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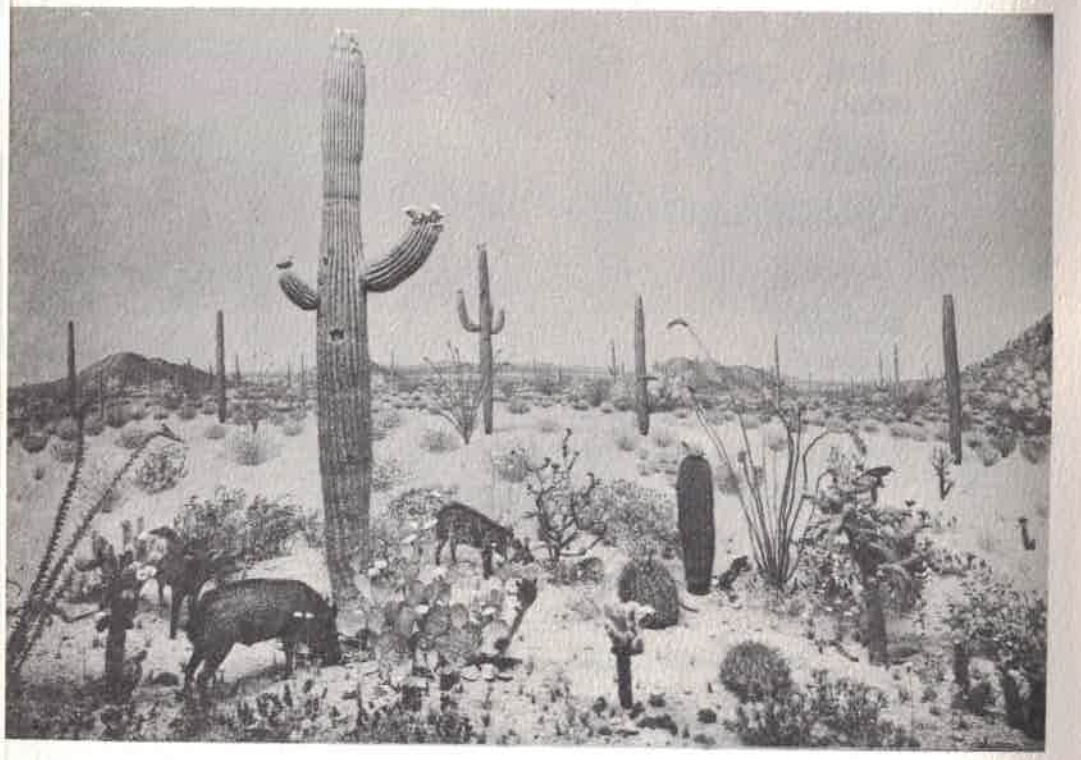


ARIZONA - SONORAN DESERT WITH CACTUS FOREST

by

EMIL P. KRUSCHKE,
Curator of Botany

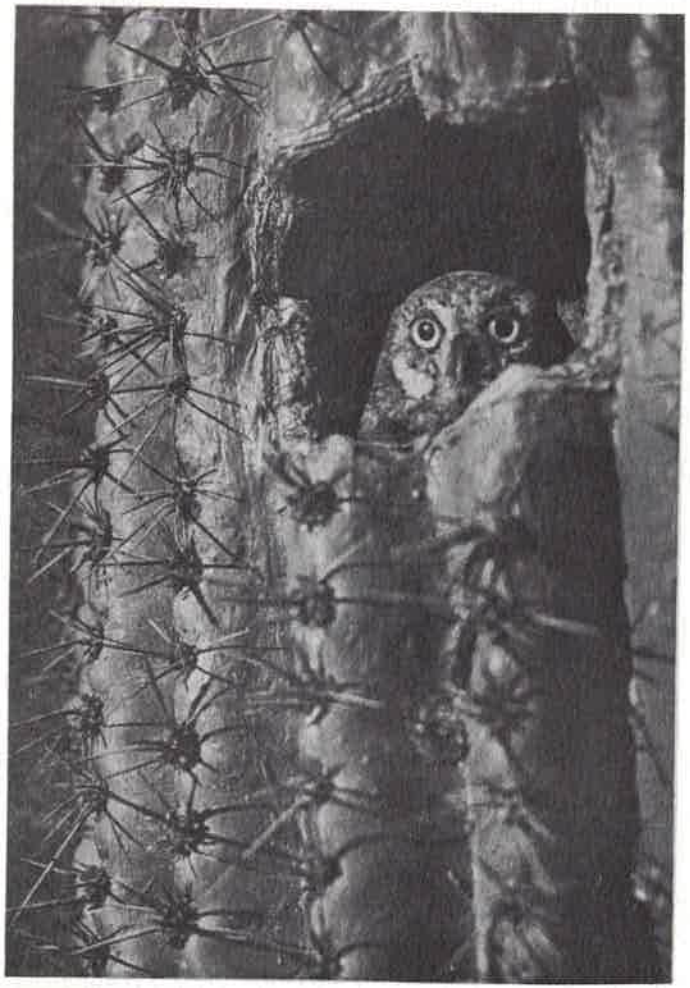
The Arizona-Sonoran desert lies in northwestern Mexico (State of Sonora) and southwestern United States (chiefly southern Arizona). It consists of two major communities: (1) the *lower desert* (below 3,000 feet) with the dominant plant community of creosote bush, saltbush, and needle grama-grass, and (2) the *higher desert* (3,000-4,500 feet), the dominant plant community being the cactus forest, consisting of saguaro, prickly-pear, chollas, ocotillo, paloverde, cassias and mesquite.

The Sonoran desert, in contrast to the Mojave desert, has mild winters and has summer (July through September) and winter (December to March) rainy seasons. Saguaro is the desert symbol. Small trees are abundant, and cacti are abundant. At the Saguaro National Monument cactus forest (depicted on the cover), elevation 3,000 to 3,500 feet, the average rainfall is three to eleven inