Volume 39, Number 1 January, 1968

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

The Museum 'Trademark'

by Patricia M. Williams, Field Museum Press

Steve Kovar, on this month's cover, has been with the Museum maintenance staff for nearly forty years. Twice a year or so, he has vacuumed the elephants in Stanley Field Hall. Mr. Kovar and the elephants are going strong, but the Museum buys a new vacuum cleaner every four or five years. In the following story, Patricia Williams tells the story of the elephants and the man who produced Field Museum's most familiar exhibit.

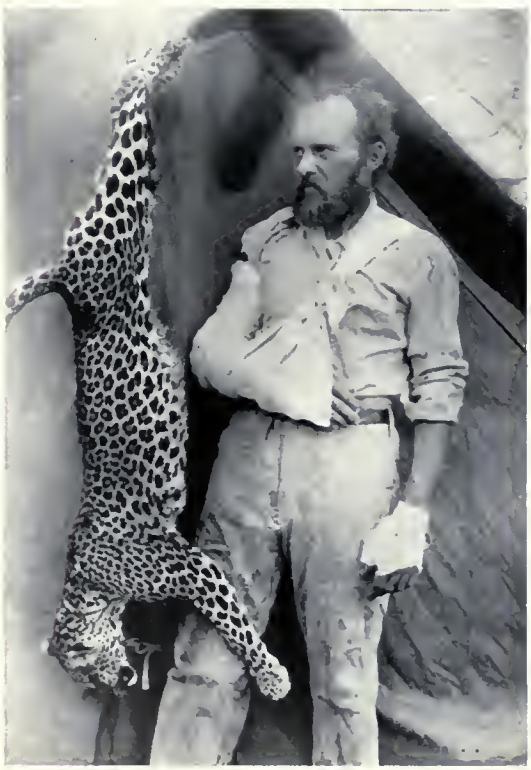
ENGAGED in mortal combat, they loom in massive majesty over awestruck children, footsore parents and clusters of toursts happily posing for snapshots. The African elephants dominating Stanley Field Hall serve as an unmistakable "trademark" of the Museum and have appeared on Museum stationery and checks, publications, postcards, souvenirs and paper bags.

This "trademark" is largely the product of the talents of Carl Akeley, both as a hunter and a taxidermist. In 1896 Akeley joined the Museum staff as Taxidermist and in February, 1905, Marshall Field approved Akeley's planned expedition to East Africa, providing the expense would "not exceed say $5000."

Following a physical examination at the Chicago Home for Incurables, the physician deemed Akeley to be expedition-worthy in that he was "free from any organic trouble. His lungs and heart are sound, and strong, and although he is not robust nor muscular in appearance, his vitality is good, and his muscles are firm." The doctor went on to say that he also thought that the long ocean voyage would do Akeley's nervous temperament good.

On August 13, 1905 Akeley's British East African Expedition left Chicago. In addition to Akeley, the party included Vernon Shaw-Kennedy, Edmund Heller and Mrs. Akeley. They arrived at the port of Mombasa on October 8, 1905, and by November 7 Akeley had written to the Museum requesting an additional $5,000, stating that "something over Four thousand dollars of the original appropriation has been expended and your decision can scarcely reach me before the entire amount (Five thousand dollars) is gone." In addition to the hiring of porters, gun bearers and personal servants, Akeley explained that he had "received practically no concessions from the government without paying handsomely for them. . . ."

The following day, November 8, Akeley wrote to the President of the Museum, H. N. Higinbotham, enlarging



Carl Akeley in Somaliland. He was mauled by the leopard before he managed to bring it down.

Vernon Shaw-Kennedy, who accompanied the Akeleys, buying a sheep from a Wakamba native.
Akeley took nearly a thousand photos during the 1906 expedition. Many of the glass negatives remain on file in Field Museum.

upon the difficulties of the expedition as follows: "For several weeks, while I realized that the funds were melting away twice as fast as anticipated and prospects were uncertain, I often regretted having undertaken the trip. My state of mind caused by the uncertain conditions has made it impossible to decide anything in regard to future movements. Now that we are well under way, have had splendid success for the three weeks here with every prospect of a continuation of the good work, I make this recommendation (for funds) unhesitatingly and in full confidence that the returns will more than justify the expenditure.

"Mr. Shaw-Kennedy has been as greatly disappointed with the necessity of heavy expenses as I, but he is "game" and will see the trip through to the end and I feel that the least we can do is to keep our end up.

"In material the country is rich far beyond my fondest hopes and our working force is efficient."

In Akeley's own words, the expedition proved to be "a good return for the money invested." This "good return" totalled, in 12 months of active field work, over 17 tons of natural history material. This included 400 mammal skins ranging in size from that of a rabbit to that of an elephant, about 1200 small mammal skins, 800 bird skins and a "fair number" of mammal and bird skeletons. Collection of large mammal skins included material for groups of about 20 species of antelopes; a buffalo group of six; a fine series of eight lions; two large male elephants, complete; one rhinoceros; one hippopotamus. There were also about 1000 photographic negatives as well as other studies of collected material, such as plaster casts, measurements, leaves, etc. The two elephants included in this listing are those now on display in Stanley Field Hall. One was shot by Akeley on July 27, 1906 in the Aberdare Mountains and the other was shot by Mrs. Akeley on August 31, 1906 on Mt. Kenya.

In describing the elephant hunt, Akeley wrote, "The trans-Tana trip had been indefinitely postponed on account of trouble with the natives at the base of Mt. Kenya, where the government had sent troops that were at this time, July 10th, engaged in warfare, but as it seemed likely that the trouble was nearing the end, the services of Mr. R. J. Cunningham, professional hunter and safari runner, were secured, and we headed for Fort Hall and the Tana River, with the intention of looking for Elephants on the way; three weeks were spent on the Aberdare Mountains, during which time we prepared the skin of one Elephant, a series of Duiker, and a number of other specimens. . . . the edge of the forest at the base of Mt. Kenya was reached, and here work with the Elephants was begun. The five weeks spent among the Elephants was eminently satisfactory in point of experience, and knowledge gained of the habits of these interesting animals, but disappointing in that we failed, for want of time, in securing all the specimens required for the group. The return from Mt. Kenya to the Tana River was distressingly slow and tedious, owing to the difficulties encountered in securing porters to move the material, but the Tana was finally reached on October 2nd, and a few days later we proceeded down the river in search of Buffalo. . . . The three months in trans-Tana country were months of hard work and bitter disappointments, but results, on the whole, were satisfactory, in that the material obtained was eminently desirable, and difficult to secure. We returned to Fort Hall on November 22nd, and with 175 porters pro-

The Wakikuku people gathered at a joint camp of the Governor of British East Africa, Sir James Hayes-Saddler, and the members of the Field Museum Expedition, in Trans-Tana Province.

The expedition coming down from Mount Kenya, where one of the elephants was shot.

ceeded to Nairobi with the collections. Mr. Cunningham returned by way of the Aberdare, to bring in the Elephant and other skins that had been left on the summit of the mountains, nearly four months previously."

The elephants, with the rest of the collection, were packed in Nairobi, shipped by rail to Mombasa, trans-shipped at Naples, arrived at New York on January 28, 1907 and then proceeded to the Museum to await the next stage in their evolution as the Museum's "trademark."

When Akeley entered the field of taxidermy the methods used were far short of ideal. As Akeley described them, these methods consisted "of first treating the skin, then wiring and wrapping the bones, which were inserted in the legs of the animal while the body was hung upside down and stuffed with straw until it would hold no more." The animal was then endowed with a pair of Raggedy Ann-type eyes and popped into a display case.

Apparently, the crudeness of the procedure did not bother Akeley as much as the stiff and unlifelike result.

The first elephant Akeley worked on was Barnum's famous Jumbo. In mounting Jumbo, Akeley was under the direction of J. William Critchley, and the elephant was mounted much after the fashion of the specimen in the Museum of Natural History, Paris, which had been done more than a century earlier.

Critchley was a most proficient taxidermist "who had few equals in mounting birds and few superiors with the average mammal." However, before Jumbo was finished, Akeley had become the dominant member of the team.

It became apparent at this time, about 1885, that Akeley's "superb neuromuscular organization seemed to have been specially designed to give plastic expression to the refactory hide of the huge quadruped, and the successful accomplishment of the task furnished the inspiration for his later work in Africa, the Field Museum, and the American Museum."

It was basic to old-time taxidermy that skins be tanned in a salt and alum bath, both to "set" the epidermis and to dry hard, so that the skin would retain shape. Unfortunately, specimens, particularly the larger quadrupeds, prepared by this method soon went to pieces when exposed to the changing atmosphere of museum halls. Akeley, however, discovered a vegetable tan that fullfilled all the necessary conditions and yet permitted the hide to remain soft and flexible for many days without losing any epidermis. This discovery was essential to Akeley's revolutionary technique of taxidermy. The Museum's pair of African elephants represent its first application to such large animals.

Although Mr. Akeley described his method in detail in a speech before the American Association of Museums in May, 1908, no written record of his speech can be located. Carl Cotton, the present Museum taxidermist, can only assume, therefore, on the basis of his own professional knowledge, that the following steps are those that Akeley must have followed in the mounting of the African elephants.

First, the elephant's skin was tanned and shaved. Akeley then sculpted a life-sized clay figure following accurate and detailed measurements made from the actual animal. That Akeley was a talented and able sculptor was most evident in this second step. Next, the skin, which was in precisely numbered sections, was applied directly to the clay model and carefully worked into all the musculature, curves and

Porters carrying an elephant skull. Animal skins were treated with salt and wrapped in matting for the journey back from Mount Kenya to Nairobi. The collections went by the newly completed Uganda Railway to Mombasa, thence by ship to the United States. It was on the Uganda Railway, a scant eight years before, that the famous man-eating lions of Tsavo terrorized the construction parties, killing 135 workmen over a nine month period and actually halting construction for three months until they were killed by Colonel J. H. Patterson, a contruction engineer. Years later, Patterson presented the skins to Field Museum, and they are now on display in Hall 22.

Akeley relaxing at day's end. The drink is cognac.

wrinkles. Then plaster was applied over the entire skin-covered model. After the plaster had hardened, the joined plaster and skin sections were removed from the clay model. (The clay model had now served its purpose and was dispensed with.) These sections were now reinforced on the inside. At this stage, the sections were composed of three fused layers—reinforcement, on the inside, skin, in the middle, and plaster, on the outside. These layered sections were next reassembled and joined together with the reinforcing substance. When assembled, they were further strengthened as a unit. Finally, the outer plaster shell was removed and the seams in the skin were covered. Last, the finishing touches, such as the application of a gluten coating and the insertion of tusks and artificial eyes were accomplished.

This pair of elephants was noteworthy not only because they were the product of this remarkable new technique, but because they were posed in such a dramatic and life-like manner. The static, unimaginative efforts of earlier taxidermy seem particularly lifeless when viewed in contrast to this pair. They are an excellent testimony to the statement that Akeley "did more for taxidermy than any other man, and but for him, museum exhibits would not be what they are today."

The elephants were placed on display in 1909 in the central rotunda of the Field Museum, then located in Jackson Park, where they remained until April 26, 1920—the Museum's moving day. It had required three years of work by the entire Museum staff to dismantle exhibits and pack collections preparing them for the move. This move was undoubtedly one of the largest transfer operations ever seen anywhere, involving 321 freight car loads, 354 five-ton truck loads and a total cost of just under $70,000.

The pair of elephants travelled by rail and the Museum's *Annual Report* for 1920 states that, "The African elephants, after removing the head of the one mounted with its trunk elevated, were placed on an open flat-car and came through without mishap."

The move was completed on June 1, 1920 and the staff began the huge task of arranging and reinstalling material. A year later, May 2, 1921, the Museum was opened in its present location and the elephants were again on display to the public.

It seems incongruous that so noble a pair should be involved in anything so prosaic, but the elephants are dusted regularly and vacuumed with an ordinary household vacuum cleaner. They are periodically checked for signs of wear or damage and are patched and treated as necessary, insuring their continued standard of quality.

Even being crushed by a charging elephant in 1912 apparently never dimmed Akeley's enthusiasm for the great beast. In a tribute to the taxidermist, Henry Fairfield Osborn said, "Akeley's first love was perhaps for the elephant. . . . Often did he dwell upon the nobility of the elephant, its courage in the charge, its sympathy in removing the wounded comrade. . . . Little wonder that, in the confines of the . . . city . . . he longed for the sweep of the African plains and savannahs, for the unspoiled beauty of the African forests, for the majestic march and trumpeting of the elephant. . . ."

These sentiments were eloquently expressed by Akeley in the superbly mounted pair of African elephants which remain a unique, impressive and enduring "trademark" of the Museum.

Lake Elementeita, a small lake just west of the Aberdare Range, where Akeley shot one of the elephants.

Christmas in Kenya, 1906.

a fossil comes to life

by William D. Turnbull, Associate Curator, Fossil Mammals

The mammal Burramys *was known only from fossil remains until 1966, when Dr. K. Shortman of the Walter and Eliza Hall Institute of Medical Research, Melbourne, discovered and collected a living specimen. Identification was made by Mr. R. M. Warneke, Senior Research Officer of Fisheries and Wildlife Department, Victoria. The photos of the living animal are by Mr. James Cooper of the same agency.*

In August 1966, in the hut of a ski lodge at Mt. Hotham, Victoria, Australia, a most unusual and unexpected zoological discovery was made. The appealing little animal shown here, a small phalangerine possum, was seen and captured. When put into the hands of scientists of the Victorian Fisheries and Wildlife Department, the animal was recognized to be the first living representative of the genus *Burramys*, which heretofore had been known only from fossil remains. It is indeed remarkable that an animal as distinctive in its dentition as *Burramys* has survived so long without zoologists being aware of its presence. However, its small size, wary nature and outward similarity to other related small possums can account for this oversight. Nevertheless, in this day of world-wide, extensive alteration of natural environments by man, it is truly astonishing to discover a living representative of a mammalian genus previously thought to be extinct.

Burramys is a familiar name in the Geology Department, since fossils of this genus have been studied for many years. In 1895, the paleontologist Robert Broom (who subsequently became well known for his work on South African Permian fossils from the Karoo) gave the name *Burramys parvus* to a few cave fossils from a travertine deposit from the Wombeyan Caves of southeastern New South Wales, Australia. This material consisted of six jaws and three or four skull fragments of animals characterized by the form of their high, serrate, grooved and ridged last premolar teeth. For over 50 years Broom's original description and other brief notes published in 1896 were all that was known about the genus *Burramys*. In the 1950's two advances were made. The first of these was made by W. D. L. Ride (presently the director of the Western Australian Museum at Perth). He restudied Broom's original materials and prepared and studied other materials which Broom had collected but not worked on.

In Broom's day, the preparation technique for exposing travertine-encased bones was to scratch away the lime rock to expose the contained bones. This procedure could only be done after the presence of bone was ascertained, by breaking the rock or seeing suggestive surface irregularities. Ride began to restudy Broom's materials, using an acid preparation technique which enabled him to recover more of the contained bones with minimum damage to the small, delicate fossils. The reports on Ride's findings, including a redescription of *Burramys parvus*, appeared in the *Proceedings of the Zoological Society* (London) in 1956 and 1960.

At about the same time that Ride was working on the New South Wales fossils, another discovery of *Burramys* remains was made in southeastern Victoria at the Buchan Caves. There, Norman Wakefield (presently associated with Monash University) discovered numerous remains of *Burramys* which he re-

ported in 1960. This fossil deposit contains a mixed sample, as far as time of deposition is concerned. Some of the bones are reddish, and these Wakefield believes to be the older specimens, possibly several thousand years old. Other bones are white, and Wakefield gives evidence that they are very recent, perhaps only a few hundred years old or less. This evidence led to informal speculation on the possibility of the existence of a living *Burramys*.

The first *Burramys* materials obtained for the Field Museum collections consist of three tooth fragments and a complete molar tooth from the Late Pliocene of the Grange Burn, Hamilton Fauna that Dr. E. L. Lundelius and I collected in 1963–64. This material is insufficient to form the basis of a new species, but nevertheless it is adequate to show the unique ridging of the premolar teeth which suggest that the material represents an undescribed species. The fauna to which these four teeth belong has been dated at 4.35 million years by the potassium-argon method. Hence *Burramys* now has a time range of nearly four and one-half million years, and a geographic range that extends in an arc from within 100 miles of Sydney in the East to within about 150 miles of Adelaide in the West—a straight line distance of about 500 miles.

In 1963 it was arranged through Mr. Harold Fletcher, then the Assistant Director of the Australian Museum, Sydney, that 185 unprepared Wombeyan Cave travertine blocks belonging to that institution be loaned to Field Museum for preparation and study by Dr. Lundelius, myself and associates. Frederick Schram and I have completed a preliminary report on the first of the rodent remains recovered from that fauna. Work is going ahead on the other groups. The entire lot of travertine blocks has been acid prepared, leaving us with thousands of bones, teeth and fragments for study. Among these are additional unreported specimens of *Burramys parvus*.

Thus, the Museum is in a unique position of involvement with the work on this little-known mammalian genus, and the 1966 discovery gives us the great advantage of working from a live specimen in addition to fossil remains.

Each of the fossil Burramys *specimens shown here are mounted on pins (the rough shafts beneath the teeth). They are not all to the same magnification, but the common pin mountings will serve to scale them.* Top Row: *Three of the oldest teeth (4.35 million years) recovered from a fossil soil near Hamilton Victoria. Two of them* (left and center) *are partial lower premolars seen in side view, and the third is a complete upper molar seen in crown view.* Bottom: *A left lower jaw of a* Burramys parvus *specimen from the Wombeyan Caves of New South Wales, the locality that yielded the original materials upon which the genus was based. The relatively large incisor tooth and the distinctively ridged, serrate premolar are clearly shown.*

ONE DAY ADDED TO TOUR, RESERVATIONS STILL OPEN

Places still remain available on Field Museum's Mexican Tour, which now will include an additional day in Mexico City and a day's earlier departure—April 3–21. The shift from Thursday to Wednesday, the 3rd, as a departure date was made because of airline schedule changes and because an additional day in Mexico City seemed desirable—for those interested in seeing the new Museum of Modern Art and the new Museum of Natural History, and for those wishing a free day for independent activities.

Price of the Tour will be raised to include a still undetermined charge for the extra day. All other Tour expenses are included in the Tour price, $975, including a $200 tax-deductible donation to Field Museum.

Tour membership will close on February 4, due to the necessity of making reservations early for the usually busy Mexican Easter season. Those interested in taking the Tour should mail their $200 deposits together with their reservations. Final payment should also be completed by February 4.

The Tour will be the first to travel over the newly-completed highway from Villahermosa, capital of Tabasco, to the ruins of Palenque, in Chiapas, which according to many archaeologists, artists and photographers are the most beautiful of the ruins of ancient Mexico. The Maya ruins are deep in tropical jungle, a setting which adds much to the impressiveness of the temples and the unique palace building.

Other major stops of the 19 day tour include: Mexico City, Villa Guadalupe, Teotihuacan, Colonial San Angel, University City, Cuicuilco, Xochimilco, Cuernavaca, Xochicalco, Taxco, Merida, Uxmal, Chichen Itza, Oaxaca City, Monte Alban, Mitla and Santa Maria del Tule.

For reservations or further information, write Field Museum's Mexican Tour, Field Museum.

CALENDAR OF EVENTS

January hours: Open from 9 a.m. to 4 p.m. daily and until 5 p.m. on Saturdays and Sundays.

January 1 Field Museum is closed.

Through January 21 Exhibit: NEW GUINEA: BIRDS, BOOKS AND STAMPS, showing the variety and color of the avifauna in the jungles and mountains of New Guinea, including birds of paradise, parakeets and bower birds. Accompanying the exhibit are color slides and commentary, a collection of postage stamps featuring birds from 52 countries, and a set of first-day postal covers of parrot stamps issued by the Government of New Guinea. The exhibit also announces the American release of the *Handbook of Birds of New Guinea* by Dr. Austin L. Rand, Chief Curator, Zoology and the late Dr. E. T. Gilliard of the American Museum. Hall 9 Gallery.

Through February Winter Journey: MAGIC, MEDICINE AND MINERALS.

February 1–25 23RD CHICAGO INTERNATIONAL EXHIBITION OF NATURE PHOTOGRAPHY, bringing hundreds of wildlife photographs to the Museum.

February 6 Indiana University's Chicago Showcase of Music: ALFONSO MONTECINO, PIANIST. Mr. Montecino, famed Chilean pianist, is a professor at I. U. School of Music. He has just returned from a triumphant tour of Russia and Hungary and has been re-engaged to return to Russia and Czechoslovakia in 1969. Mr. Montecino made his debut in Carnegie Hall in 1950. In 1954 he received the Bach Medal, granted by the Harriet Cohen International Foundation, for his outstanding interpretations of Bach in London. Complimentary tickets to this concert are available to Members by request to the Museum. 8:15 p.m. in James Simpson Theatre.

MEETINGS:

NATURE CAMERA CLUB, Jan. 10, 7:45 p.m.
CHICAGO SHELL CLUB, Jan. 14, 2 p.m.
SIERRA CLUB, Great Lakes Chapter, Jan. 16, 7:30 p.m.
ORCHID SOCIETY, Jan. 21, 2 p.m.

FIELD MUSEUM OF NATURAL HISTORY
Roosevelt Rd. & Lake Shore Drive
Chicago, Illinois 60605

Founded by Marshall Field, 1893

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BULLETIN

Edward G. Nash, Managing Editor

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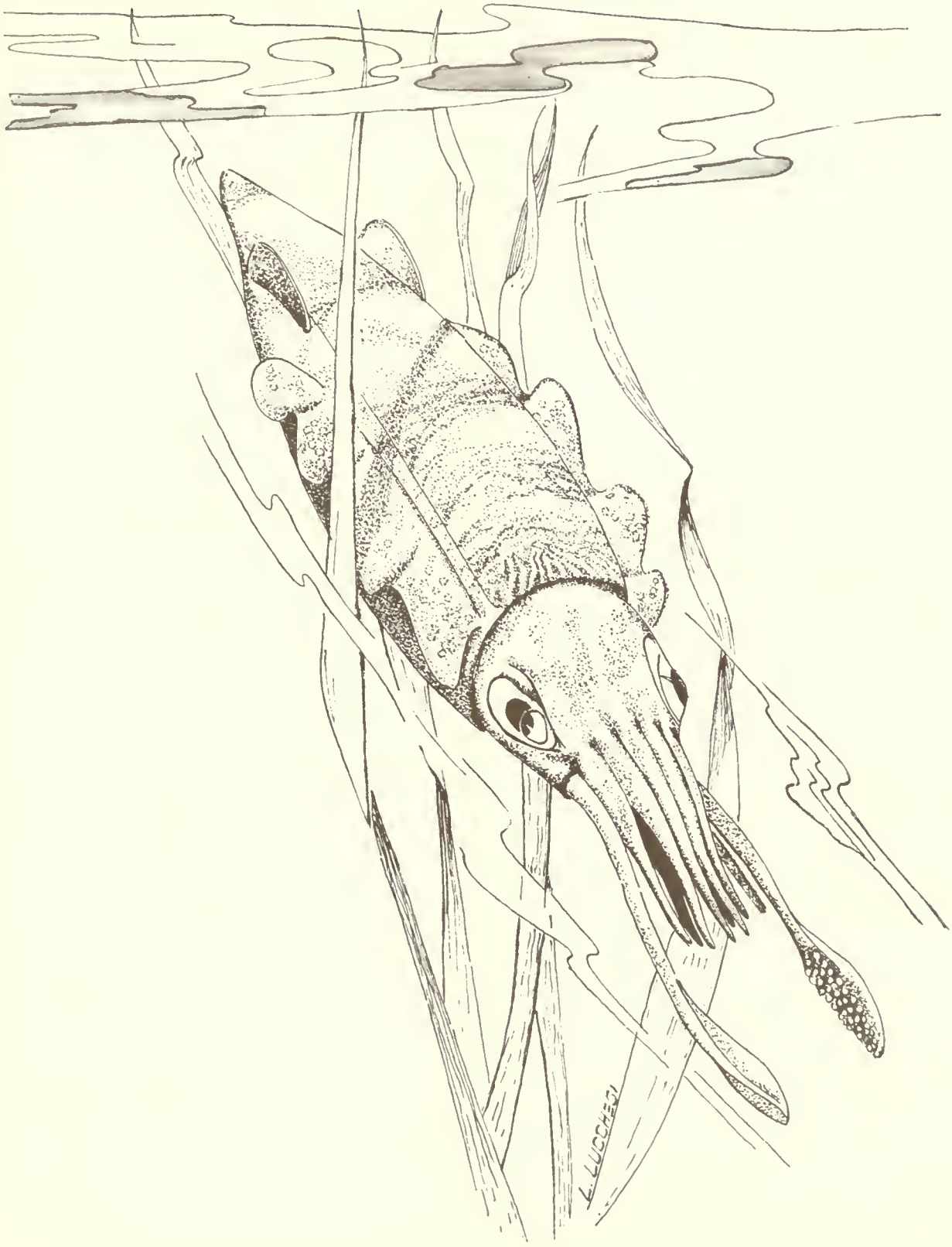

Local Universities and Field Museum in joint project

NEW GRADUATE CENTER OPENS

by Robert F. Inger, Curator, Reptiles and Amphibians

THE MAJOR natural history museums in this country are well known for their exhibit halls and the educational programs tied in with these exhibits. They are perhaps less widely recognized by the general public as institutions that are engaged in research. Probably their least publicized function is their direct contribution to the formal training of university students. Although it is easy to arrange these three functions or activities of museums in order of their public acknowledgment, it is difficult to say which is most important.

To carry out the last function more effectively, Field Museum of Natural History in cooperation with Northwestern University and the University of Chicago recently organized a Center for Graduate Studies. At present the scope of the Center is limited to systematic zoology and paleontology, which involve problems in classifying organisms and in evolutionary biology. We hope eventually to include the other scientific areas of interest to the Museum's staff. The next few paragraphs will outline the purposes, program and organization of the Center.

The purpose of the Center is to provide for the graduate training of university students. Museum scientists will participate in the supervision of the research done by graduate students for their advanced degrees and the Museum will provide laboratory space, library facilities, and specimens for those students. Museum staff may also conduct graduate classes as the need arises. (As of this writing, eleven members of the Museum's staff are giving such a course at the Museum for the University of Chicago.) The universities will provide the remainder of the training and instruction necessary for the Ph.D. degree and will award the degrees.

The program of the Center is regulated by an Advisory Committee consisting of three curators from the Museum, Drs. Zangerl, Wenzel, and Inger, and two faculty members from each of the universities, Drs. Peter Bretsky and Orlando Park from Northwestern and Drs. E. C. Olson and Ronald Singer from Chicago. The Advisory Committee is also responsible for admission of students to the Center.

In mid-1967 the Museum received a grant from the National Science Foundation to help support the activities of the Center for two years. Funds from the grant will be used for two main purposes: to provide support for students in the form of fellowships, equipment, and supplies, and to hire additional supporting staff at the Museum. The last is essential if curators are to be relieved of certain duties in in order to devote time to students.

This grant represents a new venture for the National Science Foundation. It is the first research training grant made to a non-university museum from the Foundation's research funds. The Museum's monetary contribution to the Center, largely in the form of the time of its staff, facilities, and money from its Dee Fund, is approximately 35% of the total budget.

All of the preceding is the bare bones skeleton, so to speak. What is the motivation for initiating the Center? What do we hope to accomplish through it?

The principal motivation is the desire to contribute to the development of an area of science with which the Museum and its staff are concerned. One of the most effective ways of advancing any scientific or professional field is by providing better training for the young men or women entering the field. One man trains two and thereby enlarges the field. If, in addition, he gives them better training than he had as a student, the growth of our knowledge proceeds at an even faster rate. We hope through the Center to improve and increase the opportunities for professional training in systematic zoology and paleontology.

Beyond our hope to advance these academic fields, there are several more "practical" motives. Our nation, through several major scientific-technological programs, has uncovered a shortage of persons trained in these fields. The big push in exploring the oceans has come up against a hard fact—there simply are not enough people with the training required to identify and classify the animals collected by the great oceanographic programs. Many ambitious medical projects concerned with insect-borne diseases, projects being conducted in Vietnam and other tropical areas, require the services of systematic zoologists and again the demand exceeds the supply. As a nation we are becoming increasingly concerned with a variety of environmental problems at home and abroad; the active participation of systematic zoologists is needed if we are to solve these problems. The Center can help relieve this manpower shortage.

There is still another motive for the Center. Good graduate students ask stimulating, sometimes embarassing questions. The attempt to answer them helps keep university professors and museum scientists mentally alive. Our third motive, then, boils down to the selfish desire for an intellectual fountain of youth.

It would be misleading if this article gave the impression that the Center represents an entirely new approach for the Field Museum. It does not. On an informal, individual basis museum curators have been working for years with graduate students from our great local universities. In fact,

several members of our present staff are the intellectual products of university-museum cooperation. These arrangements, which had previously been formalized at the institutional level, will be much more effectively implemented by the availability of the special funds.

The Center, because of its funds, will make it possible to expand the Museum's professional training activities. Expansion is especially important in view of the shortage of systematists. Tuition and fellowship funds for systematic biologists have never been adequate on either an absolute or a relative scale. The funds now available to the Center for these purposes should help attract good students to this area. It is not that students are more mercenary now than they were. It simply costs a good deal more to go to graduate school than it used to. Ask any parent.

The establishment of the Center for Graduate Studies as a formal administrative entity has another advantage that, though difficult to measure, is significant. It will force Museum staff and members of the faculties of the two universities to meet more often and talk about shared problems and interests. In effect, we have here another manifestation of the two-heads-are-better-than-one phenomenon. The staffs should get together oftener. But biologists, like all other people, get caught up in day-to-day affairs. The dialogue, which the Center will generate, will benefit each institution and thereby improve higher educational and scientific activities in the Chicago area.

Although at present only the University of Chicago and Northwestern University are participating with the Museum in operating the Center, it is understood that other Chicago-area universities may join in the near future. We hope, for example, that the University of Illinois (Chicago Circle) will become an active member of the Center after the Circle Campus is authorized to award the Ph.D. degree in appropriate areas of biology and geology.

The pooling of resources on a regional basis, which is what the Center signifies, is not only highly desirable but absolutely essential. No city, state or nation is so rich in scientific resources that it can afford to duplicate facilities endlessly. The Center for Graduate Studies represents a formal acknowledgment by these three institutions and the National Science Foundation of this economic truth.

The Center also represents the recognition by these institutions that systematic zoology and paleontology are fields that have played and will continue to play important roles in the history of science and human thought.

recent acquisition—zoology

COELACANTH

A THREE-FOOT-LONG formalin-fixed specimen of the "living fossil" *Latimeria chalumnae*, caught on August 25, 1967 at a depth of about 1000 feet off the Comoro Islands near Madagascar, has been added to the scientific collection of the Museum through the courtesy of the Department of Anatomy, University of Illinois College of Medicine.

The coelacanths are members of the fringe-finned fishes, the Crossopterygii, which made their first appearance in the Devonian some 300 million years ago.

One group of the Crossopterygii, the Rhipidistia, used their limb-like fins and their ability to breathe air to scramble ashore and move on land to fresh waters when the pools they had lived in started to dry up. As they became progressively better adapted to live on land, their paired fins evolved into true legs. When this dramatic evolutionary stage was reached they were no longer fish, but the first primitive amphibians.

The second air-breathing group among the fringe-finned fishes, the lung-fishes (Dipnoi), did not evolve further. Lung-fishes are still found in parts of Australia, Africa and South America.

The third crossopterygian group, the coelacanths, are related to our distant ancestors, the Rhipidistia, but they have never been the direct line of evolution. However, since the first coelacanths were related to the ancestral line of all land vertebrates and since they have changed so little in 275 million years, they may have preserved some of the primitive features they shared with our far-off ancestors. A careful study of *Latimeria* may, therefore, throw light on our very remote ancestry. Functional anatomical studies by scientists of Field Museum and the University of Illinois will be made on the endocrine system, the respiratory apparatus, the brain tracts, the reproductive apparatus and the sensory apparatus.

—By Karel F. Liem, Assistant Curator, Vertebrate Anatomy

by Ida L. Thompson, Geology Department

cuttlefis

This month's cover shows *Geoteuthis*, years ago. The original was drawn in reproduced it here in a sepia to give yo is on display in Stanley Field Hall duri Here is the story of *Geoteuthis* and its in the age of the great dinosaurs, whe predators in warm shallow seas that c

The SUN and other stars have been photographed by their own light; many animals leave tracks on their trail. Why not, we of the Geology Department thought, a picture of a Jurassic cuttlefish drawn in its own 170 million-year-old brown ink?

The Museum's Geology Department had a specimen of the well-known fossil cuttlefish, *Geoteuthis*, from the Jurassic Period 170 million years ago. This cuttlefish was preserved with its inksac intact. We also had a squid-like fossil from the Pennsylvanian Period, about 100 million years earlier. This squid-like fossil had a small amount of black material adhering to it in approximately the position the inksac should have been. Several members of the Geology Department were curious to know if this dark substance was the fossilized remnant of an inksac. Our plan was to dissolve some of the known cuttlefish ink, then see if the same solvent would dissolve the black material on the squid. This would have given us circumstantial evidence that the squid fossil also contained ink. "Project Cuttlefish" informally established itself to carry out this experiment.

The ink of the cuttlefish, *Geoteuthis*, was preserved in a glassy solid that was soft enough to be cut away with a knife. The next step was to immerse some flakes of the inky-looking substance in the "universal solvent," water. Failure! Next, we tried the other standard solvents: xylene, acetone, alcohol, hydrochloric acid and ammonia. Again failure. A bit of research on the chemistry and preparation of cuttlefish ink produced the needed information. Fresh cuttlefish pigment is *melanin*, the same brownish substance that comes to the surface of your skin when you tan in the sun. Melanin does not dissolve to produce ink; rather it must be prepared in a suspension, tiny particles in an alkaline solution.

At this point we realized that "Project Cuttlefish" was going to fail in its original goal. There just was not enough black material on the squid fossil to try to make a suspension. But there was plenty of the cuttlefish fossil ink, so the project continued out of curiosity to discover what could be done with this ink.

We applied mortar, pestle and elbow grease to the fossil ink flakes, then mixed the resultant powder with ammonia. We were startled to discover a deep brown mixture that looked like artists' sepia pigment. It even flowed like ink in a quill crow pen.

Could it be used? We consulted Mr. Lido Lucchesi, an artist with the Harris Extension of the Museum. He confirmed that it was not only sepia ink, but so fine in quality that he agreed to immortalize the ancient cuttlefish, *Geoteuthis*, by drawing it in its own ink, 170 million years old. The drawing, shown on the cover, was based on a reconstruction of the Jurassic Age cuttlefish made by Naef, a German fossil-cephalopod expert, and on the Museum's photographs and drawings of extant cuttlefish.

While Mr. Lucchesi worked on the drawing, "Project Cuttlefish" continued its research. *Geoteuthis* is a mollusk of the class Cephalopoda, which also includes nautiloids, squids and octopuses. Cuttlefish are easy to confuse with squids, since both have similar body shapes, eight arms and two long tentacles. The shell of the cuttlefish, though, is oval and broad, while the squid's is long and narrow. The shells of both animals are internal, although homologous to the nautilus' external shell.

The present cuttlefish evolved from an earlier cephalopod with an external shell, perhaps similar to the straight-shelled ammonites commonly found fossilized in Paleozoic rocks. In the course of evolution the cuttlefish shell was reduced in size and eventually enclosed within the mantle, gaining the animal two important advantages, speed and maneuverability. However, the price of increased swimming capability was the loss of protection for many of the animal's soft parts. To compensate for this vulnerability, somewhere along the evolutionary line cuttlefish ancestors developed an inksac.

When a cuttlefish is alarmed, it shoots out a jet of ink as a decoy. After discharging the ink, the cuttlefish changes its color from sepia-brown to pale beige, almost white. The brown ink in the water looks like a cuttlefish to witless pred-

story

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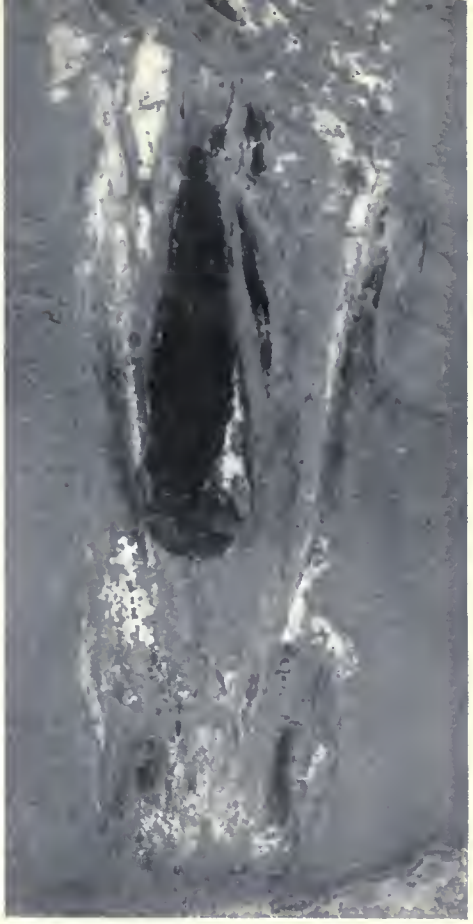

Fossil Geoteuthis. *The inksac is clearly visible in black, and the outline of the internal skeleton of the squid is somewhat less distinct.*

ators, while the real cuttlefish gets safely away.

There is speculation that the melanin ink may also have an anesthetizing effect on the olfactory nerves of the cuttlefish's predator. The decoying ink, and its possible anesthetizing qualities, have proved extraordinarily successful as adaptations go; cuttlefish and squid are abundant throughout most of the salt water on the Earth.

Melanin is an organic compound and almost all such compounds decay. Until recently, scientists did not attempt to recover organic materials from fossils, but now it is known that such chemicals can indeed be recovered. Experiments have been done on shells more than 100 million years old, and the amino acids of the original proteins are found to correspond to those composing the protein in shells of living species. Amino acids have been been found in fossils with an age as great as 300 million years.

Preservation of organic material requires protection from attack by oxygen and bacteria. If the body of an animal is deposited on a quiet lake or ocean bottom with little current and an abundance of organic material already present, then the water may be acid enough to prevent both oxidation and bacterial growth. Cuttlefish are not exceptions. The inksacs of fresh cuttlefish decay readily and must be dried quickly if they are to be preserved. The *Geoteuthis* specimen must have fallen in a place where conditions were optimal since the organic inksac was preserved.

At one time, most of the dark brown and black inks used in writing and drawing came from cuttlefish. Cicero wrote his *Orations* and other works in sepia, the Roman name for cuttlefish and now the name for brown ink.

Cuttlefish ink, like *Geoteuthis*, eventually lost out in the struggle for survival. Although sepia is quite permanent in the dark, prolonged exposure to sunlight fades it. A longer-lasting ink can be made from lampblack, and therefore the market for cuttlefish ink is much reduced today from its popularity of the last century. Nevertheless, sepia is still prepared and sold in England.

Cuttlefish themselves still have great commercial value, especially in the Far East and Mediterranean countries. Italians, following their Roman forebears, dry and sell the sacs for ink, eat the flesh and use the cuttlebones for pumice and bird feed.

While "Project Cuttlefish" continued its research, finding that melanin is a protein attached to a complex carbon molecule of unknown structure, Mr. Lucchesi finished the drawing. Everyone was surprised at the result. The 170-million-year-old ink had flowed as smoothly and beautifully as the best modern ink. The most startling aspect of the drawing was the warm brown color of the ink, the true color of fresh cuttlefish ink.

The first man to make ink from fossil specimens was Dean William Buckland, who was describing *Geoteuthis* for the geology and mineralogy volume of *The Bridgewater Treatises*. The year was 1849, and artists still made regular use of a pigment prepared from cuttlefish for brown tones. Buckland chipped off some fossil ink from a specimen, had it prepared, and handed it over to his artist as a medium for the *Geoteuthis* illustration. The quality of that ink was excellent, too, according to Henry Lee's report of the incident in his 1875 classic *The Octopus*.

Fortunately for the safety of museum collections of fossil sepia, the use of fossil ink did not continue in vogue. As far as we can determine, Field Museum's "Cuttlefish Project" is the first in 118 years to prepare a drawing of the fossil cuttlefish *Geoteuthis* from its own ink. Consequently, according to cautious extrapolations, not until the year 2085 will the cuttlefish be so immortalized again.

YAQUI DEER DANCE, taken by Erwin Bach, Chicago Tribune *Camera Editor, at the Ballet Folklorico at the Palacio de Belles Artes in Mexico City. The photograph was taken with a Pentax 35 mm. single lens reflex camera from the wings of the opera house. The Ballet is included in Field Museum's Mexican Tour itinerary.*

MEXICAN TOUR BRIEFINGS

For reservations and information write: Mexican Tour, Field Museum

Members of Field Museum's Mexican Tour, April 3–21, will participate in a series of programs preparatory for their South-of-the-Border travels. Talks will be given at evening gatherings in Museum President James L. Palmer's office during March, on photography, archaeology, art, current affairs and flowering plants, with discussion periods following. The get-togethers will also acquaint Tour members with each other.

There is still room for a few more members on the Tour. Tour price is $975, which includes a tax deductible $200 donation to Field Museum. All expenses are covered by the price except those for an extra day, which was added after the Tour budget was completed. Tour membership will close when the full complement is reached or by March 4. Full payment should be made for any reservations made after February 4.

Enthusiasm about Mexico and its people, a practiced artist's eye and specialized knowledge of photography will characterize the discussions led by Erwin Bach, the *Chicago Tribune*'s Camera Editor. Mr. Bach is widely known as an experienced traveler, writer and commentator on cultural matters, and his photographs are distinguished for their clarity, expressiveness and beauty. He will show some of his photographs of Tour sites and of people typical of Tour areas at the gathering on March 15, when he will speak on "How to Photograph the People and Ruined Cities of Mexico."

On March 18, Mexican art—from its distinctive beginnings in pre-Spanish Mexico to its climax in the mural movement—will be discussed by George Schneider, staff lecturer specialized in Mexican art, of the Art Institute. He will show slides of art from the major sites included on the Tour.

Phil Clark, Field Musuem Public Relations Counsel and Tour Leader, on March 22 will discuss Mexico's revolutionary example to Latin America and will show slides of flowering trees in blossom at the time of the Tour.

On March 29, Dr. Donald Collier, Chief Curator of Anthropology, will prepare the group for confronting the cities of ancient Mexico by describing the peoples who inhabited them and their histories. A motion picture on Mexico will be shown that same evening.

In addition to Mr. Clark, the Tour will be accompanied by Mexican archaeologists who will supply background and answer questions about the ancient sites included in the Tour—Cuicuilco, Teotihuacan, Xochicalco, Monte Alban, Mitla, Palenque, Uxmal, Kabah and Chichen Itza. The Tour will also visit private homes and gardens. Short motor coach trips will be made in each major area, but long distances will be covered by plane. The Tour will see Taxco's famous Passion processions on Holy Thursday and Good Friday, will be in Oaxaca's ornate Church of Santo Domingo for Easter, and will visit the unique outdoor museum of Olmec monuments in botanical garden-zoo setting at Villa Hermosa and the great new National Museum of Anthropology in Mexico City. We will stay at hotels in Mexico City, Cuernavaca, Taxco, Oaxaca City, Villa Hermosa and Merida.

Erwin Bach, Camera Editor of the Chicago Tribune *who will show slides and discuss photo problems in Mexico at a gathering of Field Museum's Mexican Tour, on March 15.*

1968 SPRING FILM-LECTURES

The Museum is offering its 129th series of Saturday afternoon programs starting March 2. These illustrated lectures, open to adults and the children of Museum Members, are held in James Simpson Theatre at 2:30; reserved seats are held for Members until 2:25.

MARCH 2 LAOS BY KENNETH ARMSTRONG

From Vientiane, the administrative capital, to Luang Prabang, the royal capital, and right up to the Red Pathet Lao headquarters at Khang Khay, Kenneth Armstrong has filmed paradoxical Laos. Inhabitants of a warm, green land, with a taste for fried river moss and toad stew, Laotians simply refuse to see the world as a whole. An area of steep chasms, limestone cliffs and rich alluvial plains, Laos can grow enough rice, bamboo, flowers and toads to keep its people happy forever. But outsiders are interested in their rice if not their toads; and in their strategic geographical position. Laos is in crisis, and Ken Armstrong shows us a gentle, dreamy-eyed, flute-playing, explosive Laos.

MARCH 9 OUTDOOR YEARBOOK BY KARL MASLOWSKI

Here is a rare combination of the usual and unusual—albinos of catfish and red-tailed hawk; a patternless copperhead; a blond meadow mouse and a blue bullfrog. Normal wintertime activity of gray foxes, snowy owls and Cooper's hawks contrast with the exceptional behavior of the bright-colored Baltimore oriole that wintered in snowbound Ohio. Lives of hummingbirds, eagles, cricket wasps and whitetailed deer are portrayed against time lapse sequences of blossoming tulip trees, autumn foliage and snow and ice.

MARCH 16 ALASKA BY HARRY R. REED

The name "Alaska" was derived from an Aleut word meaning "great land" and every inch of Alaska lives up to its name. It is an incredibly big, beautiful land of sharp contrasts. There are massive, snow-capped mountain ranges and vast flat tundras, towering forests and ancient glaciers, picturesque villages and modern cities, steep-walled fjords and expansive ice fields, meandering Arctic streams and plunging waterfalls, and much more that makes Alaska a Fantasyland of the North. Alaskan wildlife is well represented by shy caribou, giant moose, bothersome black bears, rare Toklat grizzlies, busy beavers and little Parka squirrels.

MAR. 23 TWO WORLDS OF POLYNESIA BY STANTON WATERMAN

Of the two worlds of Polynesia, one involves an island people, both gentle and beautiful, with customs and skills and a way of life that has resisted the impact of Western man. Their land environment includes 110 islands, ranging in size from populous Tahiti to the tiny atolls of the Tuamotu Archipelago. The other world of Polynesia is the underwater world of the lagoons and the barrier reefs, abounding with life, color, and action. In this world the fight for survival is constant and unchanged.

MAR. 30 THE CONGO BY LEWIS COTLOW

The key to Africa is the Congo. The key to the Congo is its tribal system. There, Africa is fragmenting. Blacks are at sword's point; whites are on the run. Economy is in jeopardy. Leadership is a sometime thing. Crisis in the Congo affects the future of all Africa. For more than 25 years sub-Saharan Africa has been Louis Cotlow's specialty, primitive people his focus, animals his joy and the Congo's fate his concern.

APRIL 6 MEXICO BY GENE WIANCKO

After centuries of colonial rule, followed by violent revolutionary upheavals, Mexico now builds upon the vast potential and native intelligence of her own people. These people, for the most part, had their origins in the Indian cultures of Mexico. This outstanding motion picture tells their story: the story of the capacities and potentials of the Mexican people and their ways of life. For those unable to take the Museum's Mexican Tour that leaves April 3, this film is a good alternative for seeing that fascinating country.

(continued on page 8)

1968 Spring Film-Lectures continued

APRIL 13 THE HOLY LANDS BY RICHARD LINDE

The Holy Lands are sacred to three great religions: Judaism, Christianity and Islam. Here the Israelites lived; here Christ walked; here Mohammed ascended into the seventh heaven. Today this region is divided, with Arab guns and Israeli barbed wire adding to the paradox of the lands called "holy." These are the hallowed places that live in the hearts and minds of men throughout the world . . . Bethlehem, Galilee, Nazareth, Jerusalem and Jericho. Richard Linde presents the Holy Lands as they are, a dramatic blend of the past and present.

APRIL 20 INDIA BY FRAN WILLIAM HALL

India is less than half as large as the U. S., yet she holds within her borders nearly three times as many people, restless and extremely religious. She encounters great odds in her race to modernize and create a living for her populace. Beset on the north by external dangers and internally by age-old problems, today India looks to both East and West for solutions to survival. See India, land of countless temples and colorful people, as filmed by Fran Hall.

APRIL 27 THE BAHAMAS BY HARRY PEDERSON

The lives of Bahamians are centered on the sea. Nassau waxes wealthy from visitors beckoned by sun and surf. People in Abaco build boats, mend nets. Above the surface is a friendly society, gentle and genteel. Below is another world. There, in the many-hued waters, a different climate prevails. Neighbors eye each other hungrily. Survival depends on being quick as a trigger fish, tough as a sea turtle, clever as a shark, elusive as an eel. Harry Pederson has filmed the people along the shores as well as life in the waters below.

CALENDAR OF EVENTS

February Hours: Open from 9 a.m. to 4 p.m. daily and until 5 p.m. on Saturdays, Sundays, February 12th and 22nd.

February 1 – 25 23RD CHICAGO INTERNATIONAL EXHIBITION OF NATURE PHOTOGRAPHY brings hundreds of the world's top wildlife photographs to Field Museum, Hall 9. The exhibit features black and white photographs, color transparencies and prints selected from thousands of entries received from the United States and abroad. Awards will be made by the show's sponsors, the Chicago Nature Camera Club and Field Museum. Winning color transparencies will be projected at two Sunday showings, 2:30 p.m. February 4 and 11 in James Simpson Theatre.

February 6 Indiana University's Chicago Showcase of Music: ALFONSO MONTECINO, PIANIST. Complimentary tickets to this concert are available to Members by request to the Museum. 8:15 p.m. in James Simpson Theatre.

February 18 Audubon Wildlife Film: NATURE'S PLANS AND PUZZLES by G. P. Lyons. A story of plant and animal adaption in the Northwest. 2:30 in James Simpson Theatre.

Through February Winter Journey: MAGIC, MEDICINE AND MINERALS.

March 2 Spring Film-Lecture Series: LAOS by Kenneth Armstrong. 2:30 in James Simpson Theatre.

MEETINGS:
CHICAGO SHELL CLUB, Feb. 11, 2 p.m.
CHICAGO NATURE CAMERA CLUB, Feb. 13, 7:45 p.m.
ILLINOIS ORCHID SOCIETY, Feb. 18, 2 p.m.

NEW TRUSTEE NAMED

Nicholas Galitzine, Vice President of the Commonwealth Edison Co., has recently been appointed to the Board of Trustees of Field Museum. He has been with the Commonwealth Edison Co. since 1923. In past years, Mr. Galitzine has been associated in numerous capacities with the Crusade of Mercy, serving as its Campaign Vice Chairman in 1961. He is Vice President and Director of Passavant Memorial Hospital, a Director of the Hartford Plaza Bank, the Sears Roebuck Foundation, the Lyric Opera of Chicago, the Better Business Bureau of Metropolitan Chicago and the Sterling Hydraulic Co. In 1958 he was presented an achievement award by the Immigrants Protective League for his civic and charitable activities.

February 6 8:15 p.m.

INDIANA UNIVERSITY'S
CHICAGO SHOWCASE OF MUSIC
presents
ALFONSO MONTECINO,
Chilean Pianist
at Field Museum

BEETHOVEN
33 Variations on a Theme by Diabelli, Opus 120

ALBENIZ
El Albaicin (from Iberia)

SCHOENBERG
5 Piano Pieces, Opus 23;

GINASTERA
Sonata (1952)

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
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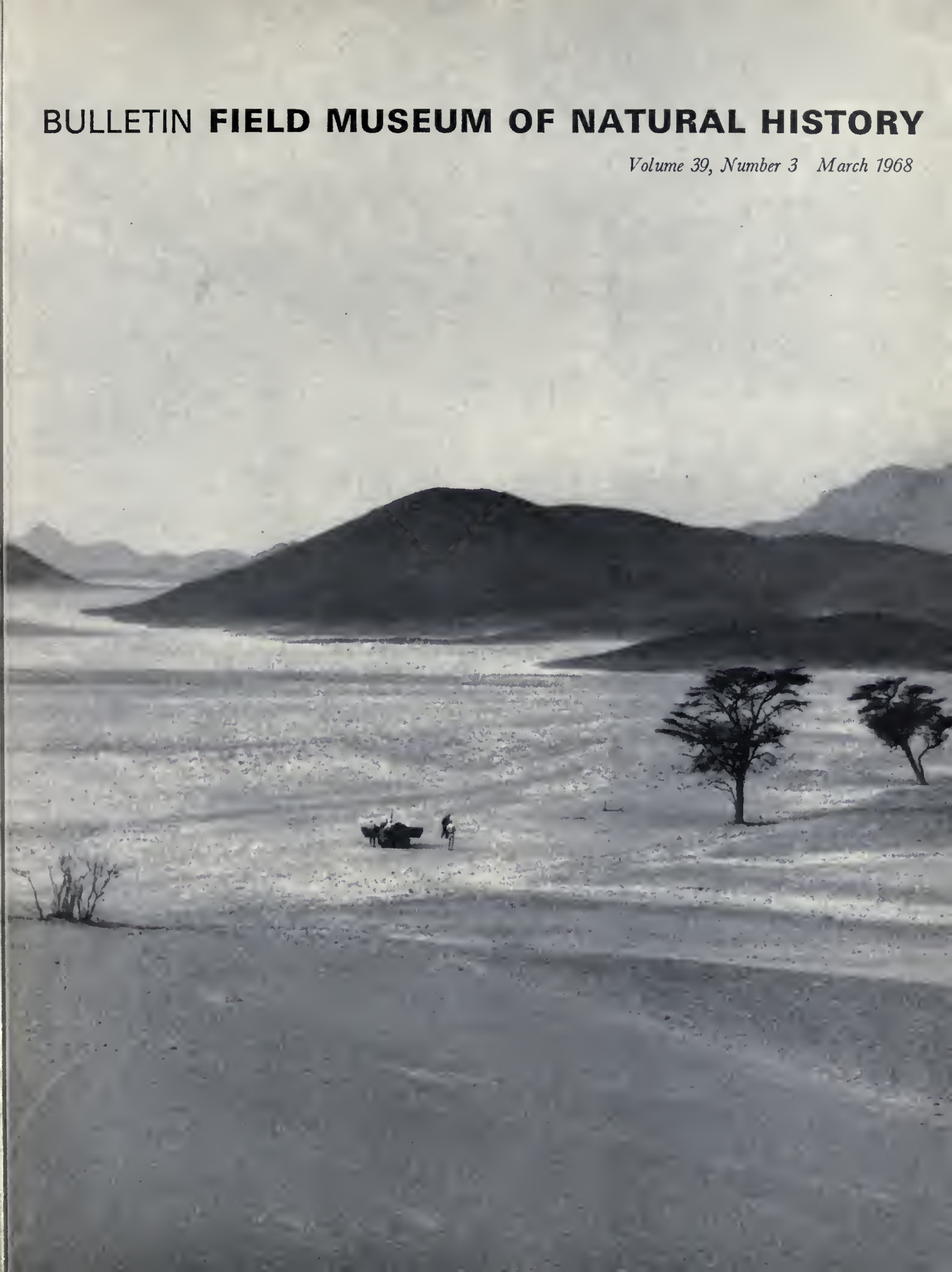


hyena hunt

by

Dale J. Osborn

Mammologist, Department of Medical Zoology, United States Navy Medical Research Unit Number Three, Cairo Egypt; Field Associate, Field Museum

This month's cover shows the author and his party in March, 1966 on the desolate plains of Umm Shilman in the Nubian Desert, in search of the hyena.

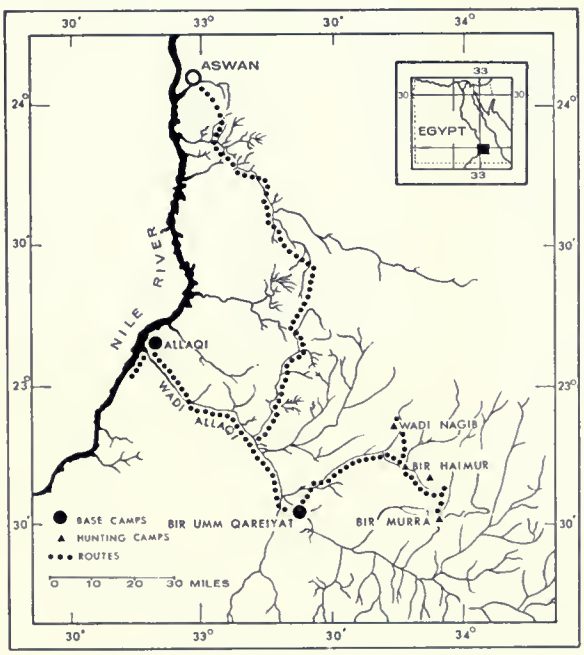
For three years, 1964 to 1967, I explored the Egyptian deserts, working for the Naval Medical Research Unit Number Three, a group which has been studying the role of animals and ectoparasites in the dissemination of human and animal diseases for the past 20 years. I collected mammals, plants, and whatever else might be useful to our research. With a small crew of Egyptians, I lived like a Bedouin for weeks at a time, camping at wells or carrying precious water hundreds of miles into the desert. We traveled in trucks and jeeps, not on camels, but our fare was often little better than that of the nomads. If Allah and the desert provided wood enough, we sat cross-legged around campfires at night reminiscing on the pleasures and hardships of past journeys. To my Egyptian associates, for whom hunting is a favorite pastime, pursuing hyenas had been particularly thrilling. I shared in that excitement, of course, but to me the fact that we had collected for the first time a study series of hyena specimens (*Hyaena hyaena*) from Egypt was of greater importance. Furthermore, the expedition provided me many special memories of desert people and a part of Egypt that few foreigners had ever seen.

Wadi Allaqi drains from the mountains of southeastern Egypt and northern Sudan, westward across Nubia and debouches into the Nile Valley about 100 miles south of Aswan. Around the turn of the century Wadi Allaqi was famous for an abundance of good pasture and high quality camels. The last "year of plenty" was 1907; then followed a succession of dry years until the 1930's. The ensuing years of drought brought drastic changes; however, reports of local rains in 1965 suggested a favorable climatic cycle had come again. With hopes of seeing the desert "blooming" we decided to explore Wadi Allaqi.

Aswan was our port of exit from civilization. The High Dam Project had transformed this once sleepy village into a bustling town, and on the architects' drawing boards it was already a city with a university. Behind the new avenue and modern buildings along the river, the heart of Aswan remained—narrow, dirty streets lined with tiny shops jammed one upon the other where piles of cheap trinkets, cooking ware, fruits, vegetables, sweets and bolts of brightly colored cloth collected dust and flies. Crowds of Nubians and fellahin in flowing *galibeyas*, dapper engineers, grimy laborers and sturdy Russians pushed their way past honking trucks and taxis, donkeys, carts, and wagons. We joined the shoppers and bought food, tea and sugar for our expedition.

During the hours that it took to purchase supplies and obtain desert passes, the men who stayed to guard the vehicles were treated to glasses of tea and "informed" by friendly passers-by about Wadi Allaqi. Our men were told it was a verdant valley full of gazelles, wild sheep, ostriches, ibexes, jackals, oryxes, and wild asses. A geodetic survey party, it was rumored, had killed up to 12 hyenas near the mouth of Wadi Allaqi. Another less encouraging story from the townspeople, many of whom fear the desert, was that Wadi Allaqi was full of dangerous animals and thieves who waited beside wells and water holes to pounce on unsuspecting travelers. A soldier told of a French expedition that had gone into Wadi Allaqi a few months before and had not been heard from. I surmised that that expedition, if there were one, had been en route to Sudan. But strangely enough, we were never told about the legendary good spirit who presided over Wadi Allaqi and to whom the desert Arabs ceremoniously sprinkled an offering of *dhurra* (sorghum) on the ground upon entering the wadi.

After obtaining a guide named Abdullah Ali Hamid, who claimed to know the most direct route into Wadi Allaqi and the location of a dependable source of good water, we were ready and eager to enter the desert. Before the sun rose on March 1, we were moving along in the deep dust of a truck road east of the Aswan-High Dam Highway. Here and there were open areas between the low hills of granite where waste from the dam project had been dumped—acres of trucks, machinery, tires, scrap metal and wood.



The route of the expedition. As the waters of Lake Nasser slowly back up behind the High Dam at Aswan, much of this country will be inundated. In years to come, Wadi Allaqi will be flooded as far back as Umm Qareiyat.

Beyond this lay about 30 miles of open desert, and then we followed a narrow pass that wound for 12 miles through precipitous mountains of gneiss. Beyond the pass our route was southward through a type of landscape we had not seen before, the Nubian Desert—broad sandy plains and clusters of steep pyramidal and flat-topped hills of reddish sandstone. Once the cry of "*dubbah*" rang out, and we stopped to examine the huge dog-like tracks of a hyena that zig-zagged over the sand.

As the speedometer indicated 105 miles from Aswan, we coasted down a soft slope into Wadi Allaqi. There was no green grass to satisfy our expectations; only the desiccated stubs of senna bushes, long dead. I recalled the record that the last great flood to reach the Nile flowed past here in 1830. As we looked across this broad, desolate streambed and scanned the low cliffs on the far side, a grayish haze moved over and beyond us. Thus warned of an approaching sand storm, we proceeded immediately on up the wadi. Southeastward for the next 20 miles we raced over hard gravel terraces and plowed through wide, shallow channels of soft sand and silt. After a few miles, sculptured sandstones had been replaced by round, dark hills of granite and schist. Patches of annual plants grew here and there where months before local showers had wetted the mud flows. There were eight or ten acacia trees in this grim, 20-mile piece of Wadi Allaqi.

Abdullah bade us stop beside a pile of stones on a gravel delta that emerged

from a narrow tributary. He also pointed to two cairns on the top of a black, barren hill to the north. Here was our destination, a branch of Wadi Allaqi called Wadi Umm Qareiyat (The Valley of the Mother of the Village). A short distance inside this wadi was shaft number nine of the deserted Umm Qareiyat gold mine. Two of us walked into the drift carefully, looking for vipers in the dust and rubble of the floor and along the ledges. About 20 yards inside was the shaft, or well. We got a rope and bucket and drew water from a depth of about 90 feet. After sampling the water, we congratulated Abdullah. Then we set to work establishing a base camp—two tents connected by a fly.

The next few days were spent exploring Wadi Umm Qareiyat and the adjacent parts of Wadi Allaqi. As I was checking the cliffs for signs of animals, I noted the wash of mud several feet high that marked the local flood waters of 1902. We trapped jirds (*Meriones crassus*) and gerbils (*Gerbillus gerbillus*) that were living on the bitter seeds of *handal* or ground gourd (*Colocynthis vulgaris*) and senna (*Cassia italica*), which grew abundantly in this area. Sand foxes (*Vulpes ruppellii*), which lived in the vicinity, readily entered live traps for the sardine baits, and we eventually caught six.

Abdullah shared our desire to explore and gave freely of his knowledge of the country. One day he suggested we go northeast about 40 miles to Bir Haimur and visit a Bishari friend of his, Gar el Nabi (Neighbor of the Prophet) who might know the whereabouts of hyenas. A few days later we set out for Bir Haimur via the wadi of the same name.

Gar el Nabi's camp, typically Bisharin, was three low, round, palm-mat shelters that stood on a rise just beyond a canyon where several wadis merged. We stopped at the west side of the canyon while Abdullah went to the camp to arrange our meeting. At the base of the cliff was an open, shallow, brackish well; one of the few watering places for the thousands of market camels and the caravans that pass each year over the ancient road from Sudan. This, I suddenly realized, was the last of the old caravan roads still in use.

Piles of charred remains of dead camels were scattered about the well area. They had been burned, we found out later, because the people believed that the odor of rotting flesh gave the water a bad taste. Before we realized it, camel ticks (*Hyalomma dromedarii*) were climbing up our legs and clothing. Hundreds more were crawling out of the gravel and racing toward us. We moved to the shade of the eastern cliffs and got free of them.

Preparations for the trip to Bir Murra began early the following morning. A barrel was filled from the well. The cook pre-cooked a quantity of rice and beans and the rest of us made a batch of Bedouin bread. Unlevened dough was rolled into thin sheets the size of a plate and baked on a hot piece of sheet iron. Abdullah shared in this operation and was most proficient. After rolling the dough out thin he kept it on the stick and deftly turned it off onto the baking iron. About noontime everything was in order. We took our lunch to Bir Haimur and ate in the shade of the cliffs.

The camel road between Umm Shilman plain and Bir Haimur

Gar el Nabi arrived and unlike most Arabs, wasted little time with greetings. He began almost immediately to tell us about hyenas. He said they lived in the Shilman mountains and fed upon the dead camels along the road. He told us that they sometimes came to drink at his well, but right now they were drinking every night at Bir Murra (Bitter Well), 15 miles to the east. He thought that would be the best place to shoot them, and he sounded so convincing that we decided to return the next day prepared for a two day hunting trip. Before leaving we gave Gar el Nabi five gallons of fresh water from Bir Umm Qareiyat and a promise of more upon our return. This token secured the bonds of friendship and the obligations of business.

After the heat of the day had passed we left for Bir Murra via the Umm Shilman plains. The ways in and out of the latter were not easy, we found, even for four-wheel-drive vehicles. For the first seven miles we crawled along in low gear through narrow wadis choked with steeply-sloping piles of sharp, angular rubble. Suddenly, the wadi we had been following opened into the Umm Shilman plains. When we saw that vast spread of sand strewn with mountains, all thoughts of bad roads were forgotten. We followed camel trails that meandered across that fantastic land, criss-crossed with tracks of gazelles and hyenas. Dead

camels seemed to be everywhere, and I counted 20 half-eaten carcasses in a five-mile stretch. Hyena tracks encircled almost every one. Gar el Nabi remarked that when a hyena finds a camel carcass it eats the fatty hump out first. Every camel I saw had the hump missing. Rocks in the vicinity of dead camels were smeared with the bleached excrement of vultures. Probably these diurnal scavengers feasted after the hyenas had torn open the dead bodies.

As we left Umm Shilman via a crooked pass that led down into Wadi Murra, some elongated piles of stone and a great number of camel bones caught our attention. Gar el Nabi told us that a year ago five people and thirty camels became lost in a sandstorm and died there. He found the bodies partly eaten by hyenas and put the remains under stones.

Wadi Murra was a winding, graded bed of coarse gravel 100–200 yards wide, bounded by low, steep hills and cliffs of disintegrating schist that looked like piles of rotting wood. Acacias, the only vegetation, grew sparingly along the edges of the wadi and on the terraces. Bir Murra was another shallow well and easily entered by animals. Hyena, gazelle and fox tracks were all around it. Gar el Nabi mentioned that he had seen a large herd of ostriches here in this wadi 30 years before when there was vegetation on the ground.

We placed five steel traps beside the water and then drove north one mile to another well. There we made our camp by spreading a canvas on the gravel and rolling out our sleeping bags. We were around a big bend in the wadi and out of sight and hearing of Bir Murra. Before sundown we put a large, live trap baited with sardines in a side wadi about 50 yards from camp. A few rodent live-traps were put under acacia trees and beside holes in cliffs. As the twilight deepened and evening prayers began, I had a sip of zibib, the Egyptian equivalent of the anise-flavored drink of the eastern Mediterranean.

We ate an early supper and then two of us and Gar el Nabi walked to Bir Murra. We carried shotguns loaded with buckshot and wore headlamps. Gar el Nabi was certain that we would see a hyena with the lights and that it would

Abdullah baking bread

stand and let us shoot it. No hyena was in sight, but a sand fox was in one of the traps by the well.

When we returned to camp tea was ready. We lounged around sipping tea and listening to Gar el Nabi and Abdullah talk about hyenas. We learned that the bravest Bishari fears the hyena and considers it to be very dangerous because of the belief that there is one hair from the lion on the back of the hyena. When questioned, Gar el Nabi knew no case of a hyena attacking a man or a living camel. He told of hyenas being attracted by sick or weak camels and hanging around while the owner kept guard. He told us that two months before, two hyenas had fought near the well and one was killed and partly eaten. He believed that when there are no dead camels to feed upon, the stronger hyenas kill and eat the weaker ones and the babies. I merely listened without comment.

I had read the hyena lore in the writings of earlier explorers in Egypt. Guides such as mine had warned them to be careful when sleeping out in the desert not to let a limb protrude from the blankets lest a passing hyena snap at it. The hyena was regarded as a wicked enchanter, metamorphosed by the anger of God. For this reason the hair, teeth, bones and flesh of the hyena were thought to possess miraculous powers and were in great demand. Lying on a hyena skin was supposed to eliminate pains in the back. The skull was believed to bring good luck to the household under whose doorstep it was buried. Certain parts were boiled and swallowed by barren women who wished to become fertile. Many were the stories of hyenas preying on dogs, donkeys, men and especially children. No wonder primitive people live in awe of this beast.

That evening I determined that if we were going to get a hyena we had better drive down to the well and shoot one before it could escape into the hills. Before leaving we checked the live-trap near camp and found that while we were talking a hyena had dragged it about 25 yards. Four excited men climbed into the car; two carried shotguns and one, a spotlight. We hugged the eastern side of the wadi until we were around the bend, and then raced in the direction of the well. There was nothing in sight so we drove a few miles on down the wadi, frightening two gazelles that had been feeding in acacia bushes. At 10:30 we made another run down the wadi. As we approached the well, the lights reflected white from the eyes of a hyena.

Dead camels. The dry desert air mummifies the carcasses, after the hyenas and other scavengers take their toll.

It stood still for a moment, and when I accelerated, it turned and ran across the wadi. We came within range just before it reached the hills and killed it with three quick shots. This was a long-awaited occasion. Gar el Nabi plucked a whisker from it and tucked it under the thong which held the small leather box of prayers above his right elbow. This charm from a freshly-killed hyena he considered to be very strong protection against the "evil eye." About every

hour and a half during the night we drove down the wadi. Several times we saw a hyena, and once more we brought one down.

At dawn we began the work of skinning. Gar el Nabi pulled a double-edged knife from a sheath on his left arm and helped us. It was no easy job, for each animal had a thick layer of fat under a rather thin skin. The fur of these hyenas was very clean. One smelled only slightly of dead camel. The stomachs contained small pieces of bone and camel skin. Gar el Nabi took the eyes of the hyenas, saying that he would dry them and hang them around the necks of his young boys to make them brave. He informed us that this amulet required about one month to take full effect. He wanted the canine teeth, too, because he believed they transmitted strength and virility to the wearer. He said that men hang a tooth around the neck and women hang one in the armpit. I asked him if he ate hyena meat. He did not, but he told me that the Nile people ate the flesh as a cure for rheumatism and the heart to give them courage. Had I known then that the ancient Egyptians fattened hyenas and ate them, I would certainly have tried the clean-smelling meat myself.

When the skins had been prepared we drove half way to Umm Shilman plains and spent the remainder of the day eating and resting in the dense shade of an acacia. After eating the last of our beans and rice, I fell asleep listening to the bubbling of a Bedouin's water pipe.

Though we spent the night routinely hunting the plains, we saw nothing. The following morning a search in the boulder hills indicated that hyenas were no longer living there; they had undoubtedly moved to Wadi Murra. Taking stock of what we had seen, we figured we could count on three more hyenas in Wadi Murra, and decided to return.

Gar el Nabi making coffee

We followed the main camel road out of Umm Shilman. The individual trails, diverging and converging between windrows of stones made driving the slowest I had ever encountered. It took us two hours to go eight miles. Gar el Nabi remarked to one of the Bedouins in my crew that he had lost a sandal on this road two years before (and we wondered if that was the reason we had been guided this way). Anyway, our frustration ended at Gar el Nabi's camp when glasses of tea were placed in our hands.

Several days later, when we returned to Bir Haimur, a large herd of camels was being watered at the well. Three fuzzy-haired Bisharin with swords hanging down their backs came to meet us. They had heard of the "hyena hunters" and held us in esteem. Gar el Nabi stood by looking very proud.

Before we left for Bir Murra, Gar el Nabi honored us by making coffee. Through a hole in one end of an old water skin he withdrew an odd assortment of coffee-making implements. First he put some beans in a sardine tin fitted with a handle of twisted wire and roasted them over the fire. Then he pulverized the beans in a wooden mortar with the end of his cane. The coffee was boiled in a small, globular tin pot with a narrow spout. A bit of ginger was added, but no sugar. When the brew had boiled to his satisfaction, a wad of palm fiber was stuffed into the spout for a filter and coffee was poured into China demitasses.

While we sipped coffee, we discussed the likelihood of finding hyenas this trip. Gar el Nabi told us that the previous evening his young boys had seen a hyena beside the well. They had thrown stones and the dog had barked at it, but it had not run away. This hyena, he said, could be expected to return, so we decided to go to Bir Murra as planned and hunt near Bir Haimur the next night.

This time we detoured the Umm Shilman plains and took a route that was sand and gravel all the way to Bir Murra —20 miles in only 45 minutes. Traps were set and the night hunting routine was carried on as before. We saw the three hyenas and succeeded in shooting one. The following night we shot another near Bir Haimur. This one was an old female with her teeth worn to the gums; yet, she was as fat as the others we had shot.

In our conversations with Gar el Nabi we learned of a place where the *wabr* or hyrax (*Procavia syriacus*) lived. This is a rabbit-sized animal with small ears and no tail and called coney or dassy in the Bible. Being an opportunist and a collector I decided a few days spent in search of this animal would be well worth the time. Our guide took us north of Bir Haimur over 12 miles of wretched camel road into a wadi where there were prehistoric carvings of ostriches in the rocks. *(continued on page 14)*

Watering Camels at Bir Haimur

Selections from the 23rd Chicago International Exhibition of Nature Photography

February 1968, Sponsored by
Chicago Nature Camera Club
and Field Museum

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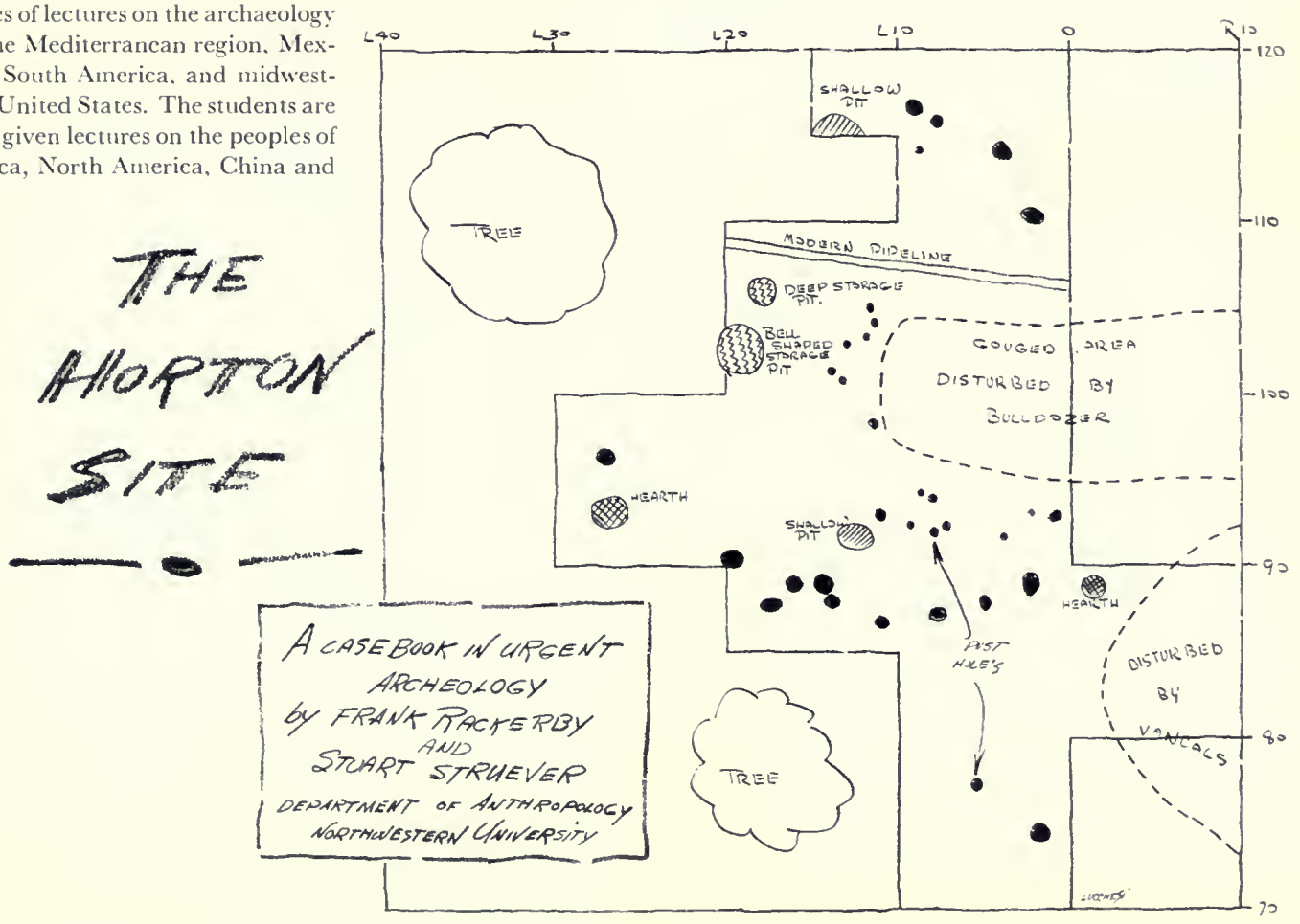
BLE MENTION
BI, KENYA

IN THE past two summers archaeological excavations have been carried out at the Horton Site, located in suburban Flossmoor, just south of Chicago. These excavations were part of the Field Museum's Summer Training Program in Anthropology. This program, which receives its financial support from the National Science Foundation, is directed by Miss Miriam Wood, Chief of the Raymond Foundation.

Each summer for one week the 25 students of the class have been given the opportunity to learn archaeological theory and field methods by participating in the excavations of a local Indian camp site. This week of field work is the climax of a six-week course introducing the students to the field of anthropology. The course is open to all High School Sophomores and Juniors who live within commuting distance of Field Museum. Selection of the 25 students is based on their academic achievement, recommendations by their teachers, and personal interviews of the highest rating applicants with members of the staff of the Raymond Foundation. Since anthropology is otherwise unavailable in a high school curriculum, this course provides these high-ability secondary school students from the Chicago metropolitan area with an opportunity of receiving an introduction to this field before they enter college.

Raymond Foundation anthropologists Edith Fleming and Harriet Smith are the instructors for the course. The program is intended to provide a general survey of the field of anthropology, from lectures on Fossil Man, through a series of lectures on the archaeology of the Mediterrancan region, Mexico, South America, and midwestern United States. The students are also given lectures on the peoples of Africa, North America, China and other parts of the world. Research specialists in each of these fields come to the Field Museum to lecture to the students.

After several weeks of lectures and discussions of the various aspects of anthropology, ranging from human evolution to the social life of various peoples, the students participate in actual archaeological field research. The intensive training in anthropology in the weeks preceding the excavations helps the students to grasp the relationship between archaeology and anthropology. They are taught to understand the kinds of questions about culture that the archaeologist tries to answer when he goes into the field to excavate a prehistoric site. An archaeologist does not dig to collect materials primarily for their esthetic value or for display, but to gather information which, when analyzed by the archaeologist with training in the science of culture, provides a reconstruction of the life patterns of an extinct people. The students are taught that archaeologists are not the collectors of *things*, but of *information* about prehistoric cultures. The pieces of pottery, arrow points and other artifacts which the students excavate are valuable as clues to the behavior of the extinct people. The scientific value of the specimens can only be retained by collecting this information using rigorous excavation methods. Before the students began excavation of the Horton Site they were given lectures on the methods of scientific archaeology so that when they picked up a shovel, they knew how to dig and why.



The Horton Site

The Horton Site lies in a small meadow near Butterfield Creek. On the southern edge of expanding metropolitan Chicago, this area is being rapidly converted into subdivisions and shopping centers. Parts of the Horton Site had already been destroyed by the construction of a road and sidewalk for a subdivision. The site was discovered by Vernon Grubisch, a high school student and amateur archaeologist from nearby Chicago Heights. Grubisch had closely followed the gradual destruction of the ancient settlement; he collected artifacts in the areas disturbed by power machinery. Realizing that Horton represented an ideal location for its excavation project, and that the total destruction of the site was imminent, Field Museum contacted Mr. Michael O'Malley, who granted permission to excavate portions of the site situated in his subdivision.

The first class of the Anthropology Summer Training Program, under Struever's direction, began excavations at Horton in 1966. During the ensuing winter no further destruction occurred at the site, and Mr. O'Malley granted permission for a second season's work. During this second year of excavation, Rackerby continued the line of excavation units begun the previous summer. By doing so, the plan of a former Indian house was almost fully exposed, as well as several storage pits and other types of subterranean constructions, called features by archaeologists. These features reflect the kinds of domestic activities that occurred at this location some 500–600 years ago.

Excavation Strategy

The purpose of the Horton Site dig was twofold—to demonstrate to the students proper archaeological excavation methods, while retrieving valuable information on a prehistoric community before its destruction by the housing development. On the basis of the pottery fragments — or sherds—which were found on the surface of the disturbed area of the site, it was determined that the occupation belonged to the cultural tradition known to archaeologists as *Upper Mississippian*. The strategy for the excavation the first summer was primarily to determine the limits and depth of the occupation, as well as to collect information on the village plan. A topographic survey map was made of the area, and a grid system of 10-foot squares was staked out on the surface of the site. The students were grouped into teams of three and assigned to excavate one of these squares. All of the soil from each square was screened and the artifacts were bagged and labeled separately for each square and for each level which the students dug. In this way both horizontal and vertical relationships of all types of cultural debris screened from the soil were recorded.

Earlier in the 20th century the entire surface of the site had been plowed, thus disturbing the cultural remains to a depth of 8 inches. This level was carefully shoveled off and screened, and the material recovered was kept separate from the underlying, undisturbed level. The Horton Site proved to be very shallow, running to a depth of no more than 12 inches. In the second level many larger pieces of pottery, stone tools, and the tops of pits and post holes were first encountered.

The first season's exploratory excavation revealed several dark, circular stains, 7–8 inches in diameter that are interpreted as the remains of former house posts. The second season's work focused on this area and thereby exposed the pattern of the house and its associated pits. This part of the site extended into a lot owned by Mr. William Sikkema, who kindly gave permission to continue the excavations on his land.

Author Frank Rackerby shows Andy DePeder the square he will dig. Drawing on page 12 was done by Artist Roxanne Pearson-Rackerby, the Author's wife.

Each student learned to keep his own notes and to record detailed observations as the work progressed. These notes, together with the archaeologists' drawings of the features, and the artifacts and natural material (unworked stone and bone), are the evidence from which archaeologists reconstruct former cultural activities.

The information recovered by the Horton excavations can be grouped into three classes: artifacts, features, and debris. Debris includes such food evidence as discarded animal bones and shell, as well as items like hearth stones or waste flakes chipped off in the manufacture of stone tools. Features are the observable remains of former building activity, such as house construction or the digging of storage or cooking pits. The artifacts themselves provide clues to much of the behavior of the extinct people. Artifacts may be tools which functioned in the technology of the culture, such as arrow points or flint knives. Other artifacts, such as ornaments or smoking pipes, functioned in their social life, either as items for recreation or as symbols to communicate status.

Cultural Reconstruction

The following reconstruction of the Horton Site occupation is based primarily on the field observations of the authors. Some preliminary washing and sorting of the artifacts from the site was accomplished during laboratory periods with the class, but the bulk of the material collected

remains to be analyzed. These conclusions illustrate how archaeologists go about their task of cultural reconstruction after the excavation is completed.

The Horton Site was found to be primarily a single component site; that is, it was only occupied during one prehistoric culture period. This occupation belongs to the Upper Mississippian Period, beginning about 1400 A.D. and extending into the historic period in this area. This dating is based upon similarities between pottery from the Horton Site and from other Upper Mississippian sites of known age. A few sherds from an apparent earlier occupation period were observed the first season. Within the Upper Mississippian period there are several local variations known to archaeologists, such as the Langford Tradition which is centered in the Upper Illinois River Valley. A second Upper Mississippian tradition, similar to the Oneota of Wisconsin, is the "Blue Island Culture" localized in the southern Chicago area. The Horton pottery places this site in the Blue Island Culture. The Anker Site, located on the Little Calumet River four or five miles away, is very similar in ceramic and projectile point styles to Horton.

All of the observed Upper Mississippian ceramics from Horton were shell-tempered. There were few sherds with incised and punctuated shoulder decorations, and many rim fragments were notched. Most of the sherds were fragments of plain globular vessels approximately 6 inches or more in height.

On right, sherd found at Horton Site; on left, complete pot of similar ceramic tradition from nearby Fisher Site

Although the ceramic remains tell us where to place the site in time, interpretation of particular activities carried out at the site is based on other kinds of evidence.

Quantities of large mammal bones were recovered. Most belonged to the white-tailed deer; buffalo bone was rare or absent. The archaeologist observed few bird bones, while fish remains and fresh water mussel shells occurred in small amounts in different areas of the site.

These observations in part reflect the animals exploited by the Horton residents, and when correlated with the artifact evidence they enable us to infer a prehistoric subsistence pattern of which the Horton occupation was part. Projectile points occurred in high frequencies. These reflect a bow and arrow technology used to hunt the deer and other mammals documented by the Horton bone assemblage. While there are abundant projectile points on the site, little flint debris was recovered except for tiny chips of the kind produced by sharpening and reshaping a tool. It appears that finished chipped stone tools were being brought to Horton with only minimal tool maintenance preformed there.

The excavators also recovered an abundance of chipped flint tools interpreted as scrapers and apparently used in preparing animal hides for tanning. Several flake knives were also recovered. The arrow heads, scrapers and knives, together with the mammal bones, comprise a hunting-butchering assemblage indicating that the killing and processing of large mammals (particularly deer) was a major activity carried out at the site.

Seed-grinding tools, such as manos and metates, were absent at Horton. The combined evidence suggests that this site functioned differently from Anker and other Upper Mississippian sites in the area. Seed grinding and agricultural tools, along with charred corn remains, are often found in abundance in these other sites.

Also lacking in the Horton Site artifact assemblage are "tools to make other tools," such as hammerstones, bone awls, flint working tools, etc. Therefore, tool manufacturing was not a major activity at the site. This indicates that all the recovered artifacts were carried to the site in their finished state. Nor was Horton an agricultural settlement since farming tools and evidence of corn was not recovered. Instead, the Horton community focused its attention on the exploitation and processing of wild food. The hunting of large mammals was most important, and the collecting of fish, mussels and birds provided additional food.

The 1966 and 1967 excavations recovered quantities of hearth stone, attesting to the importance of cooking and perhaps household heating to the settlement. Some of the pit features contained quantities of this stone and appear to be undisturbed hearths. Unfortunately many other hearths, and other constructions at or just below the ground surface, have been destroyed by plowing. Their presence is reflected only by the cooking stones and charcoal dispersed through the plowed soil of the site. Analysis of this charcoal will tell the archaeologist what woods were being selected for fuel. This same charcoal will also allow us to accurately date the site by the radiocarbon method.

Bone artifacts are notably rare at Horton. In the other Upper Mississippian sites in the Chicago area many bone tools were recovered. Since the majority of bone artifacts serve manufacturing purposes, their presence in some sites and absence at Horton points up an interesting contrast in the activities performed in different Upper Mississippian settlements in one region.

No beads or other ornaments were recovered by the Horton Site excavators, although a fragment of a tobacco pipe with a design reminiscent of a stylized bird was excavated by one of the students.

A particularly interesting contrast between Horton and other Upper Mississippian sites in the area is the lack of burial mounds or cemeteries associated with the living area.

Three fragments of human bone were screened from the disturbed upper level which suggests that at least one burial took place there, but the important difference between the sites is the degree to which human remains are lacking at the Horton Site.

Debbie Loeff and Marlene Dubas remove the plow zone down to undisturbed occupation level, while Terry Patten sifts out the mixed cultural content.

A total of 23 10-foot squares was excavated by the students during the two seasons of excavation. Besides the several thousand pot sherds and hundreds of stone artifacts, fragments of animal bone, and flint chips, 53 post impressions and 13 pit features were recorded. Most pits appeared to be filled with water-laid silt, suggesting that the pits were refilled by the natural process of erosion. Two large pits, both located within the walls of the house, contained many large pieces of pottery and animal bone and appear to have been filled in rapidly with this refuse material. These pits undoubtedly were used as storage containers in the floor of the house, probably for food and tools. Most of the other pits were shallow basins and appeared to be roasting ovens or disturbed hearths rather than storage containers.

Thirty-one of the recorded post molds form part of an oval-shaped house. The larger posts, which form the outside perimeter of the structure, are 8–12 inches in diameter, while the internal supporting posts are only 4–5 inches in diameter. This framework of wooden poles was then covered over, probably with thatching or animal skins. Similar oval houses have been found at other Upper Mississippian sites in the area. The post size of the Horton house indicates that it was a fairly substantial structure, approximately 30 feet wide. Post molds recorded in other squares suggest that additional houses existed on the site, but these areas were not sufficiently exposed during our excavations to determine their size and shape.

On the basis of all the evidence at hand we suggest that the Horton Site was a hunting settlement occupied by a small group of people during the fall and winter months. At this time of year deer hunting is most successful in the sheltered secondary valleys like the Butterfield Creek area. In the spring and summer these people might join with others to form a larger agricultural villages during the corn-growing season. The Anker Site has been interpreted as such a summer agricultural settlement. At sites of this type the inhabitants would manufacture tools and grow corn which would then be stored there for consumption the following spring. Part of the corn crop might also have been taken to winter hunting camps, like Horton.

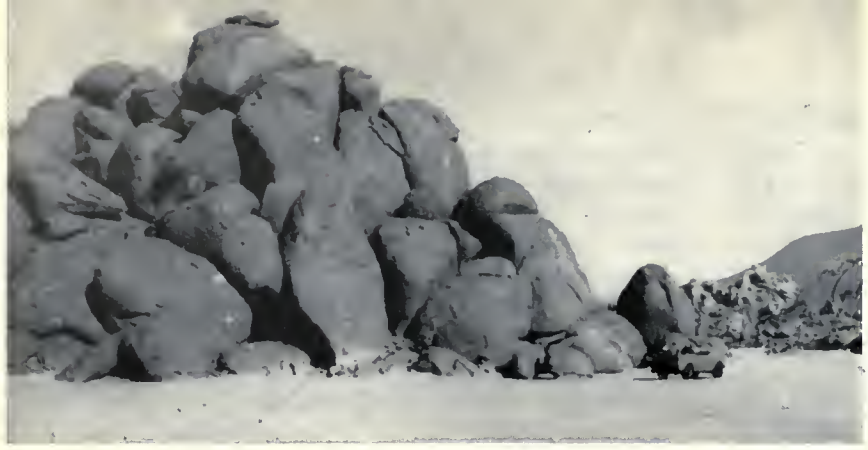
The fact that the recorded house appears to have been of substantial construction, when combined with the abundant evidence for deer hunting and the lack of agricultural tools, argues for a repeated winter occupation of the Horton Site for several years during the Upper Mississippian Period.

Diminishing Archaeological Resources

Numerous prehistoric sites, like Horton, have been and are being destroyed as a by-product of the residential and industrial expansion of Chicago. These sites, and others like them throughout North America, are the only "books" that record the history of man's occupation of this continent before the time of Columbus. Once destroyed, these sites can never be replaced and the historical information contained in them is lost forever. This makes the science of archaeology truly a race against time. Today, Chicago and other cities are expanding rapidly over the areas formerly occupied by prehistoric peoples. In most cases the historical record is destroyed without being investigated.

Lunch

The opportunity to carry out the urgently needed excavations at the Horton Site was fortunately provided by the Field Museum's Summer Anthropology Program. This program begins—earlier than is customary—the process of introducing students to archaeology as the scientific study of man's past. From their experience at the Horton Site, Field Museum's students all learned the critical reason for excavating sites in urban areas. Only by carrying out excavation programs *now* can archaeologists hope to reconstruct the prehistory of these metropolitan areas.



A boulder hill on Umm Shilman plain

(continued from page 6)

With the feelings of men who have looked upon isolated oases in the Sahara, we gazed at the grandeur of Wadi Nagib. Scattered along the few miles of this winding, cliff-bordered valley were luxuriant shrub acacias, *salam* (*Acacia ehrenbergiana*) and huge spreading trees, *sayaal* (*A. raddiana*). The fresh foliage and yellow blossoms of the *salam* were brilliant in the morning sun. Scattered clumps of *araa* (*Aerva persica*) stood out snow white against the sand and the glandular leaves of the cushiony *mashta* (*Cleome droserifolia*) glistened as though covered with dew. Sinuous drifts of golden sand swept down from the lees of the eastern promontories.

White streaks from hyrax urine on the broken western cliffs indicated several active colonies. Fresh tracks followed the cliff bases and trails out to the trees. We shot a young hyrax that was watching us from a crevice, then waited, as usual but no more appeared.

We went to the base camp for supplies and returned the following morning to Wadi Nagib. There were no signs of hyrax activity from the night before. For two days we waited patiently for them to appear. Late the second evening, nine were seen bounding over the rocks far out of range of our guns. Though we had placed traps in every trail, we caught only one other young one. We had been outwitted and outwaited and had not the time to remain longer. However, the specimens we had were valuable since the nearest localities of previous collections were Gebel Elba in southeastern Egypt and in Sudan.

Next morning farewells were expressed over many glasses of tea at Gar el Nabi's camp. We made him a casual gift of several kilos of sugar, a tin of tea, and a bag of rice; knowing he would refuse and quite possibly be insulted if we offered him money for his help.

Two days later we had established a new base camp on the shore of the gradually rising water of the Nile, now known as Lake Nasser. There we enjoyed a cooler campsite and a bathing beach on a bay that extended into what was formerly the mouth of Wadi Allaqi. We were in the land called Nubia, a name that usually brings to mind narrow strips of green along the Nile, waving palms, and gaily-decorated mud houses. All these were gone; inundated. Of Allaqi village, all that remained above water was the minaret of the town mosque. The palm logs that once supported thatch roofs were scattered along the shore. The gay and colorful Nubians had been relocated to Egyptian designed compounds near Kom Ombo. Between the water and the desert there was nothing now except a thin contour of pioneer vegetation (mostly *Hyoscyamus muticus* and *Pulicaria crispa*) that marked the high water level, about five feet above the present. In the future, Lake Nasser will creep gradually eastward nearly 50 miles into Wadi Allaqi and up to our old campsite at Umm Qareiyat.

The first night on the Nile a hyena passed within 25 yards of camp while we slept. Next day we found the tracks of hyenas and jackals (*Canis aureus*) which crossed the plains at night to drink from the Nile and to eat dead fish thrown out by fishermen. We spent several days following hyena trails into the sandstone mountains but never found an occupied den. At night we hunted back and forth over the plains, eventually shooting two jackals and four more hyenas. One hyena was killed as it carried the body of another which we had left on the plain. I regret to say that in spite of our close contact with hyenas, we never heard them. Our traps on the barren sands and sterile rocks took a small catch of gerbils and spiny mice.

The last day in Wadi Allaqi, under a scorching afternoon sun, we followed the tracks of two gazelles until we cornered the beautiful creatures in a canyon. Thus, two more valuable specimens were added to the collection. That night the carcasses were turned slowly over a deep bed of coals and as the meat sputtered and roasted we feasted.

Having eaten and stirred up the fire, the sounds of our own tea drinking and the bubbling of a water-pipe lulled everyone into meditation. I guessed the thoughts of all were the same—we were reliving those exciting nights of the chase, and we were all wondering if we should believe our own observations of the shy and retiring hyenas or the intriguing tales of the Bisharin.

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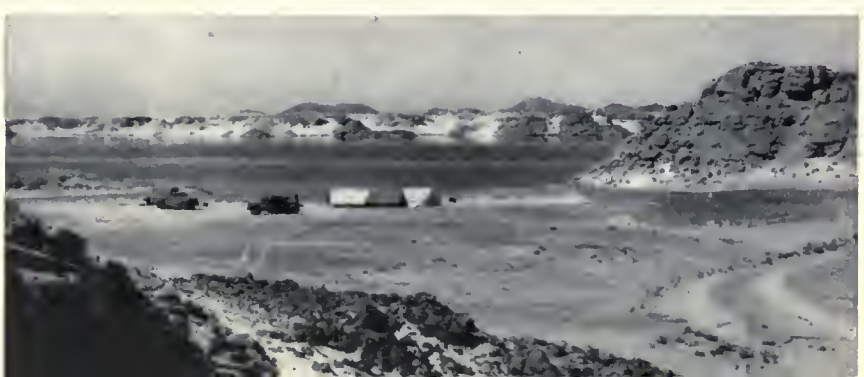
The camp at Lake Nasser



PLAN GEOLOGY TRIP TO OZARKS

Field Museum, in cooperation with the University of Chicago, will sponsor a Geology Trip to the Ozarks, April 21–27. The Ozark region is a diversified geological area that consists of igneous and sedimentary rocks. The oldest igneous rocks and granites were once molten, and are at least one billion years old. The area was many times under the sea, and into it sediments—dominantly limey—were deposited. These later became sedimentary rocks. Other geologic processes produced deposits of minable ores, particularly lead and iron. A wide variety of geological phenomena will be studied in the field and will be supplemented with the evening lectures. Fossils and minerals will be collected in the mines and quarries.

The group will depart by train to St. Louis on Sunday, April 21. From St. Louis the group will continue travel on a chartered bus. The return to Chicago is scheduled for Saturday evening, April 27.

Tuition including all transportation and hotel accommodations is $85. For those wishing private facilities an extra fee will be assessed. The trip will include four long hikes, for which hiking clothes are strongly recommended.

Photo by S. Silverstein

Matthew H. Nitecki, Assistant Curator of Fossil Invertebrates will conduct the tour. For further information and application forms, please phone Miss Barbara O'Connor, at the University Downtown Center, FI 6 - 8300.

CALENDAR OF EVENTS

March Hours: Open from 9 a.m. to 5 p.m. daily.

March 1 – 31 Chicago Shell Club's Annual Shell Fair. Displays of hundreds of shells reveal the fantasy of form and color in the shell world. Exhibits are arranged to show the development of shells and their geographical distribution.

March 2 Film-Lecture Series: Laos by Kenneth Armstrong, 2:30 p.m. in James Simpson Theatre.

March 9 Film-Lecture Series: Outdoor Yearbook by Karl Maslowski, 2:30 p.m. in James Simpson Theatre.

March 16 Film-Lecture Series: Alaska—America's Frontier State by Harry R. Reed, 2:30 p.m. in James Simpson Theatre.

March 23 Film-Lecture Series: The Two Worlds of Polynesia by Stanton Waterman, 2:30 p.m. in James Simpson Theatre.

March 26 Indiana University's Chicago Showcase of Music: Baroque Chamber Players, one of the nation's outstanding groups, presents the final concert in this series. Free tickets are available upon request. 8:15 p.m. in James Simpson Theatre.

March 30 Film-Lecture Series: The Congo by Lewis Cotlow, 2:30 p.m. in James Simpson Theatre.

March 31 Audubon Wildlife Film: Galapagos—Wild Eden by Roger Tory Peterson. This is a rare field trip to equatorial volcanic islands inhabited by some of the strangest creatures in the world—giant tortoises, sea-going lizards, penguins, Waved Albatrosses and the beautiful Fork-tailed Gull. 2:30 p.m. in James Simpson Theatre.

Through May Spring Journey: Plants that the American Indians Used

MEETINGS:

Chicago Mountaineering Club, March 14, 8 p.m.
Sierra Club, Great Lakes Chapter March 19, 7:30 p.m.

METEORITE TALKS SET

A course consisting of three informal talks on meteorites is offered for the first three Saturdays in April (Apr. 6th, 13th, 20th). The talks will be given by Edward Olsen, Curator of Mineralogy and will cover all aspects of meteorites, meteorite work, and theories about them. First hand examination of specimens will be included. Each session will be approximately two hours long, starting at 10:00 a.m. The course is limited to 25 adult Members of the Museum. Reservations must be made by mail on a first-come-first-serve basis. Write: Dr. Edward Olsen, Curator of Mineralogy, Field Museum of Natural History, Chicago, Illinois 60605.

FINAL BRIEFINGS

Members of Field Museum's Mexican Tour will view a unique motion picture on Mexican archaeology and on the development of pre-Hispanic civilizations on March 29. "The Ancient New World" illustrates its commentary with museum artifacts which are given a life of their own.

Speaker of the evening will be Dr. Donald Collier, Chief Curator of Anthropology, who will discuss the peoples who created the great cities of Indian Mexico. Other programs for the Tour include: March 15—Erwin Bach, Camera Editor of the *Chicago Tribune*; March 18—George Schneider of the Art Institute of Chicago, and March 22—Phil Clark of the Museum staff.

George Schneider

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor

Volume 39, Number 4, April 1968

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Members' Night, May 3

A preview of the special exhibit, "Masada—King Herod's Fortress," and a program of music, dance, motion pictures and a slide lecture related to the exhibit, will highlight the Museum's 1968 Members' Night on May 3. The music and dance events, including songs by the Amranim Brothers, Shalom and Barak, third generation Israelis of Yemenite descent, and performances by the Habonin Israeli Folk Dance Troupe will be in Stanley Field Hall.

The Masada Exhibit is of deep significance to archaeologists, Middle Eastern historians and scholars of the Old and New Testaments. Some of the scrolls found at Masada have added important information to what is known about the Dead Sea Scrolls and the life of Jesus.

These finds, plus large scale photo murals, coins, weapons and a diorama in miniature of Roman legions laying siege to Masada, make up the display. The Exhibit opened in London and has been complimented in the continental and national press for its graphic design as well as its archaeological impact. Organized by the Jewish Theological Seminary of America and the Israel Exploration Society, the Exhibit enjoyed a successful United States premiere at the Jewish Museum in New York.

Built in 36 B.C. by King Herod the Great, Masada was a luxurious retreat and strong fortress against a feared attack from the armies of Cleopatra of Egypt. It was in this rock fortress in 73 A.D. that 960 Jewish men, women and children gave up their lives rather than go into slavery, when 7 years of revolt against the Romans ended in defeat.

A slide lecture, "Masada, A State of Mind," will be given by Marc Michaelson, former Travel Editor of Chicago's American and Director of Publicity for the Tourism Council of Greater Chicago. Michaelson, who visited Masada last year, will speak at 7:30 and 8:30 p.m. A film on the Masada excavations by the British Broadcasting Company and a motion picture on the Bar-Kokhba Caves, where the Jewish resistance contined after the fall of Masada, will be shown continuously from 7 to 10 p.m. Two half-hour music and dance programs will be given at 7 and 9 p.m.

Research and exhibit preparation areas of the Museum, including some special exhibits related to Field Museum research, explorations and acquisitions, will be open on the third and fourth floors from 7 to 10 p.m. "Tibet—Highland of Monk and Nomad," the Museum's new permanent exhibit on the second floor, will be illuminated and open for the evening.

The special Members' preview of "Masada" will continue from 3 to 10 p.m. Refreshments will be served from 7 to 10 p.m., and the cafeteria will be open from 6 to 8 p.m.

Masada

Photo by Yigael Yadin.

The nearly sheer walls of Masada rise 1,300 ft. above the western shore of the Dead Sea in Israel.

Photo by The Jewish Museum.

Volunteers came from as far as the U. S. and Australia to work on the Masada excavation.

Photo by The Jewish Museum

Chartered buses will leave at frequent intervals throughout the evening from State and Jackson Streets, and return trips from the Museum's south entrance will continue until 10 p.m.

the Quest for the Dancing Worm

by Edward G. Nash, Managing Editor

Mr. JAMES HOOKS, who delivers the mail at Field Museum, has delivered many thousands of interesting, curious—even bizarre—letters and packages over the years. Field Museum scientists are called to give advice in many fields, some of them quite unexpected. Hymen Marx, Associate Curator of Reptiles and Amphibians, for instance, recently gave some advice to a young lady employed as a "Go-go" dancer in Texas. The lady used a Boa Constrictor in her act. She wanted to know how to tame it and keep it from biting. Mr. Marx was able to recommend a popular book on snakes by a former staff member, Clifford Pope, and also suggested that a reticulated python, which "will reach coverage size, and has a much milder and gentler disposition," would be a better candidate for work in the performing arts.

Articles in the BULLETIN often prompt letters of great interest, and few have provoked more comment than a story by Eugene Richardson, Curator of Fossil Invertebrates, called "The Tully Monster" (BULLETIN, July, 1966). Richardson told of a worm-like fossil of uncertain relationships which had been found in the Pennsylvanian (280 million years old) deposits of Mazon Creek, Illinois. He had previously described it scientifically in the weekly journal *Science*, with an official name, *Tullimonstrum gregarium*, named for Francis Tully, Lockport, Illinois, who had brought in the first specimen. It was such a strange animal that the author was unable to assign it to a phylum, which disturbed his sense of order—it would upset any systematic biologist.

The animal ranged in size from 2¼ to 14 inches, "at one end of the dirigible-like body was a spade-shaped tail; from the other extended a long, thin proboscis with a gaping claw; across the body near the base of the proboscis was a transverse bar with a little round swelling at each end, outside the body."

The response to this little animal, which may have eaten fossils so indistinct that Richardson could not even assign them to a kingdom and simply termed them "Blobs," was immediate and extensive. Many of Gene Richardson's friends took the time to write with helpful comment. One doctor noted the Tully Monster's "impish benevolent, almost Schmoo-like, expression on its cuddly frame." Another correspondent insisted that Gene had the animal backwards, and that what appeared to be fins on the tail were in actual fact ears on the head. "This view is reinforced by the obvious resemblance of *Tullimonstrum* to a certain black dog I know who has ears like that." A Norwegian woman pointed out that the whole thing sounds funny to Norwegians because "tull" means "nonsense" in that language.

One of the most interesting exchanges was with Mr. F. W. Holiday, of Pembrokeshire, Great Britain. Mr. Holiday has been a student of the Loch Ness Monster for more than thirty years. He has watched the Loch Ness Monster become, from what appeared at first to be myth, the object of serious scientific research. Mr. Holiday wrote, "I think I was the first to suggest (*Field* magazine, 1st. Nov., 1962) that the Loch Ness Monster was probably an invertebrate. Last year I narrowed the gap still further by stating my belief that the LNM was a worm—a view which I still hold."

Holiday enthusiastically suggested a close relationship between Loch Ness Monster and *Tullimonstrum*. Richardson replied that a time lag of 280 million years and a difference in size of one foot (TM) versus 40 feet (LNM) made such a relationship unlikely.

The correspondence provided Gene Richardson with a close view of the present state of the Loch Ness Monster. Holiday clearly thinks it a worm. Professor Mackal of the University of Chicago is inclined to the idea of a very large mollusc. There is still support for the sea snake, and other vertebrate, explanations. The Adventurers' Club of Chicago has provided support for some of the research on the monster. Holiday himself says he has seen the thing four times in a span of sixteen weeks at the Loch. He also mentions some strange creatures living in the Loughs of western Ireland, being investigated by Captain Lionel Leslie, a cousin of Sir Winston Churchill. Holiday remains convinced of a relationship between TM and LNM.

In early September of 1966, Mr. James Hooks delivered the first of a series of letters which were to launch Gene Richardson on the Quest for the Dancing Worm. It was an airletter, postmarked Nairobi, Kenya, and it read:

1/9/66
P. O. Box 30009
Nairobi

Dear Dr. Richards:

A recent issue of the East African Standard contains an illustrated article describing a curious prehistoric creature you discovered. This jogged my memory, carrying me back some forty years, of a tale I once heard that may be of some interest.

In 1926 having been seconded to the Kings (now Kenya) African Rifles from the Indian Army, I was in northwestern Kenya dealing with some border incidents. Passing through the administrative centre of Lodwar on my return journey, I took the opportunity of calling upon Mr. A. M. Champion, then D. C. Turkana District. In addition to being a keen shikar, Champion was a naturalist of the first rank, and during the two evenings I passed in his company he regaled me with many a fascinating yarn about the fauna of the area. Among these was one about a remarkable worm reputed to live in the swamp country to the southeast. The local tribesmen told fantastic stories about its dancing and and giving milk, if I remember correctly. Such nonsense aside, Champion did give me a description of the creature which he had obtained from various natives (he never succeeded in getting a specimen) and this curiously enough has remained in my memory when much else has been forgotten. His account agreed remarkably well with the illustration of your "Tully Monster," even to the "paddles" and the long snout. Your mention of sharp teeth, incidentally, does agree with a Turkana tale that the creature bites. On this account they are deathly afraid of it, believing that it is poisonous. But then nearly all natives believe everything of the creeping or crawling kind to be venomous.

I hardly dare to suggest that a relation of your extinct "Monster" still survives in one of the remotest parts of East Africa, but it might just be worthwhile to pursue the matter.

Yours faithfully
R. G. L. Cloudesley
(Lt.-Colonel, ret.)

Artist's impression of Tullimonstrum *in its natural habitat. (Drawing was used as cover of the July, 1966,* BULLETIN.

Richardson's original BULLETIN article had already been picked up by a Boston newspaper for its Sunday Supplement; now, it appeared, the story had also been used in the *East African Standard*, perhaps the best known newspaper in the countries of former British East Africa. We began to hope it would make the *Straits Times* in Singapore, as well. What world coverage! As happens in many newspapers on rare occasions, the facts were a little bit garbled, and the author's name appeared as Dr. Richards, of Field's Museum. A forgivable mistake.

Intrigued and flattered by the attention, Richardson was penning a reply to Colonel Cloudesley (ret.) when a second airletter arrived, postmarked Nakuru, Kenya. Nakuru is a town about a hundred miles northwest of Nairobi on the Uganda Railway. Turkana District, Gene learned from the *Times Atlas*, is more than 400 air miles north–northwest of Nairobi on the Kenya–Sudan border. The letter was written in an even, graceful hand suggestive of the mysterious East. It read:

P. O. Box 568
Nakuru
Honoured Sir: 13 September 1966

I have now seen in an old copy of the Standard

the account of a wonderful monster you have found in your country. Sir, I believe that it also lives here in Kenya! My cousins Aowind and Manu have often told me of the dancing worm of Turkana, and what they say is very like your article. What triumph it would be to catch one.

Turkana is far from here and full of naked men with spears, but my uncle Motibhai has a duka business there, and his sons, my cousins, adventure with lorries into that savage land. With their help I, even I, might catch one for you. The price would be very cheap. But, Honoured Sir, tell me how I catch it as it lives in a great swamp. This is a new thing for me. Do I keep it, do I kill it. I await eagerly your orders and instructions.

Believe me, honoured Sir,
Your hopeful servant
Purshottam S. Patel

Richardson's interest grew. Was there something in all this? He began to consult some expert opinion. Alan Solem, Curator of Lower Invertebrates (living) knew of no such animal in the area, but it certainly wasn't impossible. The area has been little studied. And unknown species of animals continually turn up all over the world. Certainly size was no problem. There is a leech in southeast Asia which grows to a foot and in northern Queensland, Australia, there is a worm which varies in length from eight to twelve feet, as it contracts and expands.

Replies went off to Cloudesley and Patel. A few discreet inquiries were made to friends and associates who might have some knowledge of the area. It was clear that Mr. Patel had dollar signs in his eyes and was looking out for Number One. The Indian small businessmen of East Africa tend to be fairly hard-headed, however, so Patel might be on to something. Weeks went by with no news. Finally, a letter arrived. It had been posted September 13, but had traveled by surface mail.

Lokori
P. O. Kampi ya Moto
via Nakuru
9 September 1966

Dear Sir:

I must ask your pardon for writing to you, a stranger, which happens in this way. I am temporary teacher at the intermediate school here where I teach elementary English among other things. Whenever I can I show the pupils newspapers which is not often as this is a far away spot. The other day I was lucky to get a Sunday Standard which is bigger and often has repeats from English and American papers. The class was soon in a buzz and I heard repeated a Turkana word which means dancing worm roughly. On looking I see an article and drawing about an animal found by you and the children say they hear of it from their fathers. One pupil Akai, a bright boy, was so moved that he later brought me a letter for sending to you. He was so proud I had not heart to refuse and so enclose.

As regards the subject of the letter, I can say nothing. Most Turkana are very primitive people and have many tales in which sometimes is a grain of truth.

Your faithfully,
Joseph N. Ngomo

Attached to the letter was a penciled note, in the painful crabbed style of a small boy, showing the same careful attention to spelling that all boys have:

Today techer show us paper and ther is anmal my pepels knows i not know name tuly moster but call ekurut loedonkakini it live ayangyangi in rains at moon fill all dance wave hands give milk ekurut leodonkakini very dangery anmal bite man die

akai s/o [son of] ekechalon

As the testimonial evidence accumulated, Gene, and a number of others, myself included, became increasingly excited about the Dancing Worm of Turkana. More inquiries went out. A note was inserted in the Newsletter of the East Africa Natural History Society, asking local naturalists for information about the worm. No one, apparently, had ever heard of the legend except Richardson's four correspondents.

Touched by young Akai's note, Gene replied to both Ngomo and the little boy, and waited for an answer to his previous letters to Cloudesley and Patel. And as he waited, belief and hope grappled with reason and training. Was there a worm in the swamps of Turkana? The evidence was slim indeed: the word of four people of whom he knew nothing, and two were themselves dubious. On the other hand, the writers were from quite different walks of life, and were separated by many miles. Surely, what appeared to be a widespread folk tale might have some basis in fact.

The possibility of an expedition to search for the worm began to insinuate itself in conversations among staff members. The evidence was still far too tenuous to justify a field trip, but if more turned up, serious consideration would have to be given to the idea. The general feeling was one of cautious optimism.

That optimism received a blow when the letters to Cloudesley and Patel were both returned, stamped "Addressee unknown." But a second letter from Patel, indicating that he had moved and was still eager to be of service cleared up part of the mystery.

Box 6005
Rongai
2 August 1967

Honoured Sir,

I have been hoping so much to hear from you in answer to my letter but only silence has

come. But I venture to write again. One, because the post here has become very slack. Only last month my cousin Motilal nine years senior in Posts and Telegraph got the sudden sack and was substituted by an inexperienced person. Oh, Sir, these days are hard for us. Your eagerly expected letter may have come and got lost. I have now you see moved.

Two, because I hear that in a little paper a man Solem asks news of the worm. Sir, there is now a rival and you should beat him. I am always you know ready to help. I think the time is good for the worm. There is much rain and the great swamp is full. With your instructions we might get one.

Believe me honoured Sir,
Your hopeful servant,
Purshottam S. Patel

Next a letter came from Joseph Ngomo, who could no longer help, but whose evident dedication to his students should be a fine example of the new spirit of Africa.

P. O. Box 1432
Gilgil, Kenya
23 February 1967

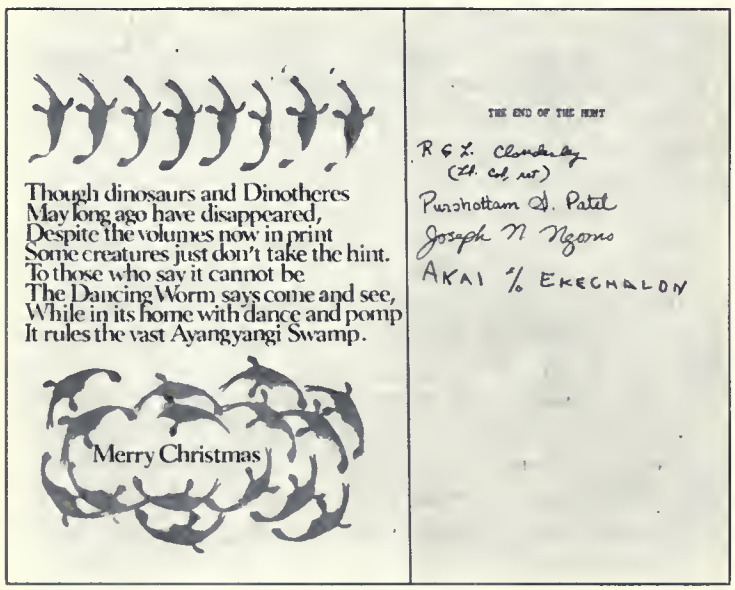
Dear Sir,

I thank you for your kind letter of 18 November which has taken so long time to catch me up. I can no longer be of help for you with the dancing worm as I am transferred from Lokori and will I hear soon be transferred also from here. As a senior teacher I am moved about where needed and moved on again when things are going well.

Before I left Lokori Akai had gone as far as was possible for him in the school. His family has no money for further education and he is with his father's goats again. This is sad for a teacher but Akai knows more than his father and his son will know more again and so we build. Harambee!

I am sorry your name was wrong in my letter but so it was in the paper. This time you see I use air letter.

Yours faithfully,
Joseph N. Ngomo



Above, *"Christmas Greetings."*

This month's Cover shows old Kenya hand Bryan Patterson and prey. He apparently bagged the little fellow with the shotgun in his right hand. Hunter Patterson brought down several Field Museum staff members with the same shot. The Editor of the Bulletin feels the Cover is appropriate for an issue published in April.

A most welcome visitor to Field Museum was able to add a tiny bit of corroboration. Bryan Patterson, formerly Curator of Vertebrate Paleontology at Field Museum, and now Agassiz Professor of the same at Harvard University, stopped to see his former associates early last year. Patterson, who had been in Kenya recently on field work, which resulted, incidentally, in some remarkable discoveries about hominid evolution, knew of Patel's uncle, whom he considered something of a rascal. A witty and charming man, he read the letters with delighted interest but he had never heard of the Dancing Worm of Turkana.

Professor Patterson had every reason to be delighted with the letters, for they represented a job well done. There were perhaps ten people in the Paleontology lab as he read the letters, but only one man knew that the letters had sprung from the same hand, their writers from a single brain, and that the Worm inhabited not the Ayangyangi Swamp but a similar habitat, the mind of Professor Bryan Patterson.

The collective leg of Field Museum had been thoroughly pulled. The hoax, admitted finally by a geologist in Patterson's confidence, although not yet by the author himself, was elaborate, satisfying and structurally magnificent. The delicate weave of hint and doubt, of fact and myth, of virtue and vice in the correspondents is convincing, but, in the final analysis, Patterson's greatest ally was the human will to believe. All of us wanted a Dancing Worm. We will miss it.

In fact, we will miss all of them—Colonel Cloudesley, in the sunset of a distinguished military career; the acquisitive Indian merchant, Mr. Patel; the devoted school teacher, Joseph Ngomo, and bright little Akai, back with his father's goats. But most of all, the Worm, who danced with waving arms by moonlight in the depths of the swamp, who gave milk, whose bite killed men. We mourn its passing.

One final message closes out the file: A card came to Gene Richardson last Christmas. On the cover was a photo of a well-known Agassiz Professor of Paleontology looking with obvious distaste at a Dancing Worm, which he has clearly just bagged with the shotgun in his hand. Inside the card, a short verse and a page headed "The End of The Hunt" and signed by our old friends.

The end of the hunt, yes. But not the end of the season. It is now open season on Mr. Bryan Patterson.

Left, *Lowry Pueblo as it appeared forty years ago, when the author began to dig.* Below, *restored Lowry Pueblo, a National Historical Landmark. The two photographs were taken from nearly the same spot.*

About forty years ago the postmaster of Spargo, Colorado, Mr. Courtney Dow, wrote that he would like to show me a large and unique ruin, perched on the rim of Cow Canyon in southwestern Colorado.

I visited the site in the company of Mr. Dow and found that it *was* large, interesting and untouched. I also noted that it included a Great Kiva—which made it unique for this area for, at that time, Great Kivas were known mostly from an area called Chaco Canyon, New Mexico. And here was one some 200 miles away from the homeland of such great ceremonial structures!

That fact aroused my curiosity about this site. Many questions came to mind, the most obvious one being "was there a relationship between the Great Kiva at Lowry Pueblo and those to the south and east?"

We spent four seasons at Lowry Pueblo, 1930–34, and excavated 37 dwelling rooms, eight kivas and the Great Kiva, or about 95 percent of the site. We were shot at by a homesteader who thought we were stealing his gold treasure (sic)! We endured snows, rains, floods, and droughts; we operated on a budget that was modest indeed (one year it was $1,000); we weathered a depression; and yet we got a lot done. During our last season, we received heaven-sent help in the form of labor from the County Emergency Relief Administration (later W.P.A.).

What are some of the results of those four years of digging and research:

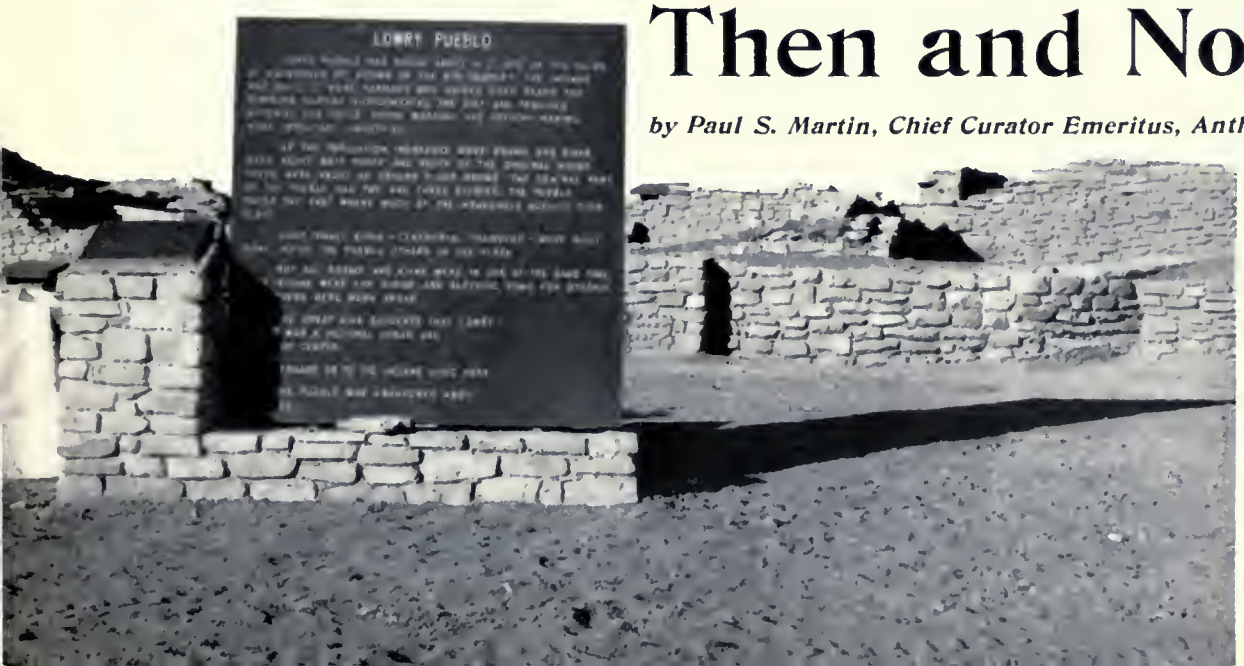
The site on which the pueblo was built is a knoll overlooking a small canyon at the bottom of which was formerly a small, permanent stream fed by springs. On clear days, to the southwest one can see the odd formations of sandstone that give their name to Monument Valley.

Sometime about A. D. 500–700, a group of farmer Indians settled on this knoll and dug their abodes, called pit houses, in the virgin clay. Several such subterranean structures were encountered beneath the walls and floors of the later town and below the floors of kivas, which are themselves also subterranean. Pottery and tools of stone and bone were found still present on these most ancient and earliest floors.

It seems likely that these first comers remained at the site, for it had many advantages to an incipient farmer folk and would not lightly be relinquished.

Lowry Pueblo Then and Now

by Paul S. Martin, Chief Curator Emeritus, Anthropology



About the year A.D. 900, the pit house inhabitants embarked on a program that was eventually to alter radically their way of life. They built a cluster of four rooms or so with contiguous walls of stone masonry on *top* of the ground. Thus came into being a "pueblo," which means "village" and implies the so-called honeycomb structure of adjoining rooms, with stone-masonry partitions that served as a common wall for two rooms. This arrangement is a great economy in effort. The old-time subterranean abodes were retained as places of worship and rituals and still are today, called "ki-va"—or, literally, "house-old"—a most appropriate appellation.

Canyon, New Mexico, about 100 miles southeast of Lowry.

Eventually, the pueblo encompassed 50 rooms, and was two stories high. If all the rooms were simultaneously occupied, Lowry may have housed a population of about 60 to 100.

About A.D. 1200, the town was abruptly abandoned. Personal and family items were left behind when the people moved out.

Why was this pueblo abandoned? Why were hundreds of other towns also forsaken—mostly in the 13th century? Many explanations have been suggested, although none of them has been set up as a hypothesis to be tested. I

These two photos show the Great Kiva as it was when first found and as it looks today. Nearly 50 feet in diameter, the Great Kiva was the religious center of the Pueblo, and may have served the same function for nearby satellite communities.

I am unable to give the explanation for this great change, but I am fairly sure it was brought about by a modification in some aspect of their culture, such as a shift in the economy, in the sociology, in the religion, or in all three. It was certainly an adaptation to a changing environment.

As the families extended through marriage, more rooms were added. When a daughter married, she brought her husband (from a nearby village) to live with her and her family, and more rooms were added to make space for the additional people. Family "suites" can be clearly observed by noting architectural features, connecting doors, and similiarities in masonry styles.

Staple foods were beans, corn, and squash, plus meats obtained by hunting deer, antelope, mountain sheep, elk, and smaller mammals.

As the town grew in size, it became gradually more important. A Great Kiva some 47 feet in diameter was built, which is twice or three times as big as the smaller kivas. It is possible that this feature, the only one in the immediate area, also served nearby satellite communities.

The Great Kiva and much of the pottery are stylistically similar to great kivas and the pottery found in Chaco

think we can definitely rule out epidemics, invasions, or meteoritic showers.

Two possibilities remain: a change in the pattern of rainfall so that moisture came at the wrong time of year to make possible the successful raising of crops. If farmers cannot grow crops, they cannot eat—and one solution is to move on. Where they moved is not known.

The second possible explanation is that the people had progressed as far as they could. Without a new technology for growing crops or new source of energy, they were doomed.

After we finished our work, Lowry Pueblo was again abandoned—the first time, about A.D. 1200, and the second time, in 1934. And there this ancient village stood, untended, unwanted, unnecessary.

It remained in obscurity until just three years ago. In 1965, Dr. Robert Lister, Professor of Anthropology, University of Colorado, Boulder, in cooperation with the United States Department of Interior, Bureau of Land Management, recommended that Lowry Pueblo be set aside as a "National Historic Landmark."

I am indebted to the Colorado State Director of the

Bureau of Land Management, Mr. E. I. Rowland, who informs me that ". . . the Historic Landmark program is handled by the Park Service. Designation of a site is made by the Secretary of the Interior. The Historic Sites Act of 1935 directs the Secretary of the Interior to make a nation-wide survey for the purpose of determining those of exceptional value. The survey is conducted by National Park Service historians and archaeologists. Their recommendations are screened by a Consulting Committee and by the Advisory Board on National Parks, Historical Sites, Buildings and Monuments. The Board then submits its recommendations to the Secretary who has final responsibility for declaring sites eligible for the Registry of National Historic Landmarks."

Mr. Rowland also advised me of some of the criteria used in selecting Landmarks. The site must have exceptional value in American history and must have produced information of major scientific importance by revealing new cultures or shedding light upon periods of occupation over large areas of the United States.

Lowry Pueblo passed all requirements. All that remained was to implement the decision of the Secretary by reopening and repairing the site. A team was organized to draw up plans for the re-excavation and stabilization of the pueblo, kivas and Great Kiva. This group consisted of Lister and experts from the Bureau of Land Management, William E. Claycomb, R. F. Noble, James H. O'Connor, E. I. Rowland, W. Reynolds, and A. W. Zimmerman.

Mr. Allan Lancaster, famous in the National Park Service for his excavations and restorations at Mesa Verde National Park, was placed in charge of the work. By a happy coincidence, Mr. Lancaster was my chief assistant at Lowry ruin and others from 1928–1932. No person more eminently fitted for the job of rehabilitating Lowry Pueblo could have been found.

In two seasons' time (1966–1967) and with the help of excavators, masons, and bulldozers, Mr. Lancaster finished the imposing job.

On Octoger 17, 1967, Lowry Pueblo was dedicated by the members and more than 300 guests of the Colorado office of the Bureau of Land Management. After an invocation given in Navajo by a Navajo Indian, some Hopi children from a nearby school (Fort Lewis) put on a brief sacred dance, perhaps reminiscent of ancient ceremonial dances. A few remarks by guests, and a dedication announcement and the brief ceremony ended with Lowry Pueblo now a *National Historic Landmark*.

Left, *Paul Martin's party excavating the small kiva at Lowry, in 1931.* At right, *Paul Martin atop a 1926 Pierce-Arrow touring car. Martin filmed the area and the site from this vantage point.*

I was invited to be present at the ceremony, which was simple and moving. It seemed strange to be sitting on a platform with Al Lancaster and other notables and to realize that some 30 years earlier, I had partially earned my spurs by excavating this site.

Today, Lowry Pueblo is reached by good roads in less than an hour from Cortez, Colorado. All the wind-blown dirt that had accumulated against the outer walls of the building during 10 centuries has been removed. I saw walls and other features that I had never before seen, since we could not afford to move such masses of dirt (thousands of tons). The Great Kiva has been completely restored except for the roof. The rooms are easily viewed from many key spots and at these spots the Bureau of Land Management has erected informative, easily-read signs that give the tourist a clear idea of what he is looking at. A bronze plaque denoting national ownership and other addenda greet the visitor as he walks toward this great and ancient town.

Today, Lowry Pueblo is an impressive and noble sight. I was awed, because I realized that here Man had lived, worshipped, adapted to an arid ecological environment and had at last been forced to relinquish his heritage—because corn no longer would grow?

A Tropical Spring

by William C. Burger,

Assistant Curator, Vascular Plants

THE SKIES have been clear for almost five months, with only an occasional cloud formation and a rare shower or two. The earth is parched; almost all the plants are leafless. The wind, dry and dust-laden, has blown steadily from the north and east. But now there is a change: the winds are shifting, and soon they will sweep in from the south. Fluffy clouds begin to form and then develop into thunderheads. The air is becoming sweet with moisture. The monsoon has begun, and with the advent of this rainy season there comes a tropical spring.

Many people think of the tropics as a steaming jungle where luxuriant vegetation prospers throughout the year; however, these areas are in the minority. Most tropical regions experience a dry season for at least part of the year. The duration of the dry period determines whether an area has a tall evergreen forest, a deciduous forest, or a sub-desert thorn-scrub. The area in eastern Ethiopia that I am familiar with has a dry period of nearly six months, and here the rains support a vegetation of deciduous trees. These are trees like our own that lose their leaves at the end of the growing season.

In a way, the monsoon, seasonally wet and dry or tropical climate, is similar to our own in the temperate zone. The dry season is comparable to our winter, and our summer is similar to the growing or wet period of the seasonally dry tropics. In these areas even the size of trees and density of vegetation may look similar to ours. For plants, winter and the dry season are very much alike: periods when physiological processes stop or are severely limited. Cold weather prevents the plant from moving water rapidly through its tissues, producing a physiological drought not unlike a climatic drought. For animals, too, winter and the dry season are the times of food scarcity.

The end of the dry period and the coming of the rains usher in a new cycle of growth and activity, it is a tropical springtime. Like our spring it heralds the blooming of flowers and leafing of trees, the nesting of birds and the emergence of insects. The comparison of temperate and tropical "spring" is not an unreasonable consideration. Plants and animals have adjusted in much the same fashion to the exigencies of winter and of drought. When the cold period or the dry period ends, the responses of living things are also similar. For plants, as for animals, survival through a long cold or dry period requires the storage of food. Whether in seeds, underground bulbs or roots, the plant must have food to carry it through the dry period and permit the resumption of active growth in springtime. Perhaps the most spectacular plants of springtime are those that exhibit this point best: plants such as the tulip, hyacinth and iris. These have an abundant underground store of food which permits them to produce a large and brilliant floral display at the beginning of the growing season. Energy is required to produce a large cluster of flowers, and this energy comes from the food produced during the previous growing season and stored over the winter. Similarly, some of the most spectacular flowers of the seasonally dry African tropics are those related to tulips and irises. These, too, have underground storage organs, and they also have the ability to produce an extraordinary floral display in a short period of time. In only two weeks *Haemanthus*, *Crinum*, and many lily-like plants can produce a cluster of flowers remarkable in size and number. Likewise, many trees of the tropics will come into flower at the beginning of the rains, not unlike our redbuds, dogwoods, and fruit trees. These, too, have food stored in their roots from the previous growing season.

Crinum in flower. Photos taken in eastern Ethiopia by the author.

Haemanthus multiflorus, a blood lily, in full flower while other plants around it have only begun to sprout.

Pancratium, a spider lily, has cracked the bare earth in sending up its flower stalk.

A problem that these plants encounter, both in the temperate and seasonally-dry tropic zones, is timing. A warm period in midwinter does not cause apple trees to blossom, nor does *Haemanthus* burst into flower after an unusually heavy rain in the middle of the dry season. Obviously, these plants have internal mechanisms that usually prevent premature flowering. These internal mechanisms, called dormancy requirements, have been extensively studied for temperate plants such as the tulip, but they have scarcely been investigated in tropical plants that pass through a long, dry season. I collected a terrestrial orchid in an acacia thorn-scrub vegetation that was flowering in April at the beginning of the rains. This is a very dry habitat for orchids, and only one orchid species is known from this particular area. This plant was taken to a greenhouse at much higher elevation where the temperatures were cooler and quite consistent throughout the year. It was watered regularly, and in the two following years produced inflorescences only in April–May. The only reasonable explanation for this precise flowering behaviour is to assume that the plant was sensitive to changes in day length: that the lengthening days of April triggered flower production. But since this plant was living about ten degrees north of the equator it had to respond to a change in day-length of less than 40 minutes. In this region the longest and shortest days differ by only that amount. There are probably many other ways in which plants of seasonally-dry areas are stimulated to resume growth at the proper time.

The Crinum plant. Only the leaves and flower stalks are seen above ground. The large bulb stores food underground during the long dry season.

While the trees and flowering herbs in the seasonally dry tropics give the advent of the rainy season a spring-like aspect, animals also behave as if it was spring. Many birds court and begin to nest at this time. Reptiles that have withdrawn into deep crevices for a period of inactivity during the dry season begin to move about again. This is the time of year when the roadways take their greatest toll, when snakes rarely encountered in the bush are found the victims of a passing car. Frogs and even fish that have survived under a hardened roof of mud become active once more as ponds refill and rivers start to run. Insects hatch from eggs or chrysalids, and a new cycle of activity begins. Where only the dry wind could be heard before, there is now a cacophony of sounds; singing birds, buzzing insects and at night the frogs and toads join in.

For men too, the beginning of the monsoon is a springtime. In areas with sufficient rainfall the farmer tills and plants his fields. In more arid areas the pastoralist, after many lean months, finds abundant food for his livestock; this is the time for calving and milk is in abundance. For many people the dry period is a time of hardship, for others simply uncomfortable with its dust and desiccating air. In these periods of long drought the skin becomes parched, lips chap; the discomfort sets nerves on edge and tempers flare. There is no water for washing, it is too precious. In some areas there may not be enough to drink. Arguments for water rights are serious, sometimes fatal, and the nomads with their livestock wander in constant search. But with the coming of the rains, with water, browse and food again available, people change. They relax their wanderings, and it is easier for all to get along. For the nomadic herdsmen living in areas too dry to plant a crop, springtime is a time for marriages, feasts, and settling debts. For these people it is a short spring, a rainy period that ends soon and then the wandering search for water and browse again becomes a serious task.

With the continuance of rain and growth, spring passes into summer. The rainy period with its cloudy weather and cooler temperature is often called winter by English-speaking people in the tropics, even though it is the growing season. In areas with a long and consistent wet period many plants will flower at the end of the rains and into the short, dry season. These areas do not exhibit the burst of flowering found in regions with a short and less reliable wet season. This sudden renaissance of growth that takes place in as little as two weeks is characteristic of the drier tropics. It is what I have called a tropical spring.

WEEKEND FIELD TRIPS SET

Three weekend trips are planned to explore the botany and geology in and around Galena, May 18–19, (with a mine visit), Starved Rock State Park, May 25–26, and Devils Lake State Park, Wisconsin, on June 8–9. These overnight trips are conducted by Botanist Gabriel Edwin and Geologist Matthew Nitecki, Curators at the Museum. The objective of these field trips is the investigation of the correlations between the rocks and spring flowers, especially the effects of the geologic history on flowering plants. The field studies will be supplemented by evening discussions and demonstrations on plants and rocks collected during the day. The cost for three trips is estimated at $50.00; or $20.00 for individual weekends. The preliminary lecture for all three trips will be held on Saturday, May 4th at 10:00 a.m. at the University of Chicago, Downtown Center, 65 E. South Water Street. For further information phone Barbara O'Connor, FInancial 6–8300.

CALENDAR OF EVENTS *April hours: Open from 9 a.m. to 5 p.m.*

April 6 Spring Series of Saturday Morning Programs for Children begins with Museum Traveler Day and presentation of awards to children who have successfully participated in the Museum's Journey Program conducted by the Raymond Foundation. A color film, "The Journals of Lewis and Clark," depicting the historical trek across the Northwestern United States from 1803 to 1809, will be shown. 10:30 a.m., James Simpson Theatre.

April 6 Meteorite Course Dr. Edward J. Olsen, Curator of Mineralogy, lecturer. 10 a.m. First of three lectures, second floor meeting room.

April 6 Film-Lecture Series: Mexico by Gene Wiancko, 2:30 p.m. in the James Simpson Theatre

April 13 Meteorite Course Dr. Edward J. Olsen, Curator of Mineralogy, lecturer. 10 a.m. Second of three lectures, second floor meeting room.

April 13 Film-Lecture Series: The Holy Lands by Richard Linde, 2:30 p.m. in the James Simpson Theatre.

April 20 Spring Series of Saturday Morning Programs for Children Camp Fire Girl Day program will feature early history of the State of Illinois, with emphasis on the Indians of the area and plants and animals they used. 10:30 a.m. in the James Simpson Theatre.

April 20 Meteorite Course Dr. Edward J. Olsen, Curator of Mineralogy lecturer. 10 a.m. Final lecture of series, second floor meeting room.

April 20 Film-Lecture Series: India by Fran William Hall, 2:30 p.m. in the James Simpson Theatre.

April 21 – 27 Geology Ozarks Trip Field Museum, in cooperation with the University of Chicago, will sponsor the trip which will include a study of geological phenomena in the field, collection of minerals and fossils, and evening lectures. Matthew H. Nitecki will conduct the tour. Tuition is $85. To apply call Miss O'Connor, FI 6 - 8300.

April 27 Spring Series of Saturday Morning Programs for Children Cub Scout Day will center its theme around life forms found in the sea. 10:30 a.m. in the James Simpson Theatre.

April 27 Film-Lecture Series: The Bahamas—From Top to Bottom by Harry Pederson, 2:30 p.m. in the James Simpson Theatre.

Through May: Spring Journey: Plants that the American Indians Used.

MEETINGS:

Illinois Audubon Society, April 3, 7:30 p.m.
Chicago Shell Club, April 7, 2 p.m.
Nature Camera Club of Chicago, April 9, 7:45 p.m.
Chicago Mountaineering Club, April 11, 8 p.m.
Sierra Club, Great Lakes Chapter, April 16, 7:30 p.m.
Illinois Orchid Society, April 21, 2 p.m.

GEOLOGY FILMS MADE FOR TV

Two new educational television programs, "Down to Earth" and "From Fish to Mammal," written by Ernest Roscoe, Raymond Foundation Lecturer in Geology, are now available for use by teachers and schools served by the New Trier Township Instructional Television system.

Robert Pirsein, NTT-ITV Coordinator, and the Raymond Foundation of Field Museum have cooperated in the production of the programs, which involved many hours of preparation and filming, some done in the Museum.

Emphasizing that these programs give students only a small sampling of the material available at Field Museum, Roscoe said, "It is hoped that the student will visit the Museum many times in the future to augment classroom instruction. The potentialities of reaching large numbers of students and teachers through this medium, of carrying the Museum's educational efforts far beyond its walls, is one of the most exciting challenges we have faced."

Roscoe was joined on the programs by Mrs. Penny Knepper, a sixth grade teacher at Logan School in Wilmette. NTT-ITV reaches more than 17,000 students and 1,000 teachers in 25 participating schools in the New Trier High School district and Avoca, Glencoe, Kenilworth, Sunset Ridge, Wilmette and Winnetka school districts from the transmission site at New Trier High School East in Winnetka.

Programs are developed and produced by cooperative efforts of curriculum experts, school administrators, teachers, TV specialists and subject-matter experts, said Pirsein.

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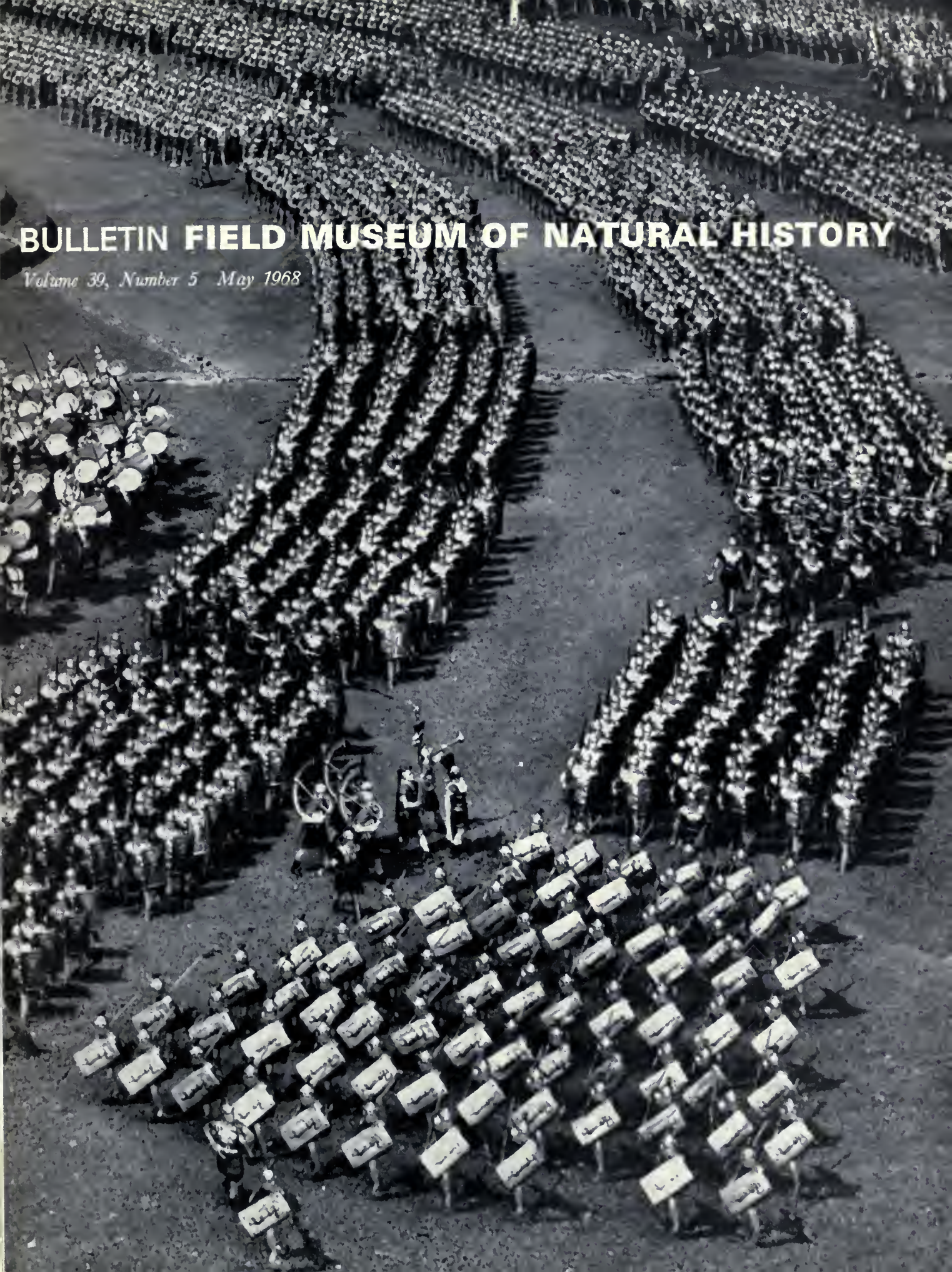


BULLETIN FIELD MUSEUM OF NATURAL HISTORY

Volume 39, Number 5 May 1968

THIS MONTH'S COVER

2 May, 73 A.D.

The Tenth Legion, Flavius Silva commanding, advances on Masada, in the last engagement of the Jewish War. Josephus, a Jewish commander who earlier in the war went over to Rome, wrote the history of the desperate rebellion of the Jews against Imperial Rome.

In the last book of his History, he describes the morning of 2 May

The Romans, still expecting opposition, were in arms at daybreak. Having planked bridges from the mounds to the fortress, they advanced to the assault. When they saw no enemy but only fearful solitude on every side, flames within, and silence, they were at a loss to conjecture what had happened. . . . In an attempt to quench the flames, they quickly opened a passage through them and reached the palace. Here they encountered the mounds of the slain. Instead of rejoicing at the death of their foes, they admired the courage of their resolve and the intrepid contempt of death so many had shown by such a deed as this.

The diorama on the cover, which in its entirety shows over five thousand military miniatures of Roman legionaries, is part of a major Special Exhibit, opening at Field Museum on 5 May.

Masada, King Herod's Fortress, shown with great acclaim in London and New York, will be at Field Museum through 15 August. The exhibit was organized by the Jewish Theological Seminary of America and the Israel Exploration Society.

In connection with the exhibit, Field Museum is sponsoring a lecture series on the significance of Masada. Four evening lectures will be held on consecutive Tuesdays in May and June. Details on the series and the distinguished speakers are on page 7.

The Exhibit tells the story not only of the heroic struggle and brave end of the zealot stronghold, but also the arduous and pains-taking work of Archaeologist Yigael Yadin and more than 5000 volunteers from 28 countries who dug the site in 1963–65. Mr. Yadin tells the story in the following pages.

by

YIGAEL YADIN

Professor of Archaeology,

Hebrew University of Jerusalem

MASADA

THE ROCK OF MASADA, at the eastern edge of the wilderness of Judea, with a sheer drop of more than 1,300 feet to the western shore of the Dead Sea, is a site of gaunt and majestic beauty. It is also the location of one of the most dramatic episodes in Jewish history.

In the first century C.E. (Common Era—A.D.), Palestine was under the occupation of the Romans, who had overthrown the Jewish Kingdom in the middle of the previous century. Periodic rebellions by the inhabitants, who sought to regain their freedom and sovereignty, were quickly crushed. But in the year 66 C.E., the Jewish rebellion flared into a full-scale country-wide war which raged with fierce bitterness for four years, with the Romans having to bring in legion after legion of reinforcements. In 70 C.E., Titus conquered Jerusalem, sacked the city, destroyed the Temple and expelled many of the Jewish survivors from the country.

One outpost alone held out, Masada. At the beginning of the rebellion, a group of Jewish zealots had destroyed the Roman garrison of Masada and held it throughout the war. They were soon joined by a few surviving patriots from Jerusalem who had evaded capture and expulsion and made the long, arduous trek across the Judean wilderness, determined to continue their battle for freedom. With the fortress of Masada as their base for raiding operations, they harried the Romans for two years. In 72 C.E., Flavius Silva, the commander of the Tenth Roman Legion, resolved to crush this outpost of resistance. He marched on Masada with a legion and auxiliary troops, with thousands of prisoners of war carrying water, timber and provisions across the lengthy stretch of barren plateau. The Jews at the top of the rock, commanded by Eleazar ben Yair, prepared to defend themselves, making use of the natural and man-made fortifications, and rationing the supplies in their storehouses and cisterns.

Silva's men tried to storm the fortress. They were beaten back. Denied swift victory, they prepared for a lengthy siege. They established camps around the base of the rock; the remains of eight are visible to this day. They built a circumvallation around the fortress. And, on a rocky site near the western approach to Masada, they constructed a ramp of beaten earth and large stones. On this they threw up a siege tower and, under covering fire from its top, they moved a battering-ram up the ramp and directed it against the fortress wall. They finally succeeded in effecting a breach. The defenders countered by rapidly building an inner wall consisting of a double stockade of wood filled with earth. Silva's reply was to set this ablaze with firebrands. This was the beginning of the end. What happened next we know from the writings of the contemporary historian, Josephus Flavius. When "the whole of the wall" was in flames, "the Romans . . . returned to their camp full of spirits, and with a fixed determination to attack the enemy at the break of day. . . ."

That night, at the top of Masada, the Jewish leader, Eleazar ben Yair, reviewed the hopeless position. The defensive wall was now consumed. The Romans would overrun them on the following day. There was no hope of relief and none of escape. Two alternatives remained: surrender or death. He resolved "that a death of glory was preferable to a life of infamy, and that the most magnanimous resolution would be to disdain the idea of surviving the loss of their liberty." Rather than become slaves to their conquerers, the defenders—960 men, women and children—thereupon ended their lives at their own hands. When the Romans reached the height next morning, they were met with silence. Then two women emerged, the only two who had not gone through with Eleazar's plan and had hidden themselves. It is their story that Josephus recounts.

The top of Masada, scene of this drama, is shaped like a boat, measuring some 1,900 feet from its northern to its southern points and 650 feet from east to west.

It was Herod the Great, King from 37 B.C.E. to 4 B.C.E., who turned Masada into a formidable fort in the early years of his reign, creating a citadel of potential refuge from the threat of Cleopatra of Egypt. He built a casemate wall around the top, defense towers, storehouses, barracks, arsenals, palaces and also a magnificent palace-villa, built on three terraces of the cliffside just beneath the northern edge of the summit. He also dug large cisterns linked ingenuously to dry riverbeds which occasionally filled with rain water. It was these fortifications and buildings that served the last band of Jewish fighters in their struggle against the

Romans some 75 years after Herod's death.

All this was known, from Josephus' minute descriptions, to travellers, explorers and archaeologists who were drawn to the site since its rediscovery by the American, Edward Robinson (father of biblical geography), more than 130 years ago. Those interested in Roman siege-craft could study the easily accessible and uniquely preserved remains of Roman circumvallation, assault rampart and camps at the foot of Masada. But classical archaeologists, interested in these Herodian structures, could do little more than look at the surface remains. After a strenuous climb to the top of the "snake path" on the eastern face, they could experience a sense of achievement simply at having viewed the site, while all thought of excavations was put out of their minds.

Rectangular Roman camps are still visible after nearly 2000 years.

The Englishman, Captain Condor, in 1867, describing his ascent by the dangerous path with delight wrote, "A false step here would have been destruction: we arrived at the top at 5:20 p.m. and gave three cheers, re-echoed from below."

But it was only after the establishment of the State of Israel that more became known of Masada through amateur research by the youth of the country. This led in 1955 and 1956, to soundings on the top of the rock by an Israeli archaeological expedition. These showed that Masada could be excavated only by a large-scale expedition camping on the site for a protracted period. It fell to me to direct this archaeological exploration. We undertook two campaigns: seven months in 1963–4 and five months in 1964–5, and by May 1, 1966, we had excavated 96 per cent of the built-up area of Masada. The remaining three per cent was left unexcavated intentionally so that future visitors could get a before and after picture.

We faced enormous administrative and logistic problems. The Israel army bulldozed a 15-mile track over the Judean wilderness so that we could reach Masada by the easier, western approach, leaving us only a gentle 10-minute climb to the top. The Israel water authority laid a pipeline. We pitched 40 tents for the expedition close to Silva's camp; we had to select an inferior site since Silva had made the strategic choice. From there we built cable-ferries to lift

Volunteers from many countries joined in the excavations

the equipment to the summit. To these difficult conditions were added uncommonly hard winters, with heavy rains and storms.

In addition to teams of professional archaeologists, we had the usual avalanche of applications from Israeli volunteers whom we took for two-week periods. We then decided on an unusual step and opened our lists to volunteers from overseas. The response was extraordinary. Throughout the two seasons of digging, we were joined by thousands of volunteers from 28 countries, who came at their own expense and put in an exciting two-week stint, often extended to many months. If we managed to achieve all we did in 12 months of excavation it is due only to the enthusiasm of these volunteers from home and abroad, the Israeli youth movements and the Israel army.

Our finds are of immense importance to archaeologists, historians, numismatists, Scroll researchers, Talmudic scholars and students of ancient Hebrew and Aramaic. We were able to clarify the nature of the architecture, art and stratigraphy of all Masada's buildings, from Herod's time up to the Byzantine period. We uncovered magnificent first century mosaics, the earliest ever found in Israel. We unearthed the buildings of the Zealots—and gruesome evidence of their last stand. Rare coins were found of the period of the Jewish revolt—from 66 to 70 C.E. We discovered extremely

precious documents, including biblical scrolls, and scrolls of the Dead Sea Sect, which can be absolutely dated from before 73 C.E., the first time that ancient scrolls can be specifically and absolutely dated. And we have been able to recreate the patterns of life on the top of this rock during its various periods of occupation.

The most spectacular building on Masada was Herod's three-tiered palace-villa (hitherto inaccessible except by the use of stakes and rope ladders, but now served by permanent

King Herod's three-tiered palace.

staircases installed for us by the army). On the upper terrace are remains of a rectangular building used as living quarters, with a magnificent semicircular porch bounded by the cliff. The rooms were adorned with frescoes and simple black and white mosaic floors. The middle terrace, 60 feet below, boasted a circular pavilion and colonnade. The bottom terrace, 40 feet lower, was the outstanding area of the villa, and the best preserved. It contained a double colonnade surrounding a large patio, with wall paintings of colored panels. Though some of these paintings show a naive attempt to imitate marble and precious stones, they are well executed, in the style popular during that period throughout the Roman Empire. This villa is the only spot on Masada which enjoys constant shelter from the searing desert winds. This, in fact, was the structure described by Josephus as Herod's palace. This description, until recently, was erroneously taken to refer to the large building in the middle of the western part of the plateau. That, we discovered, was indeed the official palace, but the northern terraced structure was Herod's private retreat.

When we excavated Herod's palace, we found it completely covered with a thick layer of ashes, and it was in the ashes of the lower terrace that we came across gruesome evidence of the fate of the Jewish defenders. Lying among coins of the Jewish revolt, a letter in Aramaic, a mantle, arrows and hundreds of silver-plated scales of armor, were the remains of skeletons of a man, a woman and a youth. Dark brown braids were still attached to the scalp of the woman and nearby were her leather sandals. Josephus had written, ". . . and the one man left till last, first surveyed the serried ranks of the dead, in case amidst all the slaughter someone was still left in need of his hand; then, finding that all had been dispatched, set the palace blazing fiercely, and summoning all his strength drove his sword right through his body and fell dead by the side of his family."

South of the hanging palace were the ruins of a large complex of buildings consisting of long, narrow halls. These

Shaft of light pierces a giant cistern at Masada.

were the famous storerooms built by Herod. We found the floors littered with huge piles of debris, mostly of stone, belonging to the walls and roofs which had collapsed when the Zealots burned their stores before their suicide. We discovered hundreds of jars containing remnants of food, each food item kept in a separate room. Some of the jars had been made in Herod's time, but they were also used by the Jewish defenders, who replenished them, and wrote labels describing their contents in Aramaic and Hebrew. These short inscriptions were of great importance for the history of Hebrew script, since they are unquestionably dated 66–73 C.E. They also told us much of the way of life of the defenders, for many of these inscriptions indicate that the contents of certain jars were tithes set aside for the Levites and Priests, and show how scrupulously they followed the laws of Moses, even under the harsh conditions of beleaguered Masada.

Floor of the Roman bath's "hot room" once rested on these squat pillars.

A great surprise awaited us when we started digging near the storerooms. As we went deeper, we came across a classic Roman-style public bath, which turned out to be the largest of its kind ever found in this part of the world, and definitely the best preserved, with all its installations and lavish adornments. The walls of the hot, tepid and cold rooms were covered with frescoes, and their floors beautifully tiled. Also well preserved were the clay pipes for the circulation of hot air, and the numerous squat pillars on which the floor of the hot room rest.

The western palace, the main palace of Herod, was the largest structure on the rock. It was a royal residence complete with throne room, reception room, service quarters, and workshops, all very well laid out. Two large, multicolored mosaics were uncovered here. They are exquisitely executed, and perhaps the finest ever found in Israel. Certainly, they are the most ancient. This palace, too, was covered by a thick layer of ashes in which were found many coins of the revolt bearing the inscription, *For the freedom of Zion*. Several small palaces were found near the main palace, obviously built for Herod's family.

Northeast of this palace are the ruins of a small Christian chapel erected by a group of monks in the fifth century. (They also built small cells in various places on Masada.) The structure consists of a rectangular hall oriented toward the east, with an inner apse. It had once been decorated with handsome mosaic paving, most of it long since removed. But we were lucky to find a beautiful mosaic still intact in the adjoining room, the vestry.

Our greatest and most important finds were in the chambers of the fortress casemate wall which encircles the top of Masada. The Zealots had used these chambers as living quarters, and here we found large quantities of domestic utensils, as well as items made of perishable materials such as mats, shoes, clothing. In some of the rooms we found a small heap of embers in the corner, with remains of sandals, clothing, mirrors; mute witness for the Josephus record; "They quickly made one heap of all they possessed and set it on fire." Several rooms contained collections of stone balls which had been fired by the Roman catapults. These chambers also yielded numerous bronze and silver coins, including rare silver shekels of the revolt, some inscribed *Jerusalem the Holy—Shekel of Israel*, and others inscribed *Year Five*, the last to be struck before the fall of the Temple. The total number of coins found during the excavation is 4,000. Among them are the equally rare silver half-shekels. This constitutes the biggest corpus of Jewish and Roman coins of the first half of the first century C.E. ever found in excavations.

From the Jewish point of view, the four most important buildings we uncovered were a synagogue, two ritual baths (*mikveh*) and a religious schoolroom, all added by the Zealots to the Herodian buildings. They confirm that the Zealots were strict observers of the Jewish Law; for these three institutions are the most important for a religious community. The synagogue, abutting the northwestern wall, is a rectangular hall with two rows of columns and mud benches all around. It is oriented toward Jerusalem. This is not only the earliest synagogue known, but the only one to survive from the time of the Second Temple. (The original Herodian structure on this site was probably also a synagogue.) Of the ritual baths, the first was found in a case-made chamber in the southeastern section of the wall, and the second in the courtyard of a large administrative building we uncovered just west of the storeroom complex. Both are identical in plan and construction, each having three basins or baths, one of which is supplied by rainwater as required by religious law. These, too, are the only surviving *mikvehs* from the period of the Second Temple. The schoolroom (*beth midrash*) was one of the first important finds of the excavation. It was located south of the western palace, and consists of a long hall, with benches on three sides and one in the center.

Fragment of ancient document was one of the most important finds.

Our greatest prize was, of course, the collection of parchment scrolls that we unearthed, biblical and others. This was the first time such scrolls have been discovered outside caves and in proper stratigraphic contexts, which permits dating them to before the destruction of the Temple in 70 C.E. They include chapters from Genesis, Leviticus, Deuteronomy, Pslams and Ezekial, and are identical in text, spelling and chapter division with the traditional Hebrew Bible. We also found a scroll fragment of the long lost original Hebrew manuscript of the Book of Jubilees, one of the most important apocryphal works, which is reserved only in Ethiopic, Greek and Latin manuscripts, but which was suspected to have been originally written in Hebrew. It was very popular with the Dead Sea Scroll Sect. Another important find, also in the Apocrypha, was a first century B.C.E. copy of the lost 200 B.C.E. Hebrew original of Ecclesiasticus, also known as the Wisdom of Ben Sira. Most astonishing perhaps of our finds was a portion of a scroll, identical with one of the Dead Sea Scroll fragments discovered in Qumran Cave IV, consisting of liturgies associated with the Heavenly Sabbath sacrifices. Since the Masada Dead Sea Scroll portion can be clearly and definitely dated for the first time as not later than the first half of the first century C.E., it conclusively disproves the views of a very small minority of scholars who hold that the Dead Sea Scrolls are either not genuine or date only from medieval times.

I should add that in addition to scrolls, we also found no less than 700 ostraca (fragments of pottery bearing inscriptions) which will be the object of fruitful future study. Among these the most important group, and certainly the most intriguing, consists of eleven small potsherds, each with a different name or nickname, and all written by the same hand. The most startling is the sherd bearing the name of Ben Yair, who may well be the very Zealot commander mentioned by Josephus. Could this group of ostraca refer to the ten or so last surviving men who drew lots among themselves to determine who would remain to kill the others? This is a tempting interpretation.

Our excavations are over. We archaeologists now face the less romantic and more arduous scientific task of examining, studying, and assessing the tens of thousands of sherds, deciphering the inscriptions, elucidating the scrolls, completing our stratigraphic plans, and evaluating all our data both from the archaeological and historical viewpoints. When this material is classified and published, it will, I hope, help to present the scientific and spiritual reconstruction of the Masada that was.

MASADA LECTURE SERIES

"The Historical Context of Masada," by Prof. William F. Albright, W. W. Spence Professor Emeritus of Semitic Languages at Johns Hopkins University, will open a series of four lectures related to the special exhibition on May 14.

Other lectures in the series will include "The Dead Sea Scrolls and Early Sectarianism," by Prof. Norman Golb, University of Chicago, May 28; "Josephus and Masada," by Prof. Morton Smith, Columbia University, June 4; and "Israel, Crossroads of Empires and Civilizations: Archaeological Evidence," by Prof. Helene Kantor, University of Chicago, June 11.

Professor Albright

Prof. Albright, the first lecturer, is an outstanding authority on the archaeology of the Near East and is a past president of the International Association of Old Testament Scholars.

He earned his doctorate in Semitic languages from Johns Hopkins University in 1916 and from 1919 to 1936 was on the staff of the American School of Oriental Research in Jerusalem, twice serving as its director.

Prof. Albright holds 27 honorary doctorates from institutions in several countries and is a fellow or honorary member of many learned societies.

Among his many books are several of general interest, including *From the Stone Age to Christianity*, *Archaeology and the Religion of Israel*, *The Archaeology of Palestine*, *History, Archaeology and Christian Humanism*, and *Yahweh and the Gods of Canaan*. With David Noel Freedman, he edits the Doubleday Anchor Bible.

Prof. Morton Smith, Professor of Ancient History at Columbia University, earned his doctorate in theology at the Harvard Divinity School. His thesis, "Judaism in Palestine I, to the Reign of Antiochus Epiphanes," was recast as a series of lectures on the History of Religions of the American Council of Learned Societies. He is co-author of *The Ancient Greeks and Heroes and Gods* (with Moses Hadas).

Prof. Norman Golb and Prof. Helene Kantor are both on the faculty of the Oriental Institute and the Department of Near Eastern Languages and Civilizations at the University of Chicago.

Prof. Golb, Associate Professor of Medieval Jewish Studies, made several discoveries and identifications of Jewish documents while secretary of the Institute of Jewish Studies of the Hebrew University in Jerusalem.

Prof. Kantor, Professor of Archaeology, is a specialist in comparative archaeology and art of the ancient Near East and formative stages of its civilizations. With P. P. Delougaz, she directed excavations at the large prehistoric settlements and protohistoric urban centers of Beth Yerah (Sea of Galilee) and Chogha Mish (Khuzestan, Iran).

The lecture series tickets are $5.00 for Museum Members and $7.50 for non-members. Lectures will be held on consecutive Tuesdays at 8:15 p.m. in the James Simpson Theatre. The "Masada" exhibit will be open on the evenings when lectures are held.

a Chicago original

The Burnham Plan and Field Museum

by Patricia M. Williams, Field Museum Press

Right, *The piers which support Field Museum, surrounded by fill. The piers, in turn, are built on piles, some of which go down nearly a hundred feet below lake level. Photo was taken looking northwest. It is interesting that the Michigan Avenue skyline, after half a century, still has most of the buildings shown here, although many additions have been made. These were the great landmarks of the Chicago School of architecture, buildings by Adler, Sullivan, Daniel Burnham.*

The arches of the second floor gallery. To the left, between the arches, one now looks down into Stanley Field Hall. The area shown houses a remarkable collection of Chinese pottery and metal work. Photo was taken in January, 1919.

TODAY downtown Chicago is in the midst of an enormous construction boom, and controversy rages over almost every building that goes up. The traditionalists call the new buildings glass boxes, the futurists decry the lack of architectural imagination, and the average pedestrian complains about the mud all over the sidewalks surrounding construction sites.

The Columbian Exposition of 1893 created a lakefront building boom too, that was the subject of great dissension. At that time Chicago was an important force in modern architecture, and designers and writers maligned the neoclassical "White City" that was the fair. Not only did the Fair slow down the modern movements in architecture, they accused, but it "strangled the bustling Chicago style" as well.

"But even that much-maligned World's Columbian Exposition of 1893 was full of technological marvels; however fake the exhibition buildings looked on the outside, the great steel vaults of the Manufacturers Building were anything but fake. And the fantastic Ferris wheel in the amusement

area, and such giant machinery as the huge Bethlehem steam hammer (the largest then extant)—all these were evidence of a continuing love affair between Chicago and technology in all its aspects."[1]

The Field Museum was one of the marvels of this controversial fair. But when the Exposition was over and the fanfare died away, the Museum lived on to become a dignified and permanent resident of the lakefront. It did not, however, live on in the same building. The original building in Jackson Park was constructed only for a summer's use and by 1897 was rapidly deteriorating. The roof leaked constantly, and the exhibits inside were exposed to damage. The steady disintegration and fall of the substance covering the outside walls made the building look a shambles. By 1900 the Museum's Director stated that it had been necessary to reconstruct the roof almost completely, and in 1902 he reported that the whole building had reached the limits of repair.

[1] *Architectural Forum*, May, 1962, p. 125.

In 1905 plans for a new building were considered, but before these plans were completed the Jackson Park building suffered further collapse, and fences were erected to protect the public from falling mortar. Inside, the collections were growing as the building died. In 1913 Director Skiff wrote. "If the pressure for space continues, as it seems likely it will do, some portions of the Museum must be closed off as an improvised warehouse where cases can be stored. . . . In some of the courts and halls the circulation provisions have been reduced to two-feet passageways which really almost prohibits an inspection of the cases."

Before Marshall Field died in 1906, he worked closely with Daniel Burnham, the renowned designer and planner, on the plans for the new Museum building. Despite the critics, Field liked the design of the Jackson Park building and of the Exposition in general and wanted the new building to follow this same tradition.

The Exposition had been planned and built under Burnham's management, and it was this Fair that sparked his

interest in city planning and great civic enterprise. Burnham, who coined the slogan so dear to every city planner's heart—"Make no small plans, they have no magic to stir man's blood," rightly believed that Chicago would never again have the opportunity to devise a grand plan for the city, so he set about to devise such a plan.

According to *Architectural Forum*,[1] "The 1909 Burnham Plan for Chicago" is the classic American master plan. It was not the first of its kind. But in its time it was the most thorough appraisal of a city ever made, and its proposals envisioned the most complete redevelopment of a city till then attempted. And looking at the Burnham Plan today, it is astounding that so much of it was realized.

Corner stone ceremony, September 28, 1917. The Staff of Field Museum of Natural History.

"Indeed, most of the major features of today's Chicago are products of the plan: the grand boulevard development of Michigan Avenue, the elegant foundations and the terraces of Grant Park, the double-decked Wacker Drive and bridges across the Chicago River, the axial cut of the Congress Street Expressway, and the long string of lagooned parks to the north and south along the lake. Even the 90-degree turns on the Outer Drive at the crossing of the Chicago River mark an incomplete stage of the plan, which was faithfully followed up through World War II."

However, as was to be expected, much of Burnham's plan was not realized. In a speech introducing his plan to the noted Merchants Club, Burnham said, "The principal feature of the Grant Park should be the Field Columbian Museum, which should lie in the center of it, leaving a parade ground on the north and a playground on the south of it."

He went on, "Picture to yourselves a stately white museum, resting on the Grand Terrace called the Lake Front, and dominating all the elements of it; the lawns, the fountains, the monuments, all of which should be placed so as to have some reference to that particular building. No structure in the world has ever had a nobler setting than this would be."

Burnham's plan placed the Museum at Congress Street, directly behind what is now Buckingham Fountain. The Museum's east steps were to lead right to the water's edge where Burnham envisioned a brilliantly-lighted yacht basin, surrounded by floating islands reachable only by boat. On the west, the Museum was to face the fountain and beyond that the Congress Street axis reaching west to Civic Centre Square at Halsted Street.

Obviously, the location of the Field Museum was a facet of Burnham's plan that went awry. A provision in Marshall Field's will gave the Museum $4,000,000 "for a building to be erected upon a site to be furnished for that purpose, provided a suitable one is procured within six years from the date of Mr. Field's death." The Board of Trustees, led by Stanley Field, who was the driving force behind the construction of the building, immediately began negotiations for the desired Grant Park site. However, opposition to placing any building in the park developed, and following extended legal negotiations, the central Grant Park site was abandoned.

In 1911, after considering several proposed sites in various parts of Chicago, the Board accepted a site in Jackson Park immediately north of the old building for construction of the new building. A contract was entered into and preparations begun for construction. Steel was at the site, the marble was being quarried and collections of the Department of Geology were moved from the west annex, where they had been housed, to the central part of the building when, in 1914, the South Park Commissioners offered a site in the reclaimed area just south of Grant Park.

The offer was accepted, the steel and marble transferred, and on July 26, 1915 construction work began. Rather than breaking ground, Thompson-Starrett, the builders, had to begin by filling ground. The natural elevation of the site

[1] *Architectural Forum*, May, 1962, p. 108.

was some 30 feet below the floor of the projected Museum basement, and it took over a year to accomplish the filling.

Although the technique used was not uncommon, the laying of the foundation was a lengthy part of the construction job. The foundation consists of clusters of wood pilings which start below the lake level and extend another 65–95 feet down. Some of these pilings go to rock, others encountered a hard substance before the rock level.

These piles support 30 feet tall concrete piers which reach up to the ground floor. The number of piles in a cluster is not uniform, but varies with the location of the cluster. For examply, there are 22 piles in the cluster that support the piers between the windows in the exterior walls, while the piers supporting the walls adjacent to Stanley Field Hall are atop 12-pile clusters.[1]

The next step, the setting of the outside marble, began in May, 1917. The exterior walls are 21 inches thick and the outer six inches of that are white marble, making the marble a structural element as well as a beautiful facing. (This is in marked contrast to the current trend of using a curtain or veneer of marble solely as a decorative element with no structural function.)

