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# MEN, MINDS AND HANDS: CULTURAL AWAKENINGS OVER TWO MILLION YEARS OF HUMANITY

by PHILLIP V. TOBIAS

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Abridged version of the opening address to the L. S. B. Leakey Foundation Symposium on  
"The Hand of Man; Origins of Art and Culture," San Francisco, February, 1979.

It is a part of man's ineluctable destiny to be the most insatiably curious of creatures, and his probing curiosity seeks ever after the roots and origins of himself and his lifeways.

My task is to dissect out any traces of cultural awakening among the earliest known members of the human family. Since beginnings are harder to discern than endings, I propose to violate Lewis Carroll's principle and to start at the end — today's world — and delve backwards in time. This should give us some idea of what to look for in our quest for the dawn of culture. Then we shall jump back to man's earliest ancestors and seek any foreshadowing of culture and art. From that misty but hopeful daybreak, we shall follow man's cultural evolution to a point where sapient man springs forth as hunter, thinker and artist.

It is no difficulty to distinguish the material products of human culture today. We are surrounded by them. Those trained in archeology can specify Stone Age man's implements dating back for a million years; but when it comes to those yet earlier small beginnings, from which such mighty things have grown, controversies abound. For beginnings are essentially untidy — here a stone might be picked up and used; there a broken-off stalactite might serve some purpose; a perishable twig or branch might solve a human problem in the very form in which nature made it.

Art is a branch of culture of which roots are harder to discern than fruits. Here and there surviving hunters and food-gatherers have painted during recorded history and even in living memory. In southern Africa, for instance, there are thousands of painted caves and rock shelters. Most paintings are attributed to the San, the little yellow peoples who once occupied at least half of Africa. Painting is a lost art among the San, but they no longer live in mountainous parts where there are caves. There are few natural rock canvases in the Kalahari Desert where most San live today. Yet the last San were seen painting in Namibia about 1870 and in Rose Cottage Cave at Ladybrand about 1900. So written testimony relates the San to some of the rock paintings in the late 19th and early 20th centuries. The same is true of aboriginal Australians, some of whom still paint.

In southern Africa, as in Australia and the Sahara, recent paintings give a lead in the study of older rock paintings. For 300 centuries there are art records on the rocks of Europe. Paintings of men, animals and strange

geometric signs tell the history of those days, as surely as do stone implements, fireplaces and graves. As we probe more deeply in time, mural art disappears, yet the collection of ochre and other red earths and mineral pigments precedes the appearance of surviving art.



*Olduvai Gorge*

photo: Hugo Van Lawick, © National Geographic Society

geometric signs tell the history of those days, as surely as do stone implements, fireplaces and graves. As we probe more deeply in time, mural art disappears, yet the collection of ochre and other red earths and mineral pigments precedes the appearance of surviving art.

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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

Synergistic (σνεργικός — or working together) is too valuable a Greek word to discard because it became a cliché in the sixties. It truly describes the workings of the Leakey Foundation, where disparate activities create a sum greater than its parts.

Our annual meeting in England was highly successful. We met for lectures in the Pythagoras Hall of St. John's College, originally a Norman dwelling and the oldest building in Cambridge, dating from the twelfth century. There Dr. Michael Day described how he has used photogrammetry and infrared photography on Dr. Mary Leakey's 3.7 million-year-old Laetoli footprints to determine the weight of the person, the speed of movement, the gait, and other characteristics.

Recipient of the Leakey Studentship at St. John's, Phyllis Lee, then discussed vervet monkeys at Amboseli. She explained, in answer to a question, a curious bit of miscellany: incest between these creatures is extremely rare because older males keep the adolescent sons sexually away from their mothers for five years, and by then they are usually in different groups. Was this true of our ancestors who left their footprints almost four million years ago?

On a light note, Phyllis thought the Laetoli footprints had been discovered by Leakey grantee Andrew Hill when, while playing football with hardened elephant dung, he juggled a pass over his head and fell backwards, whereupon he realized he was on a "pavement" and, being a paleontologist, immediately recognized the animal footprints in the rock.

But Michael good naturedly took issue with Phyllis, perhaps because, as an ex-rugby man, he didn't want it to go down in scientific history that a British player had dropped a pass. In Michael's version Andrew, while tossing the dung in some horseplay, noticed a pavement, brushed away some dirt, and began to examine impressions on the stone, which led to finding the oldest hominid footprints. As Dr. Day said, that creature walked — not ran — the same as we do today.

Incidentally, Day reported that a second individual walked in the original prints while they were still impressionable, much as one can walk in prints in wet sand. We cannot derive social patterns from the footprints, but Phyllis' work on vervets may offer clues to living primates' behavior.

Information on such discoveries is communicated in this newsletter, as well as in scientific monographs. Our editor, Elizabeth Brady, was elected a trustee at the same meeting. Her newest project is to establish a Leakey News Service, in which we will make available gratis to magazines and newspapers reports of developments in both primatology and "stones and bones."

All of this requires money. I am delighted that Gordon Getty, the new chairman of the Leakey Foundation Board, will be heading our development efforts. Gordon has had experience in fund-raising for opera, art and archeology in the Bay area. He has been intimately concerned with Leakey symposia, personally seeking out the ablest scientists to speak for us.

Larry Barker, who served superbly for two years as chairman, will work with Gordon on financing further discoveries by scientists, whether they can catch exotic footballs or not.

And if that isn't both the quiddity of the Leakey Foundation and synergistic, then it wasn't elephant dung!

*Ned Munger*

## SYMPOSIUM

A two-day symposium will be presented by the California Institute of Technology and the Leakey Foundation, January 30, 31, and February 1, in Ramo Auditorium, Caltech. Opening with a public lecture by the eminent British scientist, John Maynard Smith, a panel of international experts will explore "THE EVOLUTION OF SOCIAL BEHAVIOR: THEORY AND EVIDENCE" in a series

of lectures on the evolution of the brain and language; primate and human social systems; and discussion of the issues raised by sociobiology. Participants in this program will include Irvn DeVore, R. E. Passingham, Jerre Levy, Melvin Konner, and Paul Harvey. Leakey Foundation members may expect to receive complete information about this special program by mail. □

# THE WADING APE



reprinted from May 1980 OCEANS magazine

Illustrations by Bill Prochnow.

## A Watered-Down Version of Human Evolution

by Jerold M. Lowenstein & Adrienne L. Zihlman

At the end of a lecture on human evolution, every anthropologist has learned to expect challenging questions from partisans of three nonscientific beliefs: the existence of Big Foot, visitors from outer space, and, increasingly of late, the Aquatic Ape Theory. It is not easy, in fact usually impossible, to refute a belief with evidence. But of the three, the Aquatic Ape Theory makes the largest claims for a scientific basis. We propose here to examine this basis and see how well it squares with current scientific concepts of human evolution.

Marine biologist Alister Hardy asked the question, "Was man more aquatic in the past?", in an article in the *New Scientist* in 1960. He suggested that several characteristics that distinguish humans from apes might be accounted for if

our ancestors had become semiaquatic creatures, spending about half their time in shallow water. This could explain our relative hairlessness, upright walking and tool use. Many aquatic animals are almost hairless: dolphins, whales, walruses, manatees, dugongs, but not seals. Walking in water would have accomplished the transition from locomotion on four legs to two. Food shortage, Hardy assumes, drove our ancestors into the water, where they could take advantage of the abundant aquatic food resources. Tools then evolved from the use of stones to crack shellfish, as otters do.

These speculations might have passed quietly into obscurity had they not come to the attention of writer Elaine Morgan, who was formulating a feminist version of human evolution that emerged in the pop-

ular book, *The Descent of Woman*, in 1972. In Morgan, Hardy found his Saint Paul. She writes, "I felt when I read that page as if the whole evolutionary landscape had been transformed by a blinding flash of light." In her book, Morgan uses the aquatic theory to explain not only human hairlessness, erect stride and tool use, but also frowning and weeping, speech, the human nose, the female breast and hymen, and, this above all, frontal sex, the source of endless woes.

In this expanded version of the Aquatic Ape Theory (AAT), the earth became so hot during the Miocene period, about 12 million years ago, that some apes took to the water to keep cool and find food. They stayed in the oceanic shallows for about 10 million years. During this time, they lost most of their hair,

but females retained long hair on their heads as a convenience for babies to cling to. The human nose and female hymen, according to Morgan, were anatomical adaptations for keeping out salt water. The eyes of aquatic apes, no longer in the twilight jungle, needed protection from the bright light, and so frowning developed. Weeping evolved as a way of getting rid of excess salt acquired from a marine diet. (Here Morgan confuses human lacrimal glands, which do not secrete excess salt, with the nasal salt glands of some sea birds and reptiles, which do.) Speech, to continue the AAT exegesis, emerged because smell and vision do not work as well in the water as they do on land, so a new form of communication was needed. The fact that cetacea also use complex vocal signals is adduced in support of this speculation.

