation of a comprehensive excavation program at the main locality, Rudabanya II; collection of paleosols for geochemical analysis and age determination; and studies on mammalian systematics, taphonomy and paleoecology. The research team also engaged in regional survey to locate other vertebrate localities.

The 1992 field season was successful in placing Rudabanya in framework, and initiating paleontologic comparisons with other European localities. The research team was able to obtain suitable volcanic samples for dating an early occurrence of elephant (Gomphothere Proboscideans) from Northern Hungary (the Nemti Tuff), a famous vertebrate footprint locality (Ipolytarnoc), and the base of the Pannonian Basins. By extrapolating a series of correlations between Rudabanya and other localities in the Vienna Basin, the team was able to estimate Rudabanya's age to be nearly 3 million years younger than initially reported.

NOTE: Dr. David Begun, recipient of a Leakey Foundation grant to study Miocene hominoid sytematics, was a participant on the Rudabanya project. Dr. Begun is engaged in studying the evolutionary relationships of the Rudabanya primates to Ouranopithecus, Dryopithecus, Lufengpithecus and Gorilla. His analysis has led Dr. Begun to suggest that among the extant African apes and humans, gorillas are the most primitive, and chimps and humans share a more recent common ancestry.

Javanese Homo erectus Cultural Behavior

Dr. Francois Semah, Institute of Human Paleontology, Paris, received funding from the Leakey Foundation in support of his ongoing project at the Ngebung site, Java. The Ngebung site, Sangiran, Java is important for it gives us evidence of associations between Middle Pleistocene (Kabuh) Homo erectus-bearing deposits and artifact deposits. From artifact concentrations, we can begin to piece together a portrait of the culture and behavior of Javanese Homo erectus. Dr. Semah and a joint French-Indonesian team of 30-45 people have reached the following provisional conclusions about the tool-use of Javanese Homo erectus:

"The Sangiran Homo erectus had the technology to flake tools. Searching for raw materials at Sangiran, ancient man was deeply influenced by the natural environment, especially the scarcity of suitable pebbles... We found a lot of roughly broken pebbles, which -- if considered alone -- cannot give any evidence of man's activity, but are likely to have been used as tools. The poor quality of the stone implements is directly linked to the structure of the coarse grained, sometimes weathered, andesites which were likely to have been found by ancient man. Anywhere ancient man found a fine grained pebble, he gave it the shape of a more sophisticated tool. We conducted a short experiment in the rivers cutting into the Notopuro lahars[1], looking for materials in a situation roughly comparable with that which was encountered by 'Pithecanthropus'. We were able to find, in a limited time, ten pebbles suitable to making a polyedric tool or even a bola. However, we had to search for a long time before finding a pebble suitable for a chopper. We discovered only two andesitic smaller flakes which might be related to larger tools.

The largest number of fossil bones are long bones of herbivorous animals (except small tortoise or crocodile remains). Vertebras, ribs and cranial remains are only occasionally found. Almost all the bones are broken -- apparently without carnivore teeth marks. Unbroken bones are usually the small, distal, round-shaped bones like astragale. A statistical approach to these bones will be undertaken, together with a description of the break pattern.

Careful excavation and sieving of the sandy layers overlying Ensemble A gave several calcedony and jasper flakes like the Von Koenigswald's 'Sangiran flakes'. We now have evidence that this much discussed industry has been -- at least in part -- made by Homo erectus. Indeed, the largest number of 'Sangiran flakes' are likely to be recovered from the highest gravel on the top of the Ngebung hills. This gravel layer, probably well younger than the Kabuh deposits, contains a lot of reworked Kabuh material."

[1] *A mass flow of mud mixed with hot, volcanic debris and water.*

Birute Galdikas Receives Prestigious Awards

The Sierra Club awarded Birute Galdikas the Chico Mendes award, which is presented to "individuals or non-governmental organizations, outside of the United States, who have exhibited extraordinary courage and leadership, at the grassroots level, in the universal struggle to protect the environment." Dr. Galdikas was also awarded the Chevron Conservation Award on May 13 in a ceremony in Washington, DC. This award honors conservationists from the professional, volunteer and non-profit realms. Galdikas, who was first sent by Louis Leakey to study the orangutan on Borneo in 1971, continues to study and protect the orangutan.