By the end of 1917, the east and west wings of the building were practically complete, as was the basement work of the north and south entrances. Brick and steel work, plumbing, steam fitting, tile and glass work, and roofing all moved according to plan. Levels were taken constantly for any sign of settlement or movement.

In 1918 the Museum was unsettled by an element that no level could predict. World War I was going badly, American casualties were heavy, and the national government found itself short of hospitals needed in the event of a protracted war. Therefore, the government contracted to use the new Museum building "for three years as a Government hospital." This change in plans speeded up construction—until the Armistice was signed. With the war over, the government had no further interest in the Museum building and cancelled the contract. As Director Skiff so nicely phrased it, all of this had a "confusing and disturbing effect upon the affairs of the Museum."

Following lengthy negotiations, but "no serious dispute," the Museum accepted an allowance from the government "as full satisfaction of expenses incurred and additional cost imposed during the time the Government controlled building operations."

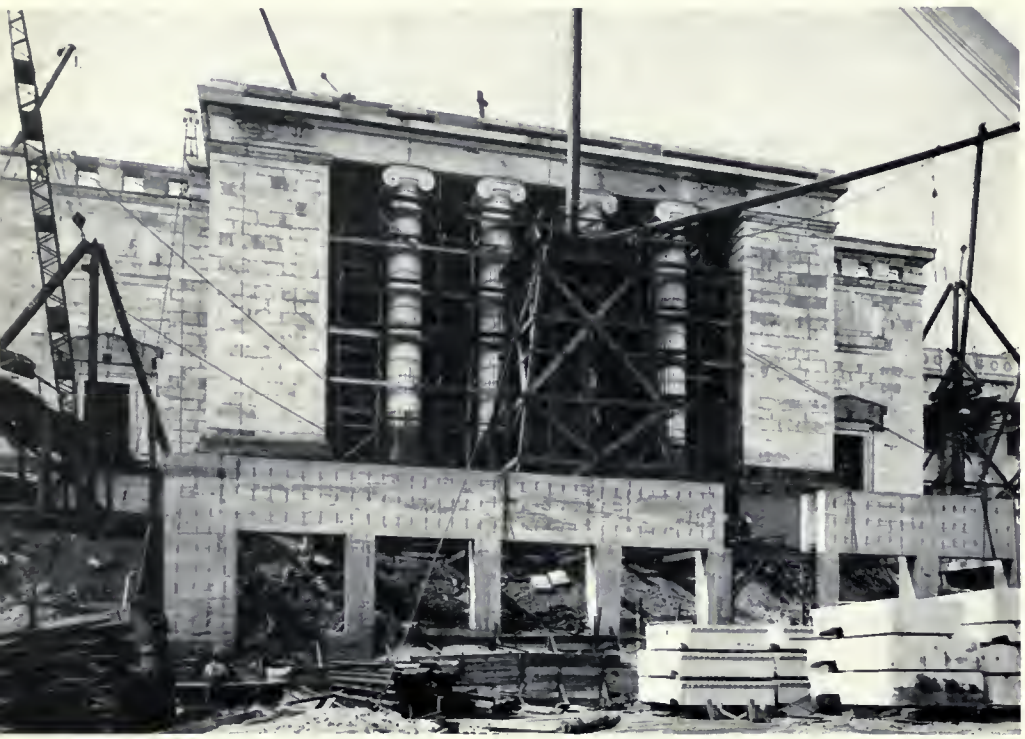
All the major contracts were closed and, except for the terrace, the building was complete on or about June 1, 1920, approximately five years from the date when construction began.

[1]The data regarding the foundation and the thickness of the walls was provided by Harry M. Weese & Associates, Architects.

Progress. Top, *October 15, 1915: while pile drivers sink the pilings which support the building, fill is brought to the site on special railway spurs.* Center, *July 6, 1915: mortar men and brick layers working on the ground floor level. The open area now houses the Division of Reptiles and Amphibians and the Division of Fishes.* Bottom, *August 24, 1919: work has progressed to the second floor, and structural steel roofing for the internal bay areas has been put in place. View is toward the Southeast.*

It sat alone in the midst of a sea of mud. There were no sidewalks or streets leading to it, only a few crude roads and footpaths crossing the newly-made land. A reporter for the *Architectural Record* poetically wrote that the Museum was "isolated on a dirt flat, from which its Georgian marble mass gleams like a white growth in black loam."

This "Georgian marble mass" was closely patterned on the Erechtheium, one of the temples of the Acropolis in Athens which are generally recognized as the finest examples of the Ionic order. Contrary to the old temple form, however, the great area and especially the long ridge and attic lines tend to create an almost squat appearance.



The most famous view of Field Museum is looking south from Lake Shore Drive at the North Door. Here is the North Door under construction, May, 1918. The supports under the columns give an idea of how deep the fill is around the Museum. Today, visitors climb 38 steps to reach the columns and the North Entrance.

Height restrictions laid down for structures in the lakefront area account in great measure for the architect's failure to adhere to the Ionic form throughout.

In addition to his passion for Greek and Roman architecture, Daniel Burnham had a passion for cleanliness. His biographer, Charles Moore, relates, "To Mr. Burnham cleanliness seemed not next to godliness, but on a par with it. Hence his use of white marble and glass in corridors. He planned so that every spot should show, and hence the building must be kept clean." The Museum's maintenance staff can testify to the great effectiveness of Burnham's planning in this area.

Henry Hering created the sculpture that embellishes the Museum inside and out. There are eight caryatids on the exterior of the building and, while at first glance they may seem to be identical, there are actually two types. These types are very similar in mass and movement, but vary in such details as hairstyle, neckline and drapery folds. The caryatids are all alike, however, in that their feet are huge, their hips more than generous and their shoulders would do credit to a stevedore. Yet, in spite of this—or perhaps because of it—they bear an unquestionable dignity.

Above each caryatid porch there is a horizontal relief panel which represents one of the four divisions of the Museum—Anthropology, Botany, Geology and Zoology. These panels are quite decorative, displaying an abundance of floating ribbon, flowing draperies and feathery wings.

The four figures flanking the arches of Stanley Field Hall complete Hering's work. These figures are intended to be symbolic of the use and inspiration of the Museum: Science, Dissemination of Knowledge, Research and Record.

Hering designed eight more figures—Fire, Earth, Air and Water; North, South, East and West—to be set across the attic (the area immediately above the columned doors), but these figures were never executed in marble and the attic remains devoid of statuary.

All in all, the Museum building took over five years and more than $7,000,000 to build. A representative of Thompson-Starrett, the construction engineers that built it, estimates that to duplicate this building today would take at least three years and $24,000,000, assuming all equipment and material was readily available. However, as Mr. William Dring of Harry M. Weese and Associates pointed out, it is inconceivable that anyone would contemplate erecting an identical building today. One could be built which to outward appearances would look much the same, but structurally it would be very different from the Museum building.

Resting comfortably on its 30 feet of fill, the Museum building is a reminder, then, of the rising cost of living and Chicago real estate values, changing technology, a fantastic lakefront fair and an architect's dream, as well as a magnificent Chicago landmark.

Destination:

William S. and Janice K. Street, leaders of the mammal survey of Turkey, have directed two previous expeditions. These photos were taken during their 1962 expedition to Iran, the most extensive mammal survey ever made in that country.

PREPARATIONS are in the final stages for the third mammal survey expedition to be led by Mr. and Mrs. William S. Street in cooperation with Field Museum. The expedition will do field research in Turkey beginning in June.

Against the background of the usual scientific work in the Division of Mammals, two young mammalogists who will be members of the expedition have been involved for several weeks in the many details of obtaining and packing the necessary equipment and in the intense study required before the survey begins.

The expedition leaders, William S. and Janice K. Street, formerly of Chicago and now of Seattle, Wash., have previously made mammal surveys of Iran in 1962 and Afghanistan in 1965.

The mammalogists of the present expedition are Daniel R. Womochel, a graduate student from Texas Technological College, and Anthony F. DeBlase, a graduate student from Oklahoma State University.

Womochel has had two separate field work experiences in the past year, one involving summer field work on lemmings in Alaska in 1967 and the other in collecting ectoparasites from southern hemisphere seals and birds in Antarctica in the winter of 1967–68. He also participated in two summer expeditions to Mexico from Michigan State University in 1962 and 1963 and earned his master's degree from Texas Tech with a thesis on a field study of eight native species of Texas rodents.

Anthony DeBlase, a graduate of Earlham College in Richmond, Ind., has collected and banded bats in Indiana, Oklahoma and Texas and will use this experience to investigate the cave bats of Turkey.

On the Turkish mammal survey, DeBlase will specialize in study of the native predator species, including small shrews, moles and hedgehogs, which prey upon insects, and medium-sized foxes, jackals, wildcasts and lynxes, which feed upon rodents, hares and birds.

Womochel will concentrate on the prey species of Turkish mammals. Among the rodent species he expects to study in the field and collect for further study in Chicago are hamsters and gerbils. He also hopes to make observations in Turkey on two hoofed species which also occur in Europe, the chamois and the wild sheep of the Mediterranean Islands, Corsica and Sardinia.

Both young scientists plan to work for doctorate degrees, with dissertations on the scientific results of the expedition.

Departure date for the expedition's mammalogists depends upon when the *S. S. Neptune*, the first ship from Chicago, reaches the eastern Mediterranean. Already aboard the *Neptune* are the Field Museum's two specially-outfitted International Harvester Travelalls. Forty wooden boxes full of camping gear and the scientific equipment for collection of mammal specimens and for recording data in the field are also on that ship.

On the Museum's top floor, expedition mammalogists Daniel Womochel (left) *and Anthony DeBlase itemize and pack some of the hundreds of items included in the equipment for the Street mammal surrey of Turkey. The equipment filled more than 40 wooden crates.*

Mr. and Mrs. Street will be setting up expedition headquarters in Ankara the second week in May and will cable for their young scientists to emplane when the *Neptune* reaches port in Istanbul.

Lists of the expedition needs run into hundreds of items and a sampling of these gives an indication of the complexities involved in planning the survey. The items include two triple-beam balance scales, three animal predator calls, two camouflage nets, two alarm clocks, one collapsed cooking stove, one potato peeler, eight salad forks, two snake bite kits, three inflatable splints for legs, four cans of *Off* insect repellent, two cans of *Raid*, one 6 by 8-inch camp mirror, 24 harmonicas and 1,000 balloons. The last two groups of items are destined for youngsters living in the villages near which the expedition will camp.

The scientists who accompanied the Streets on the two previous mammal surveys to southwestern Asia have both contributed manuscripts now being published by the Field Museum Press.

"A Study of the Mammals of Iran, Resulting from the Street Expedition of 1962–63," by Douglas M. Lay, was published in October, 1967, as part of the scientific series, *Fieldiana: Zoology*. Lay and Mr. and Mrs. Street collected 1,728 specimens of mammals from all parts of Iran and provided the most comprehensive scientific study ever published on the mammals of Iran. Lay is now completing his doctorate research which grew out of discoveries he made during the investigation of Iranian mammals.

Jerry Hassinger left graduate studies at the University of California to accompany the Streets on their 1965 mammal survey in Afghanistan and his first 100-page work is scheduled for publication in *Fieldiana: Zoology* this year. He is currently completing another manuscript on the terrestrial mammals of Afghanistan.

MRS. A.W.F. FULLER GIVES CARVED LUBA BOWSTAND

A SCULPTURED bowstand from the Luba people of the Kinshasa Congo Republic is among miscellaneous objects from the collection of the late Captain A. W. F. Fuller recently acquired by Field Museum as a gift from Mrs. Fuller.

The bowstand, of carved wood except for a chisel-shaped ferrule at its base, has three prongs radiating from the handle. The figure of a woman, decorated with a pattern of body scars characteristic of the Luba, forms the body of the bowstand.

Among this people of the Upper Lualaba River, sculptured items, such as the bowstand, play more than a utilitarian role. Sculpture incorporating the human figure is believed to be associated with the Luba nobility.

Some objects closely associated with the Luba chiefs are regarded by the people as having supernatural qualities and are handed down as heirlooms to chiefs that follow. W. F. P. Burton, a missionary who spent 34 years among the Luba, commented that "Every chieftainship has certain objects of veneration, which may be considered as the expression of the very entity of the community." He said that these objects were beyond price and, in addition, any Luba would rather risk his life than let an heirloom fall into the hands of an enemy.

Limited information available on the use and social significance of the bowstand indicates it is set in the ground or wall near the bed, where bows, arrows and spears are held by resting them in between the prongs. Responsibility for the weapons and bowstand was given to one of the chief's first wives, who may also have carried his weapons when he went to war. Among peoples descended from the Luba, bowstands are also kept and transmitted as heirlooms of deceased chiefs.

The bow is the traditional Luba weapon for hunting and war and figures prominently in enthronement rituals. To receive one of the highly prized heirlooms is indicative of the highest esteem of the Luba nobility. Young men wishing to have a noble as a patron would present that person with an arrow.

NEW CURATOR JOINS ANTHROPOLOGY STAFF

DR. STEPHAN GASSER, 29, a native of Basel, Switzerland, was recently appointed Assistant Curator of Oceanic Archaeology and Ethnology in the Field Museum Department of Anthropology.

He studied under Professor Alfred Buehler at the University of Basel and specialized in the ethnology of Indonesia, a tradition at the university since the 19th century. Dr. Gasser received his doctorate in 1967, after completing his thesis, "Pottery Craft in Indonesia," which required research at museums in both Switzerland and the Netherlands.

At Field Museum, Dr. Gasser will conduct research with the Museum's large Indonesian collections and he is also considering the possibility of investigating historical relations between Oceania and Middle and South America.

Prior to joining the Museum staff, he spent two months studying Mexican archaeological sites with several Mexican anthropologists.

CALENDAR OF EVENTS

May hours: May 1–4, 6 a.m. to 6 p.m. May 5–September 2, 9 a.m. to 6 p.m., Monday, Tuesday and Thursday; 9 a.m. to 8 p.m., Wednesday, Friday, Saturday and Sunday.

May 3 MEMBER'S NIGHT Special preview of temporary exhibit, "Masada, King Herod's Fortress," from 3 to 10 p.m. Two half-hour music and dance programs, featuring the Amranian Brothers, Israeli Folk singers, and the Habonian Israeli Folk Dance Troupe from Chicago, will be held at 7 and 9 p.m. Lecture, "Masada, A State of Mind," by Marc Michaelson, Director of Publicity for the Tourism Council of Greater Chicago, at 7:30 and 8:30 p.m.

May 4 LATIN DAY IN ILLINOIS Sponsored by the Illinois Classical Conference, state high school Latin students will attend illustrated lectures in James Simpson Theatre and tour exhibit areas in the day-long program.

May 5 "MASADA" EXHIBIT opens to the public, through August 15.

May 14 TUESDAY EVENING LECTURE SERIES First of four lectures in conjunction with "Masada" Exhibit. Prof. William Albright, Johns Hopkins University, will speak on "The Historical Context of Masada." Subscription series also includes programs on May 28, June 4 and June 11, 8:15 P.M., James Simpson Theatre. See page 7 for details.

May 18–19 WEEKEND BOTANY AND GEOLOGY FIELD TRIP to Galena, conducted by Botanist Gabriel Edwin and Geologist Matthew Nitecki, Museum Curators. The Curators will conduct two other field trips, to Starved Rock State Park, May 25–26, and to Devil's Lake State Park in Wisconsin, June 8–9. Cost is estimated at $20.00 for each trip or $50.00 for all three. Preliminary lecture for all three field trips will be held at 10 a.m. on May 4 at the University of Chicago Downtown Center, 65 E. South Water Street. Details are available from Barbara O'Connor, FI 6-8300.

Through May: Spring Journey: PLANTS THAT THE AMERICAN INDIANS USED.

MEETINGS:

CHICAGO SHELL CLUB, May 5, 2 p.m.
NATURE CAMERA CLUB OF CHICAGO, May 14, 7:45 p.m.
ILLINOIS ORCHID SOCIETY, May 19, 2 p.m.
GREAT LAKES CHAPTER OF SIERRA CLUB, May 21, 7:30 p.m.

OFFER SUMMER GEOLOGY COURSES

Two non-credit courses in geology for elementary teachers and supervisors will be offered this summer by the Raymond Foundation of Field Museum.

"Fossils and the Geology of the Chicago Area," 8 sessions, will be offered from June 24 through July 3. Registration fees: Non-members, $15.00; Members, $12.50.

"An Introduction to Rocks and Minerals," 10 sessions, will be offered from July 15 through July 26. Registration fee: Non-members, $20.00; Members, $17.50.

Registration fees for both courses are $30.00 for non-members and $25.00 for members.

Ernest Roscoe talks with teachers during a previous summer session in Geology

Each class will begin at 10 A.M. and last about four hours on weekdays. A lecture-demonstration and laboratory periods for individual study will be included. Instructor for both courses will be Ernest J. Roscoe, Lecturer in Geology, Raymond Foundation.

Registration is limited, and interested teachers are asked to write Raymond Foundation, Field Museum of Natural History, Roosevelt Rd. at Lake Shore Dr., Chicago, Ill. 60605, for applications and further information. Registration will close June 3.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
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BULLETIN **FIELD MUSEUM OF NATURAL HISTOR**

Volume 39, Number 6 June 1968

Two-thirds of the students who have worked with Paul S. Martin, Chief Curator Emeritus of Anthropology, over the last several decades, have gone on to gain doctorates. In the last two years, Martin's work with students has been aided by grants from the Undergraduate Research Participation Program of National Science Foundation. These grants have enabled Martin to expand and formalize his Summer School of Archaeology at Field Museum's field station in Vernon, Arizona. At Vernon, each student works on a private research project, as well as on the general archaeological work. The Bulletin *here presents one such report on a small structure found during a survey of Hay Hollow, Arizona. The author, Christopher White, has worked with Martin for several years, and will, next year, go into graduate work in Anthropology.*

SUMMER REPORT

by Christopher A. White
Research Assistant, Anthropology

A portion of Hay Hollow prior to the start of excavations. Hay Hollow Valley, in East Central Arizona, has proved to be the site of a prehistoric agricultural community.

SINCE THE beginning of the Hay Hollow Valley Project six years ago, we have been attempting to define and explain the total range of behavior of prehistoric man in this eastern Arizona valley. By viewing all patterns of behavior and changes in these patterns we will try to isolate meaningful regularities and factors of causality.

An important aspect of the overall study deals with the investigation of the relationships existing between man and his total environment. This interest led us, last summer, to initiate an intensive archaeological survey of a little-studied region forming the eastern periphery of the valley. The area was a large and rugged ancient lava flow that rises 500 to 600 feet above the valley floor. We wanted to know *what* kinds of cultural activities were taking place in the area, *where* they were taking place, *when* they were taking place, and hopefully, *why* they were taking place.

In the course of the survey we discovered a site located on the edge of a sandy terrace approximately 500 feet up the side of the mountain. It appeared to reflect a specialized activity previously unknown to us in the valley. After developing several working hypotheses on the possible function of this site, we proceeded to excavate it. The primary feature consisted of a semicircular windbreak constructed of basalt boulders, each of the two segments being approximately 5 feet long. At the time of occupation the structure may have been about 4 feet high. Inside the windbreak there was a single firepit which contained large pieces of charcoal. The structure faces southwest, the direction of the prevailing, often stormy, winds. Without some protection, maintaining a fire for warmth or cooking would be extremely difficult. In and around the structure we found small quantities of stone tools and a number of brown cor-

rugated potsherds which appear to be from a single jar. The pottery would date the site at around A.D. 1000. The relative scarcity of artifacts is a significant factor in inferring the type of activity that may have been performed there.

From other archaeological sources and from analogy with present-day Pueblo Indian agricultural practices, we have hypothesized that the site represents a temporary agricultural field camp used by people who maintained permanent residence at one of the pueblo villages in the valley bottom. During the short growing season the Hopi Indians often build small temporary shelters near their fields because the fields are not uncommonly located far from their homes. It is frequently necessary for the Indians to stay close to the field to keep away birds and other animals that might destroy the crop. Another feature related to the site and deserving comment was a number of small boulders in a pile near the edge of the terrace. The Indians may have made this pile in the process of removing these stones from the terrace in order to make it more suitable for growing their corn.

We have strong evidence to suggest that sometime about A.D. 1000 there was an apparently significant meteorological change in the area. There was a shift from a more or less even yearly distribution of rainfall to a pattern of summer maximum precipitation as is typical in the Southwest today. It is believed that this change made maize farming in the valley precarious. Simultaneous with change in habitat it appears that the Indians began to abandon their numerous small pueblos, coming to live together in larger and fewer villages. It has been suggested that this aggregation may have served to insure greater economic cooperation during the time of hardship.

We hypothesize that it was during this time of significant changes in the habitat and social organization that the Indians began farming the terrace adjacent to the site we excavated in addition to similar terraces on the mountain side. What we may be seeing is an agricultural pattern similar to that of the contemporary Pueblo Indians. To prevent widespread starvation, they plant their corn on a number of different types of land with varying slopes, and soils, so that if the summer thundershowers destroy the crop on one type of landform, the entire crop will not be lost. We suggest that a "cover-all-bets" agricultural practice similar to this may have been emerging in the Hay Hollow Valley at this time. There are additional data which tend to support this hypothesis. It appears, however, that this innovation in agricultural practices was not enough to sustain the population. The valley was abandoned around A.D. 1300 and the Indians moved to areas with permanent streams.

The small site that we excavated is in itself insignificant, but it provides us with additional information concerning modifications of subsistence patterns concomitant with with changes in the habitat and social organization in Hay Hollow Valley at approximately A.D. 1000.

Excavated basalt structure at Hay Hollow included sherd cluster (upper center of photo) *and firepit and possible cobble ring* (left of intersecting lines in right of photo.)

MEMORANDUM FROM THE DESK OF

E. LELAND WEBBER, DIRECTOR

Field Museum's Natural History Tours are based, like the Museum itself, on the belief that, in this era of crowded concrete and steel cities, a balanced view of the world and its problems today requires keeping in contact with the basic realities of nature.

For this reason, our program of natural history tours.

The Brazil Tour, February 14-March 11, will emphasize the botany, geology, zoology and ethnology of that vast nation, so rich in natural history. The group, limited to 35 tourists, will be led by Phil Clark, the Museum's public relations counsel and an expert on plants and gardening. Field Museum's Chief Curator of Zoology, Dr. Austin Rand, will accompany the tour as a specialist in fauna, particularly the birds. At various stops, the group will spend time with such outstanding Brazilians as the naturalist Augusto Ruschi, the landscape designer and botanist Roberto Burle Marx and the geologist Francisco Mueller Basto.

We have sought in the Tour's careful advance planning, not just a superficial "tourist's eye" view, but to show Brazil in its many-dimensioned reality: the people and the history in their natural setting of plants and animals, mountains, plains and seas.

This is Field Museum's third tour. The others, also led and planned by Phil Clark, were to Guatemala and Mexico.

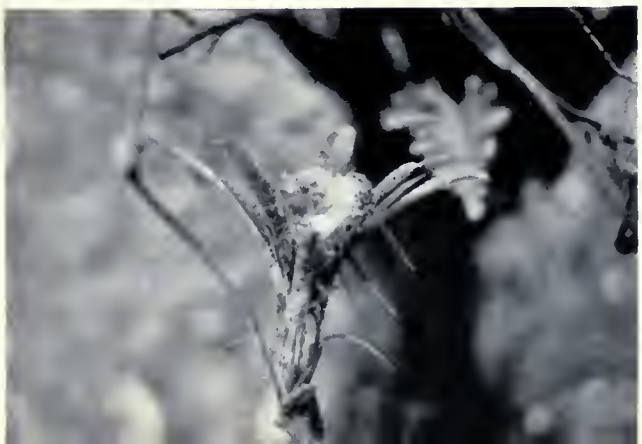
The Many-Faceted Jewel:

BRAZIL

Rio's great bay, lined with beaches of dazzling white sand, and guarded by its incredible green, gently sloping mountains.

Story and photos by Phil Clark

Above: *Brazil's celebrated naturalist, Dr. Augusto Ruschi, watches a tuxedo hummingbird feed on sugar water. Thousands of them come daily to the Ruschi veranda.* Below: *Tiny egg of a Venezuelan hummingbird lies in a nest built in a small* Bromelia *species,* Neoregelia punctatissima, *which grow in a hanging linked series.*



Brazil, South American giant among nations, is a land of jewels of earth and air and water. Its brilliant diamonds and deep green tourmalines, its magnificent wildlife—gem-colored hummingbirds, iridescent macaws, jet-striped angelfish and pearl-toned piranhas—only begin to reflect the color and variety to be found in this country.

Home of boundless varieties of plants and flowering trees, the face of Brazil ranges from cosmopolitan cities to jungle villages, from shimmering white beaches flanked by sugarloaf mountains to immense and mysterious rainforests and rivers that flow thousands of miles, in places tumbling over waterfalls that dwarf Niagara.

The people of Brazil are like their many-faceted country. They encompass many of the world's races, mingling yet retaining diversity, vibrant and creative, yet gentle and easy-going, capable of both sustained artistic originality and the spontaneous joy of Carnival.

Here is natural history in all its vitality and variety. This is Brazil, big, exciting, a nation of color and motion—the ideal site for a Field Museum Natural History Tour.

Bahia

Your first stop on the 26-day tour, is in Bahia. The trip begins on Friday, February 14, from O'Hare Field to New York where you board a Varig jet, arriving in Brazil early the next morning.

In Bahia, in the white and pastel-painted colonial town of Salvador, where on Todos os Santos Bay Portuguese discoverers of Brazil first landed, your arrival coincides

with the climax of the Carnival season, the weekend before Ash Wednesday (see Cover). The Bahian Carnival overflows with joyous, uninhibited dance, exciting music, fantastic costumes and open-handed friendliness. The unsophisticated mood and the lack of out-of-town visitors contrasts with Rio's crowded Carnival.

Besides exciting hours mingling with Carnival crowds, you enjoy sunny afternoons on the two principal beaches. You also explore the baroque splendor of some of the historic churches, taking particular pleasure in the 16th century art in Sao Francisco and Carmo. In this, the royal capital of Brazil for 214 years, you stay at the elegantly modern Hotel da Bahia.

Espirito Santo

Brazil's greatest naturalist, Dr. Augusto Ruschi, is famous for his discoveries about hummingbirds. You fly from Bahia south to Espirito Santo State to visit this scientist at his estate—Brazil's largest *living* museum. Your plane arrives in the state capital, Vitoria, on the Atlantic coast, and you are driven inland through palm-dominated jungles and rivers, up rugged mountains and past waterfalls where velvet-purple Cleistes orchids, tree ferns and huge, brown-veined white Dutchmen's pipe flowers grow in profusion. During roadside stops, your tour botanist, Phil Clark, and tour zoologist, Dr. Austin Rand, Field Museum Chief Curator of Zoology, point out interesting plants and birds and answer your questions.

You arrive in time for dinner at the Espirito Santo Agricultural College where you spend the next two nights, February 18 and 19. On the first evening, Dr. Ruschi shows you slides and discusses his work with hummingbirds. You visit him at his estate at Santa Teresa the following day, seeing thousands of hummingbirds of 28 species flying freely in colorful gardens and woodlands near his house and museum buildings. In addition to the native species, dozens of others from places throughout the hemisphere are kept in large, enclosed garden areas.

Dr. Ruschi's museum stresses the natural history of Espirito Santo. The state has an impressive botanical-zoological representation, including 14 species of monkeys, 35 hummingbirds, 45 bats (of which Dr. Ruschi has discovered five), and 22,000 species of plants, including 400 orchids and about the same number of bromeliads, families in which Ruschi has also done important work.

Rio de Janeiro

Rio, considered by many to be the world's most beautiful city, has its own special magic. Its natural setting is stunning: the great azure bay with its crescent of white sand and leaning palms and green, gently sloping Sugarloaf and Corcovado mountains looming alongside it. The magic of Rio's landscape is matched by its human magic, warm, easy-going people who bring spirited friendliness to the mosaiced promenades, the broad city streets and Copacabana and Ipanema beaches.

You spend three days here, beginning February 20, with half the time spent in sight-seeing, the remainder free for shopping or relaxing. You view the bay from the forested summits of Tijuca and Corcovado, where the famous statue of Christ the Redeemer stands, and visit the botanic garden and zoo, and the Raymundo Castro Maya Foundation, where a splendid colonial house, containing a rare collection of early engravings and elegant furnishings of the period, is set in a close-clipped formal garden overlooking the bay. Your hotel, the glass and concrete Excelsior, faces Copacabana.

Brazilian stops are numbered in the order they will be visited.

Above: *Iguacu Falls, 20 times Niagara, spreads in two giant horseshoes in tropical forests; Ouro Preto, the source of tons of gold once shipped from Colonial Brazil to Portugal. Contains excellent colonial architectural and art treasures.* Left: *The Monkey Puzzle Tree,* Araucaris angustifolia, *typically Brazilian, still grows in forests near Vila Velha; Vila Velha, near Curitiba, presents a strange landscape of red and yellow sandstone eroded in shapes resembling everything from cathedrals to eggcups.*

Petropolis

You are driven from Rio this morning, February 23, through heavy forests, alight with flowering yellow Cassia and pink and blue Tibouchina trees, to the cool highland town of summer estates, Petropolis, where you stay at the Quitandinha Hotel. During the afternoon you tour Emperor dom Pedro II's summer home and examine its rich furnishings and imperial crown jewels.

But Brazil is also a land of exciting modern movements in the arts, and it is here that the first truly new ideas anywhere in recent centuries of landscape design evolved. The guiding genius of this fresh originality is Roberto Burle Marx, who paints living landscapes with the swirling lines and vibrant colors of abstract art—creations completely appropriate set among the brilliance of tropical flowers and the unusual sugarloaf horizon. During a full day's tour of Petropolis gardens, you are shown through some of his most effective creations by the designer himself, dom Roberto, and are welcomed by the garden owners, some of Brazil's leading families. These include the Leite Garcias at Fazenda Samambaia, Senhora Odete Monteiro (whose fantastic garden was described by *House and Garden* magazine garden editor, Ralph Bailey, as "one of the most beautiful private gardens in the world"), the Carlos Somlos at Retiro Panonia and Alberto Kronforth at Rancho Pedra Azul.

You return to Rio and the following morning drive to dom Roberto's own home, south of the city, for a day in the country with this artist-botanist. His home is on a hill overlooking a vast beach area where weird plants have adapted to the dry sands.

Sao Paulo - Curitiba

You leave this morning, February 27, for Sao Paulo, where during a four-hour stopover between planes, you visit the Butantan Snake Farm, world famous for its collections of snakes and its scientific work with venoms in producing anti-venoms. Sao Paulo, you find, is a Portuguese-speaking Chicago with palms, for its skyscraper-crowded skyline spreads for miles.

By midafternoon, your continuing flight has reached Curitiba, deep in southeastern Brazil. After seeing the large collections of Brazilian animals in Curitiba's zoo, you visit some of the strikingly original small private homes in this capital city of Parana State. You dine at your hotel, the Moderno.

An all-day excursion on February 28 takes you from Curitiba to bizarre Vila Velha, where red-streaked yellow formations of eroded sandstone resemble a ruined city of cathedrals and skyscrapers. Plants of the area are as odd as the strange stone spires and include some which parallel African species and others belonging to the trumpet flower family with four-foot spikes of lavender-blue blossoms. There are forests of Brazil's strange monkey-puzzle tree, *Araucaria angustifolia*. Hot springs complete the eerie picture and a warm-water lake is so crowded with tetra fishes as to appear mottled with moving silver clouds. Your dinner is at Curitiba's attractive Swiss restaurant, the Matterhorn.

Iguacu Falls

An astonished Eleanor Roosevelt murmured, "poor Niagara," on seeing Iguacu. In volume twenty times Niagara, Iguacu has 21 cataracts and the average fall is 210 feet, though some are higher than 250 feet. The beauty of the massive falls is only partly in its tremendous flow and height and spread. Equally impressive is its tropical setting, where flocks of green and gold parrots bathe in its spray and colorful orchids, bromeliads, begonias and pas-

dian on small stream of the Amazon system shoots fish with a bow and arrow. dians of the area use spears for catching larger fishes. Piranha and other nazon fishes are often very colorful.

sionflowers grow in the tangled philodendrons, palms and flowering trees.

You stay at the Casino Acaray, a new hotel on the Paraguayan side of the river, giving you a look at Paraguay. You cross to the Brazilian side for boating and hiking along the falls on March 2 and 3 and fly to Rio for an overnight stay on March 4, with an early morning departure the following day for Belo Horizonte, to Rio's northwest.

Belo Horizonte - Ouro Preto

The Belo Horizonte area has great appeal for those interested in natural history. It is a rock hunters' paradise, surrounded by mountains of jagged, mineral-rich stone outcroppings, and a place where handsomely cut gems can be bought at bargain prices. The rugged countryside contains strange and varied flora and has extensive bird life. Belo Horizonte itself, the capital of Minas Gerais State, is a famous example of city planning and boasts an outstanding (Niemeyer-designed) church with tile murals by artist Candido Portinari. Sixty miles to the southeast is the picturebook town of Ouro Preto, with its baroque churches and their sculptures by the renowned Aleijadinho.

You arrive in Belo Horizonte in the morning and after lunch at your skyscraper hotel, the del Rey, you tour the city and spend an exciting hour in the gem houses. Local gems on sale include diamonds, topazes, amethysts, aquamarines, tourmalines, beryls, agates, kunzites, garnets, citrines, hiddenites and euclauses. You meet some of the city's leading gem cutters and the local geologist, Francisco Mueller Basto at dinner.

In Ouro Preto the next day you find the enchanting Portuguese colonial town of white-painted buildings and churches nestled in a green valley. Its narrow, cobbled streets and great architecture and works of art have made it a national monument and geology buffs find its Museum of Mineralogy exceptional. The trip by car features many botanical thrills, including plants adapted to the singular environment of rocky mountains.

Brasilia

Brasilia is the city of the future come alive. It achieves this distinction both for its careful planning (Planner Lucio Costa even arranged that no streets intersect) and for the clean-lined modern buildings, most designed by Brazilian architect, Oscar Niemeyer. On the Brazilian plateau, 3,000 feet above sea level, it has an ideal climate, and located 500 miles inland from Brazil's coastally-oriented culture, it points the way to an expanding society. Its largeness of concept and daring architecture make it a capital appropriate for a nation with such vast potential.

After an early morning hop northwest from Belo Horizonte, you arrive March 7 in Brasilia for a day of sightseeing. Particularly striking is the Ministry of Foreign Affairs with its surrounding water gardens, and the still incomplete crown-like cathedral and the saucer-form congress buildings with twin shafts containing the executive offices with the supreme court at their base. The zoo is remarkable for its collection of regional birds. Dinner is at your hotel, the elegant Hotel Nacional. Before the flight to Manaus the following morning, you take either a bird-watching walk by a small lake or a botanical stroll in an unspoiled woodland.

Manaus and the Amazon

You spend the afternoon of March 8 seeing Manaus itself—the opera house built in opulent Victorian exuberance during the boom period of the rubber industry, an agricultural experiment station with rare tropical fruits, the local Brazilnut "factory" and a small zoo. You spend the next two days on the great Rio Negro, a major river of the Amazon system, in the tour yacht, *Selvatur,* and explore smaller tributary streams in small boats. You find Indians catching fish with arrows and spears, piranhas with flashing silver and ruby-hued bodies and sinister rows of razor-sharp teeth, numerous waterfowl, the giant *Victoria regia* waterlilies with pale pink blooms and spined, enormous leaves sturdy enough to support the weight of a child, and a wide variety of flowering trees and vines. You return each evening to your hotel, the Amazonas, but you eat your lunches on the yacht. You fly on Varig, via Miami, on March 11, arriving in Chicago in the evening.

A grand concept underlies Brasilia, the national capital. Below, *water gardens surrounding the Ministry of Foreign Affairs.*

Left: *Swirling lines in brilliant colors distinguishes this garden landscape of famed designer-botanist-artist Roberto Burle Marx. Dom Roberto will personally guide tour members through five of the gardens he has designed, including this one at Alberto Kronsforth's Rancho Pedra Azul in Petropolis.* Center: *Giant spiny pads of* Victoria regia, *strong enough to support the weight of a child, float on a stream which enters the Amazon system.* Right: *Tour yacht,* Selvatur, *will make tour members on two days of sightseeing on the Rio Negro in the Amazon River system. Short trips up tributary streams will be made in small boats.*

Field Museum's Brazil Tour, with all costs—hotels, meals, gratuities, taxes and fees and including a tax-deductible donation to Field Museum of $500—is only $2050. The 26-day tour features visits to private homes and gardens, special advance planning for a natural history emphasis, meetings with Brazilian natural history experts, a view of colonial and modern art and architecture, expert leadership in areas of plants, animals and birds and a wide-ranging survey of the nation and people as a whole, beginning with the Carnival in Bahia. It takes place during Brazil's late summer, February 14 - March 11.

CLIP AND MAIL THIS COUPON TODAY

I would like.....reservations for your Brazil Tour and I enclose my check for
(HOW MANY)
a $500 deposit for each reservation

Name .....

Address .....

City..... State..... Zip .....

☐ Please check if single rooms are desired, at extra charge of $95.00.

Please send information about this tour to my friends listed below:

Name .....

Address .....

City..... State..... Zip .....

Name .....

Address .....

City..... State..... Zip .....

A giant quartz crystal in the Ouro Preto Museum of Mineralogy.

Summer Journey

Coho Salmon

The FISHES of LAKE MICHIGAN

"The Fishes of Lake Michigan" is the Museum's Summer Journey for children during June, July and August. On a self-guided tour, youngsters will be introduced to some of the different fishes found in the lake, with an emphasis on the changes in the abundance and species composition of the fish populations.

There have been many changes in the fish life of Lake Michigan in the last century. The Lake Sturgeon (*Acipenser fulvescens*), once abundant in the lake, is now rare, while other fishes have been introduced into Lake Michigan, either by accident or deliberately.

Carp (*Cyrpinus carpio*) were introduced into the lake before the turn of the century, flourished, and have provided commercial fisherman with catches as high as 7,000,000 pounds in one year. Goldfish (*Carassius auratus*) first escaped into the lake from lagoons where they were stocked for the 1893 Columbian Exposition. They were introduced many times later by fishermen and by people who simply released their pet fish in the lake.

American Smelt (*Osmerus mordax*) eggs were planted in Crystal Lake, Michigan, in 1912. These hatched and the fish lived and spawned in that lake, escaping through an outlet into Lake Michigan about 1923.

Rainbow Trout (*Salmo gardneri*) were stocked in the lake and streams of northern Wisconsin and Michigan that empty into the lake. This fish is also called the Steelhead. Other fishes extended their ranges and invaded Lake Michigan from the lower Great Lakes and the Atlantic Ocean. In the past, Niagara Falls was a natural barrier between Lakes Ontario and Erie. Construction of the Welland Canal, completed in 1829 and enlarged about 80–90 years later, allowed ships from Lake Ontario to pass into Lake Erie. Fishes also used this canal for passage between the lakes.

The Sea Lamprey (*Petromyzon marinus*) lived along the Atlantic Coast and was also found in Lake Ontario. It moved through the Welland Canal and into Lake Erie about 1921. Gradually moving into the other Great Lakes, it appeared for the first time in Lake Michigan in 1936. Since that time it has practically wiped out the Lake Trout (*Salvelinus namaycush*), once the foundation of the lake's commercial fishing industry.

About this time, when the Lake Trout and other fishes were decreasing in number, the Alewife (*Alosa pseudoharengus*) moved into the lake. This fish is also found along the Atlantic Coast and since 1873 has been in Lake Ontario, where it was probably stocked by accident. Using the Welland Canal route, it moved into Lake Erie about 1931 and was first found in Lake Michigan in 1949. With few fishes to eat it or compete with it, the Alewife thrived and became abundant.

Rainbow Trout

Sea Lamprey

Alewife

Lake Sturgeon

A control program has lowered the number of lampreys in the lake and with the lampreys under control, populations of other predator fish could make a comeback. To aid in building the populations of game fish in Lake Michigan Lake Trout and Rainbow Trout have been stocked in large numbers.

In 1966, the State of Michigan released Coho Salmon (*Oncorhynchus kisutch*) in streams that empty into the lake. This native of the Pacific Coast will not only help in improving sport fishing in the lake, but will also aid in Alewife control. The trout and salmon stocking may also help to restore the lake's commercial fishing industry.

The future for the fishes in Lake Michigan is difficult to predict. Lamprey populations will probably remain under control. Alewives will probably still be abundant, but with a restoration of predators and the establishment of a commercial fishery for them, their numbers should decrease.

Journey sheets and information on this program are available at either the North or South Doors and at the Information Desk. This is Journey No. 54 in the Raymond Foundation's Journey Program for Children.

Members' Night visitors watch a performance by the Habonim Israeli Folk Dance Troupe.

MEMBERS' NIGHT ATTENDANCE SETS A NEW RECORD

More than 4,500 Museum Members, their families and guests attended the 1968 Members' Night on May 3, a three-hour open house centering around the special exhibit, "Masada, King Herod's Fortress." The Captain of the Museum Guard estimated that at least half those attending visited the Masada exhibit, which was crowded throughout the evening.

Two short motion pictures and a slide lecture supplemented the exhibit and visitors responded enthusiastically to a program of Middle Eastern folk singing and dancing in Stanley Field Hall.

The Masada exhibit, which opened to the public on May 5, was featured recently in several Chicago newspaper articles and received critical acclaim in its previous showings in New York and London.

Archaeological treasures from Masada and historical data about the site and its excavation are included in the special exhibit. This clifftop stronghold, on the western shore of the Dead Sea in Israel, was built as a defensive retreat by King Herod in the first century B.C. It was chosen by the Jewish Zealots for their final stand against the Roman Legions from 70 to 72 A.D. Finally overwhelmed by the forces of Flavius Silva, the Zealots elected death at their own hands rather than surrender. The site was also occupied briefly in the fifth century by Christian Monks.

Masada was excavated in two seasons, 1962–63, under the direction of Yigael Yadin, Professor of Archaeology at the Hebrew University in Jerusalem. Thousands of volunteers from all over the world joined in the large scale excavations.

Members' Night also included the traditional tours of the Museum's scientific departments, which included many special displays depicting work being done in the various divisions. Hundreds of visitors took advantage of the opportunity to meet Curators and other members of the scientific staff.

E. Leland Webber, Museum Director, described Members' Night as a "thorough success, whether measured by attendance or by the enthusiasm of our guests."

Attendance at the 1968 Members' Night exceeded last year's record by more than 600. Museum membership itself has grown from 12,279 in 1967 to more than 14,000 during the first part of 1968.

CALENDAR OF EVENTS

June hours: 9 a.m. to 6 p.m., Monday, Tuesday and Thursday; 9 a.m. to 8 p.m., Wednesday, Friday, Saturday and Sunday.

June 11 MASADA LECTURE SERIES "Israel, Crossroads of Empires and Civilizations: Archaeological Evidence," by Professor Helene Kantor, University of Chicago. Final lecture of series, 8:15 p.m., James Simpson Theatre.

June 15 EGYPT THROUGH A BIOLOGIST'S EYE. Photographic exhibit by Dale J. Osborn, Field Associate in Zoology. Emphasis on rarely seen aspects of life in the desert. Hall 9 Gallery.

June 24 NON-CREDIT GEOLOGY COURSE "Fossils and the Geology of the Chicago Area," will begin for elementary teachers and supervisors under sponsorship of Raymond Foundation. Eight-session course will end July 3. Registration fee: Members, $12.50; Non-members, $15.00.

June 24 SUMMER PROGRAM IN ANTHROPOLOGY Six-week training program for high-ability high school students begins. Program will include lectures, seminars, workshops, study of Museum collections, individual projects and field studies. It is sponsored by a National Science Foundation grant.

Through August 15: "MASADA, KING HEROD'S FORTRESS" Archaeological finds from the Israeli stronghold where in 73 A.D., 960 Jewish Zealots took their own lives rather than surrender to the Roman conquerors. Museum Members and their families will be admitted free of charge. Admission fee for non-members is 75 cents for adults and 35 cents for children.

Through August: Summer Journey THE FISHES OF LAKE MICHIGAN. Among the fish to be featured are the lake trout, yellow perch, sea lamprey, coho salmon and alewife. The Journey takes youngsters on a do-it-yourself tour of the Hall of Fishes (Ground Floor, Hall O). Any child able to read and write may participate in the free Journey Program conducted by the Raymond Foundation. Journey records sheets are available at the Museum's North Door.

MEETINGS:

ILLINOIS AUDUBON SOCIETY, June 5, 7 p.m.
CHICAGO SHELL CLUB, June 9, 2 p.m.
NATURE CAMERA CLUB OF CHICAGO, June 11, 7:45 p.m.
CHICAGO MOUNTAINEERING CLUB, June 13, 8 p.m.

FIELD MUSEUM OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor

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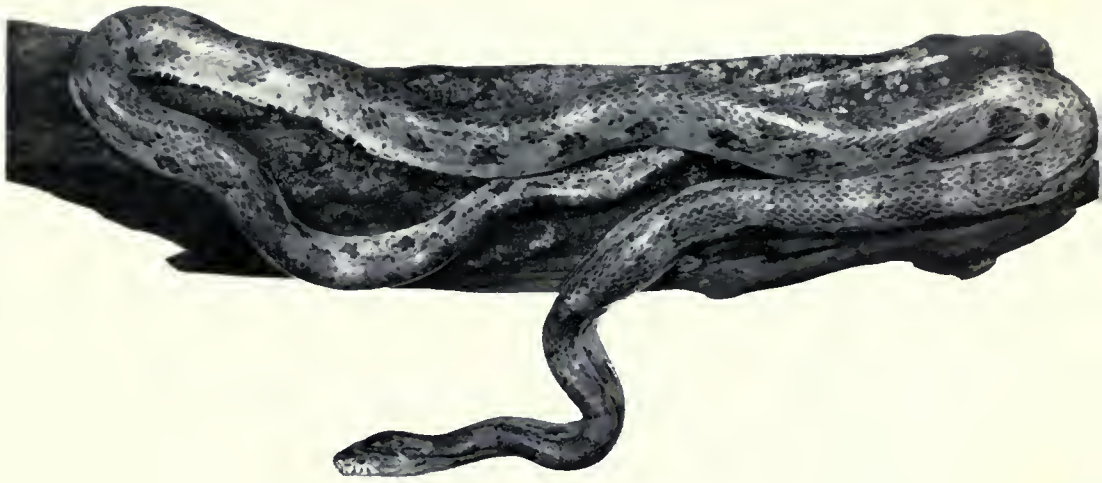
BULLETIN **FIELD MUSEUM OF NATURAL HISTORY** *Volume 39, Number 7 July 1968*

The young man on this month's cover, Johnny Kolias, 4, of Elwood, Indiana, is obviously impressed by Field Museum's skeleton of a Pleistocene mammoth, Mammuthus primigenius. *The mammoth occurred over much of North America and as late as ten thousand years ago, could still be found in the Great Lakes Area. Both mammoths and mastodons, a related elephant-like species, are featured in Field Museum's Sesquicentennial Tour of Illinois natural history.*

The corn snake (Elaphe guttata) *at right is common near farms throughout Illinois. It is a harmless, useful snake, feeding on mice. The corn snake, which has a distinctive pale red-orange body with deep red markings, is one of nearly fifty snake species in Illinois.*



Sesquicentennial Special

HALF A BILLION YEARS OF ILLINOIS HISTORY

Despite remarkable advances and changes in the life patterns of Illinoisans in the past 150 years, the history of our statehood is as brief as the flick of an eyelash in the hundreds of millions of years of Illinois' natural history. In observance of this Sesquicentennial year, Field Museum has arranged a special self-conducted tour to acquaint residents and visitors with the state's varied and complex past.

Areas of geology, zoology, botany and anthropology are deeply interrelated in the history of Illinois, of course, but its story begins with the forces which shaped the earth. The area which would become Illinois was subjected to a variety of geologic and climatic changes but its position during two particular geological periods were of great importance in giving the state its significant agricultural and economic value in modern times.

The bedrock of the Chicago area and the extreme north central part of the state is largely of the Silurian Period (about 420 million years ago) but almost the entire remaining land area in Illinois dates to the Pennsylvanian Period (about 250 million years ago), the one geological period during which climate and plant life in combination permitted the formation of coal beds.

Illinois was part of the continent that was partially covered by vast inland seas which retreated and advanced over several geologic periods. The most recent period on record of an inland sea in Illinois is in the Cretaceous Time (about 100 million years ago), although it is possible that parts of Illinois may have been undersea even later. A legacy of marine fossils testifies to the aquatic nature of life forms in Paleozoic Illinois.

Between the advance and retreat of the Pennsylvanian sea, the Illinois landscape was frequently swampland, including extensive forests which died, decayed and were buried under the sediments. Millions of years later these dead forests became the rich coal deposits that were of such economic importance in the 19th and 20th centuries.

The life in those ancient giant fern-tree forests included unusual and now extinct fishes, insects and invertebrates as well as many archaic plants. Amphibians were already diverse and the reptiles, later to dominate the animal world because of their great size and variety, were beginning their evolutionary ascent. Illinois has one of the world's three most significant fossil records of life in its Mazon Creek formation. Because soft parts of fossil animals and plants are preserved in concretions, scientists are able to do detailed studies of aspects of ancient life usually un-

available. Field Museum has become the major center of research on the fossils of the Mazon Creek area.

A second important geologic period in Illinois was the Pleistocene, the Ice Age of the last million years. The advance and retreat of the great glaciers churned up and deposited a variety of rocks and minerals in most of the state. This glacial action also produced the rich farmland coveted later by homesteaders.

Illinois has hosted a diversity of mammal residents but fossil records of mammals are scarce in the state, largely because rock of the periods which would bear these fossils has been eroded away. With the numerous glacial advances and retreats and the resulting rapid climatic fluctuations, many forms of life that had become established in the area died out or migrated elsewhere. Among the animals that did range here were the giant beaver, which measured about eight feet in length, and the mastodon. It was the presence of this ancient elephant-like creature that probably brought the earliest human residents to Illinois.

There is evidence in the form of stone spear-points that Paleo-Indians reached the Upper Great Lakes region in pursuit of the mastodon about 10,000 years ago. They were nomadic hunters and even as recently as 100 B.C. there were apparently Indians in the area whose cultures were based exclusively on hunting.

Most of the later Indian residents of Illinois, however, combined agricultural and hunting activities. Indians of northern Illinois adopted the use of canoes, sleds, snowshoes, made some pottery and built simple dwellings, but they never attained the high cultural level of those peoples living in the southern part of the state between about 100 B.C. and 1600 A.D. Perhaps partly because of the more benign climate, the Indians of southern Illinois established stable agricultural communities and developed along much more complex cultural lines.

The Hopewellian culture was predominant in Illinois from about 500 B.C. to about 700 A.D. and may have originated here. These Indians buried their dead in mounds and probably had a strong political or religious base to their mode of living. They evidently indulged in vigorous trade and developed their artistry in ceramics, sculpture and metalwork to the highest level attained by any aboriginal residents of the state.

That culture was gradually supplanted by the Mississippian, which was dominant in southern Illinois from about 500 to 1600 A.D. Traces of this culture were reported by French explorers as late as 1700.

Beginning in Louisiana and moving north, the Mississippian culture may have been influenced by the highly developed Mexican Indian civilizations, since the Mississippian peoples built terraces and flat-topped pyramids and temples. The largest of these is the Monk's Mound of the Cahokia Mound group in Illinois. It measures more than 1,000 by 700 feet and is 100 feet high. The clusters of temple sites indicate a far more elaborate civilization than the Hopewellian. Anthropologists generally believe this culture supported large communities and had a very complex political and religious structure. Like the Hopewellian culture, the Mississippian also developed a high degree of artistic achievement, particularly in ceramics.

This advanced Indian culture gradually faded and when the first European explorers reached Illinois the predominant Indians in the area were Miami, Sauk, Fox and Illinois, who followed variations of the simpler Woodland cultures of earlier Indians. They combined agricultural activities and the seasonal pursuit of game, remaining in villages only temporarily. The Indians of Illinois were forced to abandon their traditional way of living in the wake of rapid westward expansion by settlers in the 1800s.

The homesteaders who came here found good farmland, coal deposits, plentiful fish and game and good transportation provided by numerous waterways and relatively flat prairie. It probably never occurred to them that this bountiful land was a gift of millions of years of evolutionary changes, sometimes violent, sometimes subtle, but ultimately resulting in an adaptability to the needs of man that has seldom been equaled.

The Sesquicentennial Tour takes a leisurely two hours and has been designed so that visitors can see the exhibit areas with a minimum of walking and stair-climbing. Special brochures for the tour, including specific exhibits stops and information, are available free of charge in Stanley Field Hall. *—Story and cover photo by Elizabeth K. Alanne, Field Museum Press*

Hopewell Man (Hall 4) is an enlargement of a small Hopewell Indian figurine found in West Central Illinois. The male figure holds a digging stick used in planting corn and displays two distinctive features of Hopewell adornment, large spools in the ears and the hair pulled back in a knot. Art forms of the Hopewellian culture were highly advanced.

The Vanishing Tropical Forests

By Louis O. Williams
Chief Curator, Botany

Twenty years ago, when this photo was taken at Hoya Grande in Honduras, the forest on the mountaintops in the background was untouched and the pine forest (foreground) relatively unspoiled. Today, with the population in Central American countries increased by more than 50 per cent since then and growing by three per cent each year, much of the forest cover has been removed to open the land for agriculture and grazing, as in the center of the photo. Lack of conservation practices is leading to rapid destruction of the forests and ultimate damage to the soil through erosion, overgrazing, primitive agricultural practices, and neglect.

The tropical world holds a fascination for most people, though there are perhaps more popular misconceptions about the tropics than any other region. Strictly speaking, the tropics is that part of the world extending 23½ degrees north of the equator to the Tropic of Cancer and an equal distance south of the equator to the Tropic of Capricorn. A quick look at a map or atlas will show that there are some tropical lands on all continents except Antarctica and that two of the continents, South America and Africa, have more than one-half of their land area located within the tropics.

The largest tropical rain forest area, and perhaps the least disturbed one in the world, occurs in the Amazon basin. This region extends from Belém do Para on the mouth of the Amazon River west and southwest across the continent to the foothills of the Andes, northwest to the table mountains of the "Lost World," and south to southern Peru. (An Amazonian estuary is shown in a diorama in Hall 26).

The great continent of Africa is largely within the tropics. The rain forests of the Congo basin are enormous in extent but not nearly so impressive as are those of the Amazon basin. Within the African tropics are great areas of desert; the Sahara at the north and the Kalahari toward the south. The Namib desert along the coast of South West Africa, due to the cold Bengala Current offshore, is one of the least "tropical" places within the tropics. In this desert grow some of the most curious plants to be found anywhere. *Welwitschia* is one of those, shown in a diorama in the Museum's Hall 26.

The Eurasian continent has a relatively small portion of its area in the tropics, including parts of Saudi Arabia, India and southeast Asia. The tropical forests of southeast Asia were, and perhaps still are, some of the richest in the world. However, the terrific population pressure in that region seems to indicate that most forests will be gone there within the century. Europe, if considered a continent separate from Asia, is wholly outside the tropics.

Australia is seldom thought of as tropical even though nearly half of that great island falls within the tropics. On the other hand, Oceania, no continent but a name applied to that great mass of islands in the Pacific, is in many people's thinking a tropical paradise.

To those of us who live in the Midwest the easily accessible regions of the tropics are those almost straight south of us in Mexico and Central America. The exuberance of the vegetation in these tropics attracts and often overwhelms the visitor or even the botanist whose experience

has been with regions in the so-called temperate climates. We lived in a small valley in Honduras for a number of years, a valley perhaps six or seven miles wide and about 15 miles long. There are more kinds of native flowering plants in that small valley than in the eastern U.S. of Gray's *Manual of Botany*. There are possibly more kinds of native trees on don Leo Salazar's Santa María de Ostuma farm in the Cordillera Central de Nicaragua than there are in all the New England states. There is another great difference, too. A hillside in the Berkshires of New England may have relatively great numbers of individuals of two or three or perhaps a half dozen species of trees. A hillside covered with cloud forest on the Cordillera Central de Nicaragua, or in the Cordillera de Talamanca in Costa Rica may have an almost bewildering aggregation of species of trees, but relatively few individuals of any one species.

It is a common experience in the tropics to find a tree and to never see another individual of it. Tropical climates have been and are more amenable to the development of numerous kinds of plants, than are the more severe temperate climates. The competition for space among successful kinds of trees in the tropics is very great. There are relatively few kinds of trees in temperate climates that have become really successful, covering large areas geographically and abundant in appropriate habits. However, of the trees of temperate climates that may be said to be successful, some are outstandingly so. One of the contributing reasons for this may be that there may be fewer kinds of successful trees and consequently the competition for space is less among the kinds of trees.

