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FALL 1979

# PALEOANTHROPOLOGY: HOT NEWS

By Boyce Rensberger

Free lance science writer formerly with the *New York Times*

When Dr. Donald C. Johanson held a press conference in Cleveland last January to announce that he and Dr. Tim White had arrived at a new interpretation of some three million to four million year old hominid fossils—proclaiming the first new species of hominid to be named in fifteen years—reporters were on the phone to Nairobi within hours. What did Richard Leakey think? It is a reporter's natural instinct to seek comment on any new development.

Mr. Leakey said he couldn't comment in detail but made it clear that he had significant reservations. Many news reports, relying on cliches more typical of political reporting, suggested that Mr. Leakey had "attacked" Dr. Johanson or that the two "clashed."

To many followers of the field it looked as if the bitter personal feuding that bedeviled earlier generations of anthropologists was rearing its ugly head again. In the view of some, the long struggle to put paleoanthropology on a more dispassionate footing was in danger of a set-back. "If we look like a bunch of brawlers," one anthropologist told me, "we're going to lose scientific respectability and funding will be more difficult."

A month after the Cleveland press conference, Mr. Leakey and Dr. Johanson appeared together at a Pittsburgh symposium sponsored by the Foundation for Research into the Origin of Man (FROM). The conference had been scheduled long before but it happened to be the first time that the two anthropologists were to appear together since the controversy began.

Reporters for several major dailies and wire services converged on Pittsburgh for what some frankly hoped would be a scientific shootout. I remember one reporter telling me that his editor sent him to get a story not so much on human evolution as on a confrontation between Dr. Johanson and Mr. Leakey.

As it happened, there were no real fireworks. Mr. Leakey, striving to play down the differences, at least during the formal sessions, refrained from comment on Dr. Johanson's new views. In his major address to the conference, Mr. Leakey criticized "the free press in America" for trying to make too much of the issue. Some reporters were able to piece together accounts on the substance behind the difference of opinion from separate personal interviews. Many others, however, either wrote nothing or confined themselves to describing the appearance of a feud without being able to give much of the substance that would have turned a "feud" into a scientific debate—a perfectly respectable phenomenon.

The matter was still newsworthy after another month. In March Dr. Mary Leakey held a press conference in Washington to announce discoveries of more hominid footprints in Tanzania and reporters took the occasion to ask her opinion on the Johanson-White interpretation. The type specimen of the new species, *Australopithecus afarensis*, was, in fact, one of the fossils discovered at Laetoli, her site. She also criticizes Dr. Johanson and Dr. White.

In my opinion, the way this entire

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Vic Cox

Dr. Mary D. Leakey

## A QUESTION OF AGE

As the first new species of hominid to be named in fifteen years, *Australopithecus afarensis* has sparked one of the liveliest debates in paleoanthropology in some time. The last new species was *Homo habilis* and there is still some disagreement over it.

Although the new controversy has drawn much attention because of the personalities involved, the substance of the debate has significant implications for how the story of human evolution is interpreted today. If the proponents of *A. afarensis* are right, it would suggest that *Homo* emerged relatively recently, the oldest known example being "1470," which is now generally held to be around 1.8 to 2.0 million

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## the L.S.B. leakey foundation

The L.S.B. Leakey Foundation was established in 1968 by a group of eminent scientists and informed laymen who recognized a critical need to strengthen financial support for new multi-disciplined research into man's origins, his evolving nature and his environmental future. It was named in honor of the man who had 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 mankind.

Long-term primate research projects which may help us to understand how we evolved as a species.

The training and education of students in these fields.

Conferences, publications of scientific papers, and educational programs designed to disseminate knowledge relevant to man's changing view of his place in nature.

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## the L.S.B. leakey foundation news

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# PRESIDENT'S MEMO

One of the strands from which the fabric of the Leakey Foundation was woven was Louis Leakey's appearance in 1966 in the newly-built Beckman Auditorium at the California Institute of Technology. As Chairman of the Faculty Committee on Programs, I had invited Louis to lecture and asked him what kind of honorarium he was expecting.

"One hundred dollars," was his quick reply. I protested that surely the figure was too low if his American tour was to raise funds to support a young woman named Jane Goodall working with chimpanzees, archeological digs in Israel, and his own research with his wife, Dr. Mary Leakey, at Olduvai Gorge in Tanzania.

"Oh," he said, throwing back his leonine head, "I have four other lectures that day and four more the next."

But he looked tired and seemed to have aged considerably since the last time I had seen him in Nairobi. I couldn't see nine educational institutions exhausting him to speak to their students and friends for an average cost of ten cents a person. With the support of my committee, I struck a deal with Louis. We would pay him \$1,000 (those were more affluent days) and he would agree not to give another lecture for two days and get some rest. One of the world's most energetic, if sometimes controversial, archeologists was not a dray horse to pull his cart and the carts of others until he dropped.

Characteristically, Louis said, "Pay me the \$1,000 and I'll still give the other lectures. I need the money for Jane or I will have to mortgage my house in Nairobi."

"Louis," I smiled, "You've threatened to mortgage that house fifty times over. You have a good offer, accept it." He did.

The lecture attracted such a crowd that over 1,000 people were turned away. He beseeched me, and the committee relented to the extent of letting him repeat the lecture the next day for another \$300.

The strand of this experience was that the soon-to-be-formed Leakey Foundation would have as one goal the lessening of the physical strain of fundraising on Louis who always sought to use his charisma to support gifted people in their work. As a result of the Foundation's intercession, more appropriate lecture fees were established. Alas, we were not as successful in greatly extending his productive years. His declining health was worsened by tension over lack of funds for his many research projects and his students. He suffered a series of debilitating accidents; at one lecture he toppled backward off a platform and struck his head on the hard floor. He died in October, 1972.

Since the days of Louis's early lectures, over a decade ago, the Leakey Foundation has had a friendly relationship with Caltech—but no official association. Although the cramped Leakey offices are on campus, you cannot reach the Foundation through the Caltech switchboard. But the lecture programs sponsored jointly by the Caltech Faculty Committee and the Leakey Foundation have been the most successful of their kind in the United States.

It is a common experience to overlook people and events in your own backyard, so to speak. There is nothing vaguely resembling a Department of Archeology at Caltech. But a look at the Institute in divers fields is fascinating, and might well begin with Professor Samuel Epstein.

Geochemist Epstein, working with Michael J. DeNiro, analyzed carbon isotopes in the collagen of fossil human bones to learn about the maize consumption of two ancient groups of people. In a paper presented to the Society for American Archeology, Epstein and DeNiro described how they used bones from the Tehuacan Valley in Mexico and the Viru Valley in the northwest coast of Peru to determine when maize was introduced into the diet and when it became an important food source.

In other research, Epstein learned that trees keep a record within their wood cellulose of the climatic temperatures throughout their lifetimes. He studied wood from forty trees that grew throughout North America during the last ice age. This work yielded a surprising finding: the climate over ice-free sections of North America was, on a yearly average, perhaps even milder than today. The use of trees as thermometers is based on the fact that the water absorbed by a tree and incorporated into its wood has a unique isotopic "fingerprint" that depends on the temperature at the time. The tree's temperature history can be obtained by analysing its successive growth rings.

Dr. Ronald Scott, a soil scientist, has a personal fascination with the foundations of ancient cathedrals and has even worked on the Leaning Tower of Pisa.

Meanwhile, geochemist Clair C. Patterson has been studying bones of ancient Peruvians to learn how much lead contamination modern people are experiencing. He analyzed lead samples from the skeletons and teeth of Peruvians buried 1600 years

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*Frieze of Small Horses, Lascaux Cave, France*

Serigraph by Douglas Mazonowicz



## THE HAND OF MAN: ORIGINS OF ART AND CULTURE

As long ago as 37,000 years our ancestors recorded their lifeways, their mystical and religious beliefs, their possessions, their animals and themselves in sunless cave recesses and on sheltered rocks. Their tools, too, and nonutilitarian ritual objects are reflections of sophisticated artistic imagination as well as primitive invention.

In the Leakey Memorial Lectures presented last February in San Francisco, eight distinguished international scientists investigated the art and tools of prehistory. The two day symposium, given in conjunction with the opening of the Ice Age art exhibit at The California Academy of Sciences, illuminated early civilizations that led to our own.

Both the rational and emotional bases of the culturally mediated behavior of these long ago peoples were touched upon. The scientists who spoke were Alexander Marshack, Jacquetta Hawkes, and Drs. Phillip Tobias, F. Clark Howell, Bernard Vandermeersch, Jean-Philippe Rigaud, J. Desmond Clark and Patricia Vinni-

combe.

And after San Francisco? The reception there was so enthusiastic that it has been decided to continue. The Smithsonian Institution Traveling Exhibition Services will sponsor a tour of the Ice Age art exhibit and has invited the Leakey Foundation to present additional symposia in conjunction with the show in other United States cities. The 1980 schedule will include the Dallas Health and Science Museum, the Cleveland Museum of Natural History and the Boston Museum of Science. Dates in 1981 and 1982 are set for the Cumberland Museum and Science Center, Nashville, Tennessee, the Pacific Science Center, Seattle, Washington, the Carnegie Museum of Natural History of Pittsburgh, Pennsylvania, and the National Geographic Society, Washington, D.C.

Many social anthropologists have stated that a human without culture would be no human at all. By the works of his hand we may know him.



# THE ORIGINS OF CULTURE

By John H. Douglas

(Courtesy of *Science News*)

We are the product of two evolutions: the biological changes that have taken place on a time scale of millions of years and the much more recent developments of custom and art, whose pace is still accelerating. Biological evolution has usually taken most of the spotlight—the recent discovery of what may be another branch on the human family tree has already touched off another round in the long debate. Yet our common ideas of what makes us human usually involve the creative products of emotion and imagination. Discoveries relating to this cultural evolution were reviewed recently at the 1979 Louis Leakey Memorial Lectures in San Francisco, in conjunction with an exhibit of Ice Age art at the California Academy of Sciences.