Hominid Corridor Research Project, Malawi

The 1992 field season of the Hominid Corridor Research Project, lead by Dr. Tim Bromage of Hunter College and Friedemann Schrenk of Hessisches Landesmuseum Darmstadt, produced excellent results. In a report to the Leakey Foundation, Dr. Bromage states:

"Twenty two new fossil localities were established amounting to discoveries of the southernmost extents of Pliocene species of pygmy giraffe, camel, elephant, and bovid hitherto known only from eastern Africa, and the northernmost extents of bovid and suid species hitherto known only from southern Africa...With the most extraordinary luck, excavations at the UR-501 hominid locality led to discovery of important tooth remains fitting onto the hominid jaw and which now allow us to confirm the taxonomic designation of Homo rudolphensis."

"The faunal assemblages recovered by the HCRP derive from two main fossil bearing regions within the Malawi Rift that date from somewhat older than 4.0 Ma to less than 1.6 Ma based on biochronological comparisons to radiometrically dated biostratigraphic horizons in eastern Africa. Comparisons between the Chiwondo Beds faunas and endemic Plio-Pleistocene faunas of eastern and southern Africa indicate that the Malawi Rift belongs largely within the paleoecological domain of eastern Africa, though it also records the northernmost transgressions of several southern African endemic taxa. Continental position and climactic conditions responsible for the tropical versus temperate zonation in Africa is suggested to partly account for the large mammal barrier in the vicinity of the Zambezian Ecological Zone today. However, faunal dispersion from southern to eastern Africa dominates 2.5 Ma suggesting that this ecological zone drifted equatorward during Late Pliocene climate change in accordance with the 'Habitat Theory' proposed by Elisabeth Vrba of Yale University."

"The paleobiogeographic importance of Homo rudolphensis of the Malawi Rift lay in the context of its grouping with the eastern African endemic faunal assemblage. UR501, together with the Chiwondo Beds fauna, is an example of the common African Rift Valley 'corridor' of ecological significance for both early hominids and other terrestrial vertebrates during the Pliocene. We suggest that Homo rudolphensis arose during, and partly as a result of, the 2.5 Ma climactic cooling event in eastern Africa and remained endemic there in the face of prevailing equatorward dispersion tendencies in other taxa according to the Habitat Theory."

Fragments • Flakes • Sherds

Gona Late Pliocene Sites, Afar, Ethiopia

Dr. Jack Harris and Ethiopian doctoral student Sileshi Semaw, Rutgers University, conducted archeological field work in the Gona deposits, Afar Depression, during February and March 1992. Their goal was to relocate sites discovered during previous expeditions, carry out a more comprehensive survey, and excavate new sites to gain a more complete understanding of the nature and character of artifact concentrations in the Gona River drainage. These concentrations provide clues towards reconstructing the late Pliocene hominid behavior such as the beginnings and use of flaked stone tools. Associated remains of fragmentary fossilized bones found at these concentrations also provide evidence on how the stone tools may have functioned in butchering activities. Moreover, the differential aggregation of these concentrations or "sites" over the ancient land-scape provides indications of where hominids may have been preferentially foraging for food which, in turn, provides evidence of their overall ranging patterns and their land use.

The results of the 1992 field season were impressive. The Gona team identified nine new archeological sites and discovered hundreds of surface and in situ artifacts. In addition, fossilized fauna was found in a number of localities which will be important in future biostratigraphic markers for dating as well as reconstructing the landscapes and environments under which ancient animals, represented by the fossil-faunal remains found at the Gona sites, lived in the past. As Dr. Harris states in his report to the Foundation,

"There are limited variety of stone artifacts represented in all the sites surveyed and excavated. All surface occurrences, surface scrapes, screened and in situ artifacts mainly consisted of few cores (including those flaked unifacially or bifacially), and a large number of whole flakes and flake fragments. A variety of raw materials...were used for the manufacture of the stone artifacts at all the sites sampled and examined during survey. Preliminary examination of the types of raw materials used for the manufacture of artifacts at all the sites indicates that there was no preferential use of one or two types of rocks and similar pattern is exhibited on all the sites throughout the investigation..."

"...Preliminary geochronological studies carried out by Dr. R. Walter and Dr. P. Renne (IHO), in collaboration with Dr. C. Feibel (Univ. of Utah) and Dr. R. Bernor (Howard Univ.), during the 1993 field season indicate that the Gona archeological sites are older than previously believed from sites, for example, discovered during earlier fieldwork in the Shungura Formation of the Omo River and deposits west of Lake Turkana in northern Kenya. These sites to the south (dating to 2.3 mya) had demonstrated that by at least the late Pliocene, tool-using hominids had already mastered simple stone flaking procedures to produce durable implements. Therefore, if we are to understand the circumstances that led to stone tools being adaptive, then clues to the beginning of early hominid tool manufacture and regular use can only be found through extensive investigation of deposits like Gona and the lower members of the Shungura Formation that are older than 2.3 - 2.4 mya..."

"A long term independent project to the Gona is essential to gather data which will enable us to understand early hominid mobility and land use patterns and to reconstruct their technological behavior."

Longgupo Caves, Sichuan, People's Republic of China

Dr. Russell Ciochon, University of Iowa, received a Leakey Foundation grant to mount, in collaboration with Chinese colleagues from the IVPP, Beijing, a 1992 field season at Longgupo. Longgupo Cave samples an important time range in the Plio-Pleistocene fossil record of humans and apes and has great potential to shed light on the timing of human's first dispersal to the Asian continent. To date, it has yielded the largest, most diverse sample of mammalian species known from any single location in Asia. It adds to the fossil hominoid record the existence of an early species of the genus Homo in association with paleolithic stone artifacts and the remains of Gigantopithecus. Among the hominid fossils recovered from the cave is a hominid lower jaw dated by paleomagnetics to 1.67 to 1.87 mya.

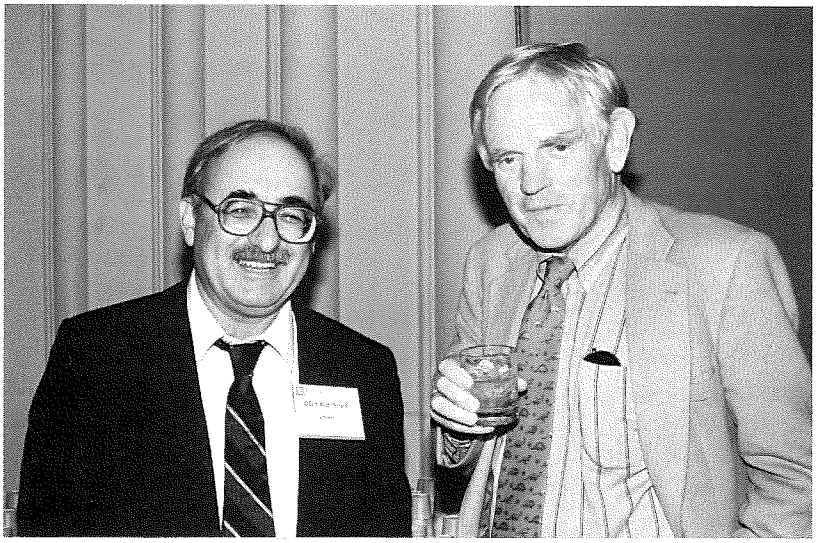
In their 1992 season, Ciochon and geoarcheologist Roy Larick and geochemist Chas Yonge were able to obtain a geomorphological history of the cave, develop a plan for its excavation and collect samples to chronometrically date the cave fauna using E.S.R. techniques. Due to the success of their collaboration, Dr. Ciochon and his colleagues have planned a three year collaborative project at Longgupo.