The old saw that "it is difficult to see the forest because of the trees" might be reversed in the tropics. The late Paul Allen, then associated with the United Fruit Company, collected specimens from a very large tree in the rain forest down in the southwestern corner of Costa Rica.* The late Paul Standley and I studied the specimens and, after showing them to many other botanists familiar with tropical floras, described a new genus and species based on them. A tree a hundred feet or more tall and 30 inches in diameter must be a rather conspicuous plant yet it was not discovered until 1951. How long it will be until another collector finds it and collects it I have no way of knowing, yet Allen said that it was a very conspicuous tree when in flower.

The Museum has had a continuing interest in the flora of Central America for more than 75 years. The knowledge so gained is useful and often essential in understanding any other branch of science. In particular, study of the flora and what is happening to it help us to understand the relation of man to his environment in Latin America, and what man is doing to his environment.

What effect does vegetation have on the production of food and on agriculture and on the regional rainfall so essential to both plantation and subsistence agriculture? What effect does a forest cover have on the climate, and what may be expected to happen if we remove that cover? Are tropical forests as luxuriant as they appear? If the soil can produce such magnificent forests, why does it not produce an abundance of food? Why are there not paper mills where plant growth is so lush? What effect do tropical diseases have on man in the tropics? Why do most people live in the highlands and shun the lowlands? Why must 80 per cent of Central Americans depend on agriculture? What about the utilization of water for agriculture? Is farm labor cheap or expensive at a dollar a day? Why not increase cattle raising and export meat? These and other questions deal with basic concepts of *conservation of natural areas; land tenure practices and the vegetation, and of agrarian laws and the forests.*

There has been much written in recent years about the population explosion. The rapid increase in the human population of Central America during this century, and more especially in recent years is bound to have, and does have, a very profound effect on the vegetation of Central America and on all the kinds of living things that depend on the natural vegetation.

It is my feeling, based on field experience in Central America and Mexico extending through 30 years, that the natural forests of Central America will all be gone before the end of this century except in spots too rugged to have any value in agriculture or too difficult to get the trees out.

The demand for land upon which to grow, or to try to grow, food crops increases in proportion to man's increase. The natural forests are being cut at an alarming rate to make way for subsistance or for plantation crops to satisfy man's immediate need for food.

Ancient volcanic soils on this mountainside in the Comayagua Valley in Honduras erode quickly when the protective forest cover is removed. Agricultural yield of this type of soil is not high, does not warrant destruction of trees to permit cultivation.

* Pentaplaris doroteae. *A design made from the technical illustration of this plant was used as a cover design on "Homage to Standley," a small book published by the Museum to honor a staff member who was one of America's best known botanists.*

This area, near Lake Yojoa in central Honduras, shows the effects of primitive "milpa agriculture" practices on the forests.

Lake Yojoa in central Honduras is a gem in the midst of a lush tropical setting. The broad-leaf forests are as beautiful as any on the continent. If one wishes to cultivate this area lack of moisture is no problem for the rainy season is about eleven months long and during the short "dry" season rains may be frequent. The lands adjacent to the lake are relatively level and I suspect that perhaps a millenium ago the Maya cleared and planted here. Their descendants practice agriculture there today perhaps much as it was done then.

A kind of agriculture described as "milpa agriculture" is traditional. To be successful it requires vast amounts of land in comparison to the population living from that land. A bit of forest is cleared by fire, and the ax is also used now (that tool was unknown until after the Spanish conquest). The crop is planted among stumps and logs by making a hole in the fire-softened soil with a sharpened planting stick and dropping in a few seeds. The stumps and logs may be a nuisance but relative to the labor of removing them they are not. Harvest is done by hand and machinery was and still is mostly unknown or not used.

A field, like that at Lake Yojoa shown in the photograph may be planted with three or four crops during a year, one after another. The cleared and unfertilized land under this regime is depleted rapidly and in the course of perhaps three years the crops become so poor that the land is abandoned and a new clearing is made, the process started over again. The old piece of land is let go back to forest for a varying number of years. The resting period always becomes shorter as population pressures increase and demand for food increases. Consequently the lands with shortened rest periods are able to produce less on each new clearing or rotation.

The drier highlands and often the Pacific lowlands of Mexico and Central America, where the rainy season may be less, often much less, than six months long and alternating with a relatively harsh dry season the situation is very different and subsistence agriculture, also of the "milpa" type, along with grazing by excessive numbers of animals has degraded much of these highlands for generations to come. The pressure to produce foods is so great that cultivation is carried out even when it is doubtful if the results warrant the time and labor involved.

The highlands of Mexico, Guatemala, Honduras and a part of Nicaragua are covered with what would seem to be endless forests of "Honduras pine," *Pinus oocarpa*. It is an excellent timber tree and a rapidly growing one. It grows on lands mostly unsuited to subsistence agriculture but on lands where cattle grazing can be practiced. Nevertheless, in times past and even now great areas of the pine is cut or burned to clear the land. Perhaps even today more is burned to clear land than is made into lumber. This pine is a renewable natural resource *par excellence*, and certainly rational use of Honduras pine would provide lumber to Central America and perhaps to much of the Caribbean region in perpetuity.

The photograph shows a new stand of "Honduran Pine" only six years after clear cutting of the pine forest. The "park-like" aspect of the forest indicates relatively heavy grazing. The control of grasses and herbs by grazing reduces the fire hazard to the young pines. Mature trees will come from this forest in 30–40 years.

At the invitation of the Mexican government about 25 years ago, the Rockefeller Foundation began an extensive research project into the potential of increasing the production of food plants used in the underdeveloped regions of the tropics. The plants involved were maize and wheat. The project, now sponsored by both the Rockefeller and the Ford Foundations, has been extended to other food crops important in the tropics and enlarged to cover other underdeveloped regions of the world.

While the increase in food production is only one of the problems of the underdeveloped regions of our continent—population control is perhaps the second in importance—I suspect that the "revolution" in tropical agriculture initiated by Rockefeller Foundation will prove to be the most important development in food production since the development of maize culture in America and that of rice and wheat in the Old World.

Valuable "Honduran Pine" forest areas are suitable for grazing but generally poor for crops, though many are destroyed for crops.

NEW EXHIBIT CHIEF OUTLINES GOALS

BETTER COMMUNICATION through imaginative museum exhibits is the goal of Lothar P. Witteborg, new Chief of Exhibition for Field Museum.

In the past 20 years, Witteborg has travelled to nearly every part of the world as a museum exhibition consultant, and has often been disturbed by what he regards as static and unimaginative use of display areas in many museums.

Although he originally graduated from college with a degree in civil engineering, the field did not hold his interest and he returned to school where he earned a degree in art history and minored in anthropology. Interest in the latter field led to graduate study in anthropology, to which he added courses in drawing, painting, sculpture and design.

As an undergraduate, Witteborg worked at the Detroit Children's Museum and the Museum of Anthropology at the University of Michigan, but he became permanently intrigued with the challenges presented by the problems of visual communication when he became curator of the University Museum at Florida State University.

He later served as an exhibition consultant for the Newark Museum and as assistant chief of art and exhibition and then department chief at the American Museum of Natural History in New York City. While at the American Museum, Witteborg was often "on loan" as a consultant to other institutions which included the British Museum in London, the Department of Antiquities in Turkey, and the School of Classical Studies in Athens. He helped in the development of the new National Museum in India.

Witteborg later joined the Museums and Monuments Division of UNESCO and helped set up the National Museum of Malaysia and acted as consultant for other institutions in Southeast Asia.

In 1960, he opened a private design firm, Witteborg and Williams, Inc., with L. A. Williams, who had been chief of exhibition at the American Museum after Witteborg. The firm's clients included museums in the continental United States, Hawaii, Puerto Rico and Canada.

Throughout his involvement in museum exhibition work, he has stressed his belief that "an exhibition is more than just a collection of interesting objects and things. It is a way of organizing material to convey information, and of organizing traffic flow to achieve optimum communication.

He has expressed these views in several articles, including a paper, "Museum Design, A Logical Approach," which he read at the annual meeting of the American Association of Museums in 1964, later published in the AAM journal, *Museum News*.

In that article, Witteborg said, "Besides its role as a research and social center, the main function of a museum should be education through the interpretation of its collections. Interpretation, the most important aspect of any museum, is achieved through scholarly monographs, popular publications, guided tours, adult education programs, and all-day programs; but, primarily it is achieved through exhibits, because it is through them that the largest number of people is affected.

"What to do with objects in a museum sounds like an easy problem. You either hang them from the wall, set them on the floor, or build a case around them. Actually, it may be simple if the designer is simply asked to create a context for objects taken out of their natural environment. It is unfortunate, but this has been the case rather than the exception. Most museums are dull, static, dead, three-dimensional text books. But what about the explanatory exhibit, the exhibit of ideas rather than of things? This type of exhibit is becoming more popular as a few museums discover that teaching involves more than arranging objects in a glass case. Within the explanatory exhibit the design possibilities are endless. Sound, animation, models, charts, and supplementary graphic materials, or any method the designer may use, will aid in putting across ideas or concepts in the exhibit.

"The designer has many useful tools, for example: in the combination of simple use of structure with well-thought-out use of color, the designer has at his disposal one of the strongest of response-producing techniques. Above all, it should be the duty of the designer to free us from the fixations of tradition and symbolism usually associated with color and form by emphasizing the direct sensuous perceptual impact of color and form as well as motion upon the spectator. The exhibition visitor should be made to feel that his trip to the museum was a spatial and visual experience in which the process of learning came through an unconscious effort on his part. The careful use of color, motion, sound, and lighting can be used to lead the exhibition visitor along a predetermined path. Another consideration, usually forgotten, is that empty space can be utilized to afford the visitor a visual and physical rest, a point that is extremely important in our larger museums. In exhibition design, where the transmission of a story, a concept, or facts is the immediate and explicit purpose, ideas can be communicated by visual symbols: color, form, lighting, and motion, which act as subsitutes for words, thereby increasing their effectiveness as meaning-carriers. It is, therefore, important in conceptual planning that structure, space (both negative and positive), form, color, motion, and light be dealt with together, not as unrelated elements."

As chief of exhibition for Field Museum, he is interested in the challenge offered in the museum's potential for development of increasingly effective displays. Witteborg regards the Field Museum building, with its classic lines and spacious galleries, as one of the finest in the world.

Field Museum's Brazil Tour will reach into private homes and gardens, including those of four prominent Brazilians in the Petropolis area. The group will tour these gardens with Roberto Burle Marx, landscape architect, botanist and abstract painter, whose work has created a new school of landscape design. At left, the residence of Senhora Odete Monteiro, described by House and Garden *editor Ralph Bailey as having "one of the most beautiful private gardens in the world." The tour, February 14–March 11, will cost $2050, including all expenses and a $500 donation to Field Museum. It is limited to 35 people. For details, write: Brazil Tour, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois, 60605.*

CALENDAR OF EVENTS

July hours: 9 a.m. to 6 p.m., Monday, Tuesday and Thursday; 9 a.m. to 8 p.m., Wednesday, Friday, Saturday and Sunday.

July 1 through August 31 Field Museum General Highlights Tour Free public tour of the Museum, conducted by the Raymond Foundation. Tour is followed by a film, "Through These Doors." Tour begins at 2 p.m., Monday through Friday; film at 3 p.m., Lecture Hall.

July 11 Thursday Film Series for Children Part of the Museum's free summer activities for Chicagoland youngsters. A different film will be shown twice on each of four consecutive Thursdays. Adults may attend when accompanying a child. First film of the series is "Nature's Engineer," a documentary about beavers. 10 a.m. and 1 p.m., James Simpson Theatre.

July 18 Thursday Film Series for Children "Elsa, the Lioness," actual films of the heroine of the book *Born Free*. 10 a.m. and 1 p.m., James Simpson Theatre.

July 25 Thursday Film Series for Children Third in a series of four films will be "Alaska." The final film, "Life All Around Us," will be on August 1. Both will be shown at 10 a.m. and 1 p.m., James Simpson Theatre.

Through July 28 Egypt Through A Biologist's Eye A photographic exhibit by Dale J. Osborn, Field Associate in Zoology. An artistic approach to scenes in the Egyptian deserts rarely seen by tourists in that country. Osborn spent three and one-half years exploring the Egyptian deserts for the Naval Medical Research Unit Number Three. Hall 9 Gallery.

Through August 15 Masada, King Herod's Fortress A special exhibit of historical data and archaeological treasures from the 1963–65 excavations at the Zealot stronghold in Israel. Exhibit includes scrolls found in the caves of Bar-Kokhbar on the western shore of the Dead Sea. Museum Members and their families will be admitted free. Admission for non-members is 75 cents for adults and 35 cents for children. A free film on Masada is shown daily at 10:30 a.m. and 2:30 p.m. in the Lecture Hall.

Through August Summer Journey: The Fishes of Lake Michigan With the aid of Journey sheets provided by the Raymond Foundation, boys and girls can learn about some of the fishes which live in Lake Michigan. Journey sheets are available free at the North and South Doors of the Museum.

Half A Billion Years of Illinois History Museum do-it-yourself tour in observance of the State's Sesquicentennial celebration takes visitors on a capsule journey through the worlds of anthropology, botany, geology and zoology. A free brochure provides a guide to pertinent exhibits.

SHINNER PROGRAM IN THIRD YEAR

Eight college undergraduate and two graduate students have begun participation in the summer scholarship-work program set up by the Ernest G. Shinner Foundation of Chicago and Field Museum of Natural History.

The ten Shinner Scholars were selected by Field Museum from 62 applicants studying at 39 different universities and colleges. Under the guidance of Museum scientists in the fields of anthropology, botany, geology, paleontology and zoology, Shinner Scholars apply laboratory and classroom techniques to practical problems related to their areas of concentration in college. The program provides science students with summer employment necessary for continuation of their studies.

Shinner scholars for 1968 are: Miss Patricia Y. Fujimoto of the University of Illinois-Urbana from Chicago, Illinois; Charles Gourd of Northeastern State College from Tahlequah, Oklahoma; Miss Mary C. James of Grinnell College from Washington, D.C.; David P. Janos of Carleton College from Chicago, Illinois; Jeff E. Klahn of the University of Chicago from Forks, Washington; Miss Susan F. Mandiberg of Oberlin College from Highland Park, Illinois; Miss Marilyn D. Miller of Mount Holyoke College from Queens, New York; William L. Overal of Northwestern University from Chicago Heights, Illinois; Robert H. Wilcox of the University of Chicago from Wilmette, Illinois, and Steven J. Zehren of the University of Wisconsin from Sheboygan, Wisconsin.

The Shinner Foundation was established by Chicagoan Ernest G. Shinner to aid deserving young students.

FIELD MUSEUM
OF NATURAL HISTORY
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BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

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Special Events Mark Field Museum's Diamond Anniversary Year

This month's cover is a preliminary sketch of the new Stanley Field Hall, drawn by Harry Weese and Associates, Architects. Any Anniversary celebrates both past and future, and, in the months to come, Field Museum will consider its aims and hopes as well as its achievements.

Dramatic changes in the appearance of exhibits in Stanley Field Hall and an active calendar of special events are planned as Field Museum begins the celebration of its Diamond Anniversary this fall.

An American Indian Festival will be the opening event of the 75th Anniversary Year. Opening ceremonies on September 23 will launch three weeks of live demonstrations of Indian arts and crafts, Indian dancing, special films and illustrated lectures. A pow-wow, arranged by the Indians, will close the Festival on October 13. A special Member's Night on September 27 will enable Members to get an unhurried close-up of the activities connected with the Festival. Special exhibits will focus on "New Directions in Indian Art," "Contemporary Traditional American Indian Art," and "Indians of Chicago, 1968."

The re-designing of Stanley Field is already underway. "Stanley Field Hall is the structural heart of Field Museum," said E. Leland Webber, Museum Director. "Stanley Field was the real heart of the Museum for more than 50 years. It seemed appropriate, therefore, that this major reinstallation during our 75th year be done in his memory in the hall that bears his name."

When completed, the hall will feature fountains, pools, live trees and plants and a rearrangement of the traditional exhibits, the African elephants and the dinosaurs.

The firm of Harry Weese and Associates, Architects, joined Lothar Witteborg, Field Museum's Chief of Exhibition, in working out the design for the hall's new look.

Among the problems facing the Museum's exhibition and engineering staffs were the repositioning of the African elephants and the rampant dinosaur. Assistance in the former case came from Leon L. Pray, a retired Museum preparator, who had worked with Carl Akeley in preparing the elephants for display nearly 60 years ago. No one on the present staff knew how the elephants were affixed to their base or what steps might be involved in attempting to move them. Mr. Pray was contacted and his answer not only allowed the Museum staff to breathe a sigh of relief but offered a tribute to the foresight of Carl Akeley.

"Answering your letter, re: Akeley's African elephants in Stanley Field Hall: *They are on separate frame bases*, with casters, ready to move. Simply tear off the plaster and fiber surface of the overall ground-cover and there you are! Mr. Akeley figured that someone would want to shift them some day and that is the way he made them," Mr. Pray wrote. The elephants will be slightly north and east of their present location in the hall and will stand on a new, higher platform.

The other large display, featuring two dinosaurs, presents a more difficult problem. The standing specimen will have to be partially disarticulated and reassembled at its new position, slightly north and west of where it presently stands. It, too, will have a new base.

The 20-foot New Guinea ceremonial masks, brought from the South Pacific by the Joseph N. Field Expedition of 1910, will be removed from the present glass cases and

will stand freely in a more prominent position near the south end of the hall. Two massive totem poles from the Canadian Pacific Coast will be added to the hall arrangement, near the dinosaurs.

Two pools, one at each end of Stanley Field Hall, will be underlighted, have bubblers and central fountain jets sending water 20 feet in the air. Seating areas for visitors will border the pools, which will be 24 feet in diameter and about 15 inches deep. New benches will also be placed at the sides of the hall, offering the public an abundance of places to relax and rest during visits to the Museum.

The impression of bringing the "outdoors" indoors will be enhanced by the addition of live fig trees and other plants at various points on the main floor of Stanley Field Hall. Hanging vines will also be used on the second floor balconies overlooking the main floor.

New second floor public lounges at the north and south ends of Stanley Field Hall will add to the "new look." Now partially completed, these lounges should be ready by mid-September, in time for the American Indian Festival. The Service Club of Chicago made a major contribution toward their construction.

Small exhibit cases are being removed from Stanley Field Hall and no temporary exhibits will be placed there after the renovation. Witteborg explains the changes as creating an "elegant promenade," an area which serves as a focal point for visits to other Museum areas.

Research by Museum Curators will be the basis for a three part Fall, Winter, and Spring Lecture Series, which will begin November 3 with "Introduction—Museum Science and Expeditions," a talk by Robert F. Inger, Curator, Amphibians and Reptiles. Subject matter will range from "Meteorites—A Poor Man's Space Probe" to "Land Life of Fishes" to "Strange Fossils of the Illinois Strip Mines." The broad reach of Museum research is shown in other lecture topics, "Hunting Monkeys in Thailand," "Searching for Economic Plants in Africa," and "Primitive Art in Melanesia." This series will end April 13 with a summary tour of the Museum's scientific departments of Anthropology, Botany, Geology and Zoology.

Several special exhibits are being planned for the 75th Anniversary Year and will be announced in the BULLETIN.

Observance of the Diamond Anniversary will close with the Museum as host to the North American Paleontological Convention in September, 1969.

The months of the 75th Anniversary Year coincide closely with those of the founding year during which the Museum gradually took shape. Incorporated on September 16, 1893, Field Museum opened its doors to the public the following June 1. During the same month the first expedition went into the field, beginning the worldwide explorations that have brought world renowned exhibits and research collections to Chicago in the ensuing 75 years.

In 1920, the recently completed Stanley Field Hall was empty.

In the 1940s, crowded with exhibits.

A social highlight of the Museum's 75th year will be the 75th Anniversary Ball to be sponsored on October 25 by the Women's Board of Field Museum. In Stanley Field Hall, guests will enjoy dinner and dancing to the music of Frankie Masters and his 15-piece orchestras. Three strolling violinists will play during intermissions.

Committee members for the $100-a-couple event include Mrs. C. Daggett Harvey, chairman, Mrs. A. Watson Armour, Mrs. Philip D. Block, Jr., Mrs. Wesley M. Dixon, Mrs. Wesley M. Dixon, Jr., Mrs. G. Corson Ellis, Mrs. R. Winfield Ellis, Mrs. Harold F. Grumhaus, Mrs. Wallace D. Mackenzie, Mrs. Henry W. Meers, Mrs. John T. Moss, Mrs. James L. Palmer, Mrs. John G. Searle, Mrs. Gardner H. Stern and Mrs. Thomas S. Tyler.

Original Tour Booked Solid

NEW GROUP SCHEDULED FOR BRAZIL TOUR

Above: *Fishes and birds of Brazil often have varied and brilliant coloring. This piranha appears in bright tones of pearl and ruby.* Left: *With 20 times the water flow of Niagara, Iguacu Falls forms two giant horseshoes in a tropical setting. Falls dwarf boat at beach below.* (Photos by Phil Clark)

A second Field Museum Brazil Tour is being organized, with departure January 22, if a minimum of 15 persons subscribe.

So great is the interest among Field Museum Members in this specialized natural history approach to Brazil that all 35 places on the February 14–March 11 Tour have been taken. In response to continuing requests for places, the new Tour was announced by Phil Clark, Field Museum Public Relations Counsel and plant specialist, who will lead both tours.

"The January 22 Tour is a mirror image of the February 14th," Mr. Clark said. "All the same places will be visited, but in opposite order. The January 22 people will tour Manaus and the Amazon first, the other group will end its trip there. Both groups will participate in the Carnival at Bahia, but this will be the end of the Tour for the January 22 group and the beginning for that of February 14th—the two tours will meet and enjoy a Carnival Ball together on February 15, the first night in Brazil of one group and the final night of the other."

Prices on the 26-day Tour are the same for both groups, of course. Including all expenses (even tips to guides) and a tax deductible $500 donation to Field Museum, the tour costs $2,050.

Stops on the Tour are: Manaus and the Amazon, the modern capital of Brasilia, the gem center of Belo Horizonte, the Portuguese colonial village of Ouro Preto, Rio de Janeiro and its beaches of white sand, Petropolis and its imperial museum and stunningly different private gardens designed by Roberto Burle Marx, the home of Burle Marx at Barra Tujuca, Sao Paulo and the Butantan Sanke Farm, Curitiba, Vila Velha, Iguacu Falls, the Augusto Ruschi estate and hummingbird center in Espirito Santo and the excitement of Carnival in Salvador, Bahia.

In addition to Mr. Clark, whose field is plants and gardens, each tour will also be accompanied by an eminent zoologist. Dr. Austin Rand, Chief Curator of Zoology and an expert on birds, will accompany the Tour which begins February 14, and another zoologist specializing in birds will be found for the January 22 Tour. With the

Tour groups averaging about 30, each member will have ample opportunity to ask questions about the animals, birds and plant life encountered in Brazil.

Brazilian specialists will also be available to talk with Tour members at various stops. Dr. Ruschi will discuss birds, orchids and bromeliads, his principal specialties, during the Espirito Santo stop, and Burle Marx will express his views on garden design and botany at Petropolis. There will also be a meeting with gem cutters and a talk by the geologist, Francisco Mueller Basto, at a dinner at Belo Horizonte.

Guides familiar with the various local areas will join the Tour at all major stops. The Tour is designed so that members will be given a wide ranging and many-dimensioned survey of Brazil's natural history and people.

Four Tour meetings will be scheduled during December and January as preparation for the Tours.

Further information or copies of the June Bulletin, with the Tour itinerary, may be obtained by writing: Field Museum Brazil Tour, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois, 60605. A deposit of $500 is required and single room accommodations for the Tour are $95 extra.

Roberto Burle Marx is the originator of a new school of landscape design based on abstract art.

Above: *Modern sculpture and landscaping add to the impact of Brasilia's startling impression. This work is on the first floor of the foreign ministry.*

Royal palms in Rio's Botanic Garden make a dramatic foreground for the Christ the Redeemer figure on Corcovado Mountain.

Below: *Blue and green hummingbird sits on her tiny eggs in a nest in a small hanging bromeliad,* Neoregelia punctatissima.

Fall Workshops for Members' Children

A series of Saturday morning workshops for the children and grandchildren of Museum Members will be held for the fifth consecutive year by the Raymond Foundation this fall. Youngsters will meet Museum staff members and work with specimens and materials from scientific collections. The small group workshops, geared to different age levels, are planned to stimulate and develop interest in the study of the natural sciences. The programs for younger children last about an hour, those for older children about an hour and a half. Extra time should be allowed if children plan to bring specimens for identification.

Reservations are necessary and an application is included in this issue of the Bulletin. Since it may not be possible to accommodate all applicants, we urge that applications be sent in early. Each applicant will be scheduled into one program only and reservations will be accepted in the order they are received. Applicants accepted will receive a confirmation card which will serve as his or her admission to the workshop.

October 5

Life in an Old Dead Tree

Marie Svoboda and George Fricke, Leaders

For ages 5–7 — 10:30 A.M.
Parents are also invited. — 1:30 P.M.

This special program for family groups will show the different kinds of animals that might make their homes in an old dead tree. Such a dwelling is not chosen for its beautiful setting, but for the protection it offers.

October 12

Indians of Woodlands and Plains

Harriet Smith. Leader

For ages 8–10 — 10:30 A.M.
For ages 11–13 — 1:30 P.M.

Indian tribes have developed ways of life adapted to their environment and have also shown great skill in utilizing natural materials to suit man's purposes. In this workshop, youngsters will handle various naturally-occurring raw materials and see how the Indians used them in making tools, weapons and household equipment. Movies showing the variations of Indian Life in the woodlands and on the western plains will also be shown.

October 19

Boneyard Menagerie

Ernest Roscoe, Leader

For ages 6–8 10:30 A.M. and 1:30 P.M.

This workshop will "rattle the skeletons in a few closets" by discussing the prehistoric relatives of familiar animals found in zoos and aquaria. Children should be accompanied by at least one parent. Be prepared for a few surprises!

Caveman to Civilization

Edith Fleming, Leader

For ages 10–13 10:30 A.M.

A movie on the life of the cave men and how they hunted prehistoric animals opens this workshop. Boys and girls will also examine actual tools used by cave men thousands of years ago, learn how they were made and compare them with modern tools.

October 26

Find, Seek, Discover

George Fricke, Leader

For ages 6–7 10:30 A.M. and 1:30 P.M.

Parents are invited

In this special program for family groups, the enjoyment of exploring natural phenomena is stressed. This will be a "treasure hunt" in the Museum halls to illustrate the fact that life is all around us if we will take the time to observe nature carefully.

November 2

Rock and Mineral Kingdom

Ernest Roscoe, Leader

For ages 9–13 10:30 A.M.

Parents are invited.

This is a slightly advanced program on rocks and minerals. After a talk on the qualities and characteristics of different rocks and minerals for their identification, youngsters will be sent to the exhibition halls with question sheets to answer independently. Children may bring their own specimens for identification.

November 9

Bones to Bodies

Ernest Roscoe, Leader

For ages 9–13 10:30 A.M.

Parents are invited

This workshop emphasizes the structure of the vertebrate skeleton. Specimens and Museum exhibits will illustrate the important points of the subject.

If there is more than one child in your family who wishes to attend a workshop, please make a duplicate application for *each* child.

FALL WORKSHOPS FOR MEMBERS' CHILDREN

SATURDAYS in the MUSEUM, 10:30 a.m. and 1:30 p.m. See article for details on programs. Please list the program you wish to attend in order of your preference. Sorry, only one program can be scheduled for each child.

	Program	Date	Hour
1st choice	_____	_____	_____
2nd choice	_____	_____	_____
3rd choice	_____	_____	_____
4th choice	_____	_____	_____

Name _____ Age _____ Tel. _____

Address _____ City _____ State _____ Zip _____

Membership in name of _____

Cut along dotted line and mail to:
Raymond Foundation, FIELD MUSEUM OF NATURAL HISTORY Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605

NEW PERMANENT COHO, ALEWIFE EXHIBIT OPENS IN HALL OF FISHES

Taxidermist Carl W. Cotton prepares a model of an alewife for the new exhibit in Hall N.

A new permanent exhibit opening August 1 in the Hall of Fishes features two of the most prominent fishes found in Lake Michigan, the Coho salmon (*Oncorhynchus kisutch*) and the alewife (*Alosa pseudoharengus*).

The growth stages in the three-year life cycle of the Coho salmon will be depicted including two models of the adult male fish to show the different coloring pattern in the breeding male.

The Coho salmon, a native of the Pacific Coast area, was raised in hatcheries in Michigan and released in 1966 into streams which feed in Lake Michigan. Since then, the Coho salmon has established itself well and has become a favorite of sport fishermen. This species may grow to a length of 32 or 33 inches and weigh up to 25 pounds.

The Coho salmon remains near shore during the spring but moves into deeper parts of the lake during the summer. In the fall of its third year, the fish moves inshore again and then goes up streams to spawn.

This predator feeds on many fishes in the lake, including alewives.

The alewife, a native of the Atlantic Coast, probably migrated to Lake Michigan through the other Great Lakes. It appeared in Lake Michigan about 20 years ago and has flourished.

Here the alewife has a three-year life cycle, although in its Atlantic Coast habitat it may live from five to seven years.

Toward the end of their life cycle, the alewives come close to the shore to spawn, usually in the late spring and early summer. The heaps of dead alewives which have been notorious on some beaches and shorelines occur at the time of this inshore migration. The alewives who spawn in July die sometime later, probably during the winter.

The newly hatched alewives remain close to shore until the autumn after they are spawned. They feed on plankton which they strain from the water with very efficient "gill traps." When they are older they move into the midwaters of the lake where they eat a type of small crustacean and the larvae of other fishes.

Alewives also have some commercial value. More than 50 million pounds of these fish were caught and processed for pet food last year.

Both the alewife and the Coho salmon are "success stories" in terms of the Lake Michigan habitat. The brief life spans are indicative of the high rate of survival of the young of these two species.

CALENDAR OF EVENTS

August hours: 9 a.m. to 6 p.m., Monday, Tuesday and Thursday; 9 a.m. to 8 p.m., Wednesday, Friday, Saturday and Sunday.

August 1 THURSDAY FILM SERIES FOR CHILDREN Final film in a series of four movies shown free to youngsters. "Life All Around Us," will be shown at 10 a.m. and 1 p.m. in the James Simpson Theatre.

Through August 15 MASADA, KING HEROD'S FORTRESS Special exhibit of historical data and archaeological treasures from the 1963–65 excavations at Masada, led by Yigael Yadin. The Museum's largest special exhibit in several years includes scrolls found in the caves of Bar-Kokhbar on the western shore of the Dead Sea in Israel. Museum members and their families admitted free; Non-members admission, 75 cents for adults, 35 cents for children. Free film on Masada shown daily at 10:30 a.m. and 2:30 p m. in the Lecture Hall.

Through September 16 CAMOUFLAGE IN NATURE Photographic exhibit in color by Edward S. Ross, an entomologist, demonstrates a variety of ways in which living things are protected by coloration. Three-dimensional Museum exhibits supplement the photographs. Hall 9 Gallery.

Continuing in August EGYPT THROUGH A BIOLOGIST'S EYE Photographic exhibit by Dale J. Osborn, Field Associate in Zoology. Moved to Hall J.

Through August 31 FIELD MUSEUM GENERAL HIGHLIGHTS TOUR Free public tour of the Museum, conducted by the Raymond Foundation. Tour is followed by a film, "Through These Doors." Tour begins at 2 p.m., Monday through Friday. Film will be shown at 3 p.m. in the Lecture Hall.

Through August Summer Journey: THE FISHES OF LAKE MICHIGAN A do-it-yourself tour for youngsters which will acquaint them with some of the residents of Lake Michigan. Sponsored by the Raymond Foundation. Any child who can read and write may participate in the Journey Program. Free Journey sheets are available at the North and South Doors and the Information Desk.

HALF A BILLION YEARS OF ILLINOIS HISTORY Do-it-yourself tour for Museum visitors in observance of the state's Sesquicentennial celebration covers aspects of anthropology, botany, geology and zoology. A free brochure, available in Stanley Field Hall, provides a guide to pertinent exhibits.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
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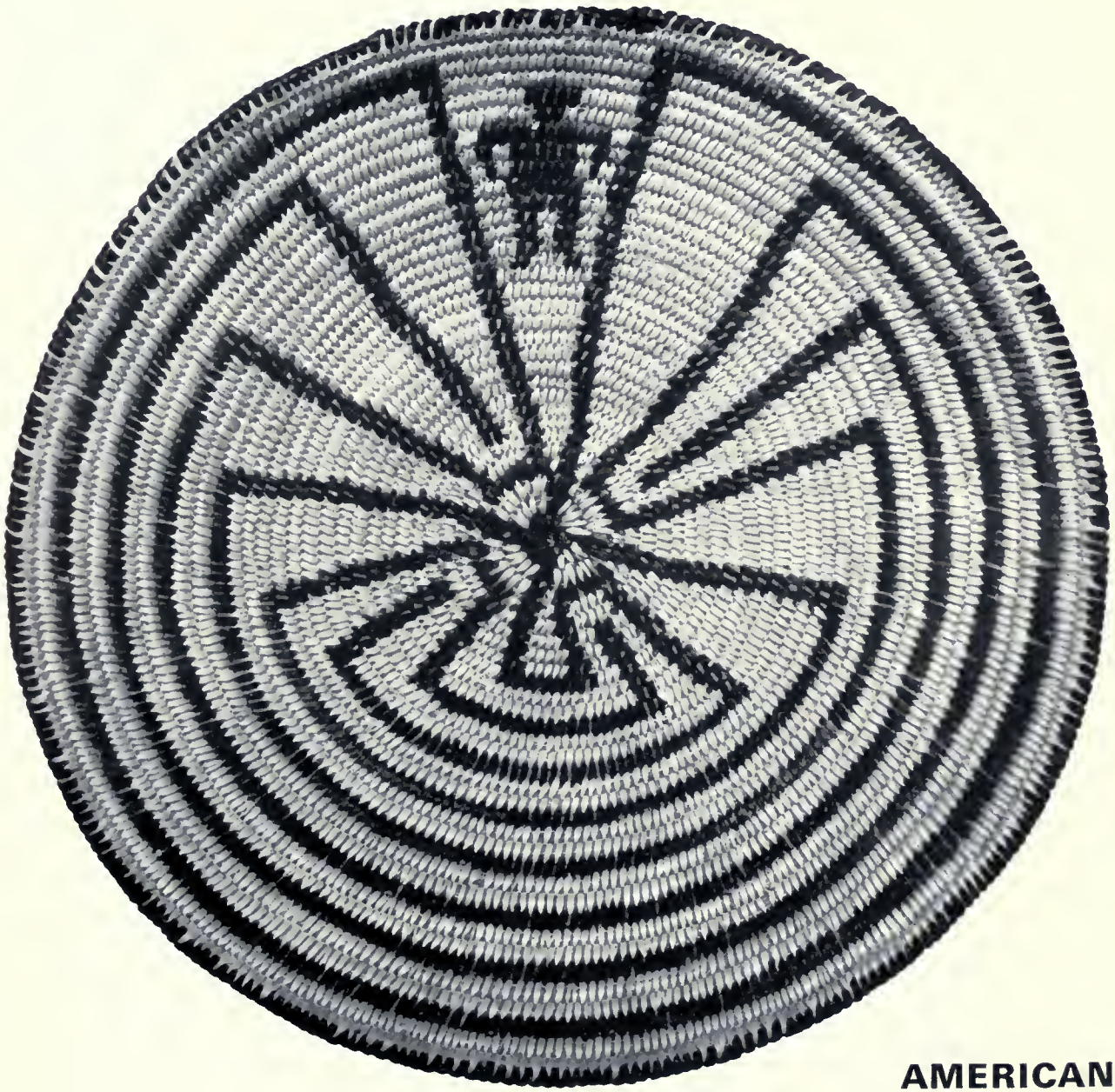

AMERICAN INDIAN FESTIVAL

The American Indian Festival

September 23
to
October 13

By Lois Rubinyi
Festival Coordinator, Raymond Foundation

The symbol of the American Indian Festival is shown on this month's cover. The design, from a Pima basket in the Museum's Grier Collection, represents the house of Siuhu, a Pima legendary figure whose mountain home was so hidden by confusing trails that no one could find him.

Rose Ayala, a volunteer at the American Indian Center, conducts a session of the Center's Community Services Day Camp. Photo by Orlando Cabanban.

To be alone in a large city—to be cut off from family, friends, land and, most importantly, from one's own identity—this is often the situation of the Indian who comes to Chicago. Indians have been arriving in Chicago in increasing numbers, from a few hundred in the early 1950's to the present population of 16,000. Many come as family units, but the largest number come alone. Many have come to participate in Bureau of Indian Affairs vocational training programs, but a number also come on their own.

Their existence largely unknown to the general Chicago public, these Indians from 99 tribes in 28 states and Canada have, nevertheless, a valuable contribution to make to the cultural and social life of this city. It was in this spirit that the idea for an American Indian Festival developed. A great deal of the creativity and ingenuity of mind, heart and hand that enabled these various Indian peoples to survive and flourish across much of the United States still remains. Since the culture of any people is often intimately related to the land where they live, it is not surprising that Indian cultures have changed even as the American landscape has been altered.

Few people see any continuity between the Indian cultures of the past and the present. Our image of the Indian past comes largely from novels (often highly romanticized), television, and films. The generalized Indian stereotype takes little cognizance of the great diversity of Indian cultures on the American continent, including vast differences in language, religion, government, art and social organization. Few people have had any contact with the Indians of today.

The American Indian Festival was conceived with the idea of providing a creative context in which person-to-person contact between Chicagoans—Indian and non-Indian—could take place. In creating the festival, the Museum is working with the American Indian Center. The Center, a non-profit organization, has sought by its own activities to preserve Indian culture. Most importantly, it provides a focal point for Indian social activity in the large city.

The Museum has long displayed some of the most beautiful creations of Indian cultures in its halls, but objects alone can never fully tell the story of their creation and creators. The emphasis of the festival is on living people and their work and its major theme is American Indian culture from past to present: continuity and change. Daily activities include demonstrations by Indian artists and craftsmen of skills from many cultures such as: totem pole carving from the Northwest Coast, basketry, beadwork, and costume making from the Plains and Woodlands, with related films on these crafts. Special events include performances by an Indian choral group, dancing, and a canoe race on Lake Michigan. Special exhibits will include a photographic essay on the Indians of Chicago and a display of traditional and modern Indian arts and crafts. The climax of the festival will come the last two days with a Pow Wow given by the Indians in which all Chicagoans—Indian and non-Indian—will participate.

Many of the festival activities relate to some aspect of Indian arts and crafts, but, most importantly, these are related to the total context of Indian life. Too often, Indian life both past and present has been devitalized by reducing it to a series of rudimentary skills and craft productions. The art of any people is a part of their culture and as such is intimately related to all aspects of their way of life. It reflects among other things, a particular view of the world, raw materials which are available, and the amount of leisure time a group of people has to pursue such interests. A

projectile point can be admired solely because of its fine workmanship, but how much more meaningful to us if we can see it as the means of supplying a people with meat to keep them from starvation. A clay pot may appear uninteresting until we realize that it has held life-giving water for the desert people who made it. We can then more deeply appreciate the meaning of the beautiful designs applied to the pot: billowing rain clouds, falling rain, rainbows, and tender young corn plants. The delightful juxtaposition of the utilitarian and the artistic can be a constant source of pleasure to discover. Watching a craftsman at work gathering his materials and working with them, one gains an increased respect for the extensive knowledge required for the production of these articles.

Change is an important theme in the festival. The way of life of any people is a dynamic ever-changing process. This was true of Indian cultures long before the Europeans came. Designs on early Indian pottery show much exchange of ideas between different groups of people. New techniques were also adopted—one very dramatic example being the art of weaving which was learned by the Navajos from the Pueblos. With the coming of the Europeans, changes came rapidly. New materials were adopted: glass beads were added to the traditional porcupine quill decoration of the Plains and Woodland Indians, silver was combined with the native turquoise to make Navajo jewelry, and wool from sheep brought by the Spaniards replaced the traditional cotton used in Navajo weaving. Shapes and uses of objects also changed. Rugs began to be made commercially by the Navajo as trade goods—design and color were often suggested by the trader. Metal containers were used by the Pueblo Indians for water storage and began to replace clay pots. Pottery began to be made more and more for tourists with new shapes and designs added to please the tourist's taste (which was often lamentable). Understandably, the meanings and function of many articles changed. Kachina dolls are regarded by some as toys rather than as representations of Hopi dieties. Iroquois false-face masks are used in interior decorating in addition to traditional curing ceremonies.

Today it is not surprising to see an Indian dancer wearing moccasins with Woodland Indian beadwork, a Plains Indian costume, and a Navajo Squash Blossom necklace. The arts and crafts of many diverse culture areas in the United States are being brought together. There appears to be a search among many American Indians, as there is among other groups within the American population, for a common identity and the means to achieve this. Indian art, dance, and song have taken on new meaning in this search. It is important to stress, however, that this artistic heritage is only one aspect of the modern Indian self-image. As one young Indian expressed it:

> The culture I am talking about is not something like a war bonnet and a pow wow dance put on for tourists. It's something that the Indian has in the way the Indian lives. Not as he lived in the past, but as he lives now. That exists in his *being* an Indian. (Stan Steiner, *The New Indians*, 156)

Chicago is fortunate that so many cultures and traditions are represented in her diverse population. It seems appropriate that the Museum which contains so much about people should be the major focal point for their meeting. It is our hope that the American Indian Festival will show the continuity through time of American Indian social life and culture and form a bridge between the past—represented by the articles on exhibit—to the present and future—represented by the people you will meet in the Museum.

The Illinois Arts Council, a state agency; the Ernest G. Shinner Foundation; and the Wieboldt Foundation provided financial assistance for the American Indian Festival.

Pow-wows are held periodically at the American Indian Center, providing Indians from many tribes living in Chicago with a focal point for social activity. Photo by Orlando Cabanban.

They built; they did not destroy
A REMARKABLE THING

By Sol Tax
Professor of Anthropology, University of Chicago
Acting Director, Center for the Study of Man,
Smithsonian Institution

From a luncheon address at the first annual meeting of the Foundation of North American Indian Culture, Bismarck, North Dakota, December 6, 1963.

Wood carving of eagle and whale, by David Williams, Sr., Tlingit Indian. Loaned by Indian Arts and Crafts Board.

Those of us who bring the European heritage often have feelings of guilt. We are proud that our fathers brought forth two new nations dedicated to liberty and to equality. But we know that it was not quite a virgin wilderness from which Canada and the U.S.A. were born. The American Indians who came thousands of years before had done a remarkable thing, relating human needs to the natural world in every corner of this continent. On the Pacific coast they learned how to live with salmon without destroying the salmon—and this required a marvelous technology. Just so Eskimos and Indians learned to live in the arctic, and made all of the inventions that were needed. In California it was acorns, which cannot be eaten unless men learn first to leech out the bitterness. In the Southwest the Indians learned to live with the desert, in the South and East with the great forests. Here on the plains the miracle was no less, for they showed us how the settled agricultural life of the river beds could combine with life on the high plains where man could live with buffalo. In every case they built; they did not destroy. They combined nature, man, and God into a harmonious whole. When Spaniards brought the horse to Mexico the Indians showed well how they could weave the new into the old. The horse almost instantly became integrally part of the older life, part of the harmony of man-nature-spirit. In the days of their freedom the nations of Indians not only thrived, but they thrived by discovering how to live with nature and with God without destroying either —or themselves. They changed readily and sometimes radically, as their environments changed or they moved into new areas or with the new discoveries they themselves made. They were never lonely individuals because they belonged to communities and each community was a moral order built on a right way to live in harmony with fellow tribesmen, which meant to live in harmony too with the greater universe. We think now of these tribes having developed "genuine" cultures: customs and ways and deep feeling about the right way to live; beauty in everything made by men because what was made was made with love and came from and was part of the universe.

Now, Europeans thousands of years ago took a different path. We discovered how to conquer nature. It was an act of will in our European tribal past that changed us from the way of tribal peoples. We invented something called "work," which is something from which we need vacations, as though what needs to be done must be separated from what we want to do. We also began to change the earth, and to glory in changing it; and to treat nature

like a thing, and the supernatural as something for Sunday —both separated from ourselves; and eventually we found ourselves treating one another as things also—each separated from the others, competing in a struggle to surpass. I am not glorifying the tribal way which was the Indian way or denigrating what we are. We too are marvelous to behold. In a few thousand years we have indeed conquered nature. When I first read that there now exists an atomic reactor that produces more energy than it consumes it crossed my mind that we seemed to be repealing some fundamental law of physics, just as in the past few years we have repealed one of our oldest proverbs, that what goes up must come down. But no, we have repealed no physical laws. That atomic reactor, (I think it is called a breeder reactor, since it breeds energy) is simply turning matter into energy. Man has become so powerful that he has begun to reduce the total quantity of the matter that constitutes our planet. The mind calls up a picture of the earth getting smaller and smaller until it disappears. But wait—as we transform our earth into energy, we shall use the energy to take us to other planets. If the universe is infinite, of course we can believe that progress can go on forever. In your minds is the question, "Is that progress?" But if you question progress at this point in our long history, you have to question it all the way back to the time, whenever it was, that we began our adventure in manipulating nature instead of relating to it, and in taking upon ourselves the role which we attribute every Sunday to the Almighty.

and excitement of their dance and their song, and the grandeur of their thought and ritual, but because they are a living example of another way of life. We need the model of that way of life not because we ourselves can turn back history and become again like tribal peoples, but because while they exist there is a chance to learn from them some of the basic values of life which (like matter) we have ourselves transmuted into energy. To the degree that we can regain these basic values we may learn to live with ourselves again.

Friends of American Indians are fond of remembering the cultural debt that we owe to them—tobacco (which we misuse), chocolate, potatoes, tomatoes, corn, pumpkin, turkey, and so on—it is hard to imagine our world without these. We also know that Indian ideas of democracy, and the federations of tribes, influenced the birth of our nation and our Constitution. We know how much our language, our place names, our nature-lore, have gained from American Indians. I am suggesting that the cultural contribution that the Indians offer to us—and which we reject—is far greater than these items which we have accepted.

Many of us, particularly in the East, are surprised to know that Indians are not disappearing—indeed Indians who identify as Indians, who associate with Indian communities, and live in terms of Indian values—even if they half starve to do so—Indians in this sense are actually increasing in numbers every year. This is due biologically to modern medicine, the control of contagious diseases, and

Walrus figure carved from walrus ivory, by Eskimo Indian. Loaned by Indian Arts and Crafts Board.

I am part of our European civilization, one of the members indeed of the very university where man first achieved his latest and greatest technical mastery over nature. I admire the mind and the spirit which is ours; I do not denigrate it. Nor do I say that the individuals of any population are better than those of another. We European Americans have as far as I know as many noble spirits and warm and kind people as any other group; we also have our share of small and evil people. I am only trying to distinguish two ways of life, two paths for men and mankind. American Indian communities need to be sustained, not only or even mainly because of the beauty of their artifacts, and charm

especially the saving of lives of children. But it is due equally to an act of will on the part of Indians. From the beginning of our history on this continent we have made it difficult for Indians to continue to live as Indians. We took away their means of making a living as Indians, offering them this difficult choice: "Maintain your communities and live in terms of Indian values," we told them. "If you can't feed yourselves that way in our competitive, utilitarian, impersonal society, then change into white men. Leave your communities and your values; stop living in ways you think proper; and you can eat and have the things you need." It was an act of will that the American Indians

generally have rejected the choice—an act of will of which they should feel proud. They chose the way of our fathers who left Europe in small ships to face unknown hazards and hardships rather than submit to tyranny or violation of conscience. What is no less important is that we still offer them only the impossible choice—live like white men, or not at all —and that they still refuse. To resolve the problem which is our problem—we say, "keep your culture if you will, but not at our expense"—and impatiently we throw them into the water to sink or to swim, as we say. But the Indians stubbornly neither sink nor swim; they float. They retreat into themselves, unable to explain that they cannot and will not be like us—that would be discourteous and aggressive and not good Indian behavior. They plead silently for understanding, patience, and help. And the help that we give them is offered as charity, in paternal spirit, forcing them in order to live they lose the independence which is their traditional heritage and the birthright of every community. Outsiders manage their affairs; because they cannot pay for their community schools and hospitals, they are not allowed to manage them. And then we complain that they do not know how. Indian tribes have from time immemorial managed the most difficult community decisions, and did so with consummate skill. Otherwise they would not have survived. They could do it now, if we let them do it in their own way. What needs to be done to protect Indian communities is to help them to protect their small remaining land base—which *is* their tribe—and to help them to provide means to earn a living and to maintain health and education; help them to do what needs to be done—help them with money and skills—but let them do it for themselves. We shall prove ourselves wise enough to run their lives only when we find ways to let them run their own. But we have to provide some replacement for the continent which we took from them, until freely they as communities can invent means to adjust to this new environment of the white man as once they adjusted to changes in nature.

If we can work this miracle of human relations as we have worked miracles of technology, our reward will be great. First, we shall have resolved a problem which weighs heavily on our hearts and consciences. Second, we shall have breathed new life into communities that are paralyzed, and we shall witness a rebirth of Indian culture. When we speak of the cultural heritage of the American Indians that we think to preserve, we are thinking of the arts and crafts and song and dance that have come to Indians from their forefathers. This is good. With encouragement and markets the traditional Indian products can continue to be produced in quantity, and the Indian powwows can be made attractive to tourists. This recognition of the value of Indian culture by the larger society is good, and helps American Indians both economically and psychologically. But it is not enough. This living on the past is living off capital. Art is not art, and music is not music, if it comes ready-made. We appreciate the old masters, but we demand of our artists that they be creative so that our generation, too, will produce those who will some day be old masters. Indian culture was changing and creative, developed out of the fabric of community life. When we think of preserving Indian culture we do not think alone of the art and artifacts which are reflections of the Indian cultures of the nineteenth century, but of the potential for creation that exists also in the twentieth century. Only by freeing Indians to live as they wish as Indians can we expect that life will again be breathed into the Indian culture that we preserve. Creative arts—all culture—are reflections of communities. Our great reward, if we help American Indian communities to develop freely in their own full directions—our great reward will be that we shall see a renaissance of Indian culture, changing with the times but remaining Indian. Indian culture is the basic identification with fundamental values and beliefs that have come down from the past in each Indian nation. These are fundamental values, and just as the values of Washington, Jefferson, and Franklin are living guides to us today, in spite of the fact that we have moved from an agricultural horse-and-buggy style of life to one that is in many ways far richer. So the basic American Indian values so important to be preserved will be best preserved if the Indian communities are protected by changes in outward things that will protect but not offend their inner values. With Indian community values preserved, the arts will be protected so that they can develop. Just as there are both museums to preserve the best of the old and *also* studios to create the new, without which our culture would dry up and die, so if we speak of preserving Indian culture we must plan first of all to help Indians to gain autonomous communities which will be their studios for the creation of a living culture in the spirit of the changing past.

Necklace made of caribou hoof, by Eskimo. Loaned by Indian Arts and Crafts Board.

The Edward E. Ayer
Fall Lecture Series 1968

The beauty and excitement of natural wonders and varying cultures from the artistic centers of Italy to the skier's world on the mountain slopes of Alaska will be featured in this year's Fall Lecture Series. The films are prepared and presented by well-known travelers and lecturers, each stressing human interest factors as well as the natural appeal of different areas of the world. The nine films will be shown in the James Simpson Theatre of the Field Museum of Natural History at 2:30 p.m. on successive Saturdays from October 5 through November 30. Reserved seats for Museum Members will be held until 2:25 p.m. Attendance is limited to adults and children of Members. Admission is free.

Moose
John Bulger's "Rivers"

October 5

Our Western Parks *Arthur Dewey*

Our magnificent national parks in a film portrayal that covers the four seasons. The human element—sports and camping—is shown as well as the wildlife and natural wonders.

October 12

Florence and the Heart of Italy
Eric Pavel

Magnificent Renaissance treasures of Florence serve as a backdrop for current artistic activity. Colorful celebrations and visits to famous scenic areas throughout Italy are also featured.

October 19

Nature's Plans and Puzzles
C. P. Lyons

Curious adaptations of animals to various environments are explored. Studies of birds, mammals, insects, reptiles and amphibians are interwoven with studies of plant life and the earth's geology.

October 26

Skis Over McKinley *Hans Gmoser*

The first ski traverse of Mt. McKinley and a skier's escape from an avalanche are among highlights in this tribute to the adventure of skiing in various areas of North America.

Pageant
Eric Pavel's "Florence"

Shrine
Philip Walker's "Japan"

Jaunting Car
Nicol Smith's "Ireland"

November 2

Ireland *Nicol Smith*

Emphasizing the people of this "land of castles and cottages," the span of Ireland from metropolitan Dublin to vast estates and historic castles to quiet seacoast villages is explored.

November 9

Japanese Summer *Philip Walker*

The contrasts and blending of ancient and modern Japan are revealed in its people, its cities, its cultural traditions and arts, and its industries.

November 16

Sweden *Ralph Gerstle*

Progressive, modern Sweden is viewed against a background of its traditional celebrations and maritime history. The nomadic Lapps and their lives above the Arctic Circle are also featured.

November 23

Wild Rivers of North America
John Bulger

Wilderness waterways from Tennessee to the Arctic tundra lead travelers through furious rapids, into raging forest fires and on whale hunts, with glimpses of wildlife in unspoiled areas near these waters.

November 30

Four Worlds of Switzerland
Alfred Wolff

French, German, Austrian and Italian influences in Switzerland are illustrated through regional festivals, crafts and unusual local institutions in this small and beautiful country.

"The other time

by Patricia M. Williams
Field Museum Press

MONDAY through Friday the buses roll down Museum Drive to the Museum's south entrance, spill out their loads of children and park five abreast the lenght of the drive. The children rush up the steps, line up in pairs and wait to be checked in. Inside, Stanley Field Hall is criss-crossed by straggling regiments of wide-eyed children. Many of these children are taking part in what the Chicago Public School Board of Education calls a Selected Cultural Field Experience.

Thousands of children tour the Museum in a year and each year that number increases. With the advent of the federal government's Elementary and Secondary Education Act, which, among other things, provides funds for buses for children in economically depressed communities, the number of school groups touring the Museum has swelled tremendously. Without this subsidy these children are unable to afford the fare needed for a chartered bus. Headstart, settlement house groups, church groups, school classes, clubs and day camps continue to come to the Museum in ever-growing numbers.

This is, of course, partially a reflection of increased effort to reach and aid the inner-city child in a constructive and progressive way. Museums across the country are taking part in this effort and the Field Museum is no exception.

As I stood and watched the seemingly endless parade of children streaming through the Museum halls, I couldn't help wondering—how much do they get out of these tours? is the effort and expense justified or is this a well-intentioned but misdirected expenditure of energy and money?

To answer these questions I took a tour with a group of third graders; I read books; and I talked to administrators, teachers, Museum personnel, social workers and children. As a result, I arrived at the suspected conclusion for some unexpected reasons.

This is in no way a comprehensive or statistical survey supported by sophisticated computer-tabulated data. It is, rather, a casual compilation of the views of experienced, interested and concerned people involved in the education of children.

I began the project by consulting Miriam Wood, head of the Raymond Foundation, the Museum division concerned with booking, arranging and guiding tours, as well as conducting workshops, journeys, and many other special programs.

Miss Wood is a petite, soft-spoken woman whose gracious manner and ready smile belie a mind crammed with facts and figures on civic, federal and private education programs and data on how these programs relate to the Museum. When questioned on these matters, she doesn't require time to gather her thoughts—they are seemingly permanently gathered and ready for use. In addition to big, formal programs, Miss Wood is interested in small, informal efforts such as those of a secretary who devotes her weekends to enriching the life of one slum child by taking him to Museums and other such places, or a family that brings small groups of handicapped children to the Museum in the family stationwagon.

Miss Wood is acutely aware of the role the Museum can play in aiding the inner-city child, the handicapped child, the problem student, as well as the average and superior students. However, she emphatically stresses the need for adequate financial support necessary to fulfill this role. There must be well-trained staff members available to guide these children, as well as facilities and equipment for special groups.

Last year the Raymond Foundation registered an unparalleled 6,214 groups, including 324,661 persons, and expects to top that figure this year. Miss Wood has six highly-trained and expert staff lecturers and nine volunteer guides to handle this burgeoning number. The volunteers are members of a recently formed, enthusiastic group of women who have completed an intensive training period and who are now qualified to conduct a tour of Indian and North American mammal exhibits tailored to the third-grade curriculum of the Chicago public schools.

Groups are, of course, welcome to tour independently—without Museum guides. However, the advantages of a guided tour are obvious and numerous, as pointed out in the following letter from Mrs. Yuji Kobayashi, a room-mother at Oscar Mayer School, Chicago.

"As a room mother I have accompanied my children's classes on a number of field trips. During some of these museum trips I have noticed that the teacher experiences difficulty in explaining exhibits to the children in her group. The children at the head of the line can hear her talk quite well but those in the rear can hear very little. Those nearest the exhibit also are able to read the signs and

l came on my birthday."

fully see the display but those farther away are only able to catch a glimpse of the exhibit as they move on the next display.