How life in the ocean affected female anatomy, and therefore female destiny, is the central thesis of *The Descent of Woman*. The hymen as a waterproof hatch has already been mentioned, despite the fact that the hymen is not waterproof and that it disappears when reproductive life begins. The breasts of human females are much larger than those of apes. Morgan's explanation: unlike ape babies, human babies cannot climb up their mothers' pelts to get at the nipples. Evolution lowered the nipples to the babies by means of pendulous breasts. The nursing process, for reasons unexplained, is assumed to have taken place on shore. Equally arbitrarily, mating is assumed to have taken place in the water, again for purposes of accounting for a feature of human females that is supposedly different from that of female apes, namely the

more ventral position of the vagina. Most terrestrial mammals copulate front to back. Many aquatic animals, like whales and dolphins, copulate front to front. Humans copulate front to front. Therefore, in this syllogism, humans must have been aquatic. Never mind the exceptions — that seals, for example, which have been aquatic for millions of years, have not lost their hair, do not have pendulous mammae, but do copulate on the beach in the usual mammalian front-to-back posture. The ventral vagina and face-to-face sex help Morgan to understand why most women (by her account) find sex unpleasurable or positively disagreeable. She postulates that, among other mammals, front-to-back copulation stimulates the sensitive part of the vagina and culminates in orgasm; but the human "missionary position", resulting from aquatic evolution, was an evolutionary disaster for human females, in that it applies friction to the wrong place and culminates in endless female frustration.

Aside from the sexual time bomb, when humans finally returned to the land about one or two million years ago, their long aquatic evolution had equipped them astoundingly well for mastery of life ashore. They walked erect, used tools, frowned, wept and talked.

Now let us take a look at the current ideas about human evolution held by professional anthropologists. The data from which these ideas derive come from the fossil record, and from comparative anatomy, behavior and biochemistry.

The earliest undisputed human fossils, known as australopithecines, come from the savannas of eastern and southern Africa, and have been dated by radioactive methods as about three and a half million years old. These early "hominids" were about the size of small chimpanzees, with slightly larger brains, but they walked upright like us and left footprints, recently found by Mary Leakey in Tanzania, that are similar to those of modern humans. The first stone tools appeared, also in Africa, about two million years ago, a million and a half years later than the first hominids we know of. By half a million years ago, humans had populated Europe and Asia as well as Africa.

Between three and a half and eight million years ago, there is a big gap in the fossil record: no ape or human remains have been uncovered. Between eight and twenty million years, though, abundant fossils have been found of two groups of apes, known as dryopithecines and ramapithecines, in Europe, Asia and Africa. Presumably some of these were ancestral to modern apes and humans, but with a four-million-year discontinuity their exact connections remain uncertain.

New and unexpected biochemical evidence has further narrowed the gap between ape and human. Our close relation to the African apes, chimpanzees and

gorillas, was deduced long ago by Charles Darwin and Thomas H. Huxley from anatomical similarities so striking that Darwin dubbed man "the third ape". "Human" behavior of chimpanzees and gorillas, their ability to use tools and communicate with sign language, has been the subject of a vast number of books and articles in both the scientific and the popular press. Less well known to the public is the molecular evidence, from the relatively new field of evolutionary biochemistry, of how close this relationship really is.

Evolutionary biochemists, or molecular anthropologists, study proteins and DNA rather than anatomy and behavior. Blood proteins, like hemoglobin and albumin, are made up of various combinations of twenty amino acids, like the letters in a sentence. During evolution, these amino acids change at a fairly constant rate in a particular protein, so that comparison of the proteins of two species provides a "molecular clock" for measuring how long they have been evolving separately. The proteins and DNA of humans and African apes are 99 percent identical; forty different "molecular clocks" agree that they must have diverged from a common ancestor about five million years ago. This revelation shocked most anthropologists, who previously had estimated that the human line had been separate from that of the apes for at least twenty million years. In fact, the ramapithecines that lived eight to twenty million years ago had generally been thought to be early humans rather than early apes, though only jaws and teeth have been discovered. The molecular evidence essentially eliminates the possibility that humans, distinct from apes, existed more than five or six million years ago.

From the combined data of anatomy, biochemistry, behavior and archeology, we can try to put together a portrait of that common ancestor of humans, chimps and gorillas that moved out from the African jungles to the savannas about five million years ago. One of the authors has made a case that it must have been very much like the pygmy chimpanzee, a rare species now found only in the Congo (Zaire) River basin. Anatomically, it is remarkably similar to those early australopithecines that lived three and a half million years ago. It acts more "human" than other apes do. It walks upright more often, it is more social, and it copulates front to front. Pygmy chimpanzees might be, as *Time* magazine called them, a "living link" between humans and the African apes.

How well does AAT fit with these various lines of evidence? First, the time sequence is off. Morgan states in her book that human ancestors evolved in the water from twelve million to two million years ago. The fossil gap was that large when she wrote the book. Recently she modified the theory to fit the new evidence

#### TIME SCALE OF EVENTS IN HUMAN EVOLUTION

Time Before present	Events
30,000 years	Human exploitation of a wide range of marine resources (fish, sea birds)
70,000-130,000	Earliest human exploitation of some marine resources (shellfish, marine mammals)
300,000	Terra Amata: human habitation of Mediterranean seashore; little evidence of marine exploitation
500,000	Humans well established in Asia and Europe, as well as Africa
2,000,000	Earliest evidence of stone tools in eastern and southern Africa
3,500,000	Earliest evidence of human fossils, called <i>Australopithecus</i> in Africa
5,000,000	Estimated divergence time of humans from African apes by biochemical evidence; end of the Miocene period
4 to 8,000,000	Gap in primate fossil record; few fossils found for this period
8 to 20,000,000	Miocene fossil apes: <i>Dryopithecus</i> and <i>Ramapithecus</i>

and reduced the aquatic phase to the interval between six and five million years ago, a tenfold reduction. Presumably if more ape and human fossils are found, the swim will become still shorter. She explains the ventral copulation of pygmy chimpanzees as follows: pygmy chimps are in fact closely related to humans, but they came ashore before the ancestors of humans did and therefore remained more apelike. This new twist of AAT does not fit the DNA, for the molecules of pygmy and common chimpanzees are more similar to each other than either is to humans; yet the common chimp remains sexually an unreconstructed hairy ape that copulates front to back, in the old-fashioned way.

If the common ancestor of humans and African apes went to sea for ten million, or even one million, years, the residual aquatic adaptations should show up in all the descendant species. Yet the aquatic theory is, or was, mainly intended to explain how we become *different* from the apes. Neither present-day humans nor the earliest australopithecine fossils of three and a half million years ago show any of the skeletal adaptations to an aquatic environment that are common to all other aquatic mammals: first, reduction in the size of the limbs, especially the hind limbs, and their modification into flippers; second, reduction in thickness of the pelvis, which in water is not a structural weight-bearing truss as it is on land: the pelvis of whales, dolphins and manatees has nearly disappeared. In the earliest hominids we see precisely the opposite trends. In contrast to the apes, they were evolving longer and heavier legs and shorter arms; a sturdy bowl-shaped pelvis for supporting the weight of the upper body; muscles of propulsion and balance for walking upright; and weight-bearing modifications such as increase in size of the lumbar spine and the hip, knee and ankle joints — modifications that would have been redundant, indeed, a handicap, in the "weightlessness" of the sea. Humans display none of the skeletal adaptations or horizontal streamlining seen in whales and dolphins, walruses and seals, manatees and dugongs, otters, beavers, water shrews, hippopotami or platypi — to name aquatic or partially aquatic members of eight different orders of mammals.

Let us return to the proposed reason for human ancestors becoming aquatic. According to Morgan, the consistently hot, dry climate of the Miocene, about twelve million years ago, made terrestrial resources scarce and drove human ancestors into the seas to cool off and exploit marine food resources. Aside from the incorrect dating of human evolution, this hypothesis is in conflict with current evidence about Miocene climate and environment; the location, timing and function of the earliest stone tools; and the ancient exploitation of marine food resources.



A comprehensive review by geographer Karl Butzer of Miocene climate and its impact on sub-Saharan Africa fails to substantiate the once widely held concept of Miocene desiccation. In some respects, AAT is a variant of the theory, expounded by Robert Ardrey and others, that the forests dried up and drove our ancestors into the savannas to hunt for meat. To the contrary, Butzer concludes that the climate was actually a mixture of wet and dry, warm and cool, with a patchwork of forest and grasslands not radically different from the African savannas of the present day, which, then as now, provided an environment rich in plant and animal foods. Even if hominids had existed in the Miocene, there would have been no pressure of heat or scarcity to drive them from the upland savannas two thousand miles to the sea to look for shellfish.

If humans came ashore four or five million years ago, erect and using stone tools to crack these shellfish, why do we find no stone tools until at least two million years later? The very earliest tools, judging from the tool use of chimpanzees and modern gatherer-hunters, were very likely made of wood and other organic materials that leave no trace in the archeological record. It may well be that females, who in many cultures dig with sticks for roots and tubers and carry

them back to home base in slings and containers, were actually the earliest tool users, rather than "man the hunter" of popular imagery. A feminist revision of human evolution, which Morgan has attempted, does not require life in the water.

Were the earliest stone tools used to crack shellfish? They doubtless had a variety of functions, as they have a variety of shapes. At several African sites, dated between one and a half and two million years ago, stone tools were apparently used to butcher land animals such as the elephant, hippopotamus and antelope. At Terra Amata, a site about 300,000 years old, situated directly on the Mediterranean seashore near Nice, the humans who lived there left evidence that they ate land animals such as elephants, boar and deer, but there are few remains of shellfish or other marine life, despite their ready availability.