The extreme antiquity of some sort of cultural effort was emphasized in the keynote lecture, presented by Phillip V. Tobias, chairman of the Department of Anatomy at the University of Witwatersrand in Johannesburg. One of the oldest pieces of evidence of purely cultural—as opposed to utilitarian—activity comes from the discovery of red ochre with skeletons of *Homo habilis*. Ochres are the brightly colored earthy minerals of iron long used for pigments. Their discovery with the earliest of the true humans (*Homo habilis* shows the first unequivocal use of tools) indicates the possibility of ritual use more than a million years ago.

Even the earlier *Australopithecus*, or ape-man, may have shared some characteristically human cultural features. Pebbles with face-like features have been found with Australopithecine remains, and although the features appear natural, rather than worked, the pebbles had been collected and brought to the site from somewhere else. One way or the other, a huge evolutionary cultural gap is evident between the time of *Australopithecus boisei*—a “thug of a hominid,” Tobias calls him—and the 60,000-year-old grave discovered in Shanidar, Iraq, where the body had been lovingly strewn with at least eight kinds of flowers. The turning point, Tobias concludes, came with *Homo habilis*, the first hominid to be “culture bound.”

The real Golden Age of prehistoric art did not occur, however, until the mysteriously sudden arrival of modern man (Cro-Magnon) in Europe. His origins are still unknown, but recent evidence points to a migration from southern Asia by way of the Middle East. A new appreciation of

American Museum of Natural History



*A Bison, La Madeline, France*

has resulted largely from the patient work of Harvard University researcher Alexander Marshack, who delivered two separate addresses at the Leakey lectures and was curator for the Academy of Sciences exhibition.

A few years ago, Marshack began to study bone engravings from about 30,000 years before the present under the microscope and tried to correlate them with natural phenomena a cave dweller might want to keep track of. The result was a carefully documented, but nevertheless controversial, theory that the earliest modern humans made notations on the lunar cycle, possibly to keep track of the seasons.

Since then, Marshack has continued his microscopic analysis of engraved artifacts and has used sophisticated lighting techniques to study large cave paintings. From both investigations he has drawn the same important conclusions: that cave dwellers were indeed conscious of seasonal variations in animals and plants, and that the images they made of these objects were used repeatedly, as if in a ritual.

Under the microscope Marshack found that on one engraved bone staff each of the animals seemed to represent an attribute or activity associated with spring. For example, a tiny engraved fish, once thought to be a common mackerel, appeared clearly under microscopic examination to be a salmon with the hooked jaw characteristic of the annual spawning migration. Also, the microscope revealed that marks on

many artifacts had been made by different engraving tools at different times.

By using ultraviolet and infrared light to illuminate cave paintings, Marshack found that these, too, had apparently been reused time and again. Since infrared film essentially sees through red ochre colors, examination of some paintings using this technique revealed a previously unseen under-drawing. Examination of a horse image in the cave of Pech Merle, in France, revealed two separate drawings, filled in with red and black dots and hand prints over a period of time by different persons.

Most recently, Marshack has been studying the “macaroni” markings found throughout Europe on fragments of bone. Previously these have been dismissed as merely “doodles,” but Marshack says they belong to a widely dispersed symbolic tradition. Through them we see evolving the ability to symbolize the external world in different ways, he says. A more easily recognizable symbolic tradition can be seen in the tiny “goddess” figures found widely dispersed through Europe by about 30,000 years ago. Although they are the products of widely separated societies, each shows the same peculiar characteristics, such as tiny feet, pendulous breasts and exaggerated hips.

To interpret what these and other early symbols may mean, some anthropologists have begun to compare them with the works of “primitive” people of the present day. Such studies have generally led to a better appreciation of just how sophisti-



cated the social and ritual life of a people can be, although they may remain *technologically* primitive. This work was discussed by J. Desmond Clark of the University of California at Berkeley, and Patricia Vinnicombe of the University of Sydney.

Clark, who is considered one of the world's leading authorities on African prehistory, discussed the rock art remaining from a time when the Sahara desert was a "hunter's paradise." The pictures themselves show lively hunting scenes, complete with dogs and bows and arrows. The game shown include life-sized elephants and extinct buffalo pursued by masked hunters using a variety of hunting techniques. No complete study of myths and art of modern African hunters has been published, Clark says, but some obvious links to older forms have been discovered. Similar paintings today almost always have some connection to ritual, he says, as in a sequence of paintings used in elaborate initiation rites.

Game animals are almost always a favorite subject in prehistoric drawings, and the complex nature of the relationship between hunter and game has been demonstrated by Patricia Vinnicombe's work with the !Kung (pronounced with a cluck) Bushmen of South Africa. The Bushmen believe that different objects and animals possess various amounts of mystical power, with the most power bestowed on the eland, the large African antelope they hunt for food. The rites involving the eland are graphically displayed in !Kung art.

"The Bushman's horizon is bounded by the eland," Vinnicombe says; it is the center of social cohesion, the most important theme in art and ritual. To gain some of the eland's power, a boy will kill an eland and take its characteristic tuft of hair. Before he can marry, the boy must take the father of the prospective bride the heart of an eland. Great empathy with the power object is shown even at the moment of a kill: after shooting an eland with a poison arrow, the hunter acts as if he, too, were sick and injured until the beast dies.

Not only is the eland a favorite subject of art, but of dance as well. On the occasion of a girl's first menstruation she is put into a seclusion hut while other members of the tribe do a symbolic mating dance imitating elands. In addition to wishing for the girl's fertility, the tribespeople are also explicitly hinting at the pleasure of sex that lies ahead of her. Vinnicombe says the girls involved are often so overcome by the beauty of the spectacle that they weep for joy.

Vinnicombe also presented some as yet unpublished data on the culture of Australian aborigines, gathered for a doctoral thesis by Howard Morphy of Australian National University. By developing a close relationship with an aboriginal leader, named Narratjin, Morphy was able to learn the meaning of many symbols used in their art. In marked contrast to the realistic portrayal of power objects by the !Kung, the aborigines have developed a highly abstract art. A piece of bark painted with almost unidentifiably abstract signs may

represent a map of sacred ground, with significant features of the terrain symbolically represented.

Social structure depends heavily on a hierarchical "right to knowledge"—that is, the interpretation of the bark symbols can only be passed from one generation to another in a ceremonially correct way. Unlike many other traditions, the making of art is highly restricted and the designs are meaningful only to initiates. Narratjin's description of the artistic process sounds surprisingly similar to those of many "modern" artists: "Put into your mind all of your thoughts. You connect this to all of your power. *This* is what you paint."

Both the traditions of the !Kung and the Australian aborigines are now seriously threatened and some anthropologists are beginning to ask how such groups can receive some of the material benefits of the modern world while still preserving their traditional culture. One way is through the sort of respect Vinnicombe showed to the artist Narratjin; before coming to the conference she asked him for *permission* to explain the meaning of his symbols, which he had shared with Morphy.

In his summary statement, Tobias, too, called for more compassionate understanding as we progress along our still rapidly changing cultural evolution. "Knowledge and compassion," he said, "are the twin guides to the future of our species."

#### ANNUAL MEETING AND SYMPOSIUM IN SANTA FE

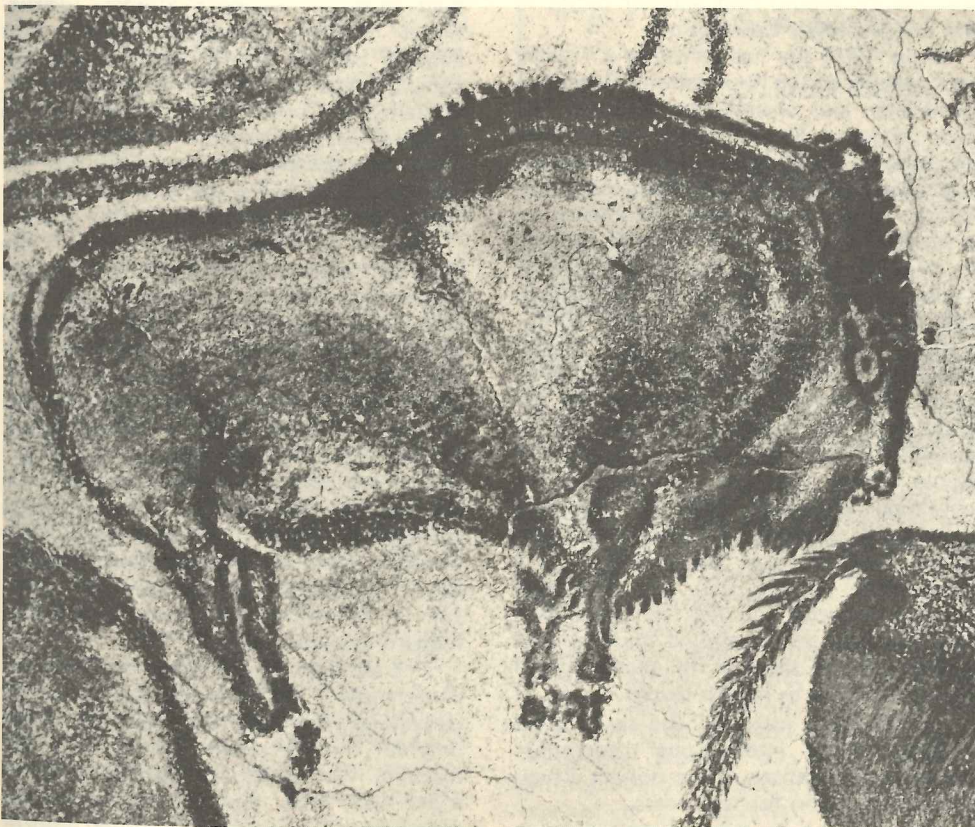
Leakey Foundation Trustees will gather in Santa Fe, N.M., for the 1979 Annual Meeting October 10 to 14. On October 13, the Foundation will sponsor a special symposium, "The Roots of Human Behavior," in cooperation with the School of American Research. Eminent international experts who will participate in the all-day series of lectures and panel discussions include Drs. Irven DeVore, Paul MacLean, Biruté Galdikas, Clark Howell, Bernard Campbell and Richard D. Alexander.

Registration for the event is \$20 and early reservations are advised inasmuch as seating in the St. Francis Auditorium is limited. For additional information, please write the Leakey Foundation.