"The conducted tour is quite different. When my son's class went on the conducted tour at the museum, they were first given an introductory talk about the exhibits they were to see that day. They were then conducted to the various displays that were related to a specific subject which, in this case, was the American Indians and their masks. At each display the guide gave a little talk and then the children asked questions. The guide was able to answer them whereas a teacher would have had difficulty in doing so.

"The children gained greater appreciation for the Indian masks and their meanings. The class then was able to apply their new found knowledge in their classroom. I believe the conducted tours are a great benefit to the children in light of the limited time they are able to spend on a field trip."

At Miss Wood's suggestion I arranged to join a group of third graders as they took a guided tour of the Museum. When I arrived for the tour Miss Wood and three volunteer guide-lecturers, Mrs. C. W. Sidwell, Mrs. Charles Fuller and Mrs. Robert Elmore—all from the Service Club of Chicago, were holding a hasty strategy meeting. The logistics of marshalling hundreds of children a day through the appropriate areas of the Museum are staggering and are carefully planned by the Raymond Foundation staff. This group's plans were being revised because instead of the expected 60 students, over 100 arrived. This meant that rather than each volunteer taking 20 students—a workable, controlable number, she would have to take over 30. The difficulties of maneuvering, making oneself heard and encouraging discussion increase proportionately with the number in a tour group. It was finally decided that the volunteers would take 90 of the students and the others would have to tour on their own.

The third-graders on this tour were from an area of Chicago that sociologists euphemistically term blighted or economically depressed. The common, accurate and painful term for this area is slum—hard-core slum. Almost all of the children had been to the Museum at least once before.

Ninety children, three volunteers, two teachers and I proceeded to the second floor meeting room to begin the tour with a movie. The movie prepares the students for the coming tour and, as an observant teacher pointed out, settles them down after the excitement of the bus ride.

After the movie each volunteer took a group of children

Will you please tell Miss wood that she did a very good job, and I want to thank you and everyone in the Museum my appreciation.

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religious work. What they believed about people that die, and where they go after their dead. And about how animals adjust to their environment. I liked it alot.

lizards and the Apes and Monkeys I like the field museum very much for all the things in it but it is not the only museum in the the world but it is good to go there and learn some thing

and we began to tour the Museum. The teachers put all of the problem children into one group—Mrs. Sidwell's—and I tagged along after them.

In spite of Mrs. Sidwell's friendliness and encouragement, the children had few questions regarding the Indians and were generally unresponsive. Their attention span was brief and, except for an exhibit of Indian children's toys, they were easily distracted.

By the time we got to the animal exhibits the children were more relaxed and had apparently decided that I was no source of disciplinary action. As we crossed Stanley Field Hall a scrawny boy, who frequently broke into energetic dance steps, had pulled a cigarette in a long black holder out of his back pocket. He stuck it into his mouth in a manner strongly reminiscent of FDR, puffed out his chest and convulsed his buddy.

It was this boy who asked the most observant questions about the animal exhibits. He and several of the other children were very interested in the deer and beaver, but whenever one of them raised his hand to ask Mrs. Sidwell a question, the teacher passed behind him, placed a hand on his shoulder and frowned. They stopped trying to ask questions and we moved along quickly, quietly and with discipline.

When we were in the Hall of Woodland Indians Mrs. Sidwell had pointed out a necklace of grizzly bear claws and commented on the bravery of the Indian who had such a necklace. Now, as we paused before an exhibit of grizzly bears, I said to the little girl next to me, "See—there are the grizzly bear's claws. Remember the Indian's necklace made of grizzly bear claws?"

The girl looked at me and then looked at the grizzly bear. She examined him from snout to stern and then asked, "Where are the claws?"

"On the ends of his feet—like toenails."

"Oh, I didn't know what claws were."

How much were they actually comprehending? I asked the teacher and she shrugged her shoulders and said, "Some of it—not all, but they understand some."

These students were third-graders doing upper first grade work. Some were slow learners and some were discipline problems. The teacher was young and cheerless. She seemed to know the children and their needs and was not indifferent to them, but seemed discouraged and tired. I asked her, "Have you been here before with a class?"

"No, although we take many tours a semester—since the government money is available—we haven't been here before. This is the first time we have had a guided tour of any of the places we have been."

"Does it make a difference?"

"Yes—the children seem to be getting something out of it and there is some point and organization to what they are seeing, instead of just wandering around. Besides, it's very hard to take 35 kids to a strange place with no one to help, except maybe one mother. Just maintaining discipline then is hard enough."

"Is it worth the effort?"

"Emphatically yes. If you could see them in the classroom—they twitch and wiggle and can't seem to sit still. They get so bored so easily. This helps to create a positive approach to school."

"How much do you expect them to retain? Any of it?"

"No—no facts. They will, hopefully, get a general impression of what they have seen. They won't remember any facts specifically. If we come again—and then perhaps again—and took the same tour, then they would begin to remember facts and associate them with other things they have learned. It takes constant repetition—everything. Over and over and over."

"Is this a good response for them?"

"Yes—they're doing well. Better than some other times."

The tour over, we returned to Stanley Field Hall, the children were reunited with the other two fractions of their group and the volunteers had a moment to rest and discuss this group. It's not easy to take a group on tour and, although new on the job, these women were good at it. They feel that they are doing something worthwhile and look forward to their tours—and it shows.

Academic preparation for a Museum tour is as varied as the teachers who present it. Some teachers give no introductory material at all, apparently thinking that the Mu-

The mommies and some other animals are very intresting to study. I hope we go visit the museum and all the wonderful and intelligent people who work there soon.

My Mother is room mother and she was amased. She was real interesting in the toothless whale.

told there ~~was~~ food and how they hunted. And all the famous ~~mean~~ men. It helps you learn all you have to learn.

And see wild animals real close without them running away. And see machines made out of junk.

I think you should keep this up because you tell us many things about what we are studying.

seum is the best introduction to the study unit. Others bring their classes at the end of the study unit, using the Museum exhibits as a summary. The Chicago Board of Education recommends planning the "educational goals of the field trip carefully and cooperatively with the pupils in advance of the tour." Mrs. O'Connell, a successful and enthusiastic teacher at Oscar Mayer School, brings classes to the Museum often and prefers to come midway through a study unit. She finds that someone new—the guide-lecturer—rekindles the children's interest. In her view, the school and the Museum supplement one another.

Follow-up is vital to reinforce the Museum experience and can be quite creative. Some schools and groups, such as the Ecumenical Institute of Chicago, simply engage in structured conversation, discussing in a casual way the things seen at the Museum and relating these things to other experiences. The Institute, a division of the Church Federation of Greater Chicago, is not an elementary school and therefore has no set study units for children, but they are attempting to enrich the lives of inner-city children and encourage "image explosion" and "imaginal" education. The children draw pictures of things seen at the Museum and discuss them repeatedly in various contexts.

The Chicago Board of Education lists a variety of follow-up procedures—making booklets, writing themes, reading stories, making checklists, etc.

Mrs. O'Connell's class of above-average students suggested their own project. They made masks similar to those made by Indians and took great care to ensure "authenticity." The masks were featured in a student art exhibit and some months later, on a return tour, the children brought their masks to the Museum to show the staff-lecturer.

Sullivan House, a settlement house in the inner city, has an effective and on-going follow-up program. Douglas Dillon, director of Sullivan House, brought nine boys ranging from 10 to 15 years of age to the Museum for a short visit. This visit was a flop. The boys, three of whom are in Educable Mentally Handicapped classes and all of whom have been involved with the police, paid little attention to the exhibits and ran around as if in a fun house. The reptile hall alone held their brief interest and the collared lizard intrigued them.

The following summer on a camping trip to Utah, they caught a collared lizard and, on return to Chicago, asked to go back to the Museum to re-examine the Museum's displayed lizard. This began a series of regular Museum visits.

Mrs. Barbara Polikoff, of the Sullivan House staff, relates, "Mr. Dillon thought of the idea of taking a camera to the exhibit halls and giving each boy a chance to take a few photographs. This follow-up of photography was very important because the boys were able to bring their museum learning right back to Sullivan House. They photographed the lizard, complete with the labeled information, and hung the best of the photographs on their bulletin board."

This established the pattern for subsequent visits. When they wanted ideas for designs in art, they roamed the anthropology halls with the camera. One of them photographed a Chinese vase and, back at Sullivan House, another boy saw the photo and used a variation of the design to decorate a ceramic bowl he made. As Mrs. Polikoff states, "The museum had stimulated a desire to learn in these boys that school has never been able to rouse."

Long-range retention of the Museum experience is, of course, greatly reinforced by a strong follow-up program. However, even when facts are forgotten, the positive impression of the Museum remains. This fact was stressed repeatedly by social workers, teachers and administrators who deal with children whose attitude toward education is negative.

Mrs. Jean Feiler of the Ecumenical Institute explained that children from the Institute respond not just to exhibits, but to the total Museum. In the Museum they lose their passivity and are stirred by their surroundings. Mrs. Feiler says, "It is as though their environment had made them different. Remove the environment and the child is transformed."

According to Mrs. Feiler, a group of three and four year olds from the East Garfield area was taken on a full summer of touring. They covered all the museums, parks and zoos possible. When they were asked what they liked best of the things that they had seen they repeatedly cited the neatness, order and cleanliness of the Field Museum.

Of course, it is desireable that facts and insights gained at the Museum be retained as well and, although I was unable to discover any testing data to support this, they undoubtedly are. One teacher was able to question a group of children who had toured the Museum two years previously and reported that they had good and specific fact retention. I spoke to a man who described himself as having been a "slow learner and poor reader with little interest in school," and who had taken a Museum tour in fifth or sixth grade—about 23 years ago. He specifically recalls the guide describing the Multi-levelled Hopi Indian

You have a good coat room so people don't have to carry their coat. It is a a very good place.

In fact I want to see the whole museum. Because it is full with things.

pueblos and asking, "How would you like to climb all those ladders every time you went out of the house to play?" That's long-range retention!

This man was typical of the kind of child who apparently receives very great benefit from the Museum tour—a slow-learner and/or poor reader. This kind of child is not unique to the inner city or lower economic levels. He is found in the most elite suburbs as well.

A young, sixth-grade teacher in one of the far northwest suburbs has found the Museum experience so stimulating to the slow learners and poor readers in his classes, that he would like to establish a small "museum" in his classroom. The idea is to provide visual, tangible experiences with the objects under study, for example, Indian tools and household items. The interest in these items is first stimulated by seeing them and, perhaps, handling them. The poor reader is then sufficiently interested to make a greater effort to read about Indian life in his textbook.

This process was reiterated by Mrs. O'Connell who felt that, although because of their lack of eloquence they may not readily indicate this importance, the Museum tour may be more important to the slow-learning group than it is to the average and superior students. She continued

again to see the Romans. So you see these trips are not for fun. But again they are a little. Our teacher takes us to the Field Museum for a better education. And education is the best thing there is.

to state that the Museum tour encourages the poor reader to read extra-curricular books. These books may be at a much lower grade level, but the reading is voluntary and pleasurable. Due to the interest in Indian art stimulated by Museum exhibits, several books on the subject have been added to the library of Oscar Mayer School.

In a letter the Sixth Grade Department of the Arlington Heights Public Schools stated, "The slower students could handle the museum displays easily in a structured situation. They do like to see items of some interest. We believe that the slower students need more concrete learning situations. Your displays help fill a basic need for this type of student. They can get more from you (the Museum) than from countless books and teacher lectures."

Further corroboration was provided by the following from *Illinois Education*, "Field trips which tie in with classroom instruction are viewed by nearly every teacher and and administrator as being an almost ideal learning experience for the slow, reluctant learner. Because this youngster usually has had limited positive contacts with the community, field trips not only provide stimulating experiences but meet his needs for activity while removing him from the often non-stimulating environment of the school and classroom. And teachers have the opportunity to interact with him on a more personal, one-to-one basis."

The Chicago Board of Education gives Museum field trips an unqualified boost when they state, "A visit to the Field Museum of Natural History is a valuable educational experience for every elementary school child." Further, with the insight gained from the tour, "the pupils are better able to observe knowledgeably how people have striven and continue to strive to improve their ways of living and to relate themselves to the improvement of community and city life."

Finally, I consulted the children themselves. Some of the older children gave parrot-like answers, saying what they thought I wanted to hear, but by sifting through garbled syntax, reading between the lines and collecting back-handed compliments, I amassed an impressive array of spontaneous and sincere solicited testimonials.

I talked to one girl who remains unique and unforgettable. She was a skinny, Negro eight-year old from a poor neighborhood. She wore a red wool cap topped by an enormous multi-colored pom-pom and her teacher described her as an "uninterested student." I began by asking her,

"Is this your first trip to this Museum?"

"No. I was here two times already."

"Did you see the Indians then, too?"

"I don't remember."

"Oh. Well . . . what did you like best on your other trips?"

"Nothing. I don't remember nothing."

After a long, disappointed pause, I asked, "Did you come with your school class both times?"

"No—only one of the times."

Again we endured a long pause. Then she volunteered, "The other time I came on my birthday."

"Oh?"

"My mother told me I could pick two presents for my birthday and if she could get them she would. I picked a doll and a trip to this Museum with my mother and father and brother."

She liked and remembered something and whatever it was merited the sacrifice of a toy and was worth sharing with her family. That's a sincere tribute from any eight-year old. From this one it was a rousing ovation.

The success and value of a Museum tour can be measured in many ways, among them, the slow-learner's grasp of a previously unreachable concept; the anti-school child's pleasure in an educational institution; the appreciation of order by a child from a disordered environment; and the stimulation of the desire for knowledge in all children. By these standards, I found the tours to be valuable and worth all the effort and expense required.

I like your museum very much. you are very nice

Right: *When living, "Joseph" probably looked like this artist's reconstruction of a Mastodon. (From a painting by Charles R. Knight in Hall 38, Fossil Vertebrates.)*

Below: *Author cleans one of the molars which probably troubled "Joseph" during his life. Shown is the roof of the mastodon's mouth. Tusks grew from the sockets below the teeth.*

"JOSEPH" == *Story Told By a Fossil*

by Gwendolyn Hall

Preparator, Department of Geology

Among the many specimens which come to the Museum's paleontology laboratory for preparation are a few which emerge as distinct "personalities," by virtue of unusual aspects of their fossil remains. Some of these specimens even get dubbed with names.

"Joseph" is a case in point. He was a mastodon (*Mammut americanum*) and unique aspects of his fossil remains gave us an interesting insight into what he experienced as a living individual.

Mastodons were common in the midwest 8,000 to 10,000 years ago during the Pleistocene. "Joseph" was ap-

proximately 10 feet tall at the shoulder and weighed about six tons, with 8-foot tusks. His appearance was generally that of a very large, stocky elephant. His fossil remains were discovered in 1960 in a bog in Medaryville, Indiana, by an excavator working on property owned by K. H. Huppert of Chicago. Mr. Huppert contacted Dr. Rainer Zangerl, Chief Curator of Geology, who, along with Dr. William Turnbull, Associate Curator of Fossil Mammals, went to the site and inspected the bones which had been removed from the bog with a power dredge.

For seven years, "Joseph's" bones, covered with dried mud, roots and burlap bags, were stored in the Museum before they were brought to the laboratory for cleaning and repair. The skeleton is very well preserved and has been restored into an excellent study specimen.

"Joseph" lived to be very old and suffered from several infirmities of old age. He carried the additional burden of dental trouble.

In the lower right mandible, there is the malformed stump of a molar which indicates a once painfully draining abcessed tooth. (*See photo, A.*) He also has a large cavity in his first lower left molar. Both left molars are very flat and worn down in contrast to the relatively unused teeth in the right mandible. The worn teeth on the left indicate he favored that side for chewing to avoid biting down on the abcessed tooth. It was the excessive wear that weakened the first left molar, leaving it susceptible to decay.

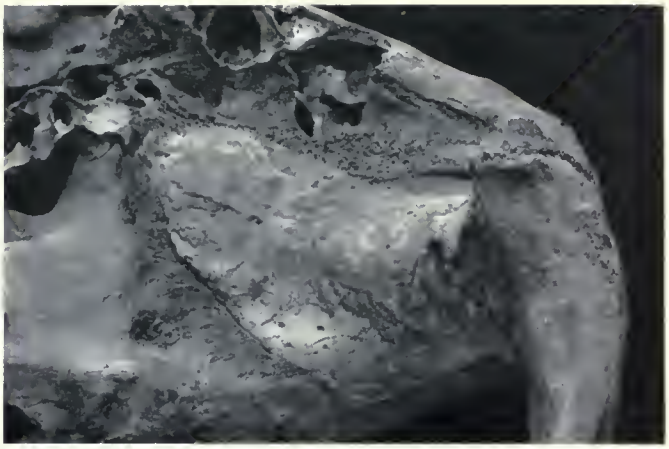
At some point in "Joseph's" life, a two-foot portion of on tusk had been broken off, exposing the pulp cavity. This healed and the end of the tusk was worn smooth before he died.

"Joseph's" jaws showed more than bad teeth. On the surfaces of the mandibular condyles (the part of the jaw that joins to the skull), especially the left, are heavy, rough, pitted calcium deposits, diagnosed as evidence of chronic arthritis. The heaviest calcium deposit is on the right glenoid fossa (on the skull at its juncture with the jaw). (*See photo.*) With these multiple handicaps, eating must have been difficult for this huge animal.

Evidence of arthritis is also present in the condyles at the base of the skull and the processes on the neck vertebra which show enough calcium deposits to indicate he could scarcely turn his extremely heavy skull from side to side. The same type of calcium deposits are found in the rest of the vertebral column and the heads of the ribs as well.

Supporting his own body weight must have been another painful experience as the articulatory (moving joint) surfaces of his limbs were also arthritic. His movement was probably very slow and restricted because of the swollen, stiff joints. This lack of mobility may well have caused the death of this aged mastodon since it is likely that he died in the bog where his bones were found.

"Joseph" was a member of a former giant "race" that left no direct descendents. The modern elephants of Africa and India are related to the mammoth (*Mammuthus primigenius*), a contemporary of the mastodon and an animal very similar in appearance.



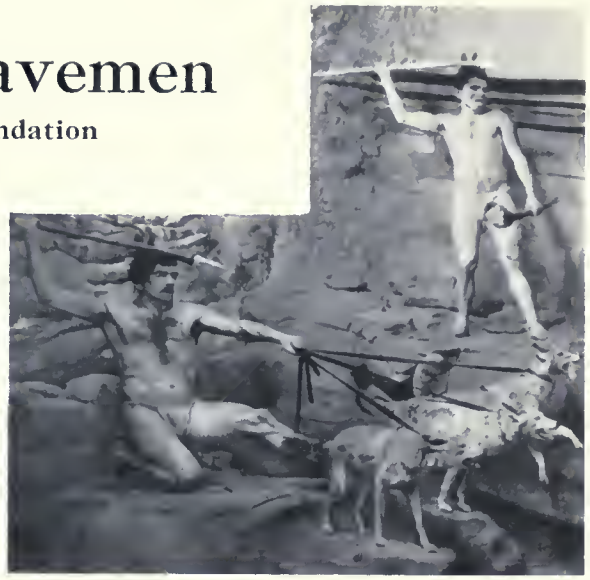
The large lighter area in the center of the photo is a calcium deposit on the right glenoid fossa, evidence that arthritis was present where rear portion of the jaw joined the skull. The rough, pitted area is similar to calcium deposits found on articulatory (moving joint) surfaces throughout "Joseph's" skeleton. He suffered from extensive arthritis.

Malformed stump of abcessed molar (A) *shows extensive damage. Molar above* (B) *is intact except for a large cavity (dark area). The complete tooth measured about 5 inches long by 2½ inches wide.*

Fall Journey:

Hunt With The Cavemen

by Edith Fleming, Raymond Foundation



Mankind was probably cradled in Africa and from this birthplace gradually spread into Asia and finally into Europe. Our own hemisphere was unpeopled until about 25,000 years ago when the Paleo-Indians began to filter across the Bering Straits from Asia. This is recent compared to the antiquity of man in Europe, where more than 500,000 years ago small bands of hunters roamed the countryside foraging and hunting wild animals. Between 100,000 and 35,000 years ago Neandertal people lived in Europe. Cartoonists have depicted them as slow-witted and bestial, but recent research and study indicates they were more like modern man than was formerly believed. They are now classified by many as a type of *Homo sapiens*, but the first truly modern man, called Cro-Magnon Man, did not migrate into Europe from the Middle East until the late Ice Age, about 35,000 years ago.

The story of the early hunters of Europe can be followed on the Fall Journey, "Hunt With The Cave Men." Prehistoric man pitted his skills against animals like the woolly rhinoceros, woolly mammoth, cave bears, bison, wild horses and reindeer. These furnished the necessities of life—food, clothing, tools, fuel for fire, even oil for stone lamps.

Gradually, these primitive people invented new and better tools and worked out improved hunting methods. Stone and bone tools as well as the bones of animals found in caves or at camp and hunting sites tell the story. Enormous piles of bones have also been found at the bases of cliffs, leading some scientists to conjecture that organized hunting bands pitched camps near the trails the animals followed from winter feeding grounds to summer pastures and drove the animals over the cliffs to kill or immobilize them.

Only the hunter's skill stood between him and starvation and he apparently resorted to magic to augment his own powers. In subterranean cave passages primitive artists drew lifelike pictures of great animals they hoped to kill. To make these drawings these people had to move through dark and dangerous tunnels lighted only by burning animal fat flickering in a stone lamp. Perhaps the early hunter braved the dangers of becoming lost or being attacked by an animal in the belief that this test of courage might work a stronger magic.

Through thousands of years man worked out a way of life suited to the Ice Age. Then the glaciers receded and as the climate grew warmer, water from the melting glaciers formed rivers, lakes and marshes. New kinds of trees grew and forests eventually covered what had once been frozen tundra. The great animals of the Ice Age died off or moved farther north and the hunting life of that period came to an end. The cave art evidently disappeared about the same time.

New animals, including deer and wild boar, roamed the land and man was forced to adapt his hunting methods to this new environment. He developed new weapons—bows and arrows, spears with tiny flint points. Instead of large hunting bands needed to hunt the large cold weather animals, single hunters pursued the smaller, more elusive game of the warmer period.

New sources of food were available, too, including seeds, nuts and berries. Groups of families could live together where these foods were plentiful and there was abundant fish and game. There had been great changes in the climate, in the character of the country, in the animals and food sources and in the way people lived. They were learning to get the most benefit from their environment and approaching a time when they would develop farming skills.

The Fall Journey Number 55, will take boys and girls on their own or with their families through the Museum's Hall of European Prehistory (Hall C). Here they will travel through thousands of years, starting with early hunters and completing their journey with the prehistoric farming sun-worshippers of Western Europe.

A new journey is offered every three months by the Raymond Foundation. With the successful completion of four journeys boys and girls are awarded certificates naming them "Museum Travelers." After eight journeys they become "Museum Adventurers" and 12 journeys make them "Museum Explorers." After 16 successful journeys they are ready for a special journey, "The Voyage of the Beagle," when they study in the Museum exhibits the natural history described by Charles Darwin on his famous voyage. Youngsters successfully completing the special journey will be awarded certificates as members of the "Museum Discoverer's Club."

Journey question sheets and further information on the Journey Program may be obtained at the Information Booth in Stanley Field Hall or at the South Door of the Museum. The Fall Journey begins September 1, ends November 30.

MEMBERS' FESTIVAL OPENS ANNIVERSARY YEAR

An exciting evening is planned for Museum Members on September 27 when the series of special events for the 75th Anniversary year opens with a Members' Festival from 4 to 9 p.m., in connection with the American Indian Festival.

The Members' Festival will include demonstrations of weaving, moccasin beading, totem pole carving, porcupine quill working, leather work, Kachina doll carving and basketry by Indian artisans representing several tribal groups.

Hand games and use of sign language will also be demonstrated. A program of traditional dances by local Indian groups is also scheduled.

Special exhibits of modern and traditional Indian arts and crafts will be on display in addition to three stationary displays which will remain on view until mid-November. The major exhibits include "New Directions in American Indian Art," "Contemporary Traditional American Indian Art," and "Indians of Chicago—1968." The last is a photographic essay on the present Indian residents of Chicago and their lives here.

Films related to various aspects of Indian culture will be shown continuously in the James Simpson Theatre. All other activities of Members' Festival will be held on the main floor of the Museum. Light refreshments will be served during the evening.

Program arrangements for the American Indian Festival and the Members' Festival were made by Robert Rietz, executive director, and Miss Faith Smith, both of the Chicago Indian Center, Dr. Donald Collier, Chief Curator of Anthropology, Solomon A. Smith II, Coordinator of Temporary Exhibits, and Lois Rubinyi, Festival Coordinator for Raymond Foundation.

CALENDAR OF EVENTS

September Hours: September 1, 9 a.m. 8 p.m.; September 2, 9 a.m. – 6 p.m.; September 3 through October, 9 a.m. – 5 p.m.

Through September 16 CAMOUFLAGE IN NATURE Photographic exhibit in color by entomologist Edward S. Ross demonstrates a variety of ways in which living things are protected by coloration. Three-dimensional Museum exhibits supplement the photographs. Hall 9 Gallery.

September 23 – October 13 AMERICAN INDIAN FESTIVAL features demonstrations of traditional and contemporary arts and crafts by Indian artists, special exhibits, films, lectures, a canoe race, a special Members' Festival and cooperation in the celebration of Indian Day in Chicago. The American Indian Festival activities will be presented in cooperation with Indian groups in Chicago.

September 27 MEMBERS' FESTIVAL A special evening event to enable Museum Members and their families to get an unhurried look at the many demonstrations of arts and crafts, a program of American Indian singing and dancing, and exhibits, films and lectures related to the American Indian Festival.

September 28 INDIAN DAY IN CHICAGO A full schedule of arts and crafts demonstrations will be featured.

September 29 LAKE MICHIGAN CANOE RACE Museum representatives will greet participants at the finish of this race, which will begin at Wilmette Harbor and end at Burnham Harbor on the Lakefront. The race, sponsored by the Chicago Indian Canoe Club, is an annual open invitation event.

September 23 – November 15 AMERICAN INDIAN EXHIBITS "New Directions in American Indian Art," "Contemporary American Indian Art," and "Indians of Chicago—1968" (a photo essay by Orlando Cabanban), will be part of the Festival and be continued following its close.

Through November Fall Journey: A HUNT WITH THE CAVEMEN The do-it-yourself tour introduces youngsters to the Museum's exhibit area dealing with Stone Age man. Any child who can read and write may participate in the Journey program sponsored by the Raymond Foundation. Free Journey sheets are available at the Museum entrances.

HALF A BILLION YEARS OF ILLINOIS HISTORY Do-it-yourself tour in observance of the State's Sesquicentennial celebration takes visitors on a capsule journey through the worlds of anthropology, botany, geology and zoology. A free brochure provides a guide to pertinent exhibits.

MEETINGS:
CHICAGO SHELL CLUB, September 8, 2 p.m.
NATURE CAMERA CLUB OF CHICAGO, September 10, 7:45 p.m.
SIERRA CLUB, GREAT LAKES CHAPTER, September 17, 7:30 p.m.

Faith Smith of the American Indian Center examines a Hopi Kachina figure, one of many Indian art objects to be on display during the Festival.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
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Edward G. Nash, Managing Editor

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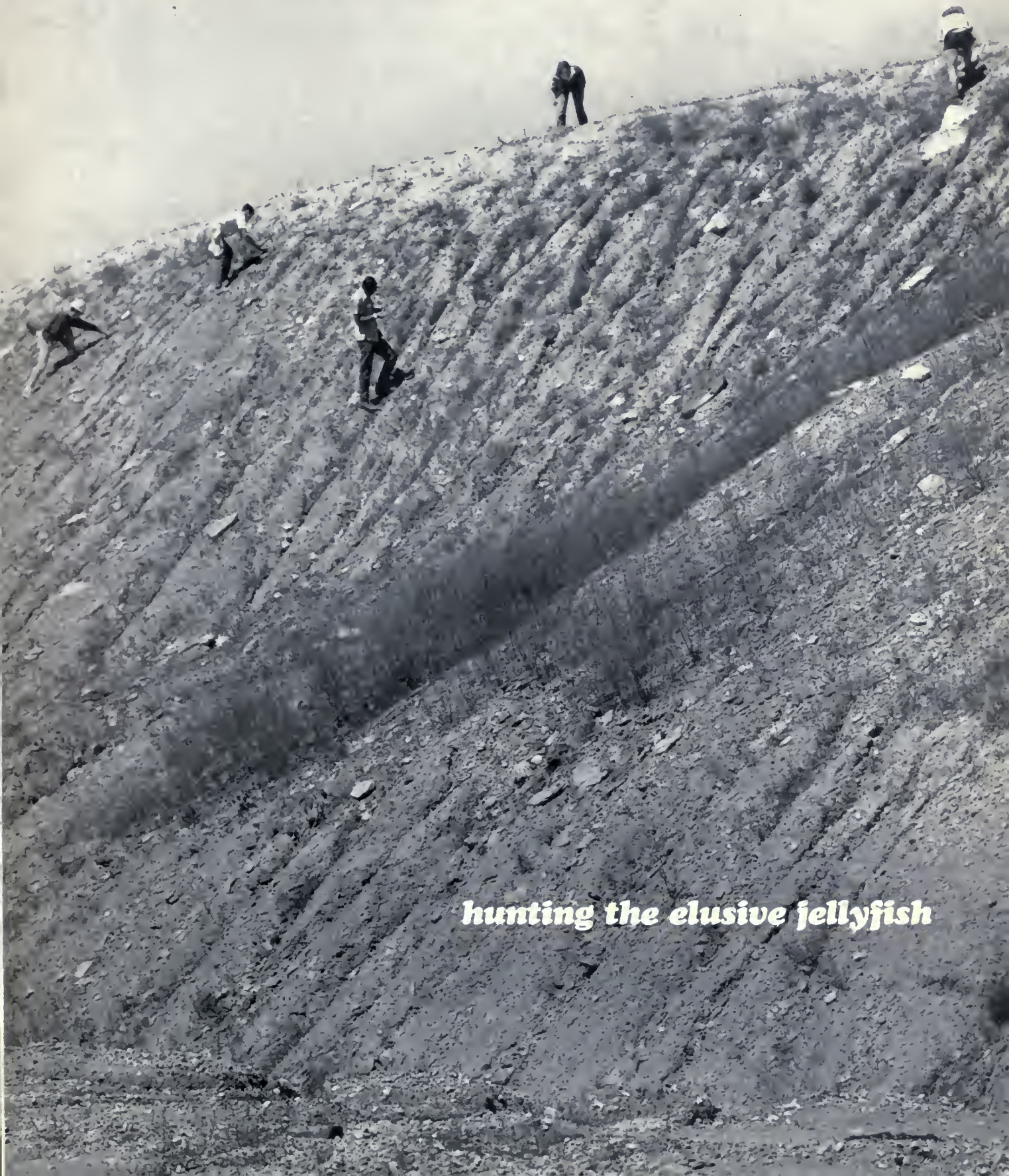
BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Volume 39, Number 10, October 1968



hunting the elusive jellyfish

"Earth, Life and Man"

75th Anniversary Lecture Series

"Earth, Life and Man," a series of public lectures by Museum Curators, will begin October 27 as part of the 75th Anniversary Year special programs and events at Field Museum.

The lectures will focus on research activities of the scientific staffs in the Museum's four departments, anthropology, botany, geology and zoology. They are designed to bring the Museum Members into closer contact with work being done in the departments and to broaden understanding of the physical and biological world and the nature, history and evolution of life on this planet.

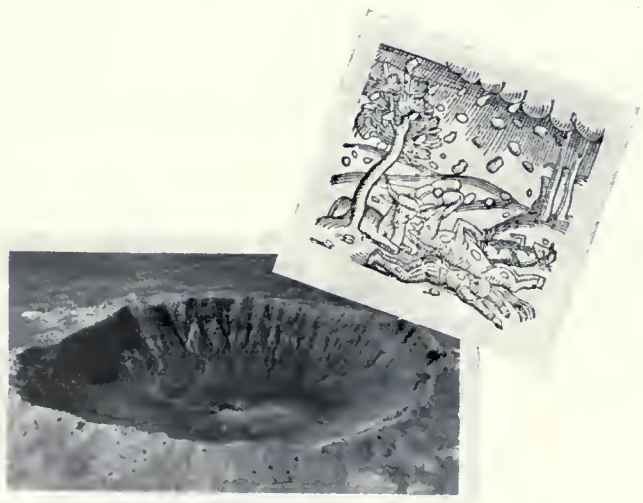
The lectures will be divided into three groups—fall, winter and spring—and will be held on Sunday afternoons at 1:00 p.m. in the Lecture Hall. The series is intended primarily for Museum Members but admission will be open to interested members of the general public.

The fall group of lectures will begin October 27 and end on December 1. Details of the winter and spring lecture series will be given in future BULLETIN articles.

October 27
MUSEUM SCIENCE AND EXPEDITIONS
Dr. Robert Inger, Curator, Amphibians and Reptiles

DR. INGER will introduce the series of talks to be presented and discuss goals of research activities in the Museum. He will explore the changing character and role of Museum expeditions and field trips over the years and new trends taking shape in research.

(Photos, right) *Nanga Tekalit, Dr. Inger's expedition campsite in the Borneo rainforest, 1962–63; Student Wayne King (now Curator of Reptiles, Bronx Zoo) works in the camp laboratory.*



November 3
METEORITES: A POOR MAN'S SPACE PROBE
Dr. Edward J. Olsen, Curator, Mineralogy

Dr. Olsen will discuss what men have determined about the earth and solar system, based on research findings on meteorites over the past several hundred years. Of particular interest is the unique role played by museums in this research effort.

(Photos, left) *"Diablo" crater near Winslow, Arizona, is the largest known meteor crater in the world; the scene on this old woodcut is believed to represent a meteor shower.*

November 24
HUNTING MONKEYS IN THAILAND
Dr. Jack Fooden, Associate, Mammals

Dr. Fooden will discuss his 1967 trip into west-central Thailand to collect monkeys. Reasons for the trip, his collecting experiences and the expedition results will be included in the talk, as well as descriptions of various areas he visited.

(Photos, left) *Dr. Fooden's campsite near the village of Pong Nam Ron in Western Thailand; leaf-eating monkeys (genus* Presbytis*) from an area near Thailand's western border.*

November 10
CENTRAL AMERICAN MOUNTAINS AND FORESTS
Dr. Louis O. Williams, Chief Curator, Botany

The Museum's history of intensive research on the botany of tropical America will be reviewed by Dr. Williams, who will also discuss the terrain and flora of the Central American countries.

(Photo, right) *Low clouds surround the Central Mountains rising behind this farm and forest in Honduras.*

December 1
THE AMAZON VALLEY FOREST
Donald R. Simpson, Assistant Curator, Peruvian Botany

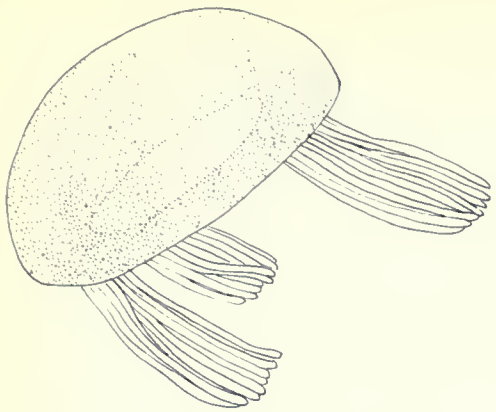
The westernmost region of the Amazonian jungle in eastern Peru has been little explored by scientists. Mr. Simpson has made two field trips there and will describe some of the plants of this wild forest region and how they are used by both local inhabitants and in export areas for food, medicine, ornament and building.

(Photo, below) *Dr. Louis O. Williams and a Peruvian botanical collector examine flora in a small man-made clearing in the dense Amazonian jungle.*

November 17
ESKIMOS AND RUSSIANS IN SOUTHWESTERN ALASKA
Dr. James W. VanStone Associate Curator, North American Archaeology and Ethnology

In the 19th century, the Russians penetrated southwestern Alaska, exploring and trading with the Eskimos and establishing missionary outposts. Dr. VanStone will describe the history of this period and relations between the Russians and the Eskimos.

(Photo, right) *Present-day Eskimo women clean fish along the banks of the Nushagak River in Alaska.*



Anthracomedusa turnbulli

Jellyfish in them thar hills

by Eugene S. Richardson, Jr.
Curator, Fossil Invertebrates

The strip mines of Illinois are one of the two or three finest areas in the world for collecting invertebrate fossils. Behind the enormous coal mining machines of the Peabody Coal Company come the geologists, amateur and professional, searching for animals dead a quarter of a billion years. In this article, Dr. Richardson tells of two important finds from Pit Eleven, near Wilmington, Illinois. In two photo reports that follow, the Bulletin presents the lively Museum field crew that worked the area during the past summer, and a survey of the Pit Eleven fauna.

It's FIVE MILLION, six hundred thousand years to the mile. By the time you've driven fifty miles southwest from the modern center of Chicago, you step out of your car onto the 280,000,000-year-old rocks of the Pennsylvanian period in the spoil heaps of a strip mine outside of Wilmington, Illinois.

You have brought some peanut butter sandwiches (or other delicacy) and a jug of water, of course—and you're going to catch jellyfish. This is a field trip. Perhaps you are one of the Museum's field crew. Or perhaps you're one of the hundreds of amateur collectors who are drawn to this spot. In either case, you have come for fossils, the remains of prehistoric life. More importantly, you are helping in a nearly unique cooperative venture in which Museum scientists and amateur collectors pool their efforts to elucidate a part of the story of life in the vanished past.

Working alone or as members of the Earth Science Club of Northern Illinois, the Des Plaines Valley Geological Society or other such organization, a host of collectors pursue their hobby and the advancement of science at the same time. Returning home tired and happy after a day in the field, these enthusiastic cooperators wash their specimens, carefully identify them, catalog them, and put them tenderly away in museum-style cabinets. Many an architect in this area would be startled, revisiting what he had thought was to be a recreation room or a utilitarian basement, to find it brightly lighted, lined with handsomely built hardwood cabinets of shallow drawers, with perhaps a few glass-topped display cases or a work table with the latest stereo-zoom microscope.

If this is your first field trip, you look a bit uncertainly at the steep and random spoil heaps with their slippery surface of clay and pebbles. The spiky xerophytic vegetation that is beginning to cover the hills bites you on the ankle. The unshaded sun hammers down on your head and shoulders. You look hesitantly at that dark line in the west, remembering that this is "Tornado Alley." You wonder why some people prefer strip mines to the corn fields that were here.

But look now at some of those pebbles on the hillside. They are red, brilliant in the sunshine. They are symmetrically shaped, rounded, somewhat flattened. These are ironstone concretions, a thing apart, something special. A drab gray when first dug up by the giant excavating machinery, they redden—it's a kind of rusting—in a year or two as sun and rain and air attack them. When first dumped on the spoil heap, they were still encased in the drab gray shale where they grew an eon ago, formed by interaction of mineral-bearing water and an organic nucleus, an animal or a plant. The shale, exposed to weather, has now broken down to the clay of the hills, but the sturdy concretions remain. Some, you note, have broken in the winter frost and summer sun. You pick one up, already neatly split along its equator. There, in its center, is a

neatly preserved shrimp, the fossil remains of a creature that lived here more than a quarter of a billion years ago, a specimen unseen by human eyes until you picked it up. Forget the slippery hills, the prickle-bushes, the beating sun! Forget the possible thunderstorm; you're out for fossils!

The strip mine was not actually dug for the purpose of turning up fossils. From the point of view of the operator (a curious view, perhaps) the fossils are a by-product and coal is what they're after. Fifty to a hundred feet below the flat farmland lies one of the most extensive beds of coal on this continent. Known here as the Wilmington Coal, it is the Colchester Coal of western Illinois, the Lower Kittanning Coal of Pennsylvania, and has other names where it is mined in Oklahoma, Missouri, Kentucky, Michigan and other states.

Coal, as is well known, is made up of the carbonized remains of plants. Plants in such numbers as to make up this vast bed mean a forest of uncommon size. Study of the Pennsylvanian rocks and coals by many geologists in the century past enables us to visualize this forest of the Wilmington Coal. Giant tree-sized ferns and horsetails and their allies, shallow-rooted, quickly growing, continually falling and accumulating on the sodden ground, lived in a vast flat swamp. Only under water can the fallen trees go through the proper chemical changes to become coal. Broad though that swamp forest was, it continually shifted its position, forming a broad band, probably hundreds of miles across, between an inland sea to the south and west and the modest uplands to the north and east. Trees on those uplands, falling on drier ground, decayed without trace while the trees in the great swamp built up the layer of substance that was almost coal. Sea level rose (or the crust of the continent sank); gently the sea advanced across Oklahoma, Missouri and Illinois. Now the former swamp forest was buried under sea-floor muds; the broad belt of swamp moved on ahead into what had been the uplands. For a while, when the shoreline lay here near Wilmington, the advance of the sea was halted.

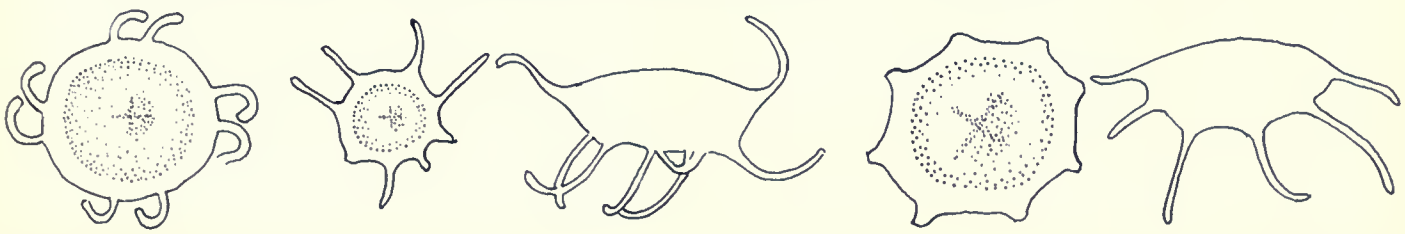
This was the time when the fossils that we find were living. For you are walking now on that former shore. But how shall we define that shore? It was no sandy strand with land on one side and sea on the other. Back into the swamp forest ran countless intricate inlets, bays, bayous and channels; far out to sea stretched a complex of islands, bars, peninsulas and shallows. Mud, carried through the swamp by sluggish streams, poured into the edge of the sea, building a delta. Like all deltas, it was chiefly under water. In time, before the sea resumed its march across the low and swampy land, the delta muds built up to a hundred feet in thickness. Now, this seems utterly improbable in water that we have solemnly declared to be shallow. The answer lies in the behavior of the earth's crust. Under the center of Illinois during this Pennsylvanian period the crust sagged more than elsewhere. While the shoreline tarried at the strip mines, the inland sea floor slowly dropped at about the same rate as the mud accumulated, and the water remained shallow.

Animals of many kinds lived on the flanks of the growing delta, drawn by the nourishing water near the swamp. Worms and snails, shrimps and clams, chitons and sea-cucumbers moved about on the mud surface, some in great numbers. Through the murky water swam Tully Monsters, sharks, bony fishes, shrimps, scallops and many others. The water draining from the land carried along fronds and pinnules, spores, stems and seeds; insects, thousand-leggers, spiders and little amphibians drifted with them out onto the delta.

All of these and more, falling to the sea floor, were quickly covered by the raining mud—so quickly on the whole that they had no time to decay before they were encased forever in the firm sediment. Before decay could attack, each little fossil-to-be was locked into place by a halo of iron mineral that soaked and hardened the shale it lay in. Teeth and bones remained unchanged as time went on; shells changed from one limy mineral to another or dissolved, leaving a perfect mold.

But what of the soft tissues of the animals? They broke down chemically after having left their impress upon the rock. All that remains today for the collector is the impression, plus some invisible amino acids and other organic compounds that have soaked into the rock. Except in these strip mines, it is most extraordinary to find even an impression of a soft-bodied animal such as a Tully Monster or a worm —or a jellyfish. Many of these impressions, exposed on the broken equator of a split concretion, have almost no relief—no ups and downs. It is the organic leftovers that finally make them visible. When a concretion has been cracked by sun and frost, the inside surface is exposed to two powerful oxidizing agents, sun and air. Between them, they make the ironstone turn red, just as the outside of the concretion did before. But where the amino acids had soaked the rock, on the impression of the fossil, they take up the oxygen before the iron gets it, and the impression remains pale.

Drawings, by the author, of five different specimens of Octomedusa pieckorum. Invertebrate fossils may be preserved at any angle, and a series such as this provides a great deal of information about the animal.



Often we find pale markings of no definable shape. Those unrecognizable ones must represent some of the shapeless masses of jelly-like material that lie about on any sea floor. There was enough to them to start the chemical process that built a concretion, but they tell us nothing definite. Others have a shape revealing some soft-tissued creature gently buried while yet intact. Among these are brilliantly visible jellyfish.

Here and there about the world there have been finds of fossil jellyfish. The *Treatise on Invertebrate Paleontology*, which will occupy a four-foot shelf when fully published, devotes only 27 pages to an exhaustive survey of the world's fossil jellyfish. They are not abundant. But they are disproportionately interesting because they represent unusual forms of preservation. Paleontologists, like other people, savor exceptions. One treasures the improbable. We like jellyfish.

A few years ago, one of the collectors cooperating with the Museum, Jim Turnbull of Libertyville and the U. S. Marines, dropped in to see us with a perfectly fine jellyfish in one of the familiar ironstone concretions. Recognizing its significance, Jim kindly gave it to the Museum for permanent deposit. We jokingly ordered some more. He returned to the strip mines, to the hill where he had found that one, and the following week was back with two more, which he also deposited with us.

Jim's jellyfish are large and splashy specimens, four or five inches across the bell, with groups of tentacles almost that long hanging from four corners. Faint dark lines crossing the bell correspond to certain structures known as *septa* that similarly divide the bell of some modern jellyfish into four areas. When Professor Ralph Johnson saw the specimens, he recognized them as being very clearly members of a living group, the Order Carybdeida, but a species new to science.

Somewhat earlier, I had the privilege of examining the collection of Mr. and Mrs. Ted Piecko of Chicago, collectors who also cooperate with the Museum. Among their fossils were several small concretions containing another kind of jellyfish. The Pieckos generously deposited several of them at the Museum. The Piecko specimens were tiny, less than an inch across, light pink against a darkly oxidized background. They had eight stubby little tentacles evenly spaced around the edge, with a *velum*, or little shelf, around the inner edge of the bell. But the clinching point was the mouth, a small x-shaped impression on a little mound in the center. Again, an undoubted jellyfish, but one not so closely modeled on the lines of any known modern form.

Now we had two kinds of Pennsylvanian jellyfish from the strip mines. As Dr. Johnson and I visited collections in the homes of other cooperative strip-mines enthusiasts, we saw other specimens of the same two jellyfish, but no additional forms. It was time to make them known to science.

Thereupon, according to the time-honored practice of collaborating authors, Dr. Johnson wrote the descriptions and handed me the typescript. I made changes and additions and subtractions in red pencil and handed him the mutilated remains. He rearranged it, keeping some of my

Octomedusa pieckorum

work and restoring some of his. This resulted in a nice, clean typescript; I made some more red hen-tracks. He weeded them out, the paper was re-typed, and we submitted the result to the Chief Curator of Geology. From him it went off to a reader outside the Museum and returned with blue pencil marks. We accepted some of the pencilling, re-typed the manuscript, and sent it again to the Chief Curator, from whom it went first to the Director and then to the Editor. Even so does a legislative bill pass from House to Senate to President to Printer. In due course the Museum Press produced a nicely printed little book on the jellyfish, the product of two authors and with the advice and consent of an adequate chain of authority.

He who puts a fossil (or a living animal or plant) upon the record for the first time, has the prerogative of devising its scientific name. Some of these names are frightful jawbreakers and should never have been thought up; others may conceal a story or a joke. Often the scientific name is based on the collector's name. We elected this latter course, in recognition of the collecting prowess of the donors of the jellyfish. *Anthracomedusa turnbulli* says in Greek (*Anthracomedusa*) "Coal-Age Jellyfish" and in Latin "of Turnbull." Similarly, *Octomedusa pieckorum* means "Eight-sided Jellyfish" (in Greek) "of the Pieckos" (in Latin).

Soon after this little book appeared, copies of it came into the hands of our cooperating collectors. Mr. A. W. Kott, of Summit, Illinois, dropped in to see us one day and received a copy. 'So that's what the jellyfish look like, is it?' said he. 'Yes,' I replied; 'They're very rare.' Having studied the pictures, Mr. Kott went forth into the spoil heaps and was back at the Museum again the following week—with four hundred specimens of the little *Octomedusa*.

We are in a position to say that there are jellyfish in them thar hills.

Above, hammers raised in geological salute, the Mazon Creek Faunal Study Field Crew, known also as the Pit Eleven Players.
Left to right, Professor Ralph Johnson, Charles Shabica, Peter Kranz, Ida Thompson, Arthur Zangerl, Paul Lund.

Below, a view of the Peabody Coal Company mining operation at Pit Eleven. The enormous wheel excavator in the background is nearly fourteen stories tall, and the length of a football field. It moves 3500 cubic yards of earth an hour, and in two sweeps disposes of the entire Pleistocene overlay, about a million years of geological history.
In parts of northern Illinois, the Pleistocene rests directly on the Pennsylvanian and there is a geological gap of 250 million years. The middle machine, a thirty cubic yard drag line, scoops about fifteen feet of Pennsylvanian shale, and the final, smallest shovel, excavates the coal itself. The coal measure is generally from two to ten feet thick.

The Hunters...

the Pit Eleven Players

The Mazon Creek Faunal Study project, supported in part by National Science Foundation, sent a field crew to Pit Eleven three days a week this summer. Led by Ralph Johnson, Associate Professor of Geophysical Sciences, University of Chicago, the effort was the first intensive, large scale survey of the area by professional and student geologists.
Johnson, who can use the carrot as well as the stick, quickly established ground rules for his brave band of assistants and graduate students. Discovery of sixty identifiable specimens on any given day in the field entitled the team to a party (a small one).
Thus, a specimen was quickly tagged an M–P, or Micro-Party.

Charles Shabica, a graduate student at the University of Chicago, in discussion with Melbourne McKee, a chemist with Peabody Coal. McKee's advice and help have been invaluable to the Mazon Creek project.

Field Museum International Scout gives an idea of the size of the 30-cubic-yard drag-line shovel.

One of the hazards of the strip mines is a peculiar, grey, exceedingly viscous mud. Shown here are two victims, below, a grasshopper, and above, a University of Chicago Travelall. The grasshopper was rescued by a geologist; the truck, up to its hubcaps in the stuff, was pulled out by tractor.

With the exception of the sponges, nearly all the major groups (phyla) of the animals now living are represented in the strip mines. The coelenterates, the jellyfish, are shown on pages 4–6. Echinoderms, which today include the sea cucumbers, starfish and crinoids, are also in the area.

Scientists gro
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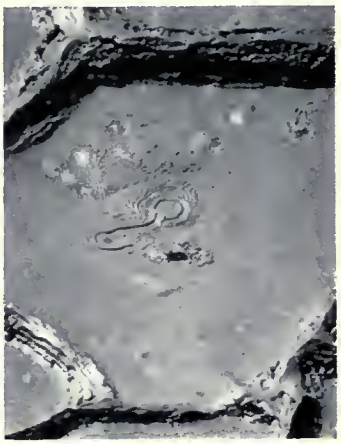
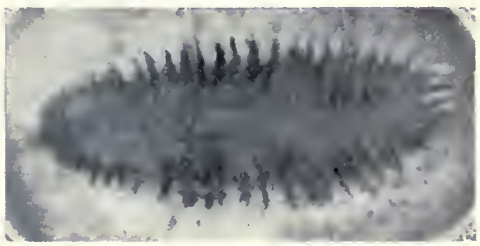
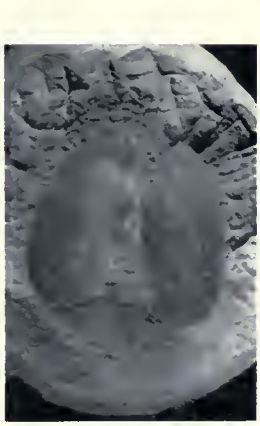


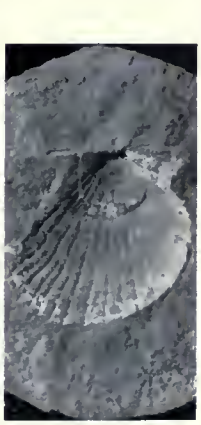


Jenny Coyle, a young Antioch College co-op student working at Field Museum, spent many hours collecting at Pit Eleven. Each member of the team had responsibilities other than mere fossil collecting. Miss Coyle was morale officer.

Shabica waters the crew mascot, a "Pit Eleven Plant," or "Barbed Wire Bush." This nasty little plant was just one more hazard faced by the collectors. Most of their ankles are still scarred.

Of the molluscs, collectors hav
left, scallops, *center,* an
ishingly, a squid. This find a
cover of the national journal,
the earliest squid found so fa





Hunter Johnson and his crew at sundown, before the long journey home.

...and the Hunted

a Gallery of Fossils

The arthropods, a large and very successful group, are very prominent in the strip mines. Shown here are a millipede, *top*, and a horseshoe crab; *below left*, shrimps, *top and side views;* a flying insect and, *far right*, a spider.

worms into a number of
wn at left are two annelid
"Cooper" worm and the
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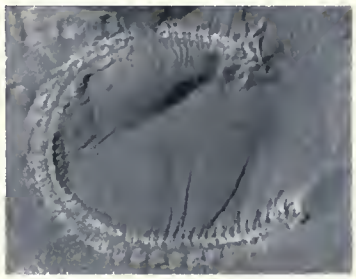

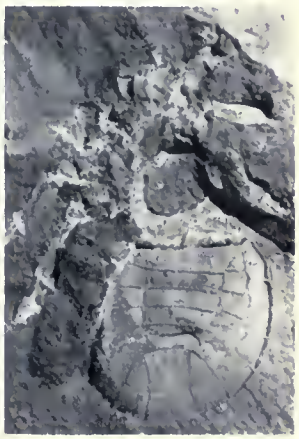

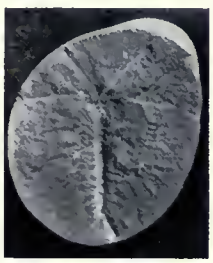

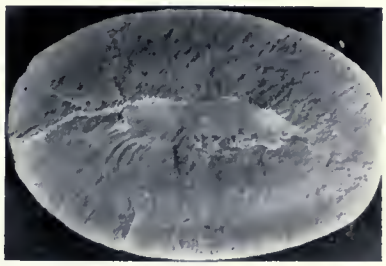

Phylum Chordata contains all the backboned animals, including ourselves. Pit Eleven has lungfish, lampreys and other fish, one, a baby coelacanth, is shown *below*. Collectors have found some amphibians, *right*. Amphibians are about as far as the vertebrates had gone during the Pennsylvanian Age.

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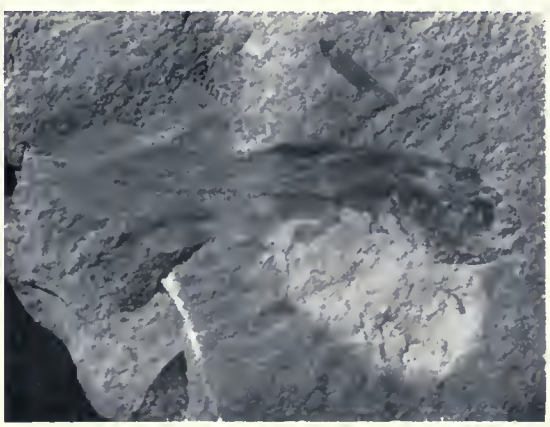
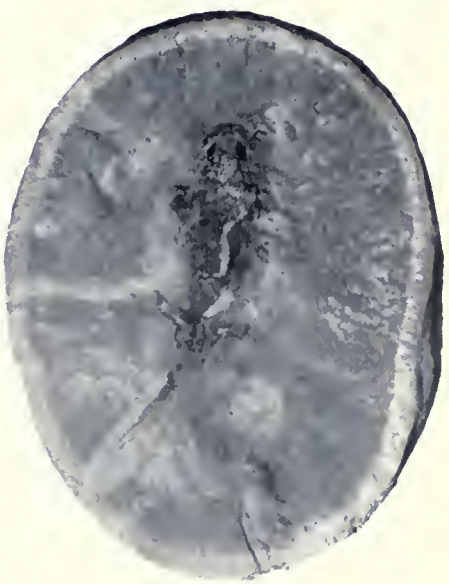




Brazil Tours Popular

A Few Openings Remain in Second Tour Group

Carnival in Bahia is a delightful confusion, more provincial and spontaneous than in sophisticated Rio.