One would expect an intelligent omnivore that had evolved for ten or even one million years in the shallow ocean to retain, on coming ashore permanently, the skills of exploiting oceanic food resources. But the archeological record world-wide tells us that humans only began systematically to use marine foods, and only in some places, between 130,000 and 70,000 years ago, a period known as the Last Interglacial — almost two million years

after humans began to make and use stone tools. Our best evidence comes from southern Africa, where archeologist Richard Klein has found human habitations with remains of intertidal molluscs, as well as bones of seals and penguins, but only rare traces of fish and flying sea birds. At a later date, about 30,000 years ago, along with changed types of stone tools, there were increased amounts of bones of fish and sea birds such as cormorants, gulls and gannets. It appears, then, that humans exploited land animals long before they learned how to gather shellfish, catch fish and kill birds; the exploitation of marine food resources developed quite late in human history.

In summary, the Aquatic Ape Theory does not hold water, anatomically, biochemically, behaviorally or archeologic-

ally. With a similar combination of imagination, a grab bag of unrelated "facts" and a popular literary style, one could make an equally convincing case that our ancestors evolved in the air — as von Daniken has more or less done in his cult book *Chariots of the Gods*.

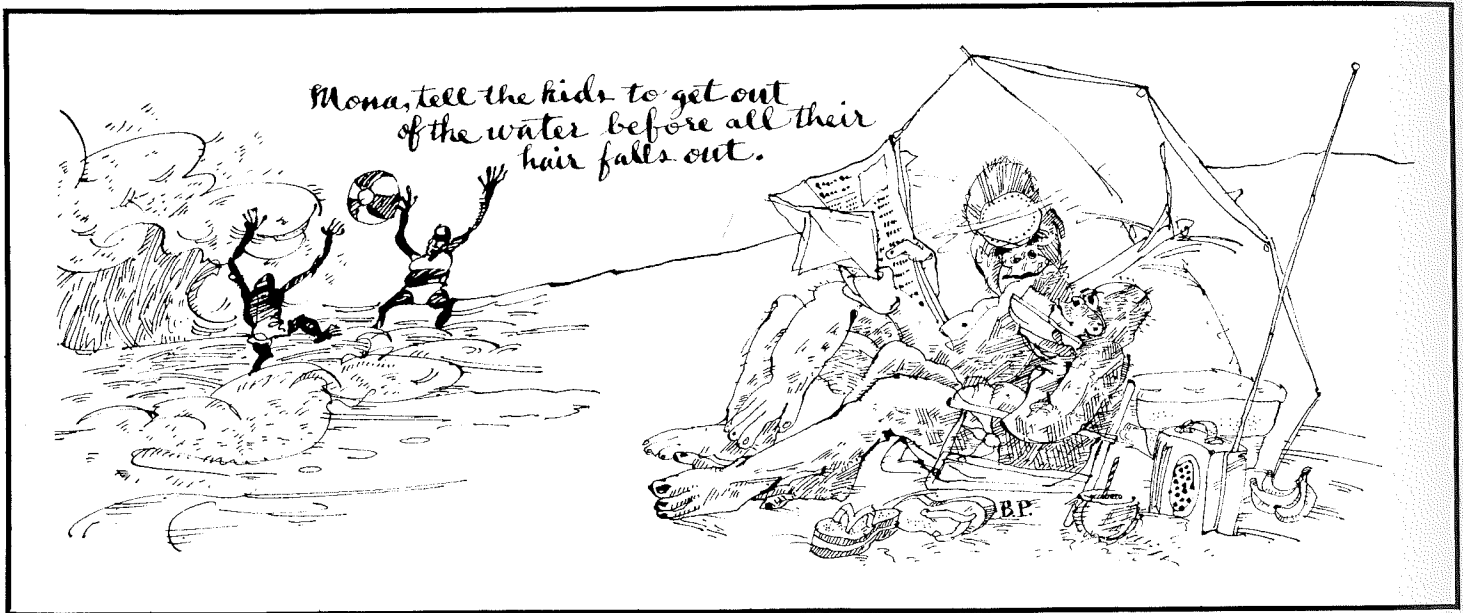
There has never been any lack of religious or mythical "explanations" of human origins, or of hordes of believers eager to be convinced. Perhaps three of the current favorites that plague anthropologists could be combined into a single scenario. Intelligent apes from outer space land in the middle of the ocean, evolve into amphibian creatures with huge foot-like flippers and . . . Finish it yourself. It is sure to sell. Scientists won't be convinced, of course, but we all know that they are a narrow-minded minority who

still prefer data to the "blinding flash" of revelation.

Both Drs. Lowenstein and Zihlman are grantees of the Leakey Foundation.

Co-founder of the Oceanic Society, Jerold M. Lowenstein, M.D., is Chairman of the Department of Nuclear Medicine at Pacific Medical Center, San Francisco.

The principal research interest of Adrienne L. Zihlman, Ph.D., professor of anthropology at the University of California, is human evolution. She recently expounded the theory that pygmy chimpanzees are the closest living prototype of the common ancestor of humans and African apes. □



## Letter to the editor

Dr. Mary D. Leakey writes from Nairobi, commenting on and further clarifying some points in the field report of Dr. J. W. K. Harris, "Archeological Studies at Laetoli," which appeared in the last issue:

"Investigation of the Laetoli area was inaugurated by my co-workers and myself in 1974 and continued throughout five field seasons until 1979, when Dr. Harris was invited by me to investigate the Pleistocene deposits in the area.

"The basal beds in the Laetoli area are the Laetolil Beds, to which the dates (3.59 and 3.77 M.Y.) apply and where 'the fossiliferous upper section is recognizable by distinctive marker tuffs'. The Ndolanya Beds, subdivided into upper and lower units of different ages and faunal content, have not been dated. All that can be stated is that they are unconform-

able to the upper Laetolil Beds and are overlain by lava flows dated by potassium argon at 2.4 M.Y.

"Concerning the availability of raw materials for making stone tools, . . . quartzite and other Precambrian rocks suitable for making stone artifacts outcrop within a few miles of the Laetoli area. Volcanic rocks . . . are not a *sine qua non* for stone tool manufacture, as evidenced at Olduvai Gorge and other early Stone Age sites.

"The assumption that sources of water were not available is not supported by the available evidence. The abundance of fossil fauna, well-used game trails, that today almost invariably lead to water holes, and the existence of water-laid Laetolil Beds within a few miles of the Laetoli area all point to the contrary."

An unfortunate error was made in editing Dr. Harris' field report which led to confusion about the name of the basal beds at Laetoli. In fact, Dr. Harris did not refer to them as the Ndolanya, as they are well known as the Laetolil beds. The editor deeply regrets the erratum. □

Barbara Newsom of San Francisco, a trustee of the Foundation, is serving as a public delegate to the United Nations General Assembly during the fall, 1980, session. She is one of three such delegates appointed by President Carter. □

# REPORTS FROM THE FIELD

## ORANGUTAN RESEARCH AND CONSERVATION PROJECT

Gary L. Shapiro,  
Vice Director

Over the last two years, the Orangutan Research and Conservation Project in Indonesian Borneo has continued to expand the scope of scientific activity in the field as the tropical rainforest ecosystems of this area inexorably fall victim to human encroachment and overuse. Directed by Dr. Biruté Galdikas, the ORCP is now in its ninth year of operations. This has in large part been made possible by the L.S.B. Leakey Foundation support which has been consistent and timely over the years. As vice director of ORCP, freshly returned from a two year visit at the project site, I would like to describe some of the recent activity that has been conducted in the jungles of Indonesian Borneo.

The long term investigation of wild orangutan behavior and ecology continues to build an impressive record of the life history of these elusive great red apes. Dr. Galdikas and her able staff have logged over 13,000 hours of observations, and it is this dedicated and persistent drive to totally document the entire life cycle of one of humankind's closest living relatives that keeps Dr. Galdikas following the orangutan through swamp and over other terrain year after year.

Closely tied to the observation of wild orangutans is the detailed survey of seven different forest plots once a month. During this time thousands of trees which support the feeding habits of the many animals of the area are examined for particular developmental conditions such as flowering, fruiting, the presence of new leaves, and other factors. Developing a better understanding of the dynamics of the forest is essential if we are to truly understand the causative factors of orangutan and primate adaptation in this region of the world.

The orangutan rehabilitation program also continues to be one of the responsibilities of the ORCP. Providing a place for formerly captive orangutans, an endangered species under protection of the Indonesian government, is the most important function of this program for it seemingly has slowed down the number of orangutans entering the captive condition as evidenced by the fact that fewer and fewer orangutans are being confiscated



Gary Shapiro and a rehabilitant orangutan.

by the government. This, however, should not cause us to overlook the threat to the species caused by habitat destruction.

My participation with the ORCP began two years ago when I was invited by Dr. Galdikas to examine the communicative skills of the rehabilitant orangutans. My intent was not to decipher their communication code, but to teach them to communicate with signs as has been done with chimpanzees and gorillas. Over the two years, those of us working on the signing program have found that orangutans, like children and chimps, respond differently to methods of sign instruction, but after time and practice they can learn a number of signs and use those signs to effectively communicate their perceptions and desires. It seems that interest is an important factor in the learning and use of signs. For example, all of the orangutans learned the sign for food before any other sign and they preferred to use it rather than any other.

Orangutans have a big interest in food; in the wild they spend most of their time in search of fruit and other delicacies. But younger orangutans' signing is less concerned about food than older orangutans' signing. More dependent upon caretakers, young orangutans are more interested in certain social activities than older ones. Consequently, their signing reflects this differential interest. The young orangutan asks to be hugged, tickled, scratched, and groomed while the older only occasionally asks to be groomed.

Also of interest is how the orangutans

combine the signs to form sentence-like utterances. It appears that orangutans, like chimpanzees, spontaneously develop longer and longer utterances, but the specifics and patterns of this development will not be clear until the data are analyzed quantitatively.

I would like to stress that the signing project was conducted with rehabilitated and not wild orangutans. Rehabs have been in close association with humans during some period of their captivity, and whether or not the experience for them was traumatic, it becomes clear that they are no longer culturally naive wild orangutans. Rehabs become skilled tool users, and social, aggregating apes. When wandering in the forest, rehabs have been observed to associate with truly wild orangutans. For those interested in understanding their behavior in the wild, like Dr. Galdikas, the potential for cultural contamination, not to mention increased ecological competition with the study animals, becomes increasingly more probable. For this reason we prefer to keep the rehabs away from the study area; this generally means keeping them near the camp where they can be monitored, fed, and cared for. Here they have the freedom to travel throughout the nearby forest and at the same time minimize contact with wild orangutans. It is the orangutan who has become unnaturally socialized, the rehab, that the ORCP has used in the signing project.

Furthering our understanding of the mental abilities of the orangutan as

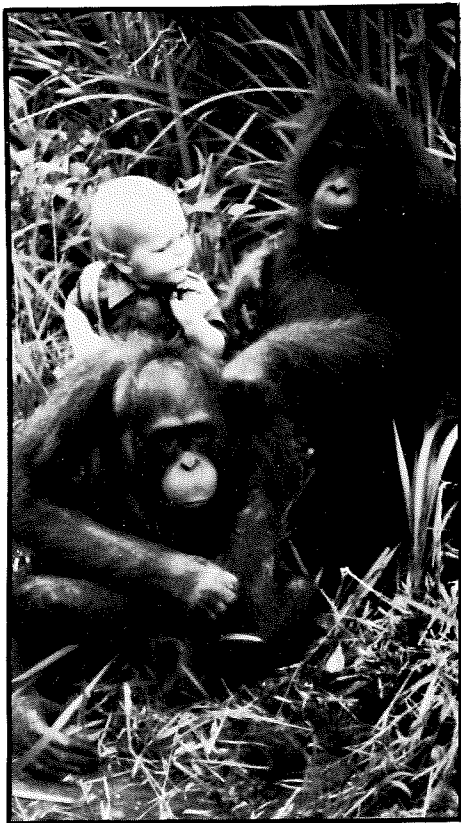


photo: Rod Brindamour

*Dr. Galdikas' son, Binti, with two rehabilitant orangutans.*

well as the other great apes may shed light on the mystery surrounding mental evolution in humankind. The ORCP hopes to continue supporting programs which are concerned with rendering a more complete picture of orangutan evolution and adaptation.

#### DR. GALDIKAS ADDS . . .

We initiated our rehabilitation program in 1971 primarily to stop the then-booming trade in illegally caught orangutans in our province. Orangutans are protected under Indonesian law but before the rehabilitation program was established, local officials were reluctant to confiscate captive orangutans as there was no place to put them other than a zoo. (In fact, we heard stories of confiscated orangutans being shot in the past because nobody could determine what to do with them!)

Over the years we have received over seventy captive orangutans and as a result, the orangutan trade in our region has come to a screeching halt. Many rehabilitant orangutans have successfully gone back to the wild; some others spend much of their time in the forest, coming back to the rehabilitant feeding station or to camp occasionally. However, a few who have spent long years in captivity show absolutely no inclination to go back to the wild and it would probably be morally irresponsible to force them to do so.

Rinnie is one such individual. She was almost a full grown adult when we received her in 1975. Up to that time she had spent most of her life confined inside a small cage. After release she required intensive care and nurture despite her size and age. When Gary Shapiro arrived in mid-1978, she was perfectly content to spend most of her time in the trees within sight of the feeding station, although she did forage on wild foods and occasionally interacted with the rare wild orangutan who passed by. Mr. Shapiro taught Rinnie sign language in an attempt to probe her world. He did not teach her signs as a food-getting device; rather that is the way that she herself decided to use them.

Some orangutans are so utterly terrified of humans that it is impossible to approach them after release. Orangutans seem fully capable of making up their own minds on the matter, based on their own experiences with humankind. Our experience has been that an orangutan who returns to the wild or even leaves the vicinity of the feeding station will no longer initiate contact with humans when encountering them in the forest. This is the case even with those animals who frequent the feeding station. Once in the forest they behave very differently from in camp. They clearly comprehend the difference between the two situations and I must admit having been myself surprised when rehabilitant orangutans with whom I had friendly relations in camp showered me with branches in full-blown agonistic displays in the forest.

Gary Shapiro was trying to communicate, as a scientist, with animals who are totally outside human control, who are totally free to come and go as they please. Ironically, in the end it was this very freedom that thwarted him. In a

primate center or zoo, apes are forced, often indirectly, to be responsive to humans and human demands, however subtle. But in the tropical rain forest which is their home and their world and where we humans are the intruders, it becomes apparent that, given the freedom to choose, apes find our questions and formulations totally meaningless and uninteresting. In the end Gary was left standing on the ground while Princess (whom he handreared from tiny infancy, probably saving her life in the process) signed "Sweet fruit" and ran off into the forest with other rehabilitant orangutans, probably to look for fruit trees.

It will be most interesting to compare Gary Shapiro's data with sign language data collected on confined apes, (such as Koko, Washoe and Chantek, the orangutan at the University of Tennessee). His data are extremely valuable because they were collected in precisely the same environment in which apes evolved. I think Gary's valiant effort will earn him at least a footnote in the annals of science. I also think Rinnie and Princess will continue to eat fruit unmolested in the nature reserve, established by the Indonesian government, once again free in the forest from which both were torn as babes.

#### THE VERVETS OF AMBOSELI

*Phyllis C. Lee  
Leakey Fellowship Student,  
St. John's College, Cambridge*

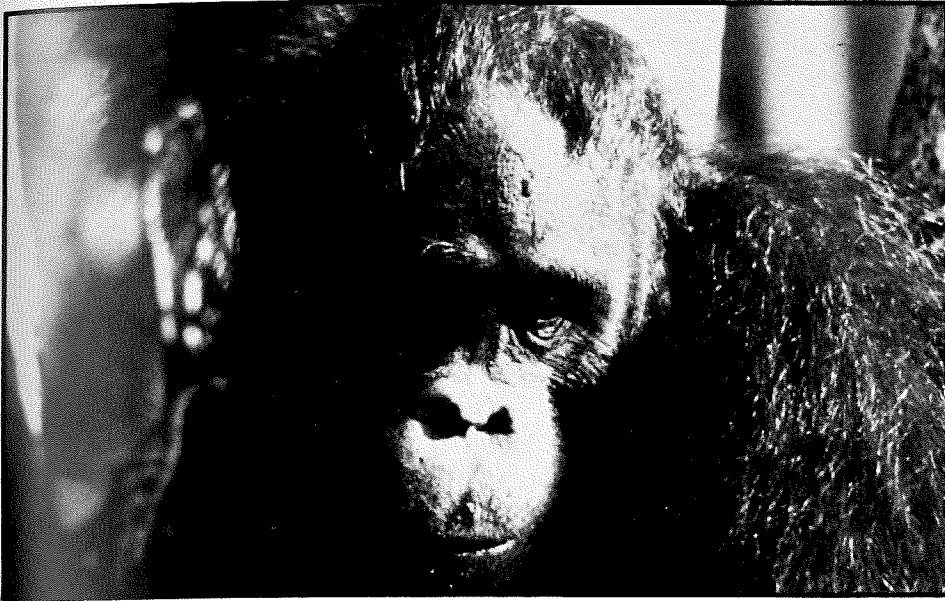
My Ph.D. project has consisted of field



*Biruté Galdikas and friend.*

photo: Rod Brindamour





*A rehabilitant orangutan.*

photo: Rod Brindamour

observations of immature individuals of three groups of habituated vervet monkeys (*Cercopithecus aethiops*) in Amboseli National Park, Kenya. This work was initiated by my interest in the nature and structure of relationships between family members and particularly in the socialization of the young. In general, it has taken the form of a study of immaturity and the development of relationships from infancy onwards. It has been structured within the framework of theories on kin selection, so as to present data on particular questions of cooperation and competition in and between family units.

Vervet families, consisting of the mother, her immature male offspring, and all her female offspring, form the social core of the stable groups. I have examined the role of the mother, other siblings, and peers in the development of the long term relationships which express the social nature of the group. I am also trying to relate social relationships to the ecological factors (diet, food availability, ranging patterns) influencing behavior, particularly competition for resources. As a result I have concentrated on several specific questions. Firstly, I have done ecological monitoring and will be able to relate the results to the rates and types of social interactions observed between the three groups. (All the groups occupy adjacent, but slightly different, defended territories.) Secondly, I am examining the family unit as a competitive and social alliance influencing the life of the young vervet. Thirdly, I am looking at the peer-peer relationships among the immatures, to define the effects of age, sex, rank, and partner availability on the early and subsequent social development.

I have found some interesting and significant differences in the expression of the social relationships between individuals of the three groups. I can relate some of these differences to specific habitat

differences, such as the availability of water. Through this I hope to be able to understand the effect of ecological factors and micro-habitat differences on group social structure. It is hoped that this will enhance our general understanding of the factors leading to differences in social structure observed between different groups of the same species in various habitats.

Another exciting aspect of my project is that I have observed extensive mortality among my subject animals over the past twenty-two months. Although this has seriously reduced my sample size of families and immatures, it has provided me with an opportunity to examine the

effect of demographic changes on development and group structure. To my knowledge, this is a unique chance to assess how changes in the kin networks of a primate group, as the result of naturally occurring mortality, will affect the development and expression of relationships. I can thus examine specific questions, such as the effect of a mother's death on her daughter's social relationships and on the relationships among the surviving offspring. I also hope that I will have information on how mortality affects overall social structure for the group. Much of the variability I observe in the social relationships between my three groups, and perhaps in many other primate species, can be related to the demographic history of that particular group, especially with respect to the family alliances. The demographic history of the group leads to the expression of certain relationships which may be lacking in another group, although the potential for such relationships might exist under another developmental and demographic regime. It is this aspect of my work which I hope will contribute to an increased understanding of both the nature, development, and expression of social structure, and of the evolution of primate societies. □

#### APOLOGY

The editors regret that the diagram of phylogenies which accompanied Dr. Russell Ciochon's article, "Miocene Ancestry," in the last issue was not credited to Dr. David Pilbeam. Dr. Pilbeam is an anthropologist at Yale University. The diagram credit should have read, "Phylogenies adapted from Pilbeam (1978)."



*Phyllis Lee and vervets.*

photo: Cynthia Moss



Photo report of the international symposium on "Miocene Hominoids and New Interpretations of Ape and Human Ancestry" held this summer in Florence, Italy, and sponsored by the Leakey Foundation. Fifteen scientists attended this meeting which was convened in the Tribuna Galileo of the Institute of Zoology (bottom center photo). Scientists pictured above include: P. Andrews, M. Baba, S. R. K. Chopra, R. L. Ciochon and R. S. Corruccini (Symposium Organizers), J. Cronin, L. de Bonis, M. de Bonis, D. Falk, D. Gantt, G. H. R. von Koenigswald, A. Kortlandt, P. Luckett, B. Senut. The proceedings of this symposium, together with an additional set of papers, will be published by Plenum Press in late 1981 in a volume edited by Ciochon and Corruccini entitled *New Interpretations of Ape and Human Ancestry*.

### Men, Minds and Hands continued from page 1

The use of red ochre occurred in widely scattered areas of Spain, France, Czechoslovakia, the Soviet Union, Israel and Africa over some 60,000 years. This was the Mousterian cultural phase, practiced in the main by Neanderthal Man. Often ochre was associated with burial of the dead. In the cave of Terra Amata at Nice, Henry de Lumley found sixty ochre pieces in early Acheulean layers estimated to be about 300,000 years old. Most of these ochre pencils show traces of artificial abrasion.

Even earlier, in the Olduvai Gorge, northern Tanzania, traces of apparently collected red earths have been reported from Bed II. The time span covered by Bed II is from about 1.7 M.Y. to about 1.15 M.Y. Three different kinds of early hominid are found there. One is *Australopithecus boisei*, a large-toothed, heavy-jawed, big-boned, small-brained hominid who became extinct about a million years ago. The second species is *Homo habilis*, the earliest true man, whose remains have been discovered from the Transvaal to Ethiopia. *Homo habilis* was small-boned, medium-toothed, medium-brained, the first hominid to be associated unequivocally with the manufacture of stone implements. The third

hominid is *Homo erectus* who seems to have arisen about 1.6 to 1.5 million years ago. There is a superb cranium from the upper part of Bed II.

Which of the three hominids in Bed II was the red earth collector? The odds are that it was not *Australopithecus boisei*. Almost certainly it was either *Homo habilis* or *Homo erectus*, or both. What function it fulfilled remains highly speculative. Originally, *H. habilis* or *H. erectus* might have had no more interest in red fragments than a baboon or a chimpanzee has in a glittering particle, whether a diamond or a splinter of glass. Much later, its capacity to color the skin might have been discovered, perhaps when it was tested upon the lips. Afterwards reddening of the skin — such as Wreschner suggests might have been practiced at Terra Amata 300,000 years ago — might have been used for group identification.

Still later, the idea of associating the color red with life-giving blood that flowed from a wound might have dawned on Stone Age man; from this might have stemmed the idea that red ochre was a vitalizing force, to be applied when death occurred.

Thenceforward, the use of red ochre becomes firmly associated with disposal

of the dead. The view that it was related to a ritual replacement of blood becomes more tenable as we come up through time. Red ochre is a feature of burials of the Upper Paleolithic, Mesolithic and Neolithic. Sometimes the cadaver was laid upon a bed of ochre; at other times the bones were smeared with red ochre in secondary burials. This use of red color for funerary purposes continued in Greek, Etruscan and Roman times, as shown by traces of red paint in burials and sarcophagi. Homer and other classical writers speak of the dead being enveloped in red shrouds. Red is still associated with the dead in certain cultures today.

So an interest in art may be traced back for at least 30,000 years, and in red ochre for 300,000 or even a million years. Ritual, ideology, symboling, we have reason to trace back at least 60,000 and perhaps 300,000 years.

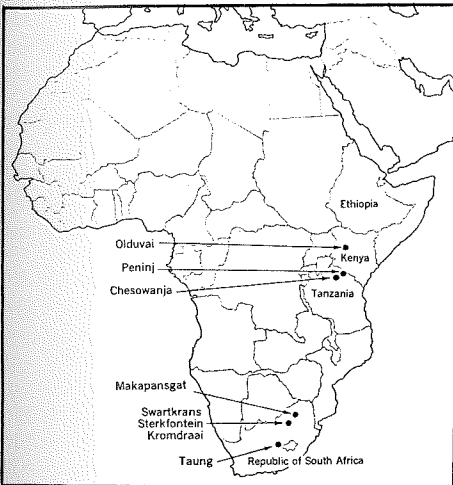
Let us turn briefly to the burial of the dead as a human cultural practice. This method of disposing of the dead did not stem from the Judeo-Christian heritage or any other religion of recent times. Burial of the dead goes back for about 100,000 years. Among the accompanying special features, we have mentioned ochre; animal bones and stone implements might

be buried with the cadaver, or the body might be encircled by stones or bones; the remains might be ritually mutilated. In northern Iraq, the cave of Shanidar yielded Neanderthal burials with signs that flowers had been laid in the grave. So even the practice of dropping flower petals into an open grave, or placing flowers upon a closed grave, has roots that go back to early Mousterian times, perhaps over 60,000 years ago.

Having started at the end and worked back in quest of roots, I now switch to the beginnings of mankind. I shall start with *Australopithecus* because everything started with *Australopithecus*.

Africa sprang its greatest surprise on the world of anthropology in 1925 when Raymond A. Dart published an account of the skull of a fossil hominid child. It had been discovered late in 1924 close to the Tswana village of Taung in the northern Cape Province.

The new find was a geographical jolt, for the world, following Dubois' discovery of *Homo erectus* in Java, was just getting



Some principal sites

used to the idea of an Asian home of mankind when the Taung child arrived to stake out Africa's claim. But its African location was not the only surprise; its morphology was disturbing. The skull had small canine teeth like those of hominids and quite unlike those of apes. The cranium showed evidence that the head had been rather well-balanced on what must have been a virtually upright spine, in contrast with the position in apes — where the head hangs forward from an obliquely postured spine. The beautifully preserved natural endocranial cast faithfully reflected the impressions that the brain, in life, had imprinted on the cranial vault. Dart detected markings on the brain-cast that allied its owner with hominids and distinguished it from apes.

The most untoward feature of the Taung child was that he was the first of the small-brained hominids to be found. A striking anatomical hallmark of mankind is the disproportionately large brain. In weight and volume, the brain of today's man is about three times the size

of the brain of modern gorilla, yet the body weight of man is much less than that of gorilla. So anatomists and anthropologists see man as the higher primate with an exaggeratedly enlarged brain. The fossil human skulls found prior to 1925 confirmed this view.

It was therefore disconcerting to find that although the Taung skull was hominid in so many other respects, its estimated cranial capacity testified to a brain-size no bigger than that of apes. From the erupting teeth, we know the Taung child was no more than about five years old when he died. However, even when we correct the Taung cranial capacity to its estimated adult value, it remains no bigger than that of apes.

Dart assigned the specimen to a new genus and species, *Australopithecus africanus* (southern ape of Africa). To a skeptical world he proclaimed that it was a creature on the threshold of humanity. A furious argument ensued. Supporters and detractors of Dart and Taung were in abundance. The essential question was: Should the small brain be considered so important as to deny hominid status to *Australopithecus*, despite many other hominid traits? Or should the status of the species be based upon the majority of features — which were hominid — even though the human trend toward striking brain enlargement was not yet evident?

Much later, after scores of new fossils had built up a clearer picture, it was recognized that, as Dart had believed, *Australopithecus* differed from apes in too many respects to be classified as an ape. On the other hand, he resembled later forms of man in so many features that his claim to be a hominid was irresistible.