#### FELLOWS' DAY WORKSHOP

Foundation Fellows, mark your calendars! October 20 has been set as a special day for you. An all-day workshop will be held at the Caltech Athenaeum where you will be able to have personal discussion with and instruction by eminent scientists. In the past, workshops have proven so illuminating that it is hoped other friends of the Foundation will be interested in becoming Fellows in order to have the privilege of attending.

Further information will be sent or can be obtained by calling the Foundation office.



Serigraph by Douglas Mazonowicz

Bison, Altamire, Spain



# PROFILE

## KAYE JAMISON Trustee



The big sky country of her Montana birthplace could well have shaped the character of Kaye Jamison's generous nature and the broad scope of her twenty-five years of accomplishments in community volunteer work. What is most impressive about that long list is that it represents not only service to others, but a long time commitment to the development of new dimensions in education for young people in her two favorite fields of interest, zoology and paleoanthropology.

Married to attorney Max K. Jamison and enthusiastically supported by him and their three sons, Max Jr., Michael and Matthew, Kaye's efforts have earned her a number of awards including a citation for outstanding service from the Los Angeles Legal Aid Society, the prestigious Assistance League Hourglass Award as the "Outstanding Woman Volunteer in Civic Leadership, Cultural Advancement and Philanthropic Service" for 1973, and just recently, a citation of appreciation from the American Association of Zoological Parks and Aquariums for her contributions in the field of public education to that association and its member institutions.

Perceiving not only immediate needs but far horizons as well, she has been a pioneering force in the development of zoological educational programs at the Los Angeles Zoo. A founding Trustee of 6 GLAZA, she has served that organization

in many roles since 1963 including that of Vice President and President. Convinced that knowledge of wildlife and conservation in general should be an important component of every young person's education, she was directly responsible for the building of the Los Angeles Zoo's Education Center. Instruction stemming from this facility under her guidance has earned world wide recognition. She served as Vice-Chairman of the Public Education Committee of the AAZPA from 1972 to 1975. Awarded the title of Benefactor by the Greater Los Angeles Zoo Association in 1975, she has lectured at the University of California at Los Angeles and similar institutions across the country. She has also authored numerous articles on wildlife education and conservation.

Her first meeting with Louis Leakey was the result of the co-sponsorship of his first West Coast appearance in 1966 by Caltech's Faculty Committee on Programs and GLAZA. Later on that year she visited with him at his Centre for Prehistory in Nairobi. She was deeply impressed with his own love and understanding of wildlife which encompassed not only the present but stretched back in time to before the dawn of humankind. It was inevitable that her vitality should find another outlet in the L.S.B. Leakey Foundation.

Since 1975 she has served as a Trustee and member of the Foundation's Executive committee and chaired the National Fellows programs. She conceived the Fellows' Workshops involving world renowned scientists and founded and heads the L.S.B. Leakey Associates. These volunteers do everything from pouring sherry at lectures to pouring epoxy at the Valley Science Center of the Los Angeles Unified School District where her most recent contribution, the paleoanthropology project known as Stones and Bones, has its casting center. In addition to helping secure the grant and the approvals necessary for a project of the magnitude of Stones and Bones, there was the massive task of obtaining assistance from the scientific community, museum authorities, and educators from all over the world. It is a remarkable venture that has demanded courage, tenacity and the firm conviction that the younger generation must have an opportunity to share in the excitement of their birthrights as human beings.

"My primary interest," she says, "is the building of an international geochronological dating center. It's a project I have been working on for two years.

"Nothing I have done could have been accomplished without the support of my family—without the expertise, time and

enthusiasm given so generously by many persons for whom I have come to have great affection."

An African visitor, having met Kaye for the first time, said, "To me, Kaye Jamison exemplifies the spirit of the people in the United States. She convinces you that you and your ideas are both important and welcome. With her you never feel pushed. She allows you space!"

Montana must surely have left its imprint!

- Janice Seaman

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## STONES AND BONES

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In 1977, Dr. Edwin S. Munger, President of the Leakey Foundation and I had an idea that the time was at hand to develop a new instructional program in paleoanthropology that could be incorporated into senior high school curriculum.

Enthusiastically encouraged from the outset by Drs. Clark Howell, Paul MacLean, David Hamburg and Bernard Campbell, we sought assistance with the plan from Dr. Seymour Sitkoff, Instructional Planning Specialist, Science, Los Angeles Unified School District, who became Director of the project, and from Dr. William Lee, Curator of Anthropology, Los Angeles County Museum of Natural History, who assumed responsibility for the casting of all fossil specimens necessary to the tactile implementation of the course.

Known as "Stones and Bones," the program involves 2,200 students in sixteen senior high schools plus thirty teachers. Curriculum materials have been developed by the School District's Instructional Planning Division with the assistance of Drs. Clark Howell, Gail Kennedy and Bernard Campbell. Funded under a Federal grant, ESEA, Title 4C, the course, under Dr. Sitkoff's guidance, has been presented for the past two years as a part of the present biology instruction as well as a one semester elective physical anthropology class. This coming year another mini-course will be developed for study in selected modern science classes.

Instructional components presently include student laboratory investigations accompanied by teachers' editions which provide the necessary information for teaching the activities; reading booklets concerned with famous anthropologists and their discoveries; an illustrated anthropology dictionary; study prints, charts, and a slide presentation created in cooperation



with Dr. Gail Kennedy which gives an overview of the field of paleoanthropology.

An integral and exciting part of the instruction is the use of fossil specimens. Strange as it may seem, there are very few sources of good quality fossil casts for the study of early man. True, excellent casts can be obtained from the museums and universities where the original, fragile materials are archived. Understandably, however, these first generation casts are expensive and produced in very limited numbers primarily for comparative studies by specialists in the study of early man. These first generation casts were used in almost all instances to make production molds for the Stones and Bones project. As twenty-two fossil prototypes are included in each study kit, it was most important to find a method by which large numbers of quality replicas of these casts, plus stone tools and other "hands-on" educational materials, could be made inexpensively to meet the demand for classroom use. Dr. William Lee met the challenge!

A very tough epoxy resin was developed which could withstand being dropped and/or roughly handled in the classroom for many years. This resin has a fast setting time and good cast replication. A natural bone color is cast as part of the resin mixture since most of the final coloration is done by hand. Each of the replicas is cast according to a specific "recipe" produced by the Museum and from start to finish, a cast can be completed in one day. Hand finishing is one of the more time consuming production stages which are being handled very efficiently by the volunteer L.S.B. Leakey Associates "fossil casting task force" at the Los Angeles Unified School District Science Center complex. The additional assistance of several students and Science Center technicians has been essential to our production needs. Casts include: *Homo sapiens* mandible, *Australopithecus africanus* cranium (Taung), *Australopithecus africanus* mandible and endocast (Taung), *Australopithecus africanus* (STS V cranium), Trinil calotte and femur, *Sinanthropus* skull and mandible, Mauer mandible, Skhul V skull and mandible, Cro-Magnon skull and mandible, chimpanzee skull, mandible and innominate, gorilla skull and mandible and a modern *Homo sapiens* skull.

Another unique teaching tool devised within the project is a television series produced with the cooperation of the School District's Channel 58. These taped thirty minute programs provide students with the opportunity to experience the point of view, state of the science, discoveries, observations, and inferences which some of the world's leading anthropologists are able to contribute. Drs. F. Clark Howell, Bernard Campbell, Glynn Isaac, Donald Johanson, Gail Kennedy and Biruté Galdikas have participated in these panel discussions with students at the request of the Foundation and enthusiastically applaud the instructional potential of the series which emphasizes the "roots

## L.S.B. LEAKEY FOUNDATION 1979 LECTURES

Date	Speaker	Location
September 18	Elizabeth Meyerhoff	California Institute of Technology Pasadena, California
October 2	Dr. Geza Teleki	College of St. Thomas St. Paul, Minnesota
13	Dr. Richard Alexander, Dr. Bernard Campbell, Dr. Irvén DeVore, Dr. Biruté Galdikas, Dr. F. Clark Howell, Dr. Paul MacLean	THE ROOTS OF HUMAN BEHAVIOR - L.S.B. LEAKEY FOUNDATION SYMPOSIUM Santa Fe, New Mexico
15	Dr. Biruté Galdikas	Audubon Naturalist Society Washington, D.C.
24	Dr. Biruté Galdikas	Kenyon College Gambier, Ohio
November 5	Dr. Biruté Galdikas	New York Science Teachers Conference - New York
*20	Dr. Carl Sagan	California Institute of Technology Pasadena, California
28	Dr. Roger Payne	University of California Santa Barbara
29	Dr. Roger Payne	Friends of the Washington Park Zoo Portland, Oregon
December 3	Dr. Roger Payne	Oberlin College, Oberlin, Ohio
5	Dr. Roger Payne	Kenyon College Gambier, Ohio
*11	Dr. Biruté Galdikas	California Institute of Technology Pasadena, California

\*Balance of Caltech-Leakey Foundation series of six lectures scheduled for 1980.

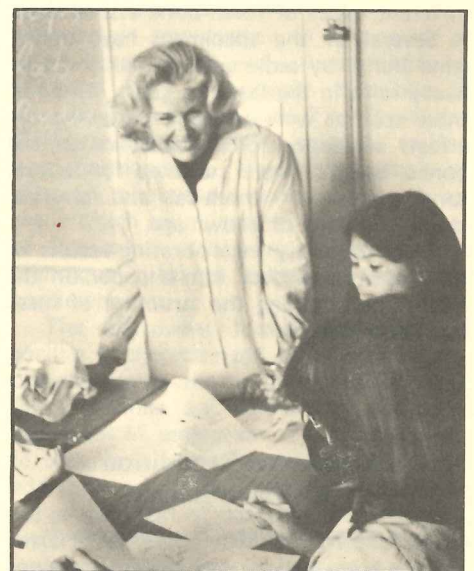
of humankind."

In-depth training sessions are held for all instructors taking part in teaching this course of study. The Foundation has taken great pleasure in providing outstanding scientists like Dr. Sherwood Washburn and Dr. Garniss Curtis to assist in the staff development so necessary to the success of our project.

Statistical data provided by an outside evaluator, Dr. Laura Wiltz, indicates that the program is very effective and that significant achievement has occurred among student participants.