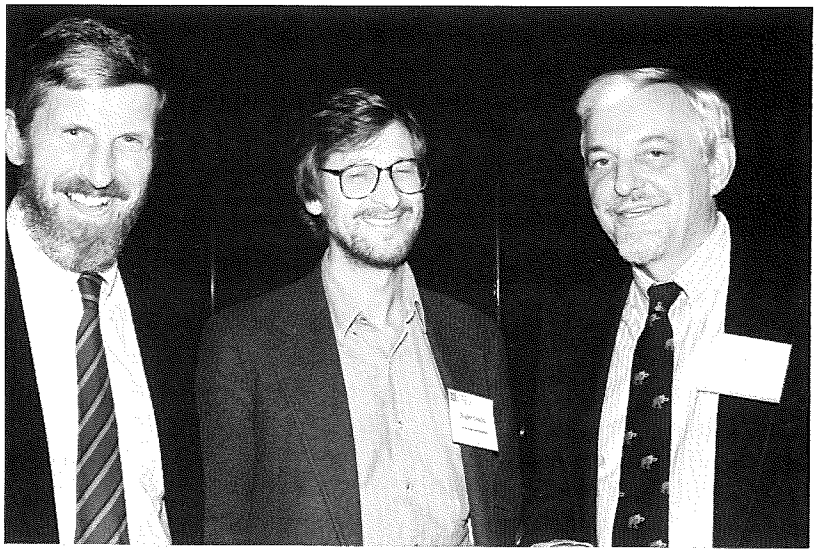
Dr. F. Clark Howell Honored at AAA Meeting

Professor F. Clark Howell enjoying the day's festivities.

Many of Dr. F. Clark Howell's friends and colleagues gathered in December at the AAA meetings in San Francisco to participate in an exchange of paleoanthropological papers.

Pictured at right are scenes from the symposium, which was organized by Dr. Russell Ciochon and Dr. Rob Corrucini. Photos courtesy of David Abrams.





Top: Dr. John Fleagle (SUNY - Stony Brook and Leakey Foundation SEC member), Dr. Russell Ciochon (Univ. of Iowa) and Leakey Foundation Program and Grants Officer Dr. D. Karla Savage.

Middle: Dr. Ofer Bar-Yosef (Harvard University and Leakey Foundation SEC member) and Dr. Garniss Curtis (Geochronology Lab, Institute for Human Origins)

Bottom: Dr. Bernard Wood (Univ. of Liverpool), Mr. Roger Lewin (noted author) and Dr. Irven DeVore (Harvard University and Co-Chair, Leakey Foundation SEC)

Book Reviews •

Technology and Human Evolution

Making Silent Stones Speak: Human Evolution and the Dawn of Technology

Author: Kathy D. Schick and Nicholas Toth
Published: Simon & Schuster, 1993
Price: $25 Hardcover

Stone artifacts are the most durable and conspicuous evidence for the great antiquity of humankind, and whole careers have been devoted to their analysis. Until the 1960's, the principal goal was to describe sequences of artifact change that could be used to date prehistoric sites, but the focus has now turned much more to understanding how the artifacts were made and used.

Nicholas Toth and Kathy Schick are leaders in this modern and clearly far more interesting behavioral approach, and their book is a thorough and engaging summary of the state of the art. At the same time, it is also a highly readable account of pre-history, from the appearance of the first primates, at least 65 million years ago, to the emergence of urban "civilizations," within the last 5000 years or so.