In retrospect, Dart's great contribution was that he forced the world of paleo-anthropology to realize that there had been, at one time, small-brained members of the family of man. A small brain alone was not sufficient to disqualify one from membership of the hominids. It compelled scientists to another realization. Not all parts of the ancestral hominids' bodies had become man-like at the same rate or time. Such a pattern of development we call mosaic evolution. Thus, *Australopithecus africanus* had clearly begun to be hominized in teeth, poise of the skull on the spine, form of brain, posture and gait, but he had not yet started the trend towards disproportionate enlargement of the brain.

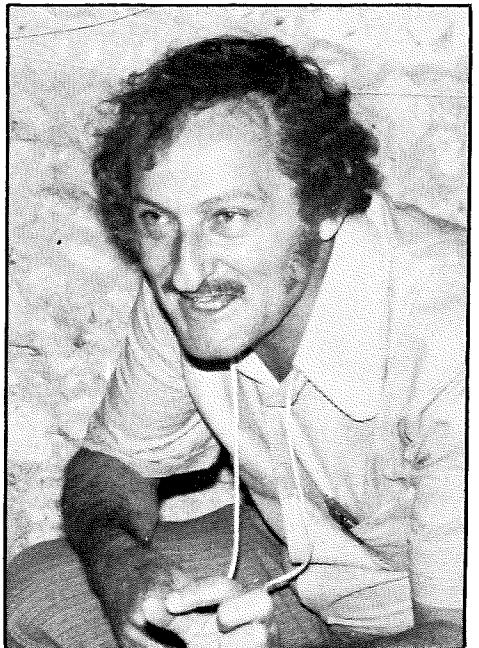
How much cultural behavior was shown by *A. africanus*, the species that seems to have been on the direct line leading to man? All indirect evidence declares that he should have been capable of at least as much implemental activity as living apes. Indeed, one would have expected him to have gone further than apes. Unlike apes that live in the wet forests of Central Africa, *Australopithecus* lived in open savannah country, an exposed and rather unprotected environ-

ment. He possessed no large, fang-like canine teeth, but small canines proportionately no bigger than those of modern man. Furthermore, *Australopithecus* walked upright; thus his hands were perpetually freed from locomotion; emancipated hands allowed more manipulation of the environment. Moreover, the brain form of *Australopithecus* was more like that of modern man than that of modern apes. Thus, one would have expected *Australopithecus* to have done at least a little more in cultural activities than today's chimpanzee.

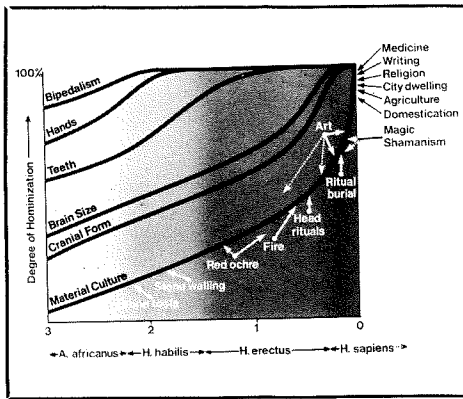
Yet when one searches for tools with early *Australopithecus*, one is bound to admit defeat; both the nature and the extent of the implemental activities of *Australopithecus* remain uncertain. Perhaps he used perishables for tool making. What is certain is that, like apes and man, he was a cultural primate, relying on learned behavior and the social heritage, more than on genetically determined instinctive behavior.

In 1949, John T. Robinson made an historical find at Swartkrans in the Transvaal. He showed that that cave held remains of an advanced hominid to which Broom and Robinson gave the name *Telanthropus*. Some bones assigned to this group were found in the same layer as *A. robustus*. Today it is classified in the genus *Homo*. Detailed study by R. J. Clarke suggests that Swartkrans' hominid has features which lie somewhere between those of *H. habilis* and *H. erectus*.

The next contribution on the emergence of *Homo* came with a series of Olduvai discoveries made by the Leakey family; these were the lightly built fossils of *H. habilis*. The first of these came to light before the discovery of *Australopithecus boisei* in 1959, but the most important ones appeared in 1960, 1963 and 1968. They are totally different from



Dr. Phillip Tobias



The degree of hominization shown by various biological and cultural characteristics at different times over the last three million years. The nearer the approach of each graph to the upper horizontal (100%) line, the more closely the evolving hominids approximated in that trait to modern mankind.

their contemporary *A. boisei*, but they differ also in a number of traits from the earlier Transvaal *A. africanus* fossils. They have cranial capacities almost fifty percent greater than the average for *A. africanus*; the teeth are on the average somewhat smaller; the premolars and first molars are more elongated, whilst all of the cheek-teeth are rather narrow and lack that buccolingual thickening which I have called the "australopithecine bulge." There are numerous differences in the brow-ridges, face, jaws, brain-case and base of the cranium. These features suggest what one would expect from later, more hominized members of the same lineage as that to which *A. africanus* earlier belonged. The brain was more developed, the teeth more human, the pattern of tooth wear curiously human, the structure in many other respects close to *Homo*. Moreover, they were identified by Mary D. Leakey as the probable fabricators of the Oldowan industry. All this evidence led Louis S. B. Leakey, John Napier and myself in 1964 to place these specimens in the genus *Homo*. We adopted a name suggested by Raymond A. Dart and called the species *Homo habilis*, the first proficient "handy-man."

The breathtaking aspect of the Leakeys' finds was that specimens assignable to *Homo* should have existed as long ago as two million years, for that is the approximate age of the earliest fossils of *H. habilis* at Omo, East Turkana, Olduvai and Sterkfontein.

In 1971, Mary Leakey provided critical evidence that stone implements from Beds I and II of Olduvai Gorge were made by *H. habilis* rather than by his contemporary, *A. boisei*. These Oldowan implements show a sustained record of cultural activity over hundreds of thousands of years, during which the culture moved from simpler to more elaborate stages.

With the evolution of *H. habilis* from its probable ancestor, *A. africanus*, a new

phase of hominization emerged. The idea of culture was adopted by man and became the basis of his survival. Instead of remaining, like *Australopithecus*, the most manlike of animals, he became all of a sudden a man. It was a major turning point. Forever thereafter the human line was culture-bound and culture-dependent, and man became the cultural animal par excellence. Neither the hominids nor the world could ever be the same again. Thenceforth, man's behavior, adjustments, survival, came to be determined more and more by what he could do with his hands under his watchful eyes and the control of his planning, foreseeing, anticipating and agile brain.

*H. habilis* had many kinds of stone tools; he seems to have collected red earths; and as far back as 1.8 M.Y. he could erect a stone shelter at Olduvai. We know nothing, however, of language, ritual, ideology among *H. habilis*. Concrete evidence for this dimension appears with the next step forward, from *H. habilis* to *H. erectus*, about 1.6 M.Y.

*Homo erectus* was a venturesome species, breaking its geographical bounds and spreading over Europe and Asia. For a million years or more, *H. erectus* flourished. We find the first convincing evidence that man had become a cave dweller: not only his bones occurred in caves, but also remains of stone and charred animal bones, collections of seeds, and what could be ancient hearths and charcoal, as at Choukoutien near Peking. Elsewhere, he seems to have lived in open encampments along the banks of streams or on the shores of lakes; proximity to water was essential to his survival. Controlled mastery of fire seems to have made it possible for man to dwell in caves, and migrate into colder climates such as the often-glaciated regions of Europe. Sooner or later, *H. erectus* started cooking his food, thus reducing the work demanded of his teeth. This might have led to diminution in the size of teeth, one feature that distinguishes *H. sapiens* from *H. erectus*.

Culturally, *H. erectus* was associated in some parts of the world with a chopper tool tradition and elsewhere with an Acheulean hand axe industry. He was versatile in the manufacture of implements and a well-diversified suite of tool types is recognizable.

Numerous animal bones have been found with *H. erectus* remains. From this evidence it seems that he was a hunter. *Australopithecus*, it appears, had been more of a scavenger, perhaps at best a facultative hunter who seized his chance when a weak, young, sick or aged animal crossed his path. *H. erectus*, on the other hand, seems to have been a confirmed hunter, a habitual eater of fresh meat; and his prey included animals of all age groups.

It is reasonable to suppose that, as with present-day hunters, meat from the

hunt formed only part of the diet of *H. erectus*. Other items might have been furnished by snakes, birds and their eggs, locusts, scorpions, centipedes, tortoises, rodents, hedgehogs, fish, crustaceans, and other edible forms of life. Vegetable foods too must have played a part in the diet, in the form of fleshy leaves, fruits, nuts and roots. There seems little doubt that *H. erectus* must have been omnivorous (as *H. sapiens* is today). Such a diet is opportunistic, and man is the most opportunistic of all living primates. *H. erectus* was probably one of the earliest of the grand opportunists, the Great Gatsby of the early Pleistocene. It is likely that his very opportunism endowed him with evolutionary flexibility.

To this enterprising go-getter and trend-setter there came a new dimension of evolution: symboling, ideology, ritual. There is no sign that *H. erectus* buried his dead. That cannibalism was practiced seems probable. The human bones of Choukoutien are in the same broken and splintered state as are those of other animals. The preponderance of human skulls in that deposit may be evidence that *H. erectus* went in for head-hunting. The site has yielded thousands of non-hominid animal bones, but, although more than forty human individuals are in evidence, almost all are represented only by parts of skulls. Human heads would seem to have been selected, as among later head-hunters.