The cooperative efforts of the L.S.B. Leakey Foundation, the Los Angeles Unified School District and the Los Angeles County Museum of Natural History have produced and will continue to refine and produce this pilot course in anthropological studies which may well be unequalled in secondary school science education.

- Kaye Jamison



Associate Frances Muir helping biology students at John Marshall High School in Los Angeles.



# REPORTS FROM THE FIELD

Excerpts from reports submitted by Leakey Foundation grantees on their work in progress:

## Taphonomic Specimens of Lake Turkana

*Dr. Diane P. Gifford, University of California, Santa Cruz, California:*

During August and September, 1978, two of my students and I conducted a follow-up check of my taphonomic specimens at Lake Turkana in northern Kenya. This check was part of a five-year study of the fate of large herbivore carcasses, monitored from the time of death, in the Koobi Fora area. The goal of this study is to describe more closely the natural processes, biological, geological, and chemical, that affect potential fossils.

With help from Dave and Debra Damosch, students in anthropology at the University of California, Santa Cruz, and from Loriano Kesis, an assistant from the local Dassenetch tribe, I was able to relocate and record some twenty-nine of my original specimens. After five years' exposure, the individual carcasses have begun to show divergent sorts of damage, dispersal, and deposition, depending upon the local environments in which each lay. One of the results of this study is a close calibration of the rates of bone weathering and disintegration in the Lake Turkana environment. The effects of scavenger action on these carcasses may be fruitfully compared to the bone accumulations found in hyena dens, which may help paleontologists understand the meaning of different types of fossil bone assemblages.

Several of the specimens have undergone burial by sediments carried down by heavy rains in the last two years. Three of these scatters were excavated to assess the effects of depositional processes on the bones. Samples were collected for laboratory analysis of chemical and physical changes in bone of known age.

I am currently incorporating results of this research project into a paper on the factors determining the structure of fossil bone assemblages.

## Fossil Man Expedition to North India

*Dr. S. I. Rosen, University of Maryland:*

Our expedition performed extensive field surveys to the north and east of the traditional Siwalik site area due north of Delhi. We discovered several very promising

sites which appear never to have been investigated.

My work in the Siwaliks has produced material for a new explanation of the paleoecology of this area and importantly the dynamics of the special situation which existed in that geologically violent area. Part of the base of this new hypothesis is derived from study of how animals in present times perish in that area and also sites where present animals die. The interplay of continental drift and the capricious monsoon form a strong basis of this new hypothesis.

Primate fossils are not statistically abundant in the Indian Siwaliks. However, we found a maxilla at one of the new sites. This jaw fragment may indicate that there was another type of hominid in this area, in addition to *Ramapithecus*. Unfortunately no tooth crowns remain in this jaw but some roots are present. Dentally this creature was more primitive than *Ramapithecus*, especially in terms of the premolar teeth.

While I cannot see such a creature as being in any direct relationship to human ancestry, I do believe such an initial find is significant. I believe the various forms of *Ramapithecus* as evidenced from Pakistan and India along with this find indicate that a good number of higher primate experiments were going forward in response to the unique and rapidly changing ecology of the Siwaliks.

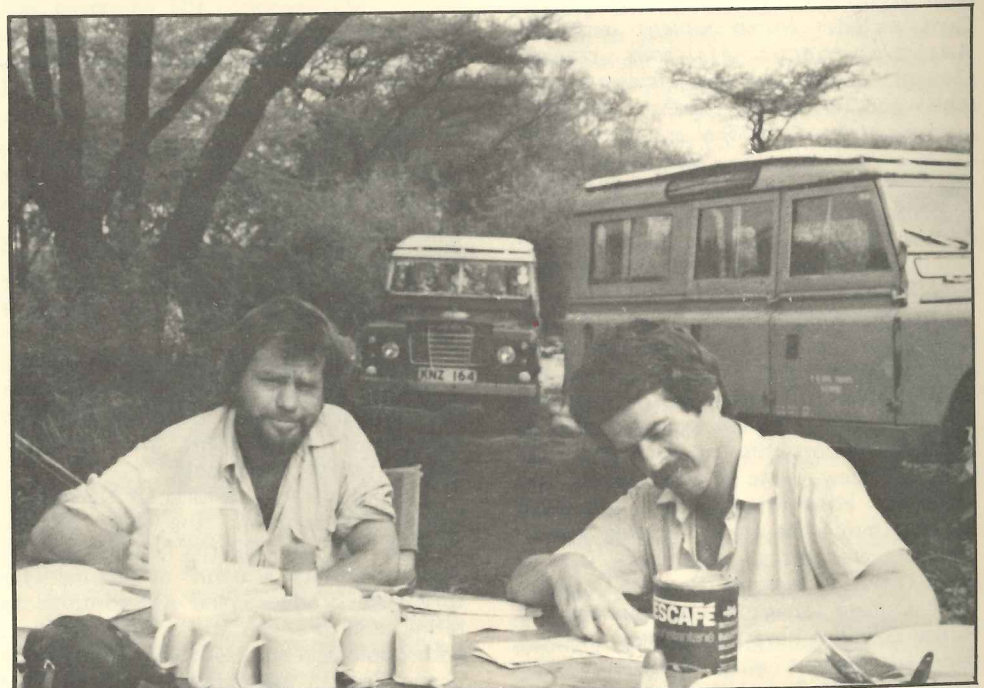
## Recent Discoveries at Chesowanja

*Dr. J.W.K. Harris, Division of Archeology, The International Louis Leakey Memorial Institute for African Prehistory, Nairobi, Kenya:*

Chesowanja, near the east side of Lake Baringo, lies ten miles inland from the lakeshore and is nestled against the rugged backdrop of the Laikipia Escarpment of the Rift Valley. Its geographical position is midway between "early man" localities to the north in the Lake Turkana basin (Koobi Fora and Omo) and those to the south in northern Tanzania (Olduvai, Laetoli and Peninj).

Our field season, lasting nine weeks, took place in early 1978 before the onset of the long rains. We wished to carry out a comprehensive survey to see just how extensive and detailed a record of fossils and artifacts might be preserved throughout the sedimentary sequence. A more specific aim was to trench promising localities to see if we could find well preserved fauna and artifacts associated together on relatively undisturbed hominid occupation floors.

The field team consisted of eight Kenyan excavators who have gained considerable skill as "flake hunters." We were fortunate to have in the group two members of the famous Koobi Fora crew,



*J. W. K. Harris and J. A. J. Gowlett, archeologist at Cambridge University, discussing plans in field camp at Chesowanja.*



Wambua and Bernard Ngeneo. The expertise of these two men was demonstrated by their discovery of the fossilized remains of an early hominid within the first hour of work.

The total area under study at Chesowanja is about four or five square kilometers and is like a microcosm compared to the large expanses of ancient sediments exposed in Hadar and Koobi Fora.

We began work in areas of exposures of the oldest sedimentary deposits of between 1.9 and 1.3 million years ago. Although the exposures are small, we were able to locate a large number of discrete surface patches of stone artifacts and fossil bone residue. We recovered quantities of stone tools, flaking debris and the broken fossilized bones of a variety of wild animals, offering evidence of tool manufacture, tool use, dietary adaptations and home base behaviors. The stone industry is based on a core tool tradition and is provisionally assigned as a geographical variant belonging to the Oldowan industrial complex.

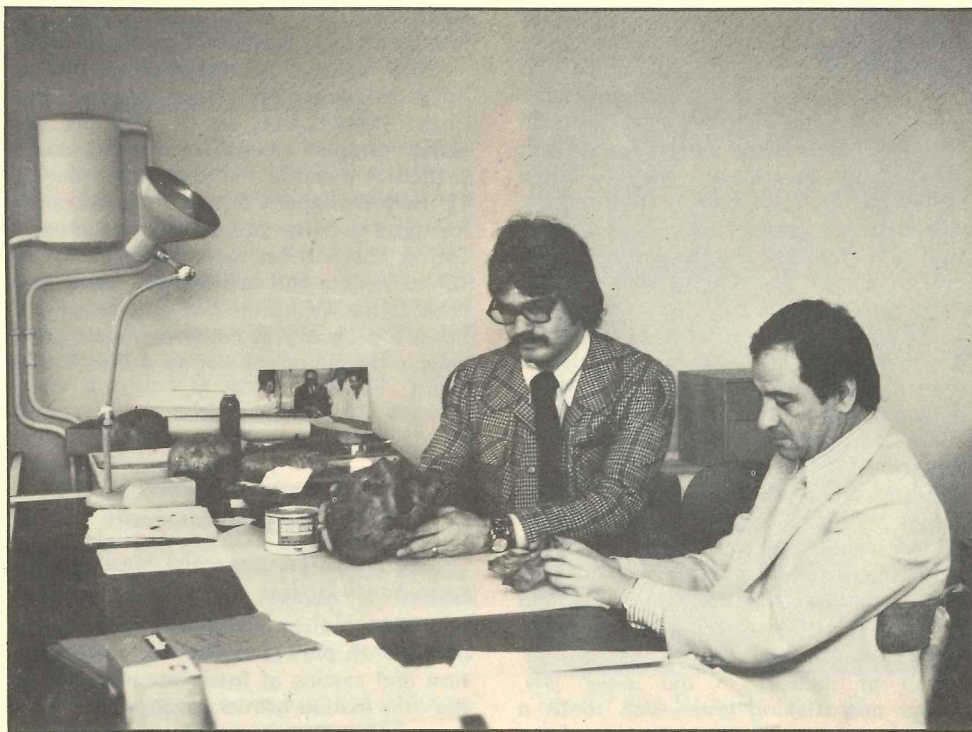
The faunal material indicates hunting and/or scavenging behaviors. The animal assemblages together with interpretations of the sedimentary environments show man was occupying places along bush covered banks of streams adjacent to more open grasslands. This is not inconsistent with earlier interpretations suggesting that Chesowanja was situated close to the margins of a saline lake.

One of the most intriguing finds was the discovery of mineral matter which could be ochre or burnt clay. This find could be an indicator of truly human behavior and will be subjected to great scrutiny by some of our colleagues.