From the vast Amazon rainforests in the north to the overpowering falls of Iguacu in the south, Brazil, giant among nations, offers almost everything for the natural history enthusiast.

So great is Brazil's attraction that one 35-member tour leaving from Field Museum February 14 is fully subscribed and another 20-member tour departing January 22 is half-filled, according to Phil Clark, Field Museum's Public Relations Counsel who will lead both tours.

Mr. Clark, a plant specialist, points out that the season chosen for the two tours is ideal, both in its comfortable temperatures and for the green and flowery countrysides. The most beautiful flowering plant during the tours, he said, is the flowering tree, *Tibouchina*, which usually bears purple blossoms but occasionally ones of brilliant pink. Known in English as "glory tree," it is called flor de Quaresma or Lent flower because the Lenten-purple blossoms open during the Lenten Season. In thrilling contrast with the purple in many forests and gardens are the bright yellow *Cassia* trees, again in various species and varying shades.

Ornate opera house at Manaus was built during a rubber boom in the late 1800's. (Photos by Phil Clark.)

Trees of Lent flowers, or Tibouchina, *bloom deep purple to brilliant pink during Lenten season.*

The tours will visit outstanding private homes and gardens as well as stopping in wild areas. Both sections of the tour will be accompanied by specialists in plants and animals.

Stops for the January 22 – February 16 tour, in reverse order from those of the February 14 – March 11 tour, will include: Manaus for a trip on the Amazon-connected rivers; the ultra-modern capital city of Brasilia; the gem center of Belo Horizonte; the Portuguese colonial town of Ouro Preto; the white beaches of Rio de Janiero; Petropolis for the dramatic gardens of the landscape abstractionist Roberto Burle Marx; the snake farm of Butantan in Sao Paulo; Curitiba for the red sandstone formations and *Araucaria* forests of Vila Velha; Iguacu with its many tremendous waterfalls; Espirito Santo for the hummingbird center and garden estate of naturalist Augusto Ruschi, and colonial Bahia for the joyous confusion of Carnival.

Cost of the tour, including all expenses and a $500 tax-deductible donation to Field Museum, is $2,050. A $500 deposit is necessary to hold a reservation. Extra charge for a single room is $95.

Reservations or additional information may be obtained by writing: Brazil Tour, Field Museum, Roosevelt Road at Lake Shore Drive, Chicago, Illinois, 60605.

The Commercial Press Model, the only Chinese typewriter actually produced for commercial use.

quick brown fox jumped over the lazy dog

CHINESE TYPEWRITERS:

A case of stimulus diffusion

now is the time for all good men to come to the aid of thei

By Kenneth Starr,
Curator, Asiatic Archaeology and Ethnology

ANTHROPOLOGISTS make common use of two terms in referring to the process whereby cultural elements, either material or non-material, diffuse or spread from one culture to another. These terms are *diffusion* and *stimulus diffusion*, which A. L. Kroeber, pioneer American anthropologist, differentiated as follows:

> In ordinary diffusion . . . both the principle and its mechanism are taken over by a receiving culture from the inventing one. Occasionally, however, there are difficulties about acceptance of the mechanism. . . . The idea or principle may then also fail to be accepted. But again, the idea may exercise an appeal that causes it to penetrate. An effort may then be made in the receiving culture to devise another mechanism that will produce the desired result. Thus an invention, or reinvention, is stimulated by contact transmission or [stimulus] diffusion.[1]

The process of stimulus diffusion is quite strikingly illustrated by the manner in which the basic idea of the Western typewriter spread to China and Japan, whose systems of visual linguistic symbolism, distinguished by the use of "characters" (as 藍, for *blue*), instead of an alphabet (a symbol for each sound) or syllabary (a symbol for each syllable), necessitated an almost complete reinvention.

Three variant forms of the Chinese typewriter have been produced: the several models produced in the late 1920's and the 30's by the Chinese publishing company, the Commercial Press, Ltd.; the experimental model introduced in 1946 by the International Business Machines Corporation; and the experimental model invented in 1947 by Lin Yutang.

THE COMMERCIAL PRESS MODEL
舒式華文打字機

Based on a Japanese prototype, the earliest Commercial Press model was produced commercially in Shanghai in the mid-20's. During the next decade the company produced several other models, all based on the same mechanical principle, but differing slightly in operational details as the invention was refined. The model described here was marketed in the mid-30's and seems to have been the last the company produced.[2]

STRUCTURAL FEATURES

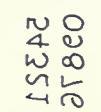
The Commercial Press typewriter consists of four main parts: the base, the frame, the grid and finder-chart, and the superstructure.

Base. The heavy base is formed of two sturdy planks, spaced slightly apart and set horizontally between two cast-iron side pieces. This base is 17¼ inches wide, 16¼ inches deep and 2¼ inches high.

Frame. The base carries a cast-iron frame that supports a mobile grid containing several thousand pieces of type, the superstructure, and a typing lever and associated ejector-pin.

Grid and finder-chart. The grid that holds the type fits into a tracked carriage that rides on the cast-iron frame. This grid of type moves from side to side on one pair of tracks, then, together with this first pair of tracks, backward and forward on a second pair of tracks and, by a combination of these two separate movements, diagonally and circularly.

This grid contains spaces for 2,546 separate pieces of type (67 across, 38 from front to back). The spaces are open at the top and partly so at the bottom, with just a slight lip to keep the type from falling through. The pieces of type rest loosely, face up in their spaces, with the type faces, as seen by the operator, backward (mirror image), oriented to the right, and in reverse order, relative to each other. Thus, with Arabic numbers as examples, two vertical rows of type would appear as follows:



Extending from the front of the grid is a short flat metal arm. This arm carries a wooden knob, by means of which the grid is moved, and at its free end, a finder-needle. It is with this needle, used in conjunction with the finder-chart, that one locates a specific piece of type in the grid, for grid, finder-needle and finder-chart are interrelated.

The finder-chart, which in a wild sort of way corresponds to the keyboard of a Western typewriter, is vital to the operation of the machine, and carries the properly printed form of each of the 2,546 pieces of type in the grid, with the location of the character on the chart keyed to that of the corresponding piece of type in the grid.[3]

The characters on the chart and the corresponding pieces of type in the grid are organized by two principles, frequency of usage and the traditional "radical" system of classifying Chinese characters. The primary organization is based upon estimated frequency of usage. Thus, to reduce lateral movement of the cumbersome grid, the most frequently used forms are located in the center of the chart and grid, while the less frequently used forms, divided into two groups, are relegated to the sides. There is also a small additional section containing special forms, including Chinese and Arabic numerals, the English alphabet, forms of address used in correspondence and forms of punctuation.

Secondary organization is according to the traditional classificatory system. Briefly, this system is based upon the fact that the great majority of Chinese characters are composed of two elements, a phonetic element and a meaningful element, the latter commonly called a "radical." Each of the several tens of thousands of characters in the language is subsumed under one or another of these radicals, which are set in number (214), fixed in their sequence and standardized in form and broad meaning. Thus, radical 9 人 is *human*, radical 75 木 is *tree* or *wood*, and radical 140 艹, *grass*. The characters in both the central and peripheral groups are organized by this system of radicals, with the only difference being that the peripheral group of characters is divided into two parts, in much the same manner as a two-volume Chinese dictionary, with characters subsumed under radicals 1–96 at the right of the central group and, along with the special forms, those subsumed under radicals 97–214 continued at the left.

The characters on the chart are keyed to the corresponding pieces of type in the grid. The positions and orientations of the two relative to each other, however, are directly opposite. Thus, the characters on the finder-chart are in proper classificatory sequence and are properly printed, while the pieces of type in the grid are in reverse classificatory sequence, backward and oriented to the right. With Arabic numerals once again as examples, this relationship is illustrated here. The usefulness of the chart is apparent.

In construction and function, the carriage is crudely similar to that of a Western typewriter. Thus, it moves from left to right and is equipped with a carriage release. The paper is inserted in similar fashion and can be released by means of a key. Two other keys below and forward from the carriage allow for spacing and backspacing. There is also a ribbon and a single margin bell.

Along with the grid of type, the selector arm and the typing-lever and ejector-pin, are distinctive features of this typewriter, for together they form the basic mechanical modification that allows the typing of a character-language. The Commercial Press typewriter operates on the basis of a selection of some 2,500 separate pieces of type set in a mobile grid. The mechanics of printing one of these characters is based on the joint action of the selector arm, the typing-lever and the ejector-pin. The selector arm is metal, pivoted at its inner end to the front center of the machine, immediately above the mobile grid. The free end of the arm extends out over the grid and is designed to move vertically in an arc upward and back toward the platen. Seen from three-quarter view the head of this arm is similar to a socket wrench, with the square hole of a size to accommodate a piece of type. This selector arm is operated by the typing-lever.

Parallel to the selector arm, and on its left, is a second and more slender arm that supports a roller which as unit also moves in a small vertical arc. When the selector arm is at rest, this roller sits upon the wrench-like head of the arm, but when the selector arm travels upward, the roller is pushed forward and upward in a small arc, out of the path of the selector arm.

Operational Features

To type, for instance, the character for *pear* 梨, a kind of tree and its fruit, the typist must first locate the piece of type whose face bears the character for *pear*. Referring to

the finder-chart that he has pulled out of its slot, the typist searches out the printed character for *pear*. An experienced operator will know the precise location of the *pear*-character on the chart. A less knowledgeable typist will look, first, in the central section and then, failing to find the character there, in one of the two peripheral sections. In either case, the operator will focus on those portions of the central or peripheral sections of the chart wherein are located all characters having the radical for *tree* 木 (radical 75) as their meaningful element. (Within the group having the same *tree*-radical, subclassification is based on the number of additional writing-strokes. Thus, the character for *pear* 梨, with seven additional strokes, would precede the character for *kind*, *style* or *form* 樣 with eleven extra strokes.) The operator then grasps the knob on the metal arm and moves the entire unit in such way that the finder-needle at the end of the arm points to the character for *pear* printed on the finder-chart. By synchronization, the selector arm then lies immediately above, and the ejector-pin, immediately below, the corresponding piece of type for *pear*.

By partially depressing the typing lever, the typist raises the ejector-pin and pushes the piece of type for *pear* upward into the waiting wrench-like head of the selector arm.

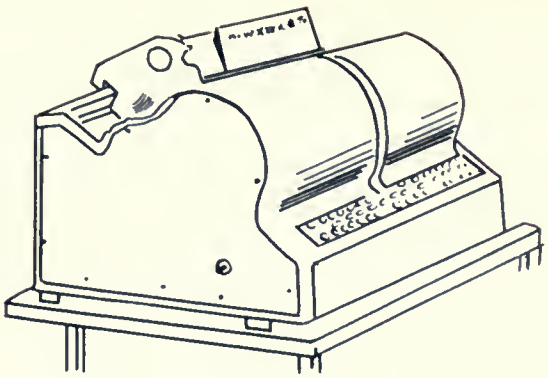
This action locks the piece of type in the head of the selector arm and, at the same time, turns it a quarter-turn in counter-clockwise direction, so that the character will be printed in proper orientation, that is, standing on its feet. (The procedure outline here produces horizontal lines of characters, reading from left to right, in Western fashion, as 1–2–3. Setting a thumbscrew in the head of the selector arm prevents the piece of type from rotating and so produces lines of characters that still read from left to right, but that lie on their sides as ㄧ-ㄟ-ㄇ. By turning the finished page of typing a quarter-turn in clockwise direction, the result is a page of characters printed vertically in columns and reading in traditional Chinese manner, from the top right corner of the page to the lower left corner.)

At the same time the piece of type is turning, the hard-rubber wheel lying atop the head of the selector arm rises, releasing the selector arm. Final downward pressure on the typing-lever lifts the selector arm sharply upward, causing the piece of type, locked in the head of the arm, to strike against the ribbon and so print the character on the paper behind. As pressure on the typing lever is relaxed, the process is reversed and the piece of type is returned to its space in the grid. The cycle now is complete, and the operator is ready to repeat the whole incredible procedure for the next character.

The Commercial Press typewriter, which is capable of thirty to thirty-five symbols a minute, may be likened to a miniature printing press. The two other character typewriters described more briefly below differ appreciably in both structural and operational principles, especially the method of character selection[4].

The IBM Model
電動華文打字機

First exhibited in New York in 1946, at which time I observed it in operation, the Electro-Automatic Chinese Typewriter was built by IBM with the assistance of Mr. Kao Chung-chin, a Chinese engineer and communications expert. The machine was never produced commercially.



Structural Features

Although not so clumsy in appearance as the Commercial Press model, the IBM machine still is quite bulky, measuring 24¾ inches wide, 17 inches deep and 13 inches high.

Externally, an aluminum housing leaves open to view only the carriage and keyboard. The carriage, similar to that of a Western typewriter, consists of a platen to carry the paper and the several keys and levers for its operation. The keyboard, the salient external feature of the Electro-Automatic, consists of forty-three keys ranged in two parallel rows and divided into four groups. Thirty-six of the keys are numeral keys that serve directly in the typing, while the remaining seven keys operate allied mechanisms, as follows:

– – – – 5 4 3 2 1 0 0 1 2 3 4 5 6 7 8 9 –
9 8 7 6 5 4 3 2 1 0 0 1 2 3 4 5 6 7 8 9 –

Internally, the Electro-Automatic is distinctive and is based on a mechanical principle differing entirely from that characterizing the Commercial Press model, with its font of 2,546 separate pieces of type. The IBM model uses as its "font" a drum, revolving continuously and capable of lateral motion as well, whose outer surface carries 5,400 type figures, arranged in vertical (running around the drum) and horizontal rows. These type figures, which include English letters and business symbols as well as Chinese characters, are grouped according to frequency of use. The first group of 1,000 characters is centrally located and includes 90% of the characters used in ordinary correspondence and 95% of those used in telecommunication. The second group is comprised of some 3,000 characters normally used less than 10% of the time. The third group consists of characters used less than 1% of the time. This grouping serves to decrease the lateral movement of the drum, thereby increasing typing speed.

Operational Features

The operation of the IBM model is quite simple, but for the average Westerner, astonishingly clumsy, for requisite to the operation of the Electro-Automatic is the cold-blooded memorization of 5,400 four-digit numbers. Although gen-

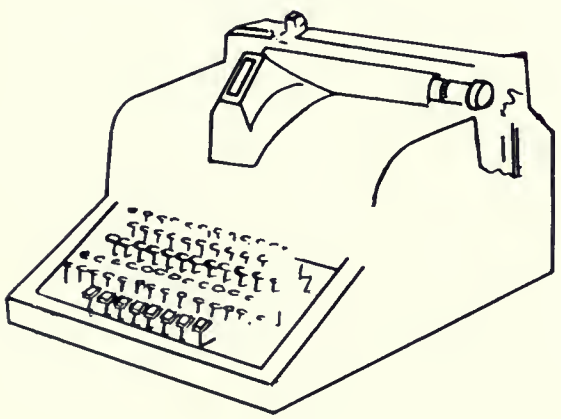
erally alien to Europeans, such massive memorization is intimate part of the Chinese and Japanese tradition. For 2,000 years Chinese scholars committed Confucion classics to memory, and even today Chinese telegraphers transmit memorized numbers assigned to characters rather than the charters themselves. The Chinese engineer, Mr. Kao, planned on a four- to six-month period for the memorization of the 5,400 characters and the numbers assigned to them.

Grouped according to the three usage categories described above, each of the 5,400 symbols has a designated four-digit code number. From here on the actual typing procedure is very simple, for it involves only the depression of four keys, one in each of the four groups. The six keys in the upper left group determine the thousands digit, the ten keys in the lower left group determine the hundreds digit, the ten keys in the upper right group, the tens digit, and the ten keys in the lower right group isolate the unit digit and, in addition, operate the typing mechanism. The first two of these number-keys define the lateral location of the character on the drum, and the second two, the vertical location within one line running around the circumference of the drum.

Once the desired symbol has been mechanically located the typing mechanism prints it by the action of a hammer that slaps the paper against the type face. As the drum is in almost continuous motion, however, synchronization is not always perfect, and as a result, the printing sometimes is uneven, with either top or bottom of the symbol improperly printed.

The Electro-Automatic prints in either horizontal lines (Western style) or vertical columns (traditional Chinese style), and in the hands of an expert operator the machine theoretically is capable of typing 50 symbols a minute.

The Mingkwai Typewriter
明快打字機



The Mingkwai Typewriter was demonstrated early in 1947 by its inventor, Lin Yutang, the well-known Chinese author and educator. As with the IBM machine the Mingkwai differs from the Commercial Press model in both structure and operation. It is in respect particularly to method of character selection that the Mingkwai has a major advantage over the other two typewriters.

In outward appearance the Mingkwai is more nearly comparable in shape and size to a Western typewriter. Thus, a hood covers the mechanical heart, and keyboard and carriage are patterned after the Western original. The machine measures 14 inches wide, 18 inches deep and 9 inches high.

Diagram of the "Magic Eye" viewer on the Mingkwai typewriter

Despite their similarity in placement and arrangement to those on a Western typewriter the keys of the Mingkwai are labeled in quite different manner. Thus, there are sixty-four round keys, eight square keys and several levers. By use of shift levers each of the round keys represents several alternative symbols. Most prominent on the machine, however, is a viewing device that protrudes from the hood just above the keyboard. As we shall see, this device, the "magic eye," performs a vital function.

As devised by Lin the interior of the machine has some 8,000 type figures mounted on octagonal bars rotating around the axes of six cylinders. The Mingkwai is said to be capable of typing 7,000 whole characters and, by combination of component elements, a theoretical total of 90,000 "manufactured" symbols.

Operational Features

As will be recalled, the Commercial Press typewriter utilized two principles in selecting one of the 2,546 available pieces of type, one, frequency of use and, two, the traditional radical system of organization. The IBM model also utilized frequency of use, but dispensed with the radical system and, instead, relied upon memorization of four-digit numbers assigned to each of the 5,400 symbols on the surface of the revolving drum. The Mingkwai machine operates on an entirely different scheme, that of breaking up the characters into component parts. The principle thus is similar to that which underlies the traditional method of dividing characters into phonetic and radical or meaningful elements. Instead of classifying the characters by their 214 radicals, however, the inventor groups them by their top and bottom parts. According to Lin, who refined his system of classification over a 30-year period, 36 tops and 28 bottoms exhaust the possibilities of top and bottom components to be found in the corpus of Mingkwai characters. To operate the machine one therefore only has to be able to recognize in any character the presence of one of the tops and one of the bottoms, an easy matter even for those only slightly versed in Chinese. Once these 64 components are part of one's experience, the actual typing procedure is admirably simple, for it consists only of depressing three keys for each character typed.

First, from among the 36 keys composing the top three rows of the keyboard, the operator selects and depresses the key that represents the top (or top left) component of the character to be typed. Thus, for the character 侶 (*mate, companion*) the typist depresses the 亻 key, and for the character 藍 (*blue*), the 艹 key. This step isolates out all of those characters having those particular tops.

Second, from among the 28 keys composing the bottom two rows of the keyboard, the operator depresses the key that represents the bottom (or bottom right) component of the character. Thus, for the character 侶, the typist would select the 口 key, and for the character 藍, the 一 key. This step acts further to isolate out from those characters having the same top element all those characters having the bottom element represented by this second key that was depressed.

With the depression of two keys, one from the upper rows and one from the lower, a group of characters has been isolated, all of which have similar tops and bottoms. Lin Yutang has calculated that out of his selection of 7,000 characters, there will never be more than eight with common tops and bottoms. After this electronic process of elimination has taken place, this group of not more than eight characters with common tops and bottoms appear on the "magic eye" viewer located on the front of the hood.

By a process of visual selection, then, the typist has only to pick out of the group of characters, numbered from one up to eight, the specific character that he wishes to type. The most frequently used 900 characters are in position one, making for greater typing efficiency. The operator then merely depresses the corresponding square numeral key on the keyboard, in this instance key number four, and automatically the character 侶 is printed. Lin's novel system of character division allows for greater typing efficiency, for only three keys are needed to type a character, and the period required for training is much shorter and simpler.

The Mingkwai, as with the Electro-Automatic, is said to be capable of producing 50 symbols per minute when operated by a skilled typist. That number, though low by Western typing standards, is superior to that generally obtainable with a writing-brush, and there are the further advantages of greater legibility and the availability of carbons. This last, it may be noted in passing, also is a factor in the great popularity of the ballpoint pen in Eastern Asia.

Summary

The three Chinese typewriters described above constitute excellent examples of reinvention as a result of stimulus diffusion. These character typewriters represent a situation in which a basic invention, the Western typewriter, was modified in both principle and structure to meet the demands of a radically different system of writing.

Because of historical and cultural factors these reinventions have been but partially accepted into Chinese culture, for the Chinese still depend almost totally on copyist and the traditional writing-brush. There are several reasons for this lack of general acceptance. One, China still predominantly is an agricultural country and not yet sufficiently needful of the typewriter as an element of common usage. Two, the large population insures an abundant supply of scribes, as all who have frequented government and business offices in China will attest. Three, the narrow selection of characters is a drawback, particularly in the case of the Commercial Press model. Four, in the case of automated models, maintenance and operation are factors, as well as cost, for such models would require a corps of trained maintenance people and an even supply of electricity, still an exception rather than a rule in many parts of China. Finally, there still is some conservatism as regards the mechanical reproduction of characters. Just as the English courts for many years refused to allow their records to be typed, so also there has been some reluctance among the Chinese to discard the brush and inkstone.

Given the present state of China's culture and economy, one can say with fair certainty that in the foreseeable future the Commercial Press style of typewriter, in the form of one of the new Japanese models, will satisfy such need as exists. Should Chinese economic progress allow for some other form of automated typewriter, such use would be very limited. Either way, the situation would be an example of stimulus diffusion, through modification of the Western typewriter to meet the demands of a character language.

One other possibility should be considered. The comments made here concerning the acceptance of the typewriter have been predicated on the assumption that the Chinese would continue in their traditional system of writing. It is within the realm of possibility that in response to pressure from the non-character world, the Chinese ultimately might adopt a system of phonetic or syllabic writing, although such change does not seem likely, given the remarkable tenacity of Chinese cultural tradition. Such a shift thus would obviate the need for a character typewriter, and the Western-style machine, already refined to a high degree, then could fill the cultural need. In such a case the result then would be a rejection of the reinvention in favor of the original invention, the Western typewriter. Should this alternative occur, the situation then in part would be a case of the Chinese modifying their traditional native system of writing to conform with one or another of those used in the non-character world and to fit within the limitations of the original foreign invention. Such a situation indeed would constitute an interesting turn in the endless flow of cultural change.

[1] Kroeber, A. L. *Anthropology* (New York, 1948: pp. 368–69).

[2] The Japanese, with whom the idea of the character-typewriter seems to have originated, still actively produce and market such typewriters which, although highly refined and, in some cases, automated, are based on the same structural and operational principles as the Commercial Press model here described. The Japanese also manufacture a syllabary-typewriter, similar to a Western typewriter, but with the keyboard modified to accommodate their more numerous syllabary of *kana* symbols.

[3] The 2,546 symbols include but a small portion of the total corpus of Chinese characters. The selection is based on common business usage, but even so is not always adequate.

[4] "Two new Chinese typewriters," *The China Magazine*, vol. 17, no. 8 (August, 1947), pp. 48–55.

CALENDAR OF EVENTS *October hours: 9 a.m. to 5 p.m., daily.*

October 5 "Our Western Parks," narrated by Arthur Dewey, opens the Edward E. Ayer Fall Lecture Series for 1968. Dewey's film explores the animals and flora of several national parks, and sports available to people visiting these areas. The free film-lecture series will begin at 2:30 p.m. in the James Simpson Theatre and will continue on successive Saturdays through November.

October 6 American Indians Today Festival Lecture Series "The Indians Stand Together," by Dr. Nancy O. Lurie, Department of Anthropology, University of Wisconsin. James Simpson Theatre, 3 p.m.

October 12 Fall Lecture Series "Florence and the Heart of Italy," by Eric Pavel, will be shown at 2:30 p.m. in the James Simpson Theatre.

October 13 American Indians Today Festival Lecture Series "The Indians Are Here to Stay," by Dr. Sol Tax, Chairman, Department of Anthropology, University of Chicago. James Simpson Theatre, 3 p.m.

October 13 American Indian Festival A Pow Wow, arranged by the Indian community of Chicago, will close the special Anniversary Year event, which includes demonstrations of Indian arts and crafts by Indian artists, exhibits of contemporary and traditional Indian art and a photographic essay of Indians presently living in Chicago. Three special exhibits will continue to November 15: "New Directions in American Indian Art," a display of modern items influenced by traditional designs; "Contemporary Traditional American Indian Art," an exhibit showing traditional arts and crafts made by present-day artists, and "Indians of Chicago, 1968," a photographic essay by Orlando Cabanban. Financial assistance for the American Indian Festival was given by: the Illinois Arts Council, a state agency; the Ernest G. Shinner Foundation and the Wieboldt Foundation. 1 to 9 p.m.

October 19 Fall Lecture Series "Nature's Plans and Puzzles," C. P. Lyons' film study of interesting adaptations of living things to their particular environments. 2:30 p.m. in the James Simpson Theatre.

October 26 Fall Lecture Series "Skis Over McKinley," by Hans Gmoser, includes the first ski traverse of Mount McKinley in Alaska and exciting scenes of skiing in other North American mountain areas. 2:30 p.m., James Simpson Theatre.

October 27 Audubon Wildlife Film Series "Land of the Cactus," narrated by Allan D. Cruickshank, is the first in a program sponsored by the Illinois Audubon Society. Admission is free. 2:30 p.m. in the James Simpson Theatre.

Through October Fall Journey "Hunt With the Cavemen" The Museum's Fall Journey for Children introduces youngsters to the exhibit area dealing with prehistoric man. Any child who can read or write may participate in the Journey Program. Free instruction sheets are available at Museum entrances.

October 27 "Earth, Life and Man" Lecture Series First in the Anniversary Year series of lectures by Museum Curators is "Museum Science and Expeditions," by Dr. Robert Inger, Curator of Amphibians and Reptiles. Free to Museum Members and interested adults. 1 p.m., Lecture Hall.

Half a Billion Years of Illinois History Do-it-yourself tour takes visitors on a capsule journey through the worlds of anthropology, botany, geology and zoology, concentrating on the prehistory and early residents of Illinois. A free brochure provides a guide to pertinent exhibits and is available in Stanley Field Hall.

MEETINGS:

Nature Camera Club of Chicago, October 8, 7:45 p.m.
Chicago Mountaineering Club, October 10, 8 p.m.
Chicago Shell Club, October 13, 2 p.m.
Sierra Club, Great Lakes Chapter, October 15, 7:30 p.m.
Illinois Orchid Society, October 20, 2 p.m.

FESTIVAL FEATURE: LECTURES ON TODAY'S INDIANS

A series of four timely lectures, "American Indians Today," will be featured during Field Museum's American Indian Festival, September 23 through October 13.

The speakers, well-known anthropologists from Midwest colleges and universities, are specialists in aspects of American Indian life.

The two lecturers for October are Dr. Nancy O. Lurie and Dr. Sol Tax. Dr. Lurie is chairman of the Department of Anthropology at the University of Wisconsin, Milwaukee. Her primary field work has been among the Winnebago of Nebraska and Wisconsin and the Dogrib Indians of the Sub-Arctic. In 1961, she was Assistant Coordinator to Dr. Tax in the American Indian Chicago Conference.

Dr. Sol Tax, chairman of the Department of Anthropology at the University of Chicago, is special advisor to the secretary of the Smithsonian Institution and editor of the journal *Current Anthropology*. A former president of the American Anthropological Association, he also organized the American Indian Chicago Conference in 1961. He is president of the International Union of Anthropological and Ethnological Sciences. He has done extensive work with the Fox Indians of Iowa and the Maya Indians of Guatemala.

The speakers for the two lectures held in September were Dr. Merwyn S. Garbarino of the Anthropology Department of the University of Illinois Circle Campus and Prof. John Hobgood of Chicago State College.

FIELD MUSEUM
OF NATURAL HISTORY
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E. Leland Webber, Director
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Edward G. Nash, Managing Editor

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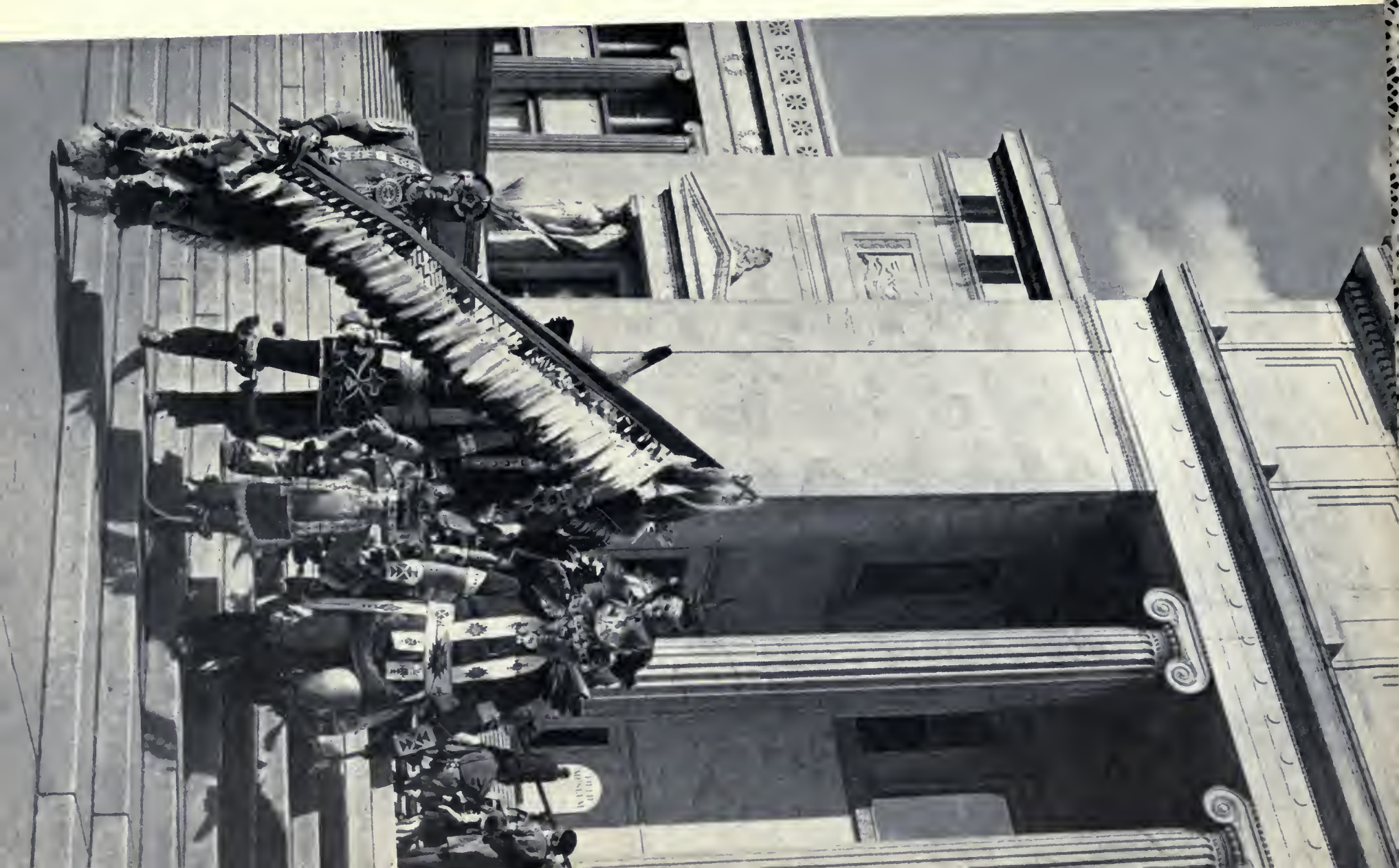


Meta Howell 1899 - 1968

Meta Pauline Howell (Mrs. Frederick S. Howell), the Museum's Head Librarian, died suddenly on Saturday, August 31, 1968, one day before her 20th anniversary in that position. Though in ill health she was thought to be recovering and was to retire toward the close of this year.

Mrs. Howell (nee Armbruester) was born in Dusseldorf, Germany, on November 7, 1899. She came to the United States in 1902 and was naturalized in 1916. She studied at the University of Buffalo and received her library degree in 1924. Before coming to Chicago she worked at the Public and Grosvenor Libraries in Buffalo. In 1926 she accepted a job as a Branch Librarian for the Chicago Public Library, and from 1927 until 1947 she worked at the Museum of Science and Industry, first as Assistant Librarian and, after 1941, as Head Librarian. She joined the staff of Field Museum in 1947. She was married to Mr. Frederick S. Howell in 1934.

Mrs. Howell loved librarianship and was devoted to improving and enlarging the Museum's Library. One of her first concerns as Head Librarian was a complete overhaul of the acquisition and exchange program, particularly as it related to serial publications. She has written that "Research centers, such as those served by museum libraries, are beyond the general book stage. Their primary need is for literature of an intensive nature, written at the specialist's level. This material is to be found only in the journals, the bulletins, the revistas of the learned societies and research institutions. As one of our paleontologists put it, 95 per cent of all written material he consults is in these publications. This is particularly true in the case of the [Field] Museum. . . ." Because of this she was very conscious of the serious gaps the Depression and World War had caused in our serial holdings and proceeded, with characteristic energy and thoroughness, to fill them. In cooperation with the Museum's Publications Division the exchange program was completely revised. The system she devised can be found in her article "Exchange of Serial Publications and Its Place in Museum Libraries" (*The Museum News*, v. 29 (1952), no. 14, pp. 6–8); the results can be seen in the Library's catalogue and on its shelves.

As an adjunct to this program Mrs. Howell was instrumental in working out an agreement between the John Crerar and the Museum Libraries whereby hundreds of natural history serials and numerous books on entomology and malacology were deposited with us on "permanent loan." These have been a welcome and valuable addition to our collections.

Mrs. Howell's emphasis on this aspect of library work continued until her death and resulted in greatly strengthening our position as one of the nation's foremost sources of specialized information in the natural sciences. In 1963 she realized a long-time ambition when, through the kind offices of former Senator Paul H. Douglas, the Library was named

Mrs. Howell assisting Dr. Louis O. Williams, Chief Curator, Botany, in the Library.

a depository for selected government publications under the Depository Library Program. Our Library, at that time, was the only museum library so designated.

The Library's growth was such that Mrs. Howell became seriously concerned about overcrowding in the stacks and increasingly cramped working quarters. At the Director's request she submitted, in 1963, a report on current needs and a projection of those of the next 20 years. This in time resulted, by means of a grant from the National Science Foundation, in a greatly expanded stack area, new facilities, and money to complete the reclassification program. A complete discussion of this can be found in her article "The Museum Library in Transition" (*Chicago Natural History Museum Bulletin*, v. 36 (1965), no. 5, pp. 2–3, 7–8).

Mrs. Howell possessed a driving and dynamic personality that strongly affected all who worked with or for her. She was prepared to defend her positions on important matters with great vigor, and sometimes heat. But she was fortunate in possessing another attribute of a commanding personality: fairness. She had the ability to see other points of view and was willing to modify her stand or change her mind. She was a bit of a feminist and felt very strongly that in the world of affairs men and women should be accorded equal treatment. She was not above using "feminine wiles" in an argument; but, as she proudly told me once, she "never resorted to tears to win one."

Mrs. Howell was not an easy person to know well. There was an air of formality about her that she strove to maintain. On the job she presented the sternly professional facade of a dedicated career woman; in private, she was gregarious, had a lively sense of humor, and was full of kindness and concern for others. As one who worked for her for 10 years I came to know both sides of her personality and respected the one and very much liked the other. She shall be missed in the Library and in the Museum; but her work remains and will be of continuing value to the staff and to the public as long as the Museum endures.

—W. Peyton Fawcett, Associate Librarian

meteorites

by edward j. olsen
curator, mineralogy

The Barranger Crater, near Winslow, Arizona, is nearly a mile across. U.S. Route 66 is the faint line visible beyond the crater.

"Make a wish on a falling star." At one time or another most children have given this fanciful method a try to obtain some much desired toy or treat. As yet there have been no reports of successful attempts to get, say, a bicycle this way, however, falling stars have, over the centuries, provided men with answers and clues to much more sophisticated wishes. Ever since man became aware of the universe around him he has had a burning desire to know what's "out there." One of the earliest sciences to be born was astronomy, which literally means "to order the stars." Astronomy grew partly out of necessity, to construct a calendar which would permit the prediction of seasons for the purpose of planting crops. It grew also out of an overwhelming curiosity. Already in the Stone Age the basic ideas of the calendar were created; recent findings have shown that England's famous Stonehenge was an actual working calendar. By Egyptian and Greek times calendars had grown to be quite accurate. This left curiosity.

In olden times any curious object or phenomenon that took place in the "air" was called a "meteor." Thus people lumped together such unrelated things as comets, tornados, aurora, fog, rainbows, water spouts, sun dogs, moon halos, rain, meteorites, lightning, thunder, clouds, snow, and swamp fires. Because of this, much later in the 19th and 20th centuries, the study of weather came to be called *meteorology*, or the study of phenomena that take place in the air. With time it became obvious that some of these phenomena, such as comets and meteorites had nothing to do with the weather as such. The objects which retained the basic name, meteorites, meaning meteor rocks or rocks that come through the air, were thus rightly excluded from meteorology.

Meteorites have had a long, but spotty, history. The chance of a person actually witnessing a meteorite fall is extremely small. On the other hand, the chance of seeing burning meteor streaks, what children call "falling stars," in the night sky is fairly good. Thus in prehistoric times when the population of ancient men was quite small the absolute number of witnessed falls would necessarily be small. As the population increased and spread over wider areas the absolute number of direct observations must have increased also. When the first witnessed fall took place is, of course, buried in prehistory. The first recorded case we have is that of an iron meteorite which fell in the ancient country of Phrygia, in Asia Minor, around 2000 B.C. It was put into a temple as an object of worship and later, in Roman times, was transported to Rome where it remained for 500 years before being lost. In the New World the Mound Builders of the Ohio valley, around 400 B.C., had a small

Woodcut of the Ensisheim Meteorite which fell in Alsace, France (now Germany) on November 16, 1492.

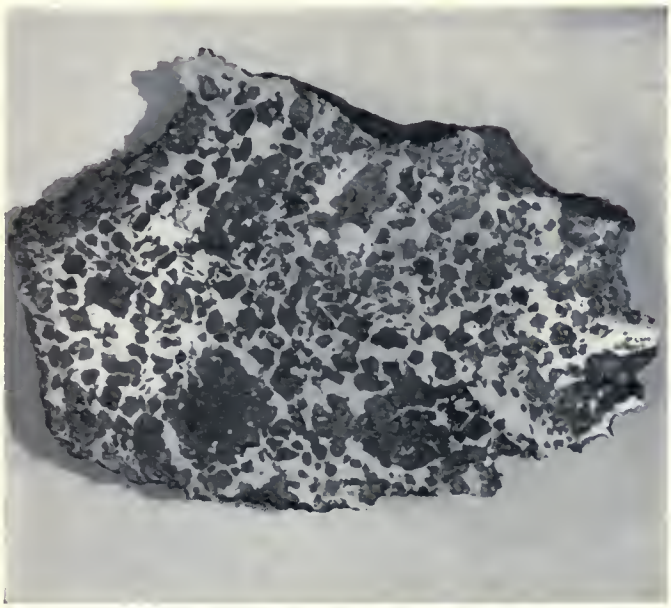
iron meteorite to which they appeared to attach religious significance. No one knows how old it is. However, it was unearthed during an archaeological dig in the early 1900's and presently resides here in Field Museum.

In most cases meteorites which were seen to fall ended up in religious temples of one sort or another. For over 2,000 years, in the ancient countries surrounding the Mediterranean Sea, meteorite worship was widely practiced. Even today meteorites are kept in some of the older temples of the middle east and the orient, especially Japan. Throughout ancient times more and more meteorites were observed and collected. They were generally considered to have mystical significance and even today, principally in the east, but also in such western countries as the United States, ground-up meteorite powder, taken orally, is considered by some people to have the power to cure a wide variety of diseases. Man, nevertheless, has always been a practical fellow, and the possible mystical or supernatural value of a meteorite, especially an iron one, was often overbalanced by this practicality. Very probably the first iron metal utilized by man consisted of objects pounded out of bits of meteorite iron. A necklace of meteoritic iron beads was found in a tomb dating from the First Dynasty of Egypt, 5,000 to 6,000 years ago. Mound-building people in the New World similarly used this kind of iron. Those of the Ohio valley made meteorite iron beads, and farther west, near the town of Havana, Illinois, several meteoritic iron beads were found. These objects date from about 400 B.C. Later, the North American Indian, who, before contact with Europeans, had not yet developed the technique of smelting iron out of its ores, used bits of meteorite iron for weapons and tools. In the meteorite exhibit here at Field Museum a large iron meteorite, called Navajo, shows gouges and scars where Indians attempted to cut out metal for use.

Thus, throughout ancient times, and in all lands, meteorites were known, used, and often revered because they fell from the heavens. The Greek, Diogenes, suggested they were related to the stars, although Aristotle did not think so. Later, in the Middle Ages, the German philosopher, Paracelsus, pronounced they did indeed fall from the sky. Thus it stood for some time until 1772 when the Paris Academy of Sciences, then the center of western scientific scholarship, solemnly pronounced that "the falling of stones from the sky is physically impossible" and that meteorites, as such, did not exist but were simply terrestrial rocks that had been "struck by lightning." This pronouncement was signed, among others, by the very brilliant Antoine Lavoisier, who is considered today to be the father of the science of modern chemistry. The sad result of this was that some institutions and individuals became embarrassed by their meteorite collections and gave or threw them away.

Meanwhile, meteorites continued to fall and be found. Unfortunately, none ever fell through the roof of the Paris Academy of Sciences, nor was any major scientist ever a witness to a fall. The reports of farmers and herders, even the mayor of one city, were written off as nonsense. And so it continued for years. In 1807 when a meteorite crashed into the ground near Weston, Connecticut and two Yale College professors went to collect it, no less a scholar than Thomas Jefferson said it was easier for him to think that two Yankee professors would lie than to believe stones would fall from heaven.

As time went on, however, the evidence became overwhelming and in the very vigorous scientific atmosphere of the late 19th century meteorites finally came into their own, as the only real physical objects man has from interplanetary space. Their study has grown since that time, as *meteoritics*, a word coined by the late Dr. Oliver C. Farrington,



Stone-iron meteorites, such as the one illustrated above, have a distinctive appearance unlike any naturally-occurring terrestrial rock.

who was a leading meteorite worker and was a curator at Field Museum from 1894 to 1933.

At the present time meteoritics has become quite cosmopolitan. People who work in it include physicists, chemists, geologists, astronomers, metallurgists, organic chemists, engineers, and statisticians. In general, this study can be divided up into four main categories: (1) mineralogy and chemical composition of meteorites; (2) ballistics of meteorites—the study of meteorite orbits, fall phenomena, and impacts; (3) physics of meteorites—age determinations, magnetic features, radioactivities, cosmic ray effects; (4) organic chemistry—study of organic compounds in some meteorites.

Although it is convenient to divide up these areas of study it must be understood that each one interacts with the other so it is hard to talk about any one category exclusively. Nevertheless, for the remainder of this article I will deal mostly with category (1).

Because of the ancient practice of worshipping meteorites, it has come down to us today that they are something unique and special. In reality, most of them are very much like some terrestrial rocks, and some few of them are quite difficult to distinguish visually from certain kinds of common earth rocks. Of the seven common minerals which make up most meteorites (see Table 1) only one of them, schreibersite, is not known to occur in terrestrial rocks, but it is found in some man-made steel mill products, and could occur naturally at depth within the earth.

Table 1.—Minerals Which Occur in Meteorites

	Name of mineral	Chemical elements which form them
1.	Olivine	Magnesium, iron, silicon, oxygen
2.	Pyroxene	Magnesium, iron, calcium, silicon, oxygen
3.	Feldspar	Sodium, calcium, potassium, aluminum, silicon, oxygen
4.	Metal	Iron, nickel, cobalt
5.	Troilite	Iron, sulfur
6.	Graphite	Carbon
7.	Schreibersite	Iron, nickel, phosphorus

Table 2.—Meteorite Groups

Group	Subgroups	Principal minerals making up each group
STONE	Chondrites	Olivine, pyroxene, metal, troilite, feldspar
	Achondrites	Feldspar, pyroxene
STONE-IRON	Pallasites	Metal, olivine
	Mesosiderites	Pyroxene, metal
IRON	Octahedrites	Metal, troilite, graphite, schreibersite (has Widmanstätten pattern)
	Ataxites	Metal, schreibersite, troilite, graphite (has no Widmanstätten pattern)

Meteorites fall fairly neatly into three groups depending on which combinations of these minerals make them up (see Table 2). Because they are generally composed of the same minerals as some terrestrial rocks, the question always arises, how are they to be identified? For iron meteorites this problem is not so difficult as for a stone meteorite. Although iron and iron-nickel metal does occur in terrestrial rocks, it is extremely rare, being limited to a few occurrences in Oregon, New Zealand, Germany, and Greenland. So, except for the added complication of man-made steel mill scrap and slag, which can be found almost anywhere in industrialized nations like the United States, pieces of metal which are found stand a good chance that they are not natural terrestrial irons. In addition, the Austrian scientist, A. von Widmanstätten, in 1808 discovered that the metal in most iron meteorites forms in two different kinds of structures in a regular geometrical arrangement. The reasons for this are now very well understood but are beyond the scope of this particular article. What is important here is that by cutting flat, polishing, and slowly etching with acid, this geometrical pattern of iron-nickel can be brought out, much like chemical treatment brings out the image on an exposed piece of film. This kind of structure is unique and is not found in any terrestrial iron, or man-made metal product. These iron meteorites are called *octahedrites* and the geometrical pattern is called a Widmanstätten pattern in honor of the discoverer. Among the iron meteorites only 14% of them have compositions which do not consist of two kinds of metal structure, but only one. For these no geometrical etch pattern exists and other tests must be used.

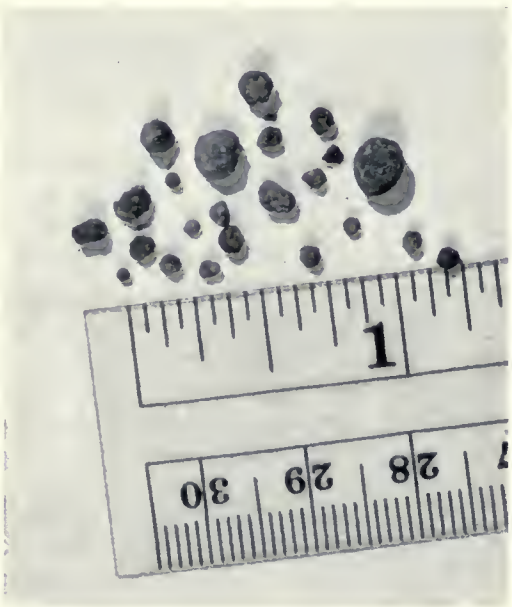
Stone meteorites are not quite so easy. Fortunately, however, most stone meteorites fall into a major subgroup called *chondrites* [con'-drites], because they contain small *spherical* clusters of grains of the minerals olivine, pyroxene, and feldspar, called chondrules [con'-drools]. The chondrules are held together by a matrix of fine grains of the same minerals plus some metal and troilite. These little spheres range from less than a tenth of an inch to occasional

large ones which are over one-half inch. In a microscope section it is quite easy to see chondrules and occasionally a meteorite is found where they are so abundant they crumble away into one's hand. Chondrules are unique to stone meteorites. They are not found in any terrestrial rock. Fortunately, the great majority of stone meteorites, 94% of them, are chondrites. The other 6% are achondrites, which means "without chondrules." It is difficult to distinguish achondrites from some kinds of terrestrial rocks, especially the common rock basalt, and special, often elaborate, testing is required in some cases.

Stone-iron meteorites consist either of irregular lumps (not chondrules) of olivine contained in a network of metal (these are called the *pallasites*) or a filigree of metal contained in a mass of mostly pyroxene (these are called the *mesosiderites*). In either case no stone-iron could be mistaken for any terrestrial rock. They have a unique appearance.

Knowing the chemical composition of meteorites, especially the largest group of them, the stone meteorites, permits us to make a series of deductions that would delight Sherlock Holmes. In the last century a device called a spectroscope was invented. It permits one to take the light of a star, concentrate it by a lens system, and break it up into its spectrum of colors. In such hot objects as stars the chemical elements that compose them are constantly emitting light, and each element has a characteristic group of colors it emits. When all the colors from all elements in a given star are blended together, as they are when they are emitted from the star, the star generally appears white. The spectroscope is designed to unblend them back to the individual colors of the elements that emitted them. Thus it is possible to tell what chemical elements are present in the star, and from the relative intensities of the colors characterizing them it is possible to determine the relative quantities of these elements.

Now, as it turns out, most stars consist dominantly of the element hydrogen along with small quantities of other chemical elements. Indeed, the entire universe consists mostly of hydrogen (over 93%). When the spectroscope was first turned on the nearest star to the earth, namely, the Sun, hydrogen was found along with a small, but significant percentage of other elements: calcium, oxygen, silicon, magnesium, aluminum, iron, sulfur, phosphorus, sodium, potassium, carbon, nickel, cobalt, etc. When the relative amounts of these were compared with stone meteorites it turned out that, element for element, they were almost identical, but different from other observed stars. Furthermore, when compared with the surface rocks of the earth's *crust*, the compositions are quite different. From this we can deduce that these elements, which form the solid minerals of meteorites, in the same relative proportions, were derived from matter being boiled off the Sun and condensing into solids. [The large amount of hydrogen, which is a gaseous element, does not condense into these solids and thus does not enter into the formation of solid objects in the solar system. It exists mostly as a thin, interplanetary gas, and partially as gas trapped between the mineral grains of solid objects.] The condensation process would involve cooling and the combination of elements together into minerals and the solidification of these molten droplets of minerals into solids. These droplets would be the chondrules observed in the majority of meteorites. Thus meteorites are, with a high prob-



Chondrules shown against a one-inch scale illustrate the range of sizes among individual chondrules. They are unique to stone meteorites.

Cross-section of chondrule (light, round area) in the Ensisheim chondrite meteor depicted in the wood cut. (Magnified 40 times.)

ability, objects of our own solar system and do not come from beyond that. Now, since we know by radioactive dating methods, that meteorites were formed generally around 4½ billion years ago, we may also tentatively deduce that the composition of the Sun itself had remained fairly constant for that period of time otherwise the Sun's composition today would be different from meteorites. This can only be a tentative deduction at this point because the argument is, as you will notice, quite circular.

Finally, since the earth's *crust* is so different from meteorites and the Sun's atmosphere we conclude that some process must have taken place on the earth that did not take place in meteorites. From a large amount of geophysical evidence we know that the earth consists of various layers going downward: the crust, the mantle, and the core, and that these layers represent different rock types with different chemical compositions and minerals. We also know that the *mantle* makes up about 88% of the volume of the earth, with the *core* making up over 10% and the *crust*, on which we live, making up less than 2%. We may assume that the earth was once a homogeneous object with no original layers and with the same composition as meteorites and the solar atmosphere, that is, formed from elements boiled off the Sun also. Since astronomers believe that all the objects in the solar system, planets and meteorites, were formed at approximately the same time, then the earth must also be 4½ billion years old. This is, in fact, the basic method for determining the age of the earth—from meteorites. Thus, we may conclude that the layers formed during this 4½-billion-year period. Now, by measuring the age of the oldest *crustal* rock which can be found we can obtain a measure of how long it took for the crust to form. Crustal rocks dating back to a little over 3 billion years are known. Thus, we conclude that it took about 1— billion years for the crust to form. From the differences in chemical composition of the crust relative to meteorites we can tell what chemical elements had to have been separated out of the original matter to form the crust, and also make some deductions about the elements that separated out in the downward direction to form the core of the earth. What arises from all this is the view of the earth as a layered planet with an iron-nickel core, surrounded by a thick mantle with the composition of a rock called peridotite (consisting of olivine and pyroxene with some feldspar, and very much like stone meteorites in composition except for the elements extracted to make the core and crust). Over this is a thin crust consisting of a basaltic base (basalt consists of mostly feldspar and pyroxene) with a granitic outer portion (feldspar and quartz). During this large scale chemical reconstitution of the earth obviously any original structures from the earth's early days, namely, chondrules, would be destroyed.

The Navajo iron meteorite (Hall 35) is about three feet long and contains a pre-terrestrial crack. Gouge marks were made by Indians attempting to break off pieces for use in tool-making.

Widmanstätten pattern is illustrated in this iron meteorite from LaPorte, Indiana.

Thus, a study of the minerals and chemical compositions of meteorites has permitted us to make some deductions regarding their origin, the origin of the earth, the chemical history of the Sun, and a view of the interior of the earth. Each of these considerations is, however, constantly being reviewed by research workers in meteoritics as new data come to light. At the present time some alternative views are showing promise and may alter these deductions over the coming years; however, the basic arguments will not change. Even after the moon and other planets are visited and sampled by men the key to the origin and early development of the solar system will come from the study of meteorites.

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Wearing dramatic and colorful costumes, Chicagoland Indian residents representing many tribes gathered for the Pow Wow. (Photo by Orlando Cabanban.)

Exciting Indian dar
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(Photo by Ferdi

Above left, Indian women in colorful tribal dress joined the men in the dancing. *Above right,* Youngest Pow Wow participants await their turn to perform in the dancing. *Right,* Tony Hunt, a Kwakiutl Indian, carved and painted a 10-foot totem pole. (Photos by Ferdinand Huysmans.)

A rapt audience
c

nerican Indian Festival in Pictures

's American Indian Festival was not
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Chicagoans their first opportunity
small, but vital Indian community in the
n of the American Indian Center

in Chicago, the Festival and the closing Pow Wow proved to be a success as evidenced by the attendance of 115,336 for those three weeks, compared to 67,552 for the same period last year. Visitors came away with a sense of the vigor and variety of the Indian contribution to American culture.

Photographer Orlando Cabanban captures the climax of the three-week American Indian Festival in this month's cover photo. Indian residents of Chicago were joined by Museum visitors for an exciting Pow Wow, which featured Indian dancing and singing in the building and outdoors on the south lawn.

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d Huysmans.)

Navajo weaver Irene Tsosie makes an Indian rug following a process that is centuries old.

(Photo by Ferdinand Huysmans.)

These visitors, who wore colorful headgear for the occasion, learned how Hopi Kachina dolls are made by Ernest Naquayouma.

(Photo by Ferdinand Huysmans.)

ns as Mrs. Ann Lim, a Winnebago, explains the intricacies
adwork. (Photo by Orlando Cabanban.)

Winnebago Indian Rob Johnson demonstrates hand games for a school group at the Festival.

(Photo by Ferdinand Huysmans.)

Turning Over An Old Leaf

by Patricia M. Williams
Field Museum Press

The Stanley Field Plant Reproduction Laboratory of Field Museum has produced the most extensive series of plant reproductions in the world. Here Mrs. Williams tells the story of plant modeling. Shown above is a model of the peanut plant, Arachis hypogaea.

Today, with department stores, drug stores and discount stores all selling fairly lifelike artificial flowers and plants, the marvelous Museum plant reproductions may too easily be taken for granted. Although understandable, this is unfortunate because these plant reproductions represent a continuing program of experimentation and artistry spanning many years.

Before the turn of the century, "taxidermists had been purchasing heavy leaves from manufacturers of millinery supplies and wiring them to any sort of branch in order to provide 'atmosphere' for their groups of mounted animals."[1] Probably the color of the leaves was determined more by the current styles than by the reality of nature and ". . . the effect produced was so completely lacking in scientific accuracy that the use of such crude-looking accessories may have served to prejudice curators against the habitat group as a museum exhibit."[2]

The first real improvement in plant reproduction was made by the Mintorn brothers and their sister, Mrs. Mogridge, for the British Museum (Natural History). "They had invented a process of manufacturing flowers and leaves which were so perfectly modeled and natural in appearance that they became one of the wonders of London."[3] Midst great fanfare the Mintorns were brought to the American Museum of Natural History to create the accessory foliage for Jenness Richardson's groups of North American birds.

"The results obtained by the Mintorns were very beautiful but, as time showed, they would not stand the test of our varying museum atmosphere, with its summer's moisture and winter's dryness, but curled up"[4] and had to be replaced. The Mintorn's process was also so slow and complicated that it was too expensive to use for any large groups needing hundreds or thousands of leaves.

Following the Mintorn failure, interest in producing durable and realistic foliage grew. Carl Akeley, the famous taxidermist, was among those vitally interested in this problem and it was he who finally provided the solution.