With scarcely an exception, the skulls of *H. erectus* show damage around the foramen magnum (the opening in the base of the skull). It is likely that the damage was not only deliberate, but also an indication of ritual mutilation and cannibalism. If this interpretation is correct, perhaps head-hunting, skull mutilation and, possibly, ritual cannibalism were among the earliest signs of ideology in the life of *H. erectus*. It may well have been he who carried culture towards a new pinnacle with the first glimmerings of ritual.

So from roots to blossoms, we have reached approximately the point to which we had previously delved. By the last eons of *H. erectus*, we see a troglodytic, hunting and gathering, fire-using, tool-making, ritual-observing man as a dominant mammal all over the Old World from Africa and Europe to China and Java. With such complex lifeways as he possessed, it is most difficult to deny him articulate speech. Biologically, he was poised on the brink of one more major step forward — the emergence of *H. sapiens*. Culturally, he stood upon the threshold of a discovery that some of his sapient successors made: the art of the hunter, which was to prove one of mankind's sublimest inventions.

The era of ritual evolution that he had pioneered was about to give way to the epoch of artistic, linguistic and spiritual evolution that has been the hallmark of modern man. □

# New Science and Grants Committee Members

The Leakey Foundation is pleased to announce that five noted scientists have accepted its invitation to serve on the Science and Grants Committee.

Professor J. Desmond Clark, a specialist in African prehistory, received his doctorate from Christ's College, Cambridge. His illustrious career includes directorship of the Rhodes-Livingstone Museum, Northern Rhodesia (now Zambia). Coming to the United States in 1961, he joined the department of anthropology at the University of California, Berkeley, and still serves there. A fellow or member of twenty learned societies, including the British Academy and the American Academy of Arts and Sciences, Clark is a frequent contributor to international scientific journals. He is presently working with Dr. Donald Johanson in the Afar, Ethiopia.

Dr. John A. Van Couvering, geologist, received his doctorate from Cambridge University after studying at the University of California, Los Angeles. He was previously affiliated with the University of Colorado Museum, Boulder, and is now editor of the Micropaleontology Press, at the American Museum of Natural History. Dr. Van Couvering's research expertise lies in the area of biostratigraphy and geochronology of the Eocene and Miocene. He is currently working on the radiometric dating and stratigraphy of Dr. Martin Pickford's Fort Ternan, Kenya, site.

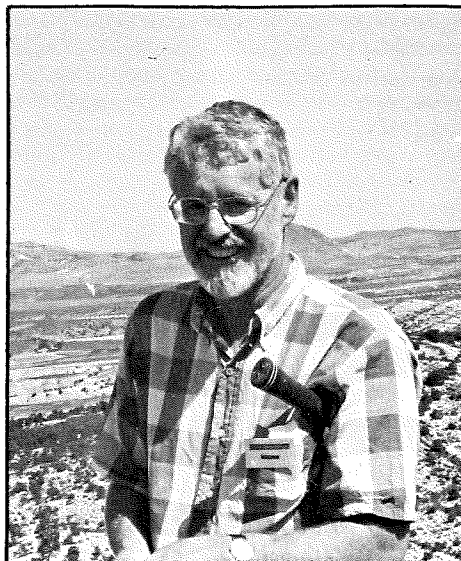
Dr. Richard W. Wrangham is an ethnologist at King's College, Cambridge. He received his doctorate in zoology at Cambridge and has taught at Harvard University. His recent field experience includes primate studies in Zambia, Kenya, Ethiopia, and Tanzania, where he was a research assistant at the Gombe National Park. Dr. Wrangham will participate in Dr. Irvan DeVore's 1981 interdisciplinary field project with the Pygmies of Zaire.

Dr. Bernard Vaudermeersch and Dr. David Western have also agreed to serve on the Committee. Dr. Vaudermeersch is a paleontologist at the University of Paris. Dr. Western, a resource ecologist with the New York Zoological Society and the African Wildlife Leadership Foundation, is presently working in Nairobi. □

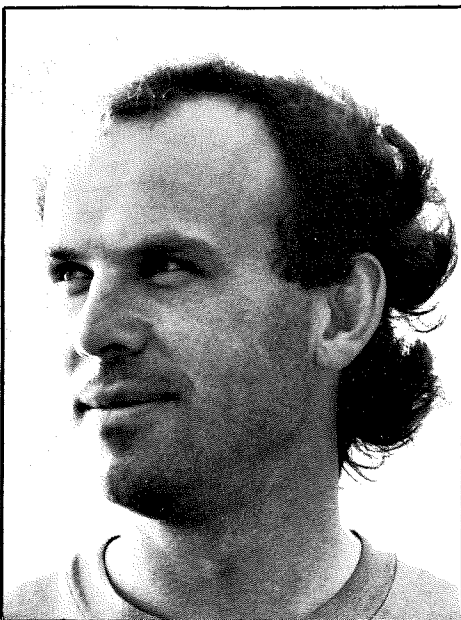


photo: Walt Mancini

Professor J. Desmond Clark



Dr. John A. Van Couvering



Dr. Richard Walter Wrangham

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. John E. Cronin      \$2,000 needed

### Mitochondrial DNA Evolution in Apes and Old World Monkeys

Dr. Cronin, Department of Anthropology, Harvard University, received a grant in support of analysis of mitochondrial DNA evolution in humans, apes and Old World monkeys. Mitochondrial DNA's characteristics, such as its small size and ease of isolation, make it useful for such an analysis. It is uniform within an individual, maternally inherited, variable between individuals, and uniform in size and information context across meta-zoans. In addition, it evolves at ten times the rate of nuclear DNA. Since man and chimpanzee differ by 10% in mtDNA genomes, and by only 1% in nuclear DNA, extremely precise and informative phylogenetic trees can be constructed from the analysis of sequence divergence between species or populations within a species.

Dr. Cronin's study will concentrate on comparisons of hominoids, especially at differentiating chimpanzee populations, and on differentiating the pygmy chimpanzee from the common chimpanzee. At a second level, species from each major group of Old World monkeys will be compared. In addition, an intensive study of the genus *Cercopithecus* will begin. The analysis of the mitochondrial DNA of these species of pongids and cercopithecids will yield substantial insight into rates of evolution, modes of speciation, and phylogenetic affinities of humans and apes.

Naama Goren      \$1,250 needed

### The Acheulian Industry of Birkhat-Ram and Its Geochronological Position

The Acheulian site of Birkhat-Ram, in the northern Golan Heights, represents a unique occurrence in the Middle East. Lithic artifacts were found *in situ* in



Dr. Munthe on the left and a colleague conferring with their charter pilot prior to conducting an aerial survey of southwestern Nepal.

sediments between two basalt flows, providing the potential for determining both lower and upper boundaries of an Acheulian industry through radiometric and paleomagnetic dating. This is the first instance where there is clear stratigraphic relationship between datable materials and artifact-bearing deposits. Most other sites in the Middle East have been dated only on the basis of their relative geologic position or their possible relationship to absolutely dated formations.

Ms. Naama Goren, graduate student, Institute of Archeology, Hebrew University, has received \$1,250 to assist with an intensive survey of the existing exposures, a systematic excavation of the artifact-bearing deposits, and collection of samples from the various levels for radiometric and paleomagnetic dating.

Mr. John Cary Mitani \$2,500 needed

### Intergroup Spacing of Gibbons and Leaf Monkeys

John Cary Mitani, graduate student in anthropology, University of California, Davis, is the recipient of a Leakey Foundation grant to conduct a twenty-six month field study investigating the diversity of primate intergroup spacing systems and the behavioral mechanisms mediating primate spacing.

Fieldwork will take place at Mentoko Camp in the Kutai Nature Reserve, East Kalimantan, Indonesia, where he will observe gray gibbons and the Sunda Island leaf monkeys. These species were selected for observation by Mr. Mitani since their behavior facilitates the testing of hypotheses formulated to determine 1) whether loud vocalizations proximately control primate spacing and 2) the causes of variations in spacing patterns between different primate species that show defensive behaviors. Previous fieldwork suggests that gibbons and male leaf monkeys use several behaviors, including loud

vocalizations, to defend exclusive areas and groups of females, respectively. Data necessary to test these hypotheses will be gathered from field observations and experimental playbacks by loud vocalizations. Results from this research will contribute to our understanding of primate population biology and to the development of a general theory of primate spacing systems.

Dr. Jens Munthe \$2,500 needed

### Vertebrate Paleontology and Stratigraphy of Cenozoic Deposits in Nepal

Dr. Jens Munthe, Department of Geology, Stockton State College, New Jersey, received a grant award to support his research in the Siwalik area of Nepal. Four American paleontologists/field geologists will spend five weeks collecting fossils and interpreting their structural and stratigraphic context in preselected areas between Butwal and Nepalganj. Some field time will also be spent studying Pleistocene midland valley-fills and karst fissure deposits of the Kathmandu and Pokhara valleys and samples for paleomagnetic analysis will be collected from the fossiliferous sections.

The importance of the Miocene-Pleistocene deposits 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 deposits in Pakistan and northern India. However, no hominoids have been recovered from 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 is hopeful his field season will remedy this situation.