A further highlight was the discovery of hominid cranial fragments, belonging to a single individual, later classified as *Australopithecus* c.f. *boisei*. It is difficult to establish whether or not these robust *Australopithecines* were tool makers and tool users. An intriguing feature of the Chesowanja hominid material is that it all belongs to the *Australopithecine* lineage and is found in strata containing stone artifact assemblages. Given these circumstances the question of the cultural capabilities of the robust forms must be reopened!

The Mukutan deposits which lie a kilometer to the east contain an extraordinarily rich record of hominid occupation and evidence of cultural activities dating to the last five or six thousand years. Extensive concentrations of stone artifacts indicate that it was probably a stone tool manufacturing area. Here we also detected decorated pottery in association with obsidian flakes.

We hope future investigations will fill in gaps in the sequence of prehistoric man's endeavors on the Chesowanja landscape.



Alan S. Ryan and Jean-Louis Heim examine the Neanderthal La Chapelle-aux-Saints at the Musée de L'Homme.

### Dental Microwear in Primates

Alan S. Ryan, *Museum of Anthropology, University of Michigan*:

As the search and discovery of fossil man continue, new scientific techniques have been introduced to analyze in detail the remains of these precious finds. The scanning electron microscope is a significant new tool which provides the capability of analyzing dental microwear at higher levels of clear magnification than possible with a light microscope.

In general, three distinct kinds of microwear can be found on the teeth of primates. These are: abrasion (pitting), attrition (linear microscratches) and microflaking (microscopic tooth chipping).

The first kind, abrasion, is found on front and back teeth and is probably related to the crushing of food and hard materials. Attrition, on the other hand, is associated with shearing and cutting food. As one tooth surface with a sharpened edge slides across another during the chewing of gritty food, parallel scratches are produced. However, microscratches observed on front teeth (incisors and canines) are often oriented perpendicular to the incisor row and may have little to do with cutting food. Rather, they indicate the stripping of abrasive vegetables or objects across teeth in a forward direction. The stripping of leaves off of branches or twigs as observed in modern apes is a good example of a feeding behavior which can produce microscratches oriented perpendicular to the incisor row. Finally, the third kind of

dental microwear, microflaking, is usually found on front teeth and may indicate that these teeth were used as a clamping and holding device in nondietary activities. For example, Eskimos have been reported to use their anterior dentition for a variety of special purposes such as softening hides, opening gasoline drum caps and straightening spear shafts. These rugged dental functions inevitably pressure-flake the enamel and dentine surfaces.

I am currently investigating microwear patterns on the anterior teeth of extinct and living primates. I would like to share with you some preliminary results I have gathered in my analysis of microwear on the front teeth of *Australopithecus afarensis* (the new species described by Donald C. Johanson and Tim D. White), European Neanderthals, American Indians and modern apes. To facilitate scanning electron microscopy, epoxy resin casts are made which assure accurate documentation of fine detail at high magnification. This technique prevents damaging the actual specimens.

The microwear found on incisors of gorillas is characterized by microscratches oriented perpendicular to the incisor row. Since gorillas are known to eat large quantities of vegetation, it is not surprising to observe a microwear pattern associated with this particular activity. After leaves are stripped off of branches, this vegetable material is further cut and ground by the molars. In contrast, incisors of American Indians recovered from a prehistoric site in northern Michigan (Juntunen) exhibit marked abrasive pitting and microflaking. 9



These microwear patterns are indicative of crushing and nondietary dental use. The crushing of food and the clamping and holding of hard materials may be inferred.

The incisors of *A. afarensis* preserve microwear patterns that are similar to both gorillas and American Indians. While abrasive pitting often scores the dentine surfaces, microflaking and stripping striae are clearly observed on the enamel. Such findings suggest that these early Australopithecines used their front teeth for crushing, stripping and environmental manipulation. Since microflaking is observed in modern humans and not in apes, the use of the front teeth for nondietary purposes indicates an important hominid dental adaptation.

In my analysis of microwear on the anterior teeth of La Ferrassie I, a Neanderthal specimen from France, the presence of marked enamel and dentine microflaking seems to indicate that this individual used his front teeth for extraordinary nondietary dental activities. On the anterior portion of incisors in the lower jaw, dentine microflaking gives each tooth a rounded appearance. The daily use of the front teeth as a clamp or vise to hold objects such as meat with adhering grit, bone stone, etc. may explain this wear pattern.

We need additional experimental and comparative studies designed to isolate the abrasive materials and conditions that lead to differences in wear patterns. As each data set is analyzed and grouped together to form a total picture of dental microwear, additional aspects of early hominid dietary preference and tooth use can be determined. The use of the scanning electron microscope can provide the pieces for this complicated jigsaw puzzle.

### Nyakongo Uyoma Site, Western Kenya

Dr. John A. Van Couvering, American Museum of Natural History:

A three week field trip to Kenya in March, 1979, resulted in several accomplishments. Rediscovery of Nyakongo Uyoma proved the exposure to be probably unfossiliferous. However, discussion with Dr. Martin Pickford of The International Louis Leakey Memorial Institute for African Prehistory in Nairobi confirmed that the *Deinotherium* reported from Nyakongo was in fact an Early Miocene species and that a site near Nyakongo was its source. Hopefully, when the field notes for this site are made available, this site will finally be re-investigated.

The Meswa Bridge site is particularly exciting because it preserves a paleo-ravine filled with articulated skeletons of large mammals. Except for Fort Ternan, this type of preservation is not known in the East African Early Miocene; discovery of a hominoid tooth during my visit raises the

possibility that articulated remains of hominoids may eventually be found there.

With the newly collected samples of mica and whole-rock from my visit, plus others handed over by Dr. Pickford and earlier samples already in my possession, sufficient material has been assembled to (1) perform experimental dating and chemical tests to solve the persistent problem of dating East African pyroclastic mica, and (2) to re-date the fossiliferous Early Miocene of the Kavirondo Gulf in one comprehensive program. A major contribution to paleoanthropological dating should be the result.

### Hominid Fossils at Transvaal Museum

Dr. L. J. Clarke, Transvaal Museum, Pretoria, South Africa:

I have now completed half of my nine-month project of cleaning, reconstruction and casting of fossil hominids. So far the information gained has proved to be of great interest and importance. Firstly we now have for the first time two good, almost complete mandibles of *Australopithecus africanus*. Secondly we now have a reasonably complete adult cranium with teeth of *A. africanus* to compare with STS 5. Thirdly we now have two other faces, one of which has a complete dentition, of *A. africanus*. Fourthly we have for the first time the calotte of an infant or juvenile *Paranthropus* that can be compared with the Taung skull. Fifthly we have the most massive and complete *Paranthropus* cranium yet known from South Africa. Sixthly we have the first virtually complete adult upper cheektooth row of early *Homo* from Swartkrans. The last yield of the current work provides an additional well-preserved mandible of an adult *Paranthropus*.

These specimens will next be described for publication and then cast before I proceed with the preparation of more fossils.

### Pygmy Chimpanzee

Dr. Randall Susman, Health Sciences Center, State University of New York at Stony Brook:

Early this year I embarked on an expedition to Africa to seek out the elusive pygmy chimpanzee (*Pan paniscus*) or bonabo with the intent of acquiring data about the locomotor behavior of this little known species. British naturalist Dr. Noel Badrian, two Mongo trackers, eight porters, and a camp cook and I spent two months in the Lomako Forest in Zaire. This is the first systematic and scientific study of the pygmy chimpanzee since its discovery in 1929.

We observed the animals mostly through binoculars while they moved from tree to tree to feed, engaged in social interactions

or fled from us. We found the dry season has severe effects on the bonabo's locomotion, group size and daily movements, due to the limited availability of food in this period. Bonabos are on the ground more in the dry season when food is plentiful on the forest floor. In the rainy or fruit season, food is more commonly found high in the canopy.

These animals are more acrobatic than common chimpanzees who are more cautious in trees. On the ground, however, the two types of apes are essentially identical. The common chimp is more gregarious, bolder, nosier and not as secretive as the bonabos. The latter are slightly smaller and more slender, with facial differences.

I am presently considering a two-year project of further investigation as I believe there are many questions yet to be answered.

## Correction

Elizabeth Meyerhoff, Foundation grantee researching the total women's role in the agricultural and pastoral communities of the Pokot in Kenya, wishes to correct a statement printed in the last Newsletter. The metaphor, "she hasn't gone to the river yet," means a woman has not finished her menstrual period. If a girl has not reached puberty, "she has not yet gone across the river." It is important to understand that this example simply indicates the complexity of communication within the Pokot culture. The use of metaphors goes far beyond these personal matters, even into court cases and throughout the whole fabric of social relationships.

### NEW FELLOWS

The Leakey Foundation is proud to welcome fourteen new Fellows to its membership roster.

They are: Mrs. William D. Harrigan, Fulton, Alabama; Mr. James C. C. Hudson, Dallas, Texas; Mr. John Pell Hudson, Austin, Texas; Mrs. William P. C. Hudson, Austin, Texas; Ms. Shelia Kemper, New York, N.Y.; Mr. Marc R. Kuehbeck, Arabellestr, West Germany; Mr. Case Hudson Lynch, Locust Valley, New York; Mrs. Case Hudson Lynch, New York, N.Y.; Mr. Edmund C. Lynch III, New York, N.Y.; Mr. John H. G. Pell, New York, N.Y.; Mrs. William P. Roth, Hillsborough, Calif.; Mr. & Mrs. L. C. Small, Irvine, Calif.; Mrs. Paul Wattis, San Francisco, Calif.; Mr. & Mrs. Don Natrass, Anchorage, Alaska.

Fellows of the Foundation now total 311.



The Grant program of the L.S.B. Leakey Foundation, under the guidance of the distinguished Science and Grants Committee, depends upon public support for its success. Every penny of your contribution dollar directly supports the grant awards. Members and donors are invited to designate their gifts in support of specific research projects.

Won't you take this opportunity to direct your contribution to the grant project of your choice?