The book can be an introduction both to ancient stone technology and to prehistory, because the authors' fundamental premise is that technological change drove evolution in other aspects of behavior and in the human form, and was driven by them in turn. A major chapter stresses, for example, a probable functional relationship between the initial appearance of stone artifacts, the emergence of the first representatives of the genus Homo, and the earliest evidence for human butchery of other animals, all between roughly 2.3 and 1.8 million years ago. The earliest artifacts are admittedly crude, but the authors argue convincingly that they already reflect remarkable insight into the mechanics of stone flaking. The evidence for this includes the relatively steep learning curve that archeologists like the authors face when they attempt to replicate even the simplest archeological tools, and also the authors' observations of a tame bonobo (or "pygmy" chimpanzee), who was quickly able to grasp the value of flaked stones but who has yet to produce readily recognizable artifacts, even after months of knapping experience. The authors suggest that the significant increase in brain size and the apparent change in brain structure that distinguish early Homo from its australopithecine forebears (and also from chimpanzees) was probably essential to the early mastery of stone flaking. In addition, the authors' experiments with replicas have convinced them that many of the earliest stone tools were used to slice through hides and meat and to open bones for marrow. This enabled early Homo to obtain animal food on a scale that is (and was) unknown among australopithecines and apes. The authors see later evolution in stone technology, in the human brain, and in the ability to obtain animal food as critical elements in a feedback loop, whereby an advance in any one tended to promote changes in the others.

For the interested lay reader, the book provides a well-written, readily comprehensible introduction both to what we know about prehistoric stone artifacts and to how we know it. For the would-be archeologist, it demonstrates that basic interest and enthusiasm are essential, but not sufficient for success. Following the authors' model, to produce real archeological knowledge, a person must also be willing to work long hours, often in uncomfortable circumstances, and to range far beyond traditional field and lab work into informed experimentation and thoughtful observation of living people and their closest living relatives.

The book is clearly designed for a popular audience, but its pragmatic, down-to-earth approach to the practice of archeology will also make it an ideal introductory text. In my view, it is especially suitable for "method-and-theory" courses that are designed to illustrate how good archeology is done.

Richard G. Klein, University of Chicago/ Stanford University, and Leakey Foundation SEC

The Last Ape: Pygmy Chimpanzee Behavior and Ecology

Author: Takayoshi Kano
Translated: Evelyn Ono Vineberg
Published: Stanford University Press; Palo Alto, 1992

The Leakey Foundation is proud to have supported the translation of this important book. This is the first comprehensive work describing the longest continuous field study of the pygmy chimpanzee. A first-hand account of Kano's observations and experiences from 1974 to 1985, this book is informative and enjoyable for scientist and primate enthusiasts alike.

August 8 - 14, 1993 . . . . . Four Million Years of Hominid Evolution in Africa: International Congress Honoring Dr. Mary D. Leakey
Arusha International Conference Centre, Arusha, Tanzania

The Leakey Foundation is pleased to sponsor this symposium in honor ofDr. Mary Leakey's important contributions to field of paleoanthropology. This conference will feature over 80 papers by key scientists studying human origins. Mr. A.A. Mturi, Prof. Philip Tobias, Dr. Richard Hay, Dr. J. Desmond Clark and Dr. Leakey herself will be the featured keynote speakers. The conference organizers are also offering symposium registrants two excursions to nearby archeological sites, including Olduvai Gorge and Laetoli.

October 24, 1993 . . . . . Louis S. B. Leakey Symposium Honoring Dr. F. Clark Howell
Oxford University Museum Lecture Theatre

In conjunction with the Foundation's 25th anniversary annual meeting, the trustees of the Leakey Foundation are proud to present this important day of scientific exchange. Scheduled speakers include Dr. Leslie Aiello, Dr. Peter Andrews, Dr. Rob Foley, Dr. Dr. Paul Mellars, Dr. Chris Stringer and Dr. Bernard Wood.

November 4, 1993 . . . . . The Allen O'Brien Memorial Lecture
California Academy of Sciences, San Francisco

In celebration of the Leakey Foundation's 25th anniversary, the trustees of the Foundation have asked Dr. Richard Wrangham to summarize developments inthe field of primatology over the past 25 years. Dr. Wrangham, Professor of Anthropology at Harvard University, is a world renown primatologist who has had extensive field experience both at Gombe Stream National Park, Tanzania and at his current field site the Kibale Chimpanzee Project in western Uganda, which he has directed since its founding in 1987.

Anthro*Quest*

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