The geology department of Tribhuvan University, Kathmandu, is collaborating with the American scientists. □

# BALDWIN GRANTS AWARDED

The following Franklin Mosher Baldwin Fellowships were recently awarded:

Berhane Asfaw,

from Ethiopia, received a Baldwin Fellowship of \$7,726, enabling him to pursue graduate studies in paleoanthropology at the University of California, Berkeley.

Amini Aza Mturi,

Director of Antiquities, Tanzania, received a Baldwin Fellowship of \$6,500 in support of the Lake Natron Archeological Research Project. Under joint sponsorship of Dr. Glynn Isaac (University of California, Berkeley), Dr. Maurice Taieb (de Luminy University, France) and the Tanzanian Antiquities Department, the project plans to re-investigate the Lake Natron Pleistocene deposits dated at 2.1 million years previously mapped and examined by Dr. Isaac in 1964. During the previous field season, an *Australopithecus boisei* (Zinjanthropus) mandible dated at 1.3 M.Y., two archeological occurrences of Early Acheulian industrial complex dated 1.6 to 1.3 M.Y., as well as vertebrate faunal materials were found.

Henry Mutoro Wangutusi,

National Museums of Kenya, was awarded a Baldwin Fellowship of \$3,750. Having successfully completed a M.A. in archeology at the University of Nairobi, Mr. Wangutusi will pursue his Ph.D. studies at the University of California, Los Angeles.

Dr. Abbas S. A. Mohammed Ali, deputy chairman of the department of archeology at the University of Khartoum, visited Dr. Edwin S. Mungler in Pasadena last October. He is seeking Leakey Foundation support for the subsistence of his students to work during vacation on a Stone Age project he is directing in Khartoum. The city is expanding and the site will be developed for residential purposes.

The Baldwin Fellowships have previously provided subsistence work grants for local projects in Zambia and Namibia. A project by indigenous researchers on Easter Island is now under review. □

“Lines written on hearing that Professor Huxley had said that ‘he did not care whether his grand-father was an Ape’,”

Oft had I heard, but deemed the tale untrue,  
That man was cousin to the Kangaroo;  
That he before whose face all nature quailed,  
Was but the monkey’s heir, though unentailed;  
And that the limber Ape, whose knavish ways  
And tricks fantastic oft our laughter raise,  
Was just what *we* were in some previous state,  
Ages ere Noah shipped his living freight.  
But now a learn’d Professor, grave and wise,  
Stoutly maintains what I supposed were lies;  
And, while each listening sage in wonder gapes,  
Claims a proud lineage of ancestral Apes.  
Alas! cried I, if such the sage’s dreams,  
Save me, ye powers, from these unhallowed themes;  
From self-degrading science keep me free,  
And from the pride that apes humility!  
But O should fate bring back these dreams accursed,  
And shuddering Nature find her laws reversed;  
Should this, the age of wonders, see again  
Men sunk to monkeys, monkeys raised to men:  
Be mine the lot, on some far-distant shore,  
Where Science wearies not nor savants bore —  
Where no learn’d Apes our fallen race may scorn,

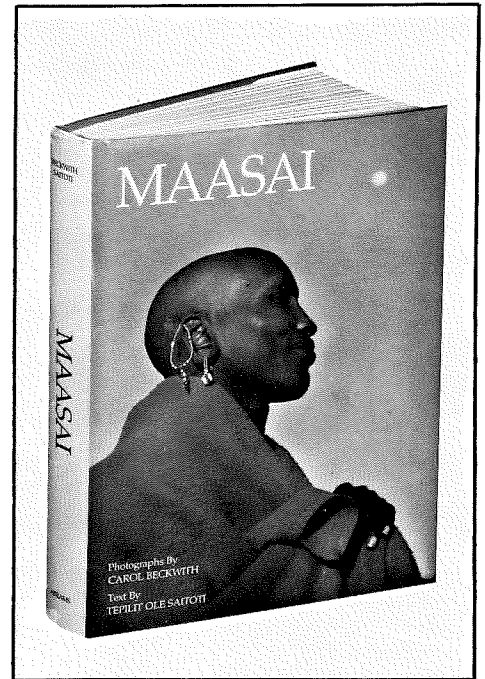
Nor point the moral which our tails adorn —  
To shun the sight of metamorphosed friends,  
Till time again shall shape their altered ends,  
To soothe each fond regret, howe’er I can;  
And, at the least, to dream myself a Man!

This poem by Samuel Wilberforce, Bishop of Oxford, has been unearthed by Richard W. Wrangham, a new member of the Foundation’s Science and Grants Committee. Dr. Wrangham says, “Wilberforce saw all too well the clash between evolutionary theory and his religious beliefs... But in this poem he sidestepped the conflict and retreated to comedy.”

At the British Association’s meeting in 1860, Wilberforce and T. H. Huxley were debating the merits of Darwinism. The Bishop ended his attack on the theory of evolution by asking Huxley if he were prepared to admit apes to his own ancestry. Huxley replied that an ape would be a preferable grandfather to an intelligent man who used his skills to bring ridicule to science. The Bishop never spoke again on evolution.

The poem, Dr. Wrangham says, implies a man too committed to accept the evolutionary argument, yet too honest in the end to deny it. “Who knows? Darwin may have had one more convert than he knew.” □

# PREMIUM



*MAASAI, a handsome book about a handsome people, is offered as a premium to Benefactors of the Foundation. Tepilit Ole Saitoti, the author of the text, is himself a Maasai and also a recipient of a Leakey Foundation Fellowship for his graduate degree at the University of Michigan.*

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# CALENDAR

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## TEPILIT OLE SAITOTI

November 18, 1980 — Caltech/Beckman Auditorium, Pasadena, California (part of series)  
November 25, 1980 — Denver Museum of Natural History, Denver, Colorado  
January 13, 1981 — School of American Research, Santa Fe, New Mexico  
January 23, 1981 — College of Redwoods, Eureka, California  
January 24, 1981 — College of Redwoods, Ft. Bragg, California

## ELIZABETH MEYERHOFF

in residence week of January 12, 1981 — Sweet Briar College, Sweet Briar, Virginia

## BERNARD CAMPBELL

in residence week of January 19, 1981 — Sweet Briar College, Sweet Briar, Virginia  
January 23, 1981 — Applied Physics Lab/Johns Hopkins University, Laurel, Maryland  
February 5 & 6, 1981 — College of the Redwoods, Eureka, California

## DONALD C. JOHANSON

in residence week of January 26, 1981 — Sweet Briar College, Sweet Briar, Virginia  
March 27, 1981 — San Francisco Zoological Society, San Francisco, California  
April 14, 1981 — Caltech/Beckman Auditorium, Pasadena, California (part of a series)

## THOR HEYERDAHL

January 28, 1981 — Philadelphia Academy of Natural Sciences, Philadelphia, Pennsylvania  
February 1, 1981 — Los Angeles Yacht Club, California Yacht Club, Long Beach Yacht Club, Cruising Club of America, & Transpacific Yacht Club, Los Angeles, California  
February 3, 1981 — Caltech/Beckman Auditorium, Pasadena, California (part of series)  
February 5, 1981 — Santa Catalina School, Monterey, California  
February 6, 1981 — San Diego Museum of Natural History, San Diego, California  
February 9, 1981 — UCLA/Royce Hall, Los Angeles, California (part of a series)

## ROGER FOUTS

February 5, 1981 — Kutztown College, Kutztown, Pennsylvania

## BIRUTÉ GALDIKAS

February 20, 1981 — Cleveland Museum of Natural History, Cleveland, Ohio

## SHIRLEY STRUM

February 24, 1981 — Pasadena City College, Pasadena, California

## MARY D. LEAKEY

March 18, 1981 — Philadelphia Academy of Natural Sciences, Philadelphia, Pennsylvania  
March 20, 1981 — University of Chicago, Chicago, Illinois  
March 25 & 26, 1981 — Denver Museum of Natural History, Denver, Colorado  
March 31, 1981 — Caltech/Beckman Auditorium, Pasadena, California (part of a series)

## DIAN FOSSEY

March 25, 1981 — University of Wisconsin, Eau Claire, Wisconsin  
March 26, 1981 — Kenyon College, Kenyon, Ohio  
April 30, 1981 — School of American Research, Santa Fe, New Mexico

## ROGER PAYNE

April 23, 1981 — San Francisco Zoological Society, San Francisco, California  
May 26, 1981 — Caltech/Beckman Auditorium, Pasadena, California (part of a series)

## JANE GOODALL, DIAN FOSSEY, & BIRUTÉ GALDIKAS

April 28, 1981 — Sweet Briar College, Sweet Briar, Virginia (special lecture/panel presentation)  
May 2, 1981 — Caltech/Beckman Auditorium, Pasadena, California (special lecture/panel presentation)

## JANE GOODALL

April 28 & 29, 1981 — Sweet Briar College, Sweet Briar, Virginia (residency)  
May 3, 1981 — UCLA/Royce Hall, Los Angeles, California (part of a series)  
May 4 & 5, 1981 — San Jose State University, San Jose, California (residency)  
May 9 & 10, 1981 — University of California, Davis, California (special program)  
May 11, 1981 — Santa Catalina School, Monterey, California  
May 13, 1981 — American Museum of Natural History, New York, New York



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