## GRANT SPOTLIGHT

Dr. Jens Munthe \$2,000 needed

### Paleoanthropological Reconnaissance of Neogene Deposits in Nepal

The importance of the Miocene-Pleistocene Siwaliks of South Asia to our understanding of human evolution is well known. Abundant hominoid fossils representing such taxa as *Ramapithecus* and *Sivapithecus* have been collected from the Siwaliks of Pakistan and northern India. However, no hominoids have been recovered from the lateral extensions of the Siwaliks farther east in Nepal, eastern India and Burma, nor have fossil hominoids younger than about 6.5 million years been collected anywhere in South Asia to date.

Dr. Munthe of Howard University, Washington, D.C., proposes to continue paleontological investigations of the Neogene deposits of the Siwaliks in Nepal which were begun in 1974 with the assistance of Dr. R. M. West. His research plans include an air survey of the area prior to the land expedition into the remote and poorly surveyed region. With the assistance of a low-level aerial survey, Dr. Munthe will be able to delineate outcrops with a high paleoanthropological potential. In addition, the research team will investigate cave deposits of both the Kathmandu and Pokhara valleys where small Pleistocene vertebrate fauna have been found.

The 1979 work will lay the foundation for the full season's work the following year.

Dr. Jack W. K. Harris \$2,000 needed

### Initial Archeological Investigations at Laetoli, Tanzania

Dr. Harris, an archeologist in Nairobi, will conduct a survey and test excavation of the sedimentary deposits at Laetoli which correspond to those of Beds I and II at Olduvai Gorge. The Laetoli beds lie stratigraphically between lava dated at 2.4 million years and beds containing fossils and artifacts which are thought to be of Upper Pleistocene age.

Evelyn Ono Vineberg \$3,000 needed

### Pygmy Chimpanzee Locomotor Behavior

As the only Westerner to be invited to the Japanese primate research station in Zaire, Ms. Vineberg, a pre-doctoral student in anthropology at the University of California, Los Angeles, has the unique opportunity to conduct a three month field study of pygmy chimpanzee locomotor behavior. Studies of genetic affinities and morphological-anatomical analyses lead many scientists to believe that the pygmy chimpanzee is a better model for assessing early hominid adaptations than is the common chimpanzee.

Data collection will emphasize the following: 1) frequency and duration of locomotor and postural behaviors sampled for sex and age class differences; 2) day-ranging patterns in relation to various modes of locomotion; and 3) ecological influences on behaviors such as foraging, resting and escape.

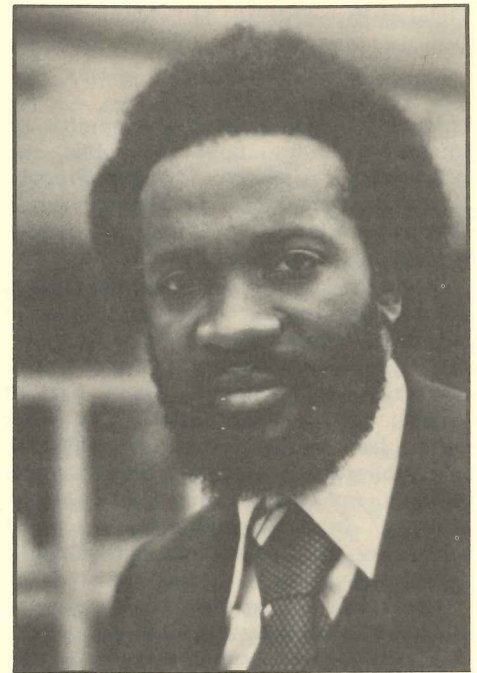
The data gathered should aid in future research on the pygmy chimpanzee.

Dr. John E. Cronin \$4,500 needed

### Pygmy Chimpanzee Evolutionary Affinities: Implication for Human Origins

Dr. Cronin of Harvard University requests funds for a comparative electrophoretic study of humans, chimps, gorillas and orangs with a primary focus on pygmy chimpanzees. The data should: 1) yield insights into the affinities and evolutionary diversity of the pygmy chimpanzee, 2) help resolve whether man is more closely related to either the chimp or the gorilla or neither, and 3) indicate the validity of the origin of the hominid lineage around five million years ago.

Man's relation to his closest relatives, the great apes, remains an open area for investigation. Biomolecular studies have confirmed that chimps and gorillas are closer than orangutans to humans. Traditionally chimp and gorilla have been viewed as being closer to one another than to man, based primarily on morphology. However, genetic data collected so far neither support nor reject this view, because the techniques used cannot resolve finely enough between closely related taxa. Questions of this type can be answered using protein electrophoretic techniques, especially when large and diverse enough samples of genes are compared. Only one comprehensive electrophoretic study has been conducted involving the human-chimpanzee relationship. It revealed that man and chimp were genetically extremely similar. By itself, however, this study does not allow us to place man in a complete evolutionary context, because we have no comparable data for gorilla, orang, and pygmy chimp. It is in this field that Dr. Cronin proposes to work.



*Tepilit Ole Saitoti*

Tepilit Ole Saitoti \$5,700 needed

### An Ecological Study of the Total Land Mass of Maasailand

Tepilit Ole Saitoti, a Maasai and former grantee of the Leakey Foundation, will undertake a comprehensive study of Maasailand ecology. Enrolled in a graduate program at the University of Nairobi, Saitoti's field work will take place in areas of Tanzania where he will study the interaction between the pastoral/agricultural pursuits of the Maasai and local wild life. This study should help to assess the alternatives which could eventually improve the threatened savannah ecosystems.

Where agriculture is encroaching on the marginal land that is home for both wild-life and the pastoral Maasai, disappearance of wildlife and extinction of a culture will certainly result unless planned land-use balances can be established. Saitoti's two year study will research this area of human and wildlife interaction which has received little attention and is urgently needed today.

Dr. John A. Van Couvering \$1,000 needed

### Biostratigraphic Dating of Israel and Egypt Mammal Localities

Dr. Van Couvering of the American Museum of Natural History has been invited to visit the early-middle Miocene sites in the Fayum and Wadi Moghra, Egypt, and the Negev of Israel. He will review the stratigraphy and take samples of marine microfossils which may be used to identify marine zones that have been radiometrically calibrated elsewhere.



## Paleoanthropology: Hot News

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episode unfolded illustrates a number of interesting things about the public, the press and the paleoanthropologist. Probably the most significant for the long run is that paleoanthropology is now regarded by the nation's press as hot news.

Over the last few years there has been a remarkable increase in popular interest in human evolution and an even more surprising increase in the efforts of the press to satisfy this interest. There has, of course, been a strong core of followers dating back at least to around 1960 and the publication of Robert Ardrey's *African Genesis* and the discovery of "Zinjanthropus" (now *Australopithecus boisei*) which cast the Leakeys into sudden public prominence.

Not until the last five years, however, did the public interest really spread widely. Richard Leakey's announcement of the "1470" skull in 1973 may have been the kick-off. Through scores of lay publications, including some as far from science as *Playboy*, K.N.M.-E.R.-1470 became the only hominid fossil whose catalog number is almost a household word. In the same year, Dr. Johanson began his string of spectacular fossil discoveries in Ethiopia with a hominid knee joint confirming bipedalism at more than three million years of age. The ensuing years witnessed the discovery of "Lucy" and an extraordinary cluster of the remains of at least thirteen hominid skeletons in one place.

As Dr. Johanson's finds came in, year by year, a public that knew "Leakey" only as the name of a paleoanthropologist realized it had to reckon also with a Johanson. Even then some people sensed a rivalry. Not a bitter feud but a sense of healthy competitiveness that gave the search for hominid fossils an added interest.

Over the past five years the public lectures of the L.S.B. Leakey Foundation have enjoyed growing success. A second fund-raising body, FROM, has joined the field and become as successful in drawing large crowds to paleoanthropology lectures. In 1978 Richard Leakey was the cover subject of *Time* magazine's largest selling issue of the year. *Origins*, Mr. Leakey's book, appeared the same year and sold unusually well. The following year he published *People of the Lake*, which also sold well. Dr. Johanson is working on a book of his own. A BBC television series on human evolution and featuring Mr. Leakey is in the works and is expected to reach the United States in a year or so. In the marketplace, paleoanthropology has arrived.

My own experience as a science writer has been that when I started trying to report on human evolution six or seven years ago, editors had a low appetite for the subject. They wanted only the occasional roundup maybe once a year. Today editors of newspapers and magazines often

hope every new detailed finding about human evolution can be called significant so that they will feel justified in giving it prominent display. They want to give it that display because they believe such articles will draw readers.

I see no evidence that the public interest in paleoanthropology will decline soon. The country is currently in the grip of an unusual wave of interest in science reporting for the general reader. Several new science magazines and television series are being prepared and the editors and producers clearly consider anthropology a staple.

This brings us to the problem of how to conduct a scientific debate in a world that now says such debates are hot news. I know of no simple guidelines here but I think a few observations may be in order. First of all, the media jealously guard for themselves the prerogative of deciding what is news. Obviously an authoritarian approach—say a paleoanthropology czar declaring what the public shall or shall not know—is as antithetical to science as it is to a free press and a free society. Any move that smacks of suppressing evidence or stifling debate is bound to create suspicion.

On the other hand, a totally open approach—anyone eligible to give opinions and assert interpretations of evidence (especially when the evidence is privately held and not widely available)—can be confusing to a lay audience and to specialists for that matter.

My bias, however, is clearly toward the second extreme and I would argue that both paleoanthropology and the public will be better served by following a more open course.

Significant elements of the public are becoming more interested in human evolution and more sophisticated in following

developments in the field. People are asking to be let in on more details of the paleoanthropological line of reasoning and to be educated in the subject. When scientists respond openly to that request, it can only make the public better prepared to cope intelligently with differences of opinion.

Compared with other fields of science where there is also hot news (say medicine or astrophysics), paleoanthropology has been a small and relatively insular community. Enjoying pitifully little of the government funding that has pumped billions into medicine and astrophysics, paleoanthropologists have tended to give their public performances mostly for private donors, from major philanthropists to buyers of lecture tickets.

There is an opportunity for this to change now. With a larger public asking to be let in on the subject, there is an opportunity to demonstrate that paleoanthropology is something taxpayers want more of. (This is not to say that reporters are public relations agents for scientists. To the extent that a reporter becomes an advocate of a news source, the reporter loses credibility as an impartial source of news.)