While Akeley was employed by the Milwaukee Public Museum he began to plan an ambitious series of four habitat groups showing the Virginia deer amid their appropriate surroundings in spring, summer, autumn and winter. In 1896, when Akeley came to the Field Museum, he was still planning and devising methods to create these groups. Working in his own studio after his Museum day was over, he used his now-famous manniken method to mount the necessary deer for the exhibits. Next, he began the reproduction of the deer's habitat. Akeley "believed it as important that the natural abode of the deer should be correctly portrayed as that the deer should look like deer."[5] It was, then, necessary to "reproduce the budding trees and the earliest flowers of spring; a thickly shaded lily pond deep in summer woods; the brilliant foliage of autumn; and, finally, the leafless trees and the mossy ground, covered with winter's snow. The production of such elaborate exhibits required exhaustive research, a large expenditure of time and a great deal of money."[6]

He succeeded in finding a simple method of creating lasting, scientifically-accurate foliage which became known as the wax-leaf method. He made plaster molds of fresh leaves and used these molds to cast wax leaves which he colored and trimmed. Using this method Akeley proceeded to make the 17,000 leaves needed for the four deer groups. However, the manufacture of so many leaves was more than he could accomplish alone so he employed "several men and women helpers to work by the hour in his shop, under his direction, but all of the delicate and difficult work he did himself."[7] Akeley patented his process, but apparently never asked for any royalty for its use.

As Akeley continued to work at night, his payroll continued to mount. Finally, "he reached a point where he had to know whether or not the Field Museum would purchase "The Four Seasons" once they were completed. The curator of zoology finally agreed to recommend the purchase of *one* of the four groups. Then Carl conferred with President Harlow N. Higinbotham who asked whether the Museum could not obtain *all four groups*. Carl assured him that it could."[8]

Evidently Akeley was a far greater craftsman than businessman for when the four years' work was done and the Museum purchased the groups at the agreed price Akeley

Accurate representation of a Michigan summer habitat of White-Tailed Deer was painstakingly devised by Carl Akeley. His four exhibits showing these animals in all seasons were the first "true habitat" displays.

Above, Models of Psilocybe Caerulescens *were part of a past special exhibit on "Mexican Sacred Mushrooms." Right, A portion of the "Illinois Woodland" diorama in Hall 29 includes trees and many types of plants made under the supervision of Emil Sella.*

found that while "he had come out even on expenditures for labor and material, for his own time and for profit there was nothing."[9] His wife was to later state that "Constituted as he was and striving always for perfection in his work rather than for this world's goods, the knowledge that he had invented excellent methods and the acceptance by the Field Museum and by the scientific world at large of his long-cherished dream of the habitat group amply repaid him. He often remarked that he felt this was 'a pretty good four years' work."[10]

"Pretty good" it was!—in those four years he invented an original type of manniken for taxidermy and an effective process of manufacturing plant accessories and he introduced the concept of painted backgrounds for mammal habitat groups. The blending of these three achievements in the "Four Seasons" resulted in "the first true habitat groups of mammals. To be sure, accessories and backgrounds had occasionally been used for other taxidermic groups of mammals, especially in ornamental wall cases, but any accessories and background that were available or that suited the taste of the artist had usually been employed. To portray a true habitat group, in other words *a faunal habitat group*, the accessories must have been secured from and the background must show the actual place in which the specimens were obtained."[11]

The "Four Seasons" were installed in the Field Museum in1902 and today, 66 years later, are still on exhibit (Hall 16).

In these 66 years the Museum has added to its halls many famous habitat groups and botanical exhibits featuring plant reproductions. The quality of "The Four Seasons" plant reproductions has not only been equaled but has been surpassed by the efforts of the technicians of the Museum's Stanley Field Plant Reproduction Laboratory. "Alpine Vegetation" and "Seashore Vegetation" (Hall 25) are excellent examples of the achievements of this department and were created by Emil Sella with the assistance of Frank Boryca.

Although Sella retired in 1961, Boryca is still busy outfitting the Museum's exhibits with greenery. Twenty-nine years ago he left a job in a foundry to become a mold-maker in the plant reproduction lab. As the years passed and staff members retired or left, he moved forward to fill their jobs and is now expert in all aspects of the lab's work. Over the years technicians have made many modifications in Akeley's original method and now have a great array of materials with which to work, but many of the essentials remain the same. For large leaves—such as a cabbage leaf—Boryca still employs a plaster mold to create a wax replica. To cast smaller leaves Boryca uses a pale green plastic in metal dies. The green color is easier on the eyes than white and it affords a base for additional coloring. Boryca adds to this color with dye, striving for the gradations of color found in nature rather than accepting the easily-achieved, uniform hues of mass-produced leaves.

Frank Boryca works diligently on the preparation of a portion of a plant model.

Meticulous attention to detail is apparent in this model of a Bell Pepper, Capsicum frutescens *var.* Grossum.

Akeley probably used scissors to cut the serrations into leaf edges. Because tools for this task are not commercially available, Boryca has devised and made his own. He has welded bits of fine-toothed hacksaw blades to ordinary paper punches which enable him to bite very uniform and delicate serrations into leaf edges.

Boryca's technical skill and expertise have not, however, reduced his job to a rote repetition of daily tasks. Each plant reproduction presents new problems to be solved. Before beginning to make a reproduction, Boryca studies the plant in life whenever possible; he studies botanical drawings and photographs; he examines the actual plant microscopically and makes careful notes regarding the color and structure. The importance of this preliminary study is emphasized by George E. Peterson, Technical Supervisor, Exhibition Department, American Museum of Natural History, when he says, "No techniques or methods, no matter how highly developed or skillfully carried out, can succeed in giving life to artificial plants unless the preparator is himself completely familiar with all aspects of the plant in its growing state. He must have observed nature itself with such care that he will recognize not only by his artistic instinct, but also by his highly trained eye, any fold or permutation of an artificial plant that is not consistent with its appearance in nature."[12]

Right now Boryca is working on a reproduction of Thunbergia, a plant replete with engineering difficulties. He had to experiment to find a way to join the blossom's six petals to the stem because there is no petiole to cover the point of fusion. Therefore, the six supporting petal wires must narrow to one slender stem wire. Precise and delicate soldering was the solution.

Obviously, such care and attention to detail is time-consuming and, as is so often heard, "Time is money." Therefore, Lothar Witteborg, Chief, Exhibition Department, is planning to begin use of the method of vacuum forming. "This process of shaping thermoplastic sheets by means of air pressure or negative pressure is used on multiple or gang molds"[13] when a vast number of leaves is required to fill out the background of a case. Coloring may be done with an air brush, further saving time while achieving an even, transluscent finish. Using this method, the 17,000 leaves made over a period of years by Akeley and his staff could easily be done in three months by two or three people, according to Witteborg.

From milliners' supplies to Akeley's "Four Seasons" discoveries and on through the years to plastic, progress continues to be made in plant reproduction. The plants are increasingly efficient to produce and are ever more lifelike and lovely. The poet, Alexander Pope, once said, "All nature is but art," and here at Field Museum the imitation of nature has become an art as well.

[1] Mary L. Jobe Akeley, *The Wilderness Lives Again.* Dodd, Mead & Co., New York, 1940, p. 68.
[2] Akeley, p. 69.
[3] Akeley, p. 69.
[4] Frederick A. Lucas, "Akeley as a Taxidermist." *Natural History,* Vol. XXVII, no. 2, p. 151.
[5] Akeley, p. 68.
[6] Akeley, p. 68.
[7] Akeley, p. 71.
[8] Akeley, p. 72.
[9] Lucas, p. 151.
[10] Akeley, p. 75.
[11] Akeley, pp. 73–74.
[12] George E. Petersen, "Artificial Plants." *Curator,* Vol. 1, no. 3, Summer 1958, p. 34.
[13] Petersen, p. 26.

Francis Brenton prepares the Sierra Sagrada *for display at the Museum*

BRENTON IS BACK

A few people manage to "do their thing" in a fashion that pleases everyone and Francis Brenton, British sailor-explorer-writer-photographer, is one of these.

Brenton arrived there on October 14, completing the final phase of a 15,000 mile solo round trip voyage between Chicago and West Africa which began on June 6, 1967.

Aboard his singular craft, the *Sierra Sagrada*, (or *Holy Mackerel*), were artifacts acquired in West Africa for Field Museum. To many, this is delivering the goods the hard way, but not to Brenton, who taught himself to sail on his first solo trip across the Atlantic in 1961. Greeted by Museum officials and the press at Burnham Harbor, he described his most recent voyage as "uneventful." The only snag occurred almost within sight of his destination when, after 15,000 miles of smooth performance, his outboard motor failed. He was towed into port by a Chicago policeboat, the *Louis A. Abbott*, sister launch of the *Morris Friedman*, which escorted Brenton on his last arrival two years ago.

Brenton's association with the Museum began in 1966 when he was commissioned by Dr. Donald Collier, Chief Curator of Anthropology, to buy a sea-going canoe from Colombian Indians in South America. He ultimately bought two, a 22-foot canoe made by the Cuna Indians of Panama and the *Sierra Sagrada*. He lashed the canoes together, rigged a sail, and guided the craft from Cartagena, Colombia, across the Caribbean and the Gulf of Mexico, skirting Hurricane Alma on the way, and up the Mississippi River to Chicago. The 3,190 mile journey took 81 days.

On the first leg of the Chicago-Senegal trip, Brenton navigated the St. Lawrence Seaway and a North Atlantic route to test two theories he developed on his 1961 solo crossing of the South Atlantic. He had found that the high humidity in southern waters eliminated the need for carrying fresh water, something he wanted to test under northern atmospheric conditions. He also navigates without a sextant or radio transmitter, relying on a solar navigation system of his own.

The west-east leg of the trip included several severe storms and a misadventure with a Russian ship which apparently thought he was in trouble about 30 miles off the West African coast. The *Kostroma* hauled Brenton's craft aboard and took him to a Moroccan port. From there he traveled to Dakar, Senegal, aboard a Danish ship and began collecting for the Museum in December, 1967.

He returned to Chicago by air in April, bringing some artifacts, then went to the Canary Islands to initiate still another adventurous project, a solo low-altitude balloon crossing of the Atlantic, which he was ultimately forced to cancel.

The long voyage from Dakar to Chicago was begun May 31, 1968, a trip he completed in 117 days. His course took him to the Virgin Islands, the Bahamas, towards Florida along the Inter-Coastal Waterway to the St. Lawrence Seaway and into the Great Lakes.

Brenton has an almost offhand attitude toward the hazards of his ventures, remaining affable and unassuming despite his accomplishments. Meanwhile, some landlubbers are truly puzzled by his actions, as happened in Leelanau County, Michigan, early in October. County Sheriff's deputies there were somewhat alarmed to see an odd-looking craft bobbing near shore during a Lake Michigan storm. According to an article in the *Leelanau Enterprise and Tribune* of October 10, an undersheriff and a deputy reported meeting a "bewhiskered man (who had a British accent)" who told them "he had sailed all the way from Africa and was headed toward Chicago." The undersheriff said he "had never seen a boat like that . . . about 25 feet long, bright red, had two masts, an outrigger and an outboard motor." They planned a further investigation of the "mysterious seafarer" but the weather cleared and he was gone the next day. They have probably learned by now it was Brenton.

A native of Liverpool, 41-year-old Brenton lives in Chicago between trips and worked at LaSalle Photo Lab before his African voyage. Plans for future projects are indefinite.

—Elizabeth Alanne, Field Museum Press

CALENDAR OF EVENTS

November hours: 9 a.m. to 4 p.m., Monday through Friday; 9 a.m. to 5 p.m., weekends. On Thanksgiving Day, November 28, and November 29, 9 a.m. to 5 p.m.

November 2 Fall Lecture Series "IRELAND," by Nicol Smith focuses on the people of this "land of castles and cottages." 2:30 p.m. in the James Simpson Theatre. Admission is free.

November 3 "EARTH, LIFE AND MAN," Lecture Series The 75th Anniversary Lecture Series by Museum Curators continues with "Meteorites, A Poor Man's Space Probe," by Dr. Edward J. Olsen, Curator, Mineralogy. 1 p.m. in the Lecture Hall. Admission is free to Museum Members and interested adults.

November 9 Fall Lecture Series "JAPANESE SUMMER," by Phillip Walker contrasts ancient and modern Japan. 2:30 p.m., James Simpson Theatre.

November 10 "EARTH, LIFE AND MAN" Lecture Series. "Central American Mountains and Forests" will be discussed by Dr. Louis O. Williams, Chief Curator, Botany. 1 p.m. in the Lecture Hall.

November 16 Fall Lecture Series "SWEDEN," by Ralph Gerstle, a film study of this country's traditional and modern aspects. 2:30 p.m., James Simpson Theatre.

November 17 "EARTH, LIFE AND MAN" Lecture Series "Eskimos and Russians in Southwestern Alaska," by Dr. James VanStone, Associate Curator, North American Archaeology and Ethnology, explores the relations between these two cultures in the 19th century. 1 p.m., Lecture Hall.

November 23 Fall Lecture Series "WILD RIVERS OF NORTH AMERICA," by John Bulger shows wilderness waterways and life near these rivers from mid-America to the Arctic. 2:30 p.m. in the James Simpson Theatre.

November 24 "EARTH, LIFE AND MAN" Lecture Series "Hunting Monkeys in Thailand," by Dr. Jack Fooden, Associate, Mammals, includes reasons for this field study, expedition experiences and results. 1 p.m., Lecture Hall.

November 30 Fall Lecture Series "FOUR WORLDS OF SWITZERLAND," by Alfred Wolff. Aspects of French, German, Italian and Austrian influence in Switzerland are shown in this film. 2:30 p.m. in the James Simpson Theatre.

Through November 15 AMERICAN INDIAN EXHIBITS "New Directions in American Indian Art," "Contemporary American Indian Art," and "Indians of Chicago—1968" (a photo essay by Orlando Cabanban). Hall 9 Gallery.

Through November Fall Journey: "HUNT WITH THE CAVEMEN" Do-it-yourself tour for youngsters introduces youngsters to the Museum's exhibit area dealing with Stone Age man. Any child who can read and write may participate in the Museum Journey program sponsored by the Raymond Foundation. Free Journey sheets are available at Museum entrances.

December 1 "EARTH, LIFE AND MAN" Lecture Series · "The Amazon Valley Forest," by Donald R. Simpson, Assistant Curator, Peruvian Botany. 1 p.m. in the Lecture Hall.

HALF A BILLION YEARS OF ILLINOIS HISTORY Do-it-yourself tour in observance of the State's Sesquicentennial celebration takes visitors on a capsule journey through the worlds of anthropology, botany, geology and zoology. A free brochure guides visitors to pertinent exhibits.

MEETINGS:

CHICAGO SHELL CLUB, November 10, 2 p.m.
NATURE CAMERA CLUB OF CHICAGO, November 12, 7:45 p.m.
CHICAGO MOUNTAINEERING CLUB, November 14, 8 p.m.
GREAT LAKES CHAPTER OF SIERRA CLUB, November 19, 7:30 p.m.

NEW MEMBERS JOIN BOARD OF TRUSTEES

Two prominent Chicago businessmen were named to the Board of Trustees of Field Museum of Natural History at a recent meeting held 75 years to the day from the founding date of the Museum in 1893.

The Board elected Thomas E. Donnelley II and John S. Runnells as its new members.

Thomas E. Donnelley II (left), (photo by Fabian Bachrach)

John S. Runnells (right), (photo by Homer Holdren)

Mr. Donnelly is a manufacturing group superintendent with R. R. Donnelley and Sons Company of Chicago. He also serves on the board of directors of the Lyric Opera of Chicago, the Lake Forest-Lake Bluff Community Fund Board and the Chicago Youth Centers.

Mr. Runnells is a registered representative with William Blair and Company, investment bankers in Chicago. He is a board member of the Chicago Boys Club and the American Brahman Breeders Association.

Both of the new Trustees reside in Lake Forest.

Although Field Museum enters its 75th year with the Board of Trustees meeting, official celebration of the aniversary began with the American indian Festival, the first of several special events planned for the coming year.

FIELD MUSEUM
OF NATURAL HISTORY
ROOSEVELT ROAD AT LAKE SHORE DRIVE
CHICAGO, ILLINOIS 60605 A.C. 312, 922-9410
FOUNDED BY MARSHALL FIELD, 1893
E. Leland Webber, Director
BULLETIN
Edward G. Nash, Managing Editor

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Give a Gift of Lasting Pleasure

You will be remembered . . . and appreciated . . . for your thoughtfulness in giving a Membership in Field Museum of Natural History. Many Members do this annually for friends and relatives at Christmas time. This is a gift that spreads a triple measure of holiday cheer . . .

to the recipient—enjoyment and opportunities for increased knowledge during the entire year.

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to the Museum—needed support to help in carrying out research and educational programs, as well as exhibit renewals and additions.

Be an armchair shopper and increase your holiday pleasure! Use the special gift-order envelope enclosed. The announcement of your thoughtful gift will arrive just before Christmas with a beautiful card in your name.

BULLETIN **FIELD MUSEUM OF NATURAL HISTORY**

Volume 39, Number 12 December 1968

Pirus ſuperba, ſiue Katherina.
The Katherine Peare tree.

Englands chiefeſt Herbariſt, Maſter John Parkinſon.

by

W. Peyton Fawcett

Associate Librarian

IN THIS AGE of specialization, when more and more seems to be written about less and less and libraries are bursting with the accumulated fruits of man's scolarship, it is sometimes pleasing to be reminded of a simpler and less cluttered era. I had this experience recently when, among books to be catalogued with titles such as A STEREOTAXIC ATLAS OF THE BRAIN OF THIS and A REVISION OF THE GENUS THAT, I came upon the THEATRUM BOTANICUM of John Parkinson, "Englands chiefest herbarist."

Here, in a thick, closely printed folio volume, was a compendium of everything known on the subject to that time, written clearly and tersely in English for both the professional and the non-professional alike. Here was the doctor's "current therapy" and the layman's "home medical companion," a flora, a materia medica, almost a pharmacopoeia, leavened moreover with a vast range of classical learning and considerable folk-lore. It was the author's second book, published in his 73rd year, and has an interesting history.

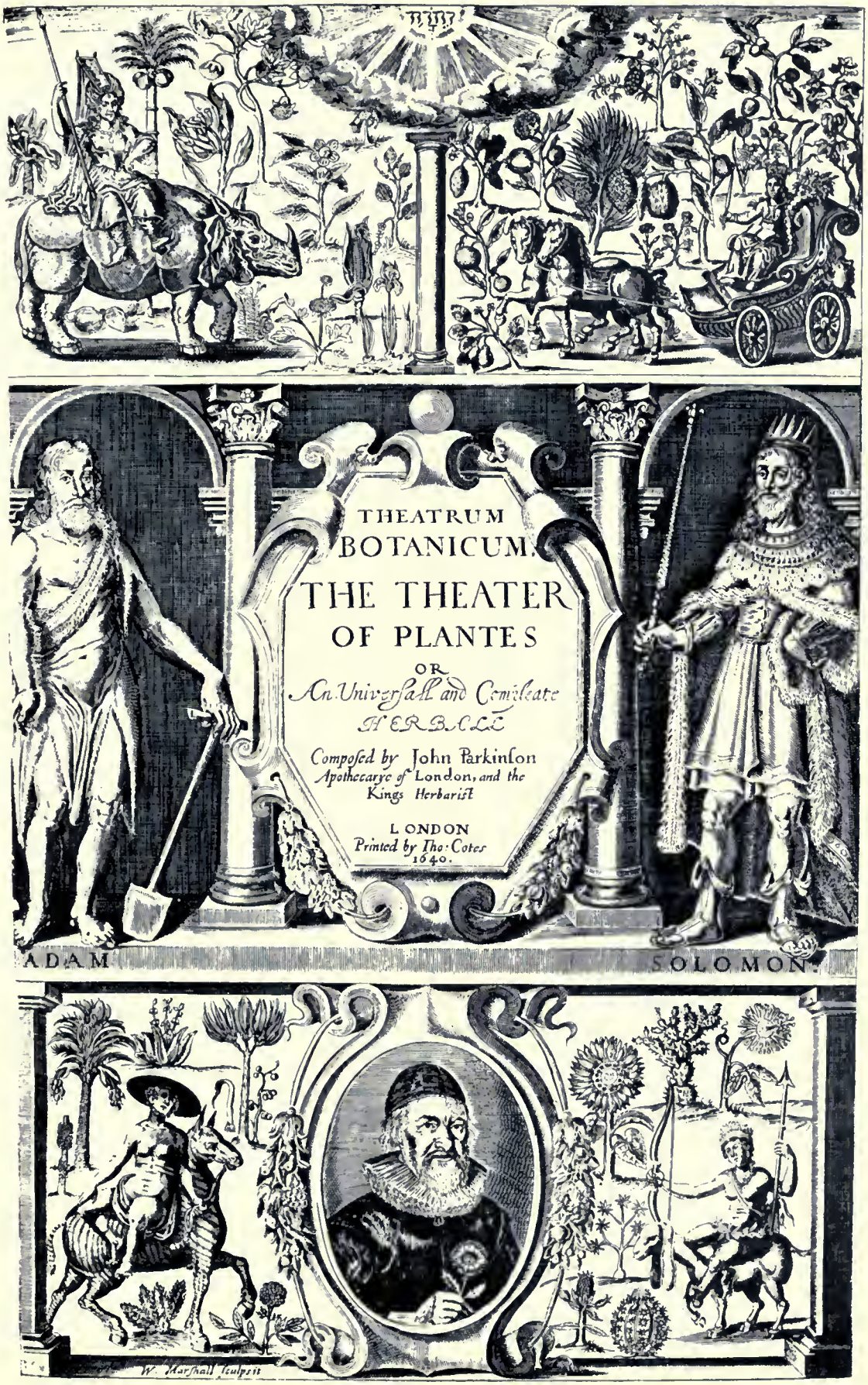
Very little is known about Parkinson's life except that he was born in 1567, that sometime before 1616 he was practicing as an apothecary, and that he cultivated a famous garden. "well stored with rarities," in what is now the heart of London. Such was his skill in his chosen profession that he was appointed Apothecary to King James I. and received, from his successor King Charles I., the title Botanicus Regius Primarius. He died in 1650.

His first, and most popular, work was published in 1629 and bears the punning title PARADISI IN SOLE PARADISUS TERRESTRIS (Park-in-sun's Earthly Paradise). It was more of a horticultural work than an herbal, as its subtitle indicates: "A Garden of all sorts of pleasant flowers which our English ayre will permitt to be noursed up: with A Kitchen garden of all manner of herbes, rootes, & fruites, for meate or sause used with us, and An Orchard of all sorte of fruit-bearing Trees and Shrubbes fit for our Land together with the right orderinge planting & preserving of them, and their uses & vertues." This was the first work of its kind of any consequence to be published in England and provides a complete picture of the English garden at the beginning of the seventeenth century. Nearly 1,000 plants are described, most of them exotics, and 780 illustrated. About 120 varieties of tulip are mentioned, 50 hyacinths, 50 carnations, and more than 40 "Flower de luces," or irises. There are 60 kinds of plums, as many apples and pears, thirty cherries, and more than 20 peaches. But despite its wide range the work was incomplete in its three parts: the "Garden of Pleasure," or flower garden, the vegetable garden, and the orchard. A fourth part, a "Garden of Simples" (medicinal plants), was lacking and the author promises in his preface that it would be shortly forthcoming.

Eleven years later, in 1640, this part finally appeared as THEATRUM BOTANICUM: THE THEATER OF PLANTS, OR, AN HERBALL OF A LARGE EXTENT. The delay in appearance is attributed to "the disastrous times" and other hindrances —possibly the cutting of the 2,600 wood-blocks. During this time Parkinson's original intention, to supplement the PARADISUS with a treatise on medicinal herbs, grew into one of a broader nature, to present in its totality the botanical science of his day.

The THEATRUM BOTANICUM, according to one authority, is the largest herbal in the English language and contains descriptions of approximately 3,800 plants, 1,000 more than are contained in one published seven years earlier. Its arrangement is somewhat confused and is based primarily on the real or supposed medicinal qualities of the plants described. Parkinson divides his plants into 17 "Classes or Tribes": 1. Sweete smelling Plants. 2. Purging Plants. 3. Venemous, Sleepy, and Hurtfull Plants, and their Counterpoysons. 4. Saxifrages, or Breakestone Plants. 5. Vulnerary or Wound Herbes. 6. Cooling and Succory-like Herbes. 7. Hot and sharpe biting Plants. 8. Umbellifer-

The ornamental title-page of the Theatrum Botanicum. *The two main figures, Adam and Solomon, represent toil and wisdom, respectively. On the four corners are female figures representing the known continents, each surrounded by specimens of its vegetation. Clockwise from the upper left these are: Asia, Europe, America, and Africa. At the bottom is a portrait of Parkinson. This month's cover is taken from John Gerard's* Herball, *from which many of the illustrations for the* Theatrum Botanicum *were derived.*



ous Herbes. 9. Thistles and Thorny Plants. 10. Fearnes and Capillary Herbes. 11. Pulses. 12. Cornes. 13. Grasses, Rushes and Reedes. 14. Marsh, Water and Sea Plants, and Mosses, and Mushromes. 15. The Unordered Tribe. 16. Trees and Shrubbes. 17. Strange and Outlandish Plants. This classification bears little relationship to modern ones and its value can be judged by Parkinson's naive comment on class 15: "In this Tribe as in a gathering Campe I must take up all those straglers, that have either lost their rankes, or were not placed in some of the foregoing orders, that so I may preserve them from loose, and apply them to some convenient service for the worke."

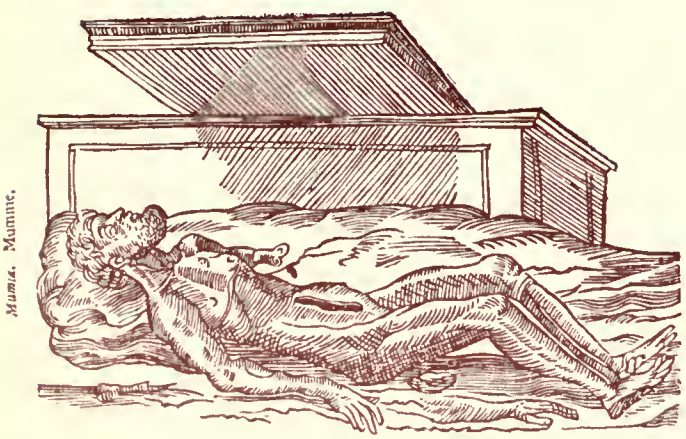
The scope of the work has been admirably summed up by J. Reynolds Green in his A HISTORY OF BOTANY IN THE UNITED KINGDOM FROM THE EARLIEST TIMES TO THE END OF THE 19TH CENTURY (London, 1914): "The descriptions in many instances were new, and great care was exercised to secure accuracy in indicating localities. In the enumeration of the synonyms the author incorporated the valuable work of K. Bauhin's PINAX, and in many cases verified them by reference to the original authors. In dealing with the medicinal peculiarities of the plants he quoted largely from the more exclusively galenical works of the time, the writings of De L'Ecluse, Orta, a Costa, Monardes, and others. He discussed also the opinions of Greek, Roman, and Arabian physicians, and took the greatest care to render his account as complete as the general state of knowledge would permit."

Nevertheless the emphasis of the work remained medical, as it had to, for the herbal served a definite and very useful function. It was not primarily concerned with plants as such, but with their use in curing man's illnesses. To understand its use we must know something of its underlying medical philosophy.

The pathogenic theories of that time were derived from the well-known doctrine of humors. It was asserted that the four elements, water, air, earth, and fire, or their associated qualities, wetness, dryness, cold, and heat, corresponded in the human body to the four humors, phlegm, bile, atrabile, and blood, and hence to the four temperaments, phlegmatic, choleric, melancholic, and sanguine. Subscribers to this belief held that good health depended on the harmony of these humors and that disease resulted from a disharmony. As a result the remedies were largely allopathic and designed to dispel humoral disturbances. George H. M. Lawrence, in his excellent essay HERBALS: THEIR HISTORY AND SIGNIFICANCE, tells us how this was accomplished: "The treatment to restore harmony when disease was present followed in general one or more of three steps or stages: the early stage, before diagnosis could approach certainty, when it was the practice to prescribe herbs and other medications that would be bland body builders, tonics, and stimulants; the critical and debilitating stage, when one would prescribe herbs for specific ills but that would not be unduly drastic on ingestion (using such preparations as distillates and decoctions in all manner of combination with nonpurgative ingredients); and finally, at the crisis, to induce the discharge of disharmonious humors through every available orifice and pore, doing so by the administration—often in rapid succession—of puratives, diuretics, cathartics, and emetics, and often accompanied by such more rigorous practices as bloodletting, enemas, or cupping." We may shudder at this treatment, secure in the knowledge that the effects of most of the herbs were at best negligible; but we should remember that this was part of the medical "science" of Parkinson's time and of earlier centuries. Still, as one writer observed, "How fortunate that, by the side of scammony, rhubarb, cassia and senna, the poppy was also cultivated!"

Herbals serve a somewhat different function today. They are the source materials for the study of the history of botany, medicine, and pharmacology, and of the history, conditions, and customs of the period in which they were written. The latter is particularly true of the THEATRUM BOTANICUM. It is the curious out-of-the-way pieces of information that interest us most, and which, together with the "quaintness" of his English, help to give us something of the flavor of Parkinson's time.

It is surprising how much legend and folklore survive in Parkinson's work. He extols the virtues of the unicorn's horn and describes the animal as living "farre remote from these parts, and in huge vast Wildernesses among other most fierce and wilde beasts." He discusses the "vegetable lamb," one of the most curious myths of the Middle Ages, and one gathers that he believed the travellers' tales about it: "This strange living plant as it is reported by divers good authors . . . groweth among the Tartares about Samarcanda and the parts thereabouts, rising from a seede somewhat bigger and rounder than a Melon seede, with a stalke about five palmes high, without any leafe thereon, but onely bearing a certaine fruit on the toppe, in forme resembling a small lambe, whose coate or rinde is woolly like unto a Lambes skinne, the pulpe or meate underneath which is like the flesh of a Crevise or Lobster, having as it is sayd blood also in it; it hath the forme of an head, hanging downe, and feeding on the grasse round about it, untill it hath consumed it



Perhaps the most curious "botanical" listed in the Theatrum *is mummy, being, as Parkinson tells us, "of much and excellent use in all Countries of Europe." Among other things it is prescribed as a "cordiall for the heart and preventeth the danger of poyson."*

Parkinson is very fulsome in the praise of the coconut tree: "There cannot be found in the world, a tree that hath so many necessary commodities for mens uses . . ." In addition to increasing potency it is listed as valuable in easing sore throat and hoarseness.

and then dyeth, or else will perish if the grasse round about it bee cut away of purpose: it hath foure legges also hanging downe; the Wolves much affect to feede on them." It is assumed that this myth grew out of descriptions of the cotton plant by Herodotus, Pliny, and other ancient authors.

Parkinson pours scorn on a good many contemporary beliefs, but accepts others unquestioningly, especially those concerning amulets. He tells us that the custom of placing a piece of mistletoe around the necks of children "against Witchcraft and the illusion of Sathan" is worthless but that a wreath of periwinkle "worne about the legs defendeth them [that wear it] from the crampe." Despite his belief that the use of herbs against witchcraft was foolish, he is, as Eleanour Sinclair Rohde points out in her book THE OLD ENGLISH HERBALS (London, 1922), "the only herbalist who gives us a potion which 'resisteth such charmes or the like witchery that is used in such drinkes that are given to produce love.' "

The THEATRUM BOTANICUM also has a large number of beauty hints. The golden flowers of mullein "boyled in lye, dyeth the haires of the head yellow, and maketh them faire and smooth"; a decoction of bramble leaves, on the other hand, will darken hair. French women, he tells us, account the distilled water of pimpernell "mervailous good to clense the skinne from any roughnesses, deformity or discoloring thereof, and to make it smooth neate and cleere." The ashes of southernwood, mixed with old salad oil, "helpeth those that have their haire fallen, or their heads bald, to cause the haires to grow againe, either upon the head or beard." The powder of the seede of elder, "first prepared in vinegar, and then taken in wine, halfe a dramme at a time, for certaine dayes together, is a meanes to abate and consume the fat flesh of a corpulent body, and keepe it leane."

Among many other useful things Parkinson tells us that the female fern was used by the women of Warwickshire "in steed of Sope" and that it was always gathered about Midsummer "into good big balls, which when they will use them they burne them in the fire, until it becomes blewish, which being then layd by, will dissolve into powder, of it selfe, like unto Lime: foure of these balles being dissolved in warme water is sufficient to wash a whole bucke full of cloathes." Purslane is given as a remedy for "blastings by lightening, or planets, and for burnings by Gunpowder." Willow-herb, being burned, "driveth away flies and gnats, and other such like small creatures, which use in diverse places, that are neere to Fennes, Marshes, or water sides, to infest them that dwell there, in the night season to sting and bite them." The bruised root of crowfoote "applied to the finger, by causing more paine therein, than is felt by the touthach [toothache], it taketh away the paine!"

In a more pungent vein he notes that the fruit of the bead tree "being drilled . . . and drawne on stringes, serve people beyond Sea to number their prayers on, least they forget themselves and give God too many." He gives us a "good jest for a bold unwelcome guest," a "smellfeast": nightshade should be infused in a little wine for six or seven hours and served to the guest, who then "shall not be able to eate any meate for that meale, nor untill they drinke some vinegar, which will presently dispell that quality, and cause them fall to their viands, with as good a stomacke, as they had before."

These are but a few selections culled from this "stately Fabrique, collected and composed with excessive paines . . . [this] curious pourtrait, and description of th'Earths flowred mantle, the Botanique Pandects, and the Herbarists Oracle, a rich Magazin of soveraigne Medicines, physicall experiments, and other rarities," as John Bainbridge writes in a commendatory letter. There are so many interesting and curious things that it is difficult to choose.

Parkinson concluded his preface to the THEATRUM BOTANICUM with these words: "Goe forth now therefore thou issue artificiall of mine, and supply the defect of a Naturall, to beare up thy Fathers name and memory to succeeding ages . . ." Three hundred years later we can still say, in the words of one of the sets of verses prefixed to the volume, "No night of Age shall cloude bright Park-in-sunne."

Winter Journey:

Ancient Sea Monsters

Dunkleosteus terrelli *was a "sea monster" by any definition of the term. A Placoderm (armored fish), this predator grew to 15 feet and lived in the Devonian Period, about 365 million years ago.*

FROM THE MOVIES and the late late TV shows we all know what a monster is. It is a hideous creature, often in humanoid form, whose primary occupation seems to be scaring pretty girls. But if we look up the word "monster" in a dictionary, we find that it merely refers to any organism, plant or animal, which is very different in size or other structural feature from the typical members of its kind. The Museum's Winter Journey examines some ancient sea monsters in the dictionary sense.

From our displays of prehistoric marine animals we find many which were of monstrous proportions for their kind. Among the Protozoa, which are generally microscopic, a species measuring a few inches long would be a giant. So would a two-foot sponge, or a 15-inch brachiopod, or a 70-foot crinoid. Many of these monsters were attractive, even beautiful, in shape. And they lived long before there were any pretty girls to frighten anyway.

Persons expecting something along the lines of the traditional monster will not be entirely disappointed. A skin diver coming face to face with a 15-foot-long Dunkleosteus might well jump right out of his gear. Sea-serpents continue to be reported from time to time. Have the Plesiosaurs, with their long, snake-like necks, survived from the age of dinosaurs to haunt us? Are they the basis for such reports as the Loch Ness monster? Although properly skeptical, the finding of living coelacanths in 1938 has made scientists cautious about completely dismissing such reports.

Both scientists and science-fiction writers (the two are often combined in one person) have long explored the possibilities of the dimensional extremes of life. Most people tend to forget that man is close to the extreme in size of most kinds of animals. The names of all larger animals could be written on a single sheet of paper. The names of the smaller forms would occupy several volumes. There are mechanical limits to how large an animal can get. I am six feet tall. A doubling of my height does not stretch the bounds of credibility at first glance. But merely doubling my height would increase my weight eight times. My normal 135 pounds would jump to 1,080 pounds, while the area of my bones, which support my body, would be increased only four times. I would be in no condition to do any running or jumping. Even ordinary walking would place me in constant jeopardy of breaking my legs.

For organisms living under a reduced gravitational force, some of these limitations are removed. It is no accident that the largest creatures that have ever lived are aquatic. The blue whale, which may attain a weight of 120 tons or more, is the largest animal that has ever lived on earth, but is strictly confined to water. The bulkiest dinosaur, Brachiosaurus, tipped the scales at only some 60 tons, and it probably spent most of its time in fresh-water lakes. For those who delight in speculative reflection, ponder the question of the significance of the fact that man spends the first nine months of his life in an aquatic environment.

"Ancient Sea Monsters" is Journey number 56 in a series begun in 1955. With the successful completion of each series of four Journeys, boys and girls are awarded a certificate and title: Museum Traveller (four journeys); Museum Adventurer (eight journeys); Museum Explorer (12 journeys). After 16 journeys have been completed the Explorer becomes a Beagler, ready to undertake a special journey which carries him throughout the Museum to study some of the natural history materials observed by Charles Darwin on his famous "Voyage of the Beagle." Successful Beaglers are awarded a certificate making them members of the elite Discoverers Club.

There is no charge for taking any of the Museum Journeys. Copies of the Journey question sheet and further information on the program may be obtained at the Museum entrances. The Winter Journey runs from December 1 to February 28.

—Ernest Roscoe, Raymond Foundation

Holiday Science Lectures in 7th Year

"How We Inherit" will be discussed by James F. Crow, Professor of Genetics and Chairman of the Department of Genetics at the University of Wisconsin in Madison, at the seventh consecutive Holiday Science Lectures program held at the Museum.

Sponsored by Field Museum and the American Association for the Advancement of Science and financed by the National Science Foundation, the program provides opportunities for outstanding high school science students to hear lectures in depth by eminent scientists. Modeled after the renowned Christmas Lectures of the Royal Institution of Great Britain, the AAAS Holiday Science Lectures are designed to give students an informative, authoritative and stimulating account of the progress, problems and methods in an active area of research.

Dr. Crow will present four lectures: "How Chromosomes Behave" and "How the Gene Is Made" on December 26 and "How the Gene Works" and "How Evolution Occurs" on December 27. Each lecture will be followed by a question and answer period.

Prior to his association with the University of Wisconsin, where he joined the faculty in 1948, Dr. Crow was an instructor in Zoology and later Assistant Professor of Zoology and Preventive Medicine at Dartmouth College. He was elected a member of the National Academy of Sciences in 1961 and is a past president of the Genetics Society of America and the American Society for Human Genetics.

Students attending a previous Holiday Lecture at the Museum

Holiday Science Lectures are held in six major U. S. cities during the Christmas holiday period.

Scientific Prize Honors Former Curator

D. Dwight Davis

A late Field Museum Curator has been honored by the American Society of Zoologists through its establishment of an annual prize in his name. The D. Dwight Davis Prize in Vertebrate Morphology will be given for the outstanding paper presented by a graduate student at the annual meeting of the Society.

Field Museum's curator of anatomy for 35 years until his death in 1965, Davis "re-established comparative anatomy," says Dr. Karel F. Liem, Associate Curator of Vertebrate Anatomy at the Museum. "His approach to vertebrate morphology stimulated the thinking of probably all American morphologists. This prize has been extablished to stimulate graduate students, by recognizing their original work and contribution to the field of vertebrate morphology."

Davis, who ranks among the foremost comparative anatomists of the 20th century, is best known for his monumental work entitled, "The Giant Panda," published by Field Museum Press in 1964. Su Lin, the giant panda, was acquired by Chicago's Brookfield Zoo in 1937. When Su Lin died a year later, his body was given to Field Museum where it was prepared for exhibition and has been a popular exhibit ever since. Davis' study on the structure, relationships, and evolution of the giant panda was a milestone in providing a new direction to the investigation of vertebrate animals.

Any graduate student who has not been awarded his doctorate degree will be eligible for the Davis Prize, which will be approximately equal to the interest collected by the award fund during a calendar year. Dr. Carl Gans, Professor of Biology at the State University of New York at Buffalo, fund chairman, is receiving contributions from those who wish to honor Davis' memory in this way.

A Special Exhibit

A "clown," belonging to the servant class of characters in the drama. The servants provide support, cheer and good advice to the heroes.

Gods, demi-gods, heroes, giants and demons, characters drawn from the long and complicated Hindu epics, the *Kamayana* and the *Mahabharata*, were the earliest representations in the Javanese puppet theatre. Contents of these early dramas were drawn entirely from these epics and remain popular today. The puppet theatre in Java dates back to the eighth century at least and the art form itself is a very ancient tradition in the Far East.

Two types of Javanese puppets are represented in the special temporary exhibit on display in Hall 9 Gallery through January 27. The *Wayang purwa*, the earliest type, are flat shadow puppets carved from leather, with varying degrees of openwork which permits the passage of light. They are controlled by means of wooden sticks attached to the arms and held above the head of the operator, called Dalang, who sat between a lamp and a screen. The audience itself was divided by the screen. The men, sitting on the side with the Dalang could enjoy the full beauty of the puppets along with the delicate and elaborate openwork emphasized by the shadows while the women, on the other side of the screen, had to be content with the shadow alone.

The shadow puppets evolved into the three-dimensional wooden puppets called *Wayang golek*. These were manipulated by means of a rod passed through the center of the body and into the head, and by sticks fastened to the hands. In contrast to the sharp exaggerated profiles of the *Wayang purwa*, these puppets demonstrated a tendency toward normal human appearance, a development which coincided chronologically with the departure from the representation of ancestor worship to the performance of more secularized plays.

The puppet faces in both the shadow and three-dimensional types were traditionally painted with masks to represent specific characters and were dressed in traditional headgear and costumes, clothing styles which were later copied by live actors in the Javanese theatre.

The Javanese puppets shown here were among the first artifacts acquired by the Museum, in the fall of 1893.

Javanese

Live Javanese theatre was closely modeled on the puppet theatre. At left, a prince's hat, similar to the head of the prince puppet below.

Above, a king and at right, a prince and princess. The puppets on exhibit were used in a play derived from the Hindu epic, "Mahabharata," in which two rival groups of cousins fight for the control of the Elephant kingdom. The good guys, the sons of Pandoe, defeat the bad guys, the sons of Dhretarashtra. Puppet shows often lasted all night.

PUPPETS

The Tanning Villas of Field Museum

By Patricia M. Williams
Field Museum Press

For the last 38 years the Museum has always had at least one tanning Villa. A solarium for the staff? A health club for members? Not at all. The Museum's tanning Villas have been Dominick and Mario, a father-son team who, together and separately, have tanned thousands of hides from all over the world.

Dominick Villa received his early training as a tanner in a commercial shop in New York where he was given skunks on which to learn. He later worked on a piecework basis, rapidly shaving piles of beaver skins a day. Villa came to the Museum in 1930 and prepared many of the hides used in the Museum's famous habitat groups. Of all the unusual skins the senior Villa prepared, one particularly stands out in his memory—the harpoon-punctured skin of a whale-shark. The pungent aroma of the whale-shark moved Stanley Field to request personally that Villa move the huge skin from the fourth floor taxidermy shop down to the basement until his work on it was completed. This skin is mounted and on exhibit in Hall O.

In 1956 Mario Villa joined the Museum staff as his father's assistant and they worked together until Dominick's retirement in 1961.

Although most of the skins Mario prepares are dried and shipped into the Museum from field associates, occasionally the entire carcass of a zoo animal may be delivered to the shop. After the dead animal in skinned, Mario puts the skin into a crock of brine where it remains for two or three days to remove the "slime." Those skins that arrive dried are put into soak water, a mixture of carbolic acid and water, for a few hours or a few days, depending upon the size of the skin. This soaking renders the skin limp and pliable. From this point on, both the dried and fresh skins follow the same procedure.

The tanner, Mario, sits before a large blade with a sharply-honed edge and passes the skin over it to remove the membrane. This process is known as "fleshing." The larger hides are laid across a shaving beam and shaved with a large two-handled knife called a currier's shaving knife. Both the shaving and fleshing require a "touch" or "feel" that comes only with experience. Too much pressure can tear the skin or release the hairs on the opposite side, resulting in a bald spot. Too little pressure, of course, will fail to get the job done. Each different kind of animal skin—fox, cheetah, or rhino—requires a different amount of pressure that the tanner must determine by "feel."

If the skin is greasy after it is fleshed, it is washed in soap flakes and rinsed thoroughly. Next, the skin is pickled for at least three days to make it more receptive to the tanning solution. When the three days have passed the

skin is shifted from the pickling crock to the tanning crock where it remains for at least a week. While in the tanning solution, the skin must be stirred several times a day to insure that the solution reaches all parts of the hide properly.

When the skin is removed from the tanning solution it is no longer a raw skin. It is then drained and oiled with neat's foot oil on the flesh side and a few days are allowed to let the oil "dry in." In the past tanners coated the hide with butter, lard or vegetable oil and the Handbook of Museum Technique states that the "Red Indians used the brain of the killed animal"[1] to lubricate the skin.

At this point in the procedure approximately eight days have passed, depending upon the skin, and the end is not yet in sight. The skin is now dampened on the flesh side with a sponge soaked in carbolic water, which prevents mold, and placed in a sweat box to permit the dampness to penetrate it thoroughly.

On removal from the sweat box, the skin is staked, a process that opens the pores by stretching and pulling. Small skins may be pulled back and forth over the fleshing knife, but big skins are tied to a board with a small loop and vigorously pulled and stretched by hand.

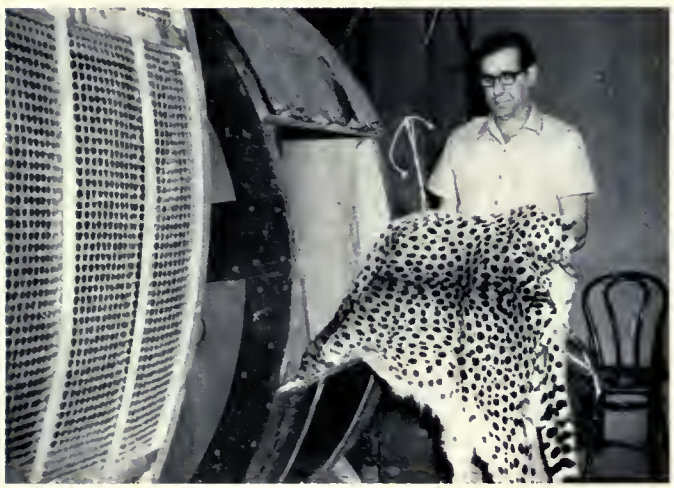
The *Handbook of Museum Technique* instructs that at this point the tanner should "Place the hide in a barrel or basin and tread for two hours or more with bare feet, turning the hide over and over. This works the vegetable oil or butter into the hide and softens it with the warmth of the feet. Kick it around and tread it thoroughly to work the oil well into the hide."[2] Years ago, Dominick Villa did stomp the skins with his feet, but the ubiquitous machine has made this unnecessary. If it is necessary to further soften the skins, Mario places them in the kicker, a strange looking wooden machine that literally kicks the skins until they reach the desired softness.

Mario Villa inspects a hide stretched out to dry after completion of the tanning process. Crock in foreground is type used for several soaking processes that skins undergo.

This weird-looking device has wooden "feet" that literally kick softness into skins.

Unusual and impressive challenge for tanner Dominick Villa was this skin of a whale-shark, now part of a Museum exhibit. Dominick retired in 1961, after 30 years at the Museum.

Mario puts the finishing touch on a skin, wetting and shaving it a second time to increase the softness and pliability of the hide.



A cheetah skin is pulled from the cage, where it was tumbled with sawdust to completely dry and clean it after the tanning process.

Hides are classified and stored on racks in one of the Museum's two "skin rooms," each about 40 feet long and containing thousands of of skins. Tiger and leopard skins are included in this view of one part of a skin room.

While the skins are slightly damp, they are put into the sawdust drum, located right next to the kicker, and tumbled about for a couple of hours. Finally, they move to the cage—an eight-foot high, screen-enclosed wheel in which the sawdust is "caged out" or the fur. These three machines, the kicker, the drum and the cage, are all housed in a rather small, dimly lit room that looks like the local branch office of the Inquisition, replete with the latest thing in torture racks.

Fine-haired skins must be combed out and brushed when they come out of the cage. The original identification tag is attached to the skin and it is now ready to join thousands of others in the Museum's enormous study collection.

If a skin is to be mounted by the taxidermist, it undergoes an abbreviated procedure known as "dressing."

Although Mario is quite modest about it, there is considerable difference between his tasks as a tanner at the Museum and those of a tanner in a furrier's shop. A furrier's tanner usually does no work on the head and legs of an animal skin, whereas Mario must carefully remove the the cartilage from the ears, slit the eyelids and include the head and leg skin in the tanning process. If he should shave the skin too closely, the animal's whiskers will drop off. If he mutilates the head in any way, the scientific value of the skin declines. Mario must also remove the leg bones, keeping intact the claws or hoofs of the animal. Also, a furrier's tanner may only work with a few different kinds of pelts, for example, fox or beaver. This tanner then follows very nearly the same procedure daily—the shaving technique is the same, the amount of time the skin is in the crocks is the same, etc. Mario works on everything from a squirrel to a rhino and must be familiar with the tanning requirements of each.

The Museum's zoological study collection is known and respected around the world, as are the habitat groups on exhibit. The skill of the Villas, father and son, has contributed significantly to the value of both.

[1] Aiyappan, A. and Satyamurti, S. T., eds. *Handbook of Museum Technique.* 1960. Gov't. of Madras. p. 56.

[2] Idem.

Next Stop:

BRAZIL

A special advantage for participants in Field Museum's Natural History Tours is the program of background lectures in the natural history of the tour area. The two Brazil-bound groups, leaving in January and February, will meet for a series of four evening meetings in January.

Only seven places remain open in 25-member Tour B, January 22 – February 16, and Tour A, February 14 – March 11, a 35-member group, has been completely booked up for several months.

Field Museum Chief Curator of Zoology, Dr. Austin L. Rand, who will accompany Group A as Tour Zoologist, and Loren P. Woods, Curator of Fishes, will discuss Brazil's excitingly varied birds, mammals and fishes on January 10.

The gems of Brazil will be shown and described by Dr. Edward J. Olsen, Curator of Mineralogy, on January 17.

Carnival gaity will close the Brazilian travels of Tour B and open those of Tour A in Bahia the weekend of February 14–16. The two groups will meet together for a Carnival ball on February 15.

On the same evening Dr. Rupert L. Wenzel, Curator of Insects, will show specimens of some of that country's colorful insects.

A tour member, Robert C. Victor, Staff Astronomer of Abrams Planetarium at Michigan State University, will familiarize tour members with the skies of the southern hemisphere, speaking on "Under the Southern Cross," on January 20.

Also on January 20, Phil Clark, Public Relations Counsel of Field Museum and Brazil Tour Leader and plant specialist for both groups, will show slides of Brazil and its plants and discuss the country's contemporary political situation.

Tour zoologist for Group B will be a Brazilian, Dr. Helio Ferraz de Almeida Camargo, a bird specialist from the Sao Paulo Departmento de Zoologia.

Above: *Countryside around Petropolis, where the tour will visit private garden-estates, is characterized by sugarloaf-form mountains and a year-round spring climate.* Right: *Roadside stop near Santa Teresa in the state of Espirito Santo features* Cecropia *tree and wax begonias growing wild along the bank of a waterfall. Tour members will stop here on the way to a personally conducted tour of the estate of famed zoologist Augusto Ruschi.* (Photos by Phil Clark.)

The Museum Hall

Then . . .

The evolution in the appearance of museum halls seems unutterably slow, yet when changes are made they are frequently quite dramatic.

In its infancy, Field Museum (then Field Columbian Museum) had to rely on some artifical animal displays which lacked realism both in themselves and their exhibition. This was true of most museums before the development of modern techniques made possible the life-like exhibits now available.

By the time the Museum moved to its present location in 1921, it had the superb animal displays by Carl Akeley and an impressive classic main hall in which to display a variety of its most popular and important exhibits.

Since 1921, some additions and changes have been made in the hall, such as the addition of the rampant dinosaur in the 1950's, but the general layout of Stanley Field Hall remained unchanged.

Field Columbian Museum hall in Jackson Park in 1894 featured reproduction of a mammoth, cross-section of a redwood tree and a mastodon skeleton. By today's standards the arrangement of exhibits was stilted and unimaginative but it was typical for its time.

Above: *This mammoth was one of several animal "mock-ups" on display when the Museum first opened. Notice affixed to the creature's trunk warns visitors to keep "Hands Off."* Right: *Stanley Field Hall appeared like this prior to recent renovation. The rampant dinosaur was added in the early 1950's but there have been few changes in the hall since the present building was opened in 1921.*

Now . . .

Visitors to the Museum in the late summer and early fall of 1968 found a seeming state of chaos with well-established exhibits being uprooted and new construction underway. The result of all this activity is apparent in the new look of Stanley Field Hall today. Favorite "trademark exhibits" remain and an added vitality has been given with the addition of two fountains and clusters of live trees. Small exhibit cases and temporary displays have been moved elsewhere in the Museum.

The final impression? A more spacious, more restful and more interesting gateway to the Museum.

Above, left: *Fountains and trees provide a backdrop for a favorite Museum exhibit, the rampant dinosaur. It has been relocated and has a new base.* Left: *In operation only a few weeks the new fountains have already become favorite Museum resting and meeting places.*

Lively fountains greet visitors at both Museum entrances since the completion of Stanley Field Hall's makeover. Modern seating along walls has replaced the dark wooden benches and all small display cases and temporary exhibits have been removed. Purpose of the new arrangement was to eliminate a cluttered impression and add vitality to the hall's classic architecture.

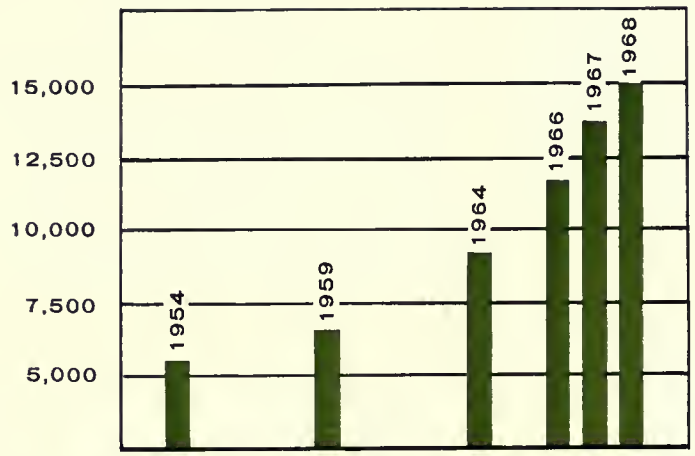
Museum Membership Shows Steady Growth

Field Museum membership has more than doubled in the 1960's and passed the 15,000 mark in November.

Steady growth in membership has been the trend since 1954, when the Museum had 5,280 members. With an annual average increase of about 200 members, membership was 6,555 by 1959.

During the 1960's, the number of new memberships each year increased to a net average of about 500 with a sharp increase of 2,000 in each of the last three years.

With the increase in membership has come an accelerated program of special exhibits, lectures and other events in which members have participated. Members are the life blood of Field Museum and no aspect of the 1960's is more important to the Museum's future than the increased interest and number of its Members.



CALENDAR OF EVENTS

December hours: 9 a.m. to 4 p.m., Monday through Friday; 9 a.m. to 5 p.m., Saturday and Sunday and December 23–January 3. The Museum will be closed on Christmas Day.

December 1 "Earth, Life and Man" Lecture Series "The Amazon Valley Forest," by Donald R. Simpson, Assistant Curator, Peruvian Botany, will close the fall group of 75th Anniversary Lecture Series by Museum Curators. 1 p.m., Lecture Hall. Admission is free.

December 1 Audubon Society Series "Four Seasons" This film journey into British Columbia will be narrated by Wilfred E. Gray. 2:30 p.m., James Simpson Theatre.

December 26 and 27 Holiday Science Lectures See Page 7.

Through December Winter Journey: "Ancient Sea Monsters" Newest in the Raymond Foundation's Journey Program series for children introduces boys and girls to the prehistoric giants of the ancient seas. Any child who can read and write may participate in the free do-it-yourself Journey Program. Journey sheets are available at Museum entrances.

Through January 27 Javanese Puppets Hall 9 Gallery. See pages 8 and 9.

Half a Billion Years of Illinois History Do-it-yourself tour in observance of the State's Sesquicentennial celebration ends on December 3. Capsule journey through times takes visitors through the worlds of anthropology, botany, geology and zoology. A free brochure guides visitors to pertinent exhibits.

MEETINGS:
- Chicago Shell Club, December 8, 2 p.m.
- Nature Camera Club of Chicago, December 10, 7:45 p.m.
- Chicago Mountaineering Club, December 12, 8 p.m.
- Illinois Orchid Society, December 15, 2 p.m.
- Great Lakes Chapter of Sierra Club, December 17, 7:30 p.m.

FIELD MUSEUM OF NATURAL HISTORY
Roosevelt Rd. at Lake Shore Dr.
Chicago, Illinois 60605
Founded by Marshall Field, 1893

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