Rather than shrink from explaining differences of opinion (a step that does often give the appearance of brawling and cover-up), I think paleoanthropologists should be more open. Educated readers are quite accustomed to large disagreements in other fields of science such as the debate over causes of cancer or whether the universe oscillates or expands forever. These are not commonly perceived as unfortunate brawls but as legitimately challenging questions. Leading exponents of either side are not seen as bitter antagonists (although, of course, antagonisms will always exist in all



National Geographic Society

Richard Leakey and Donald Johanson



professions) but as intellectual rivals, vying in a challenging and worthwhile way as part of a search for truth.

No good science writer wants to wait until every new hypothesis is confirmed before reporting it to the public. Science reporting that waited for a final bit of confirming data would be about as interesting as a mystery that skipped the work of the detectives and told you right off the bat who done it. Such writing would communicate little of the stuff of science, nothing of the challenge and excitement that drives scientists and without which the thrill of discovery would be weak indeed. If political reporters adopted such a rule, we would know nothing of congressional debates on important issues, we would be told only the final vote. Scientific debates, I would suggest, often involve matters that have far greater significance for the public than do political debates.

After all, paleoanthropology is more than a scheme for keeping a few fossil hunters and caliper-wielders off the welfare rolls. It is a pursuit of knowledge about the origins of all human beings—pursuit that every human being has the right to follow.

## A Question of Age

continued from page 1

years of age.

On the other hand, if the opponents of *A. afarensis* are right, it would mean that *Homo* emerged at least 3.75 million years ago and that we have no known fossil ancestors unless one reaches all the way back to *Ramapithecus* around twelve million years ago. (Even the hominid qualifications of *Ramapithecus* are now in some doubt.)

The current controversy also has implications for the ways in which fossil assemblages with a mixture of relatively modern and relatively archaic traits are interpreted. Do you lump them into one species or split them into two or more?

Before the current debate broke out with the report in the Jan. 26 issue of *Science* by Dr. Donald C. Johanson and Dr. Tim White, there were two major sets of hominid remains known from the period between 3 million and 4 million years ago.

One was a group of mandibles and teeth found at Laetoli in Tanzania and reported in 1975 by Dr. Mary D. Leakey. Her view was that the fossils showed enough modern features to qualify them as *Homo*. As with most attempts to classify fossils, this was based largely on subjective interpretations of anatomical features. Dr. Leakey's report was startling because the bones were as much as 3.75 million years old. At a stroke, the antiquity of the *Homo* lineage appeared to have been nearly doubled from the age of "1470."

The other fossil collection from roughly the same period was being collected through the early 1970's at Hadar in the Afar region of Ethiopia by Dr. Johanson and his colleagues. In this case, however,

preliminary interpretations suggested two different species—a primitive form of *Australopithecus* represented by "Lucy," the forty percent complete skeleton, and a more advanced species that resembled the Laetoli hominids.

Subsequently, however, Dr. Johanson met Dr. White, who had been brought in by Dr. Leakey to analyze the Laetoli fossils. The two agreed that both sets of bones and teeth should be considered as belonging to one unusually variable species of hominid. They attributed the variability mostly to sexual dimorphism, or differences between males and females.

In their report in *Science*, the two anthropologists said they believed they had found a new species that was ancestral to later forms of *Australopithecus* (such as *A. africanus* and *A. robustus*) and also ancestral to the known forms of *Homo*, "1470" being the earliest of these. They suggested that the mixture of modern and archaic traits meant not that there were two species but that the one species was in evolutionary transition, retaining some old features while sporting new ones. They proposed a Y-shaped evolutionary tree with *A. afarensis* being on the stem of the Y, very close to the branch, and the two arms representing *Homo* and later forms of *Australopithecus*.

Richard Leakey's challenge to this interpretation, made during his lecture tour in the United States last February, rests on at least two points. One is a group of eight isolated hominid teeth found in Kenya at a place called Kubi Algi, not far from Koobi Fora on Lake Turkana. There are questions about the dating of the teeth but Leakey suspects they are of approximately the same age as the Laetoli and Hadar fossils.

Although the teeth have not yet been published as of this writing, Leakey has said in interviews that they are sufficiently distinct from either the Hadar or Laetoli teeth to indicate that they represent a different species. If subsequent study bears this out, it would mean that *A. afarensis* cannot be the only candidate for an ancestor of all later hominids.

Dr. Johanson says that although he has seen the eight teeth only briefly, they do not appear very different from those of *A. afarensis*. He says they might also be teeth of *A. africanus*, which he considers a descendent of *A. afarensis*. "The material I've got," Leakey said of the teeth, "is very insignificant, but there's enough to challenge Don with. It gives me the right to offer my opinion."

The other main point on which Leakey rests his challenge is the large degree of sexual dimorphism invoked by Dr. Johanson and Dr. White. According to Mr. Leakey the variability is greater than that known between the sexes of any living primates. The difference is so great, he holds, that it should be interpreted as signifying distinct species.

To this Dr. Johanson has a ready reply. All the variability among the fossils can be found within a remarkable cluster of

hominid fossils known as the "first family." This is a group of bones and teeth representing at least thirteen individuals of various ages that were found in one place known as locality 333. According to Dr. Johanson, it appears that the thirteen or more individuals were living together when some catastrophe, perhaps a flash flood, killed them all.

Interpreting the burial conditions of fossils can be tricky. It is well known that various agents from stream flow to carnivores can gather scattered bones into a single spot. Dr. Johanson believes, however, that such agents can be ruled out for the 333 site. If he is correct, then, it would appear likely that however different the individuals found at the site, they must all have been members of the same species and possibly even members of the same immediate family. It is generally thought unlikely that two different species of hominid would be travelling together.

As with most differences of opinion in paleoanthropology, this one is not likely to be resolved soon. Although facts are not established by popular vote, it is significant that both sides have garnered support from other anthropologists. It may take years to find enough other fossils to clear up ambiguities or make more detailed interpretations possible.

Another recent discovery in the field, however, is causing no controversy. This is the finding by Mary Leakey, with the collaboration of Tim White, of an extraordinary set of hominid footprints covering seventy-three feet in a nearly straight line at Laetoli. There are two sets of tracks running parallel. One set was made by larger feet, estimated to have been possessed by a 4-foot, 8-inch hominid. The other set is smaller, probably produced by a hominid who stood four feet tall.

The prints were created as the two individuals, living 3.6 million years ago, walked across a layer of volcanic ash that had just been wetted by a rain. The ash then hardened like plaster, preserving the impressions under subsequent deposits of sediment and natural erosion that re-exposed some of them.

Dr. Johanson's 1973 discovery in Ethiopia of a hominid knee joint of approximately the same age had already indicated that a fully bipedal form of locomotion had evolved by this time. But the prints—the oldest known mark of a humanlike creature on the face of the earth—clearly provide dramatic confirmation that a totally modern form of locomotion had arisen very far in the past. If the prints were made by the same kind of hominid whose skeletal remains are already in hand—hominids with a brain size hardly larger than that of apes—they confirm that one distinctively human trait, bipedalism, had reached full development before another peculiarly human trait, the expanded brain, had even begun its transformation.

- Boyce Rensberger



Continued from page 2

ago in the Viru Valley. Patterson and his colleagues concluded that industrial pollution has increased the levels of lead in the bodies of modern Americans to 500 times normal. They chose these Peruvian skeletons for study because they were isolated from early sources of lead poisoning, and because they had been buried in an arid desert.

Professors John Benton, Pol Duwez, and William Schaefer are involved in a study of the chemical composition of medieval coins. Benton, a professor of history, has taught a course with Patterson, the History of Metals and Man. Benton's current enthusiasm is the application to medieval manuscripts of the image-enhancing breakthroughs at the Jet Propulsion Laboratory. Almost invisible and unreadable medical notes from 1300 A.D. have been enhanced through this specialized, space-satellite, digital image processing and are described in a recent French scientific publication.

In research partly supported by a grant from the Leakey Foundation, mineralogists George Rossman and Russell M. Potter explored the possibility of using desert varnish for age dating. A smooth black coating that accumulates on rock formations in arid regions, desert varnish was often used as an art medium by early man, who chiseled through it to carve petroglyphs. Then the carved surface "healed" as new varnish accumulated. Archeologists

had hoped to age-date petroglyphs by learning how rapidly the varnish collects. But Rossman and Potter discovered that desert varnish is composed mainly of clay and that environmental factors—and not merely time—determine its rate of deposit. One easily forgets that all promising scientific ideas don't work!

Working in another discipline, applied scientist Gilbert McCann has turned to computer technology to discover the secrets of Persian artisans. McCann used a high resolution internal scanner at Pasadena's Huntington Memorial Hospital to learn how Near Eastern art objects—lent by the Los Angeles County Museum of Art—were put together. The scanner located the vessels' seams, revealing how many pieces of metal they comprised and how these were joined. Then data from the scanner's two-dimensional photographs of the art works were programmed into Caltech computers. The computers created detailed three-dimensional images of the objects on a television screen. McCann used the technique on a Fifth Century Grecian urn from the J. Paul Getty Museum in Malibu to ascertain that there was a small container inside the urn—apparently the only part of the urn which held oil for the gods. And in another project, McCann has worked to create a mini-computer to be used for data analysis at archeology sites.

On other archeologically related work, geologist Kerry Sieh has been reading

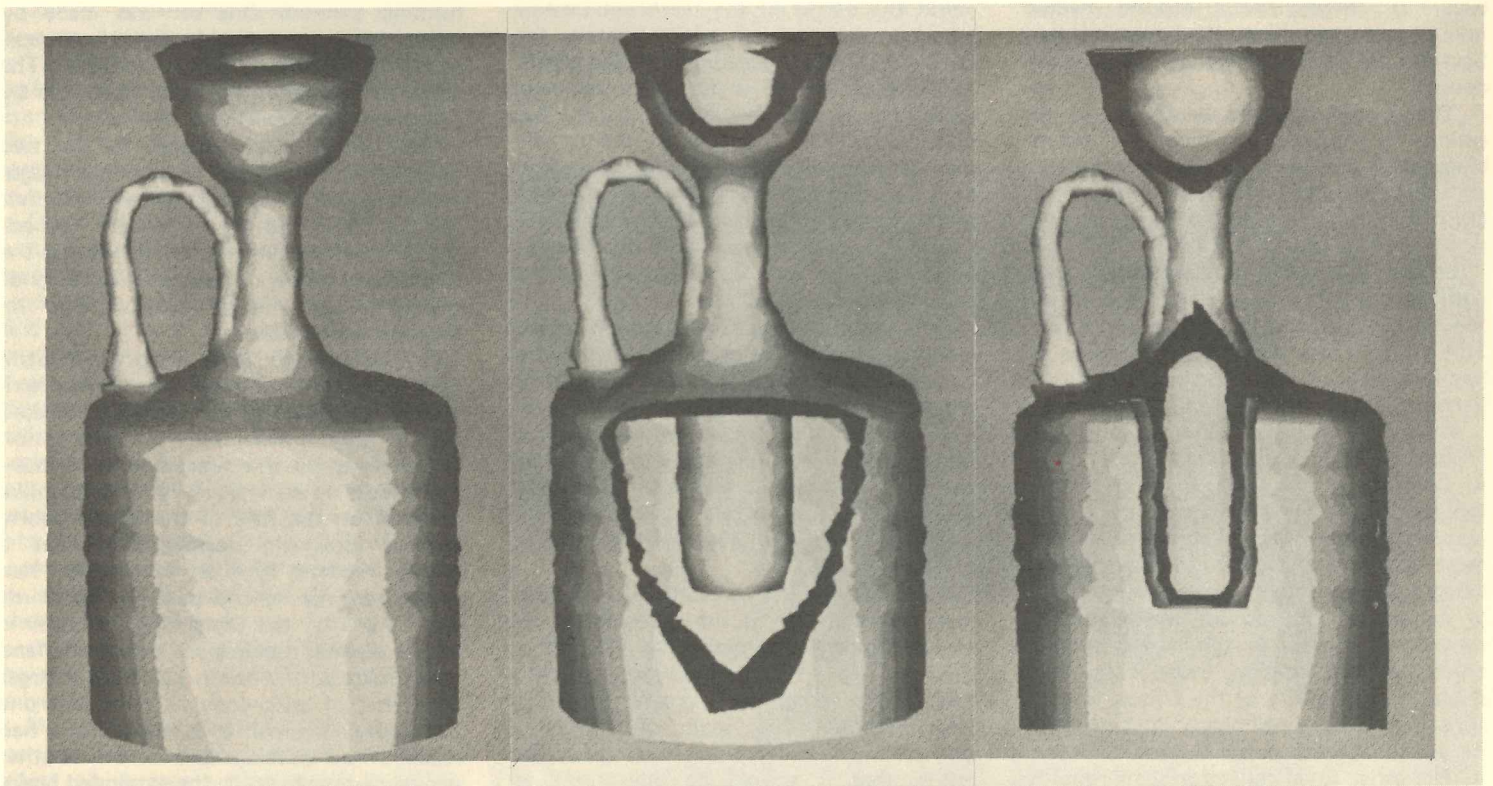
cracks and wrinkles in the earth for evidence of ancient earthquakes. He has found hints of an intriguing pattern of earthquake recurrence in Southern California over the past 1500 years—including evidence that at least nine large earthquakes have struck the Palmdale region since the Sixth Century. Professor Sieh was able to determine their approximate dates via carbon-14 dating of organic matter from a dried-out marsh and a diverted stream that straddle the San Andreas fault.

The foregoing does not include Professor Gerald Wasserburg's work on dating the origins of the earth, the JPL Jupiter missions and others that may tell us if life exists elsewhere, and the astronomers at the 200-inch telescope at Palomar, who work on dating this solar system and the universe.

Nobel Laureate Murray Gell-Mann is a final example of a renaissance man, who accepted the nomination to the Leakey Foundation's Science and Grants Committee because of a great intellectual curiosity in a dozen archeological fields.

So, perhaps, the Leakey Foundation does not live in such a strange neighborhood after all!

*Ned Munger*



14 An x-ray scanner and a computer guided by Gilbert McCann of Caltech look inside the ancient Grecian funeral urn to reveal a small inner oil container.





Burmese scientist field team (standing) who participated in the recovery of new 40 million-year-old primate remains from the Pondaung Hills of Upper Burma. Kneeling in foreground are American scientists R. L. Ciochon (left) and D. E. Savage, (right). Photo taken on a field trip to the Pondaung Hills in December 1978.

upper Burma also results in a geographical shift for the origins of these mammals from which humans, apes and monkeys all descended. Because of fossils found in Egypt, the view had previously been held that they evolved in Africa. "The new finds certainly put Burma back into consideration as the evolutionary center for anthropoids," Dr. Savage said. However, more evidence must be gathered before southern Asia can be accepted definitely as the cradle of primates. Ciochon and Savage plan to return for more research. "We think there's a lot more to be found there," said Savage.

The jaw fragments have been classified by the scientists as coming from two different types of creature which they have named *Pondaungia* and *Amphipithecus*. The fossils indicate animals of a size approximately equal to that of today's gibbons. Two contain teeth. The shape of the dental crown as well as the structure of the jawbones identify them as having been those of *Anthropoidea*. The geological strata in the Late Eocene seabed in which they were found date them.

## BURMESE DISCOVERY

The remarkable discovery in Burma by two Leakey Foundation grantees of four lower-jaw fragments may set a new and much earlier date for the origin of anthropoids.

Dr. Russell L. Ciochon, anthropologist at the University of North Carolina, and Dr. Donald E. Savage, paleontologist at the

University of California, Berkeley, announced their find last May. Their contention is that the jaws are those of small, apelike creatures that lived more than forty million years ago. This dating pushes back the previously accepted origins of anthropoids at least ten million years.

The find in the Pondaung Hills area of



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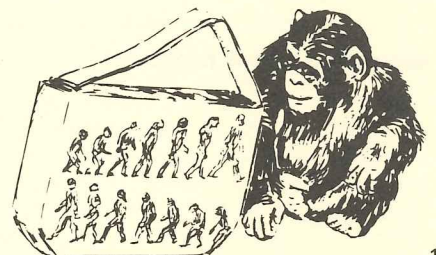
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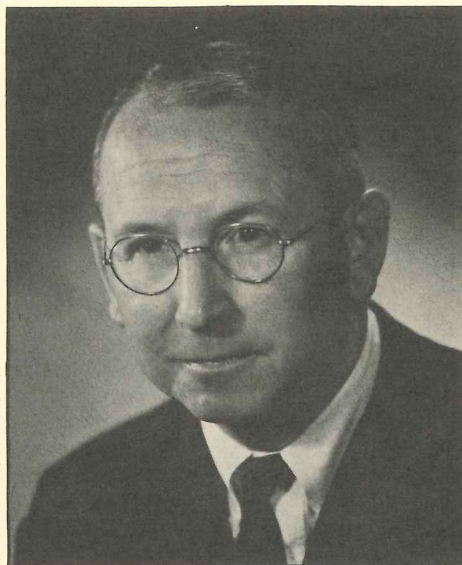
# THE SAURIAN CONNECTION

At his Poolesville, Maryland, animal complex, Dr. Paul MacLean unravels the intricacies of reptilian brains—and consequently those of man's. Director of the National Institute of Mental Health Laboratory of Brain Evolution and Behavior and a member of the Leakey Foundation Science and Grants Committee, he has spent twenty-two years on this research. "We have hardly begun learning our ABC's," he says.

However, he is now convinced that the ancient brain shared by all vertebrates is not merely a vestige in man but leads him directly to certain behaviors.

The human brain, MacLean says, is in fact triunal—three brains in one: the ancient (about two hundred million years) reptilian core, which he calls the R-complex; the old mammalian brain or limbic system; and the neocortex which differentiates humans from other animals. His work—the attempt to define the natural behaviors dictated by the R-complex—is a unique approach in brain research. The projects at the animal center have been primarily directed toward testing the hypothesis that the R-complex is of major importance in integrating the kinds of behavior involved in self-preservation, preservation of the species and non-verbal communications.

Observation shows that reptiles are ruled by routine and ritual. Having discovered much evidence of R-complex insistence on social conformity in human



Edward A. Hubbard

*Dr. Paul MacLean*

behavior, MacLean suggests that extraordinary creativity in man might be caused by defects in brain development. "Some individuals may become creative because of a constitutional incapacity for imitation," he has written.

MacLean proposes study in a new branch of knowledge which he calls "epistemics," combining brain sciences and psychology, researching the subjective self and its relation to the external and internal environment. "We would have an entirely different appreciation of ourselves and the world if we could get a little deeper than the neocortex," he says. "No matter what speed man attains with his new mammalian brain, he faces discontent unless he learns to accommodate to the horse and buggy pace of his animal brains."

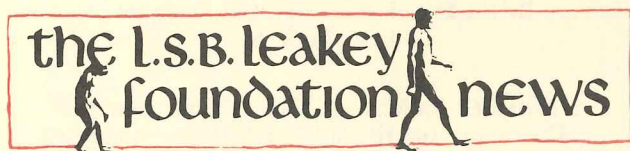
# BALDWIN GRANTS

**Dorothy Dechant Boaz,**

Ph.D. candidate at the University of California, Berkeley, has been awarded a Franklin Mosher Baldwin Fellowship of \$1,500 in support of her research project: Modern Riverine Taphonomy: Its Relevance to Omo Hominid Paleontology. Field work will be conducted in the Maasai Mara Game Reserve in Kenya since it contains a diverse animal community and is relatively free of human interference. Skeletal material found within specified transects will be recorded as to species, body part, individual age, damage and weathering stage. Excavations will be conducted in several sedimentary environments along the river and skeletal material recovered will be plotted on an excavation map. Ms. Boaz will then use data gathered to determine what the taphonomic variables are in a riverine setting and then place them in the Omo setting. She hopes it will be possible to extrapolate what might have been the community structure and environmental setting when early humans inhabited this area two to three million years ago.

**Dr. Ronald Clark,**

recipient of a \$500 Baldwin Fellowship, has been asked by Dr. Mary D. Leakey to join her for a summer field season at Laetoli where he will assist her in the excavation and preservation of the noted site of hominid and vertebrate fossil footprints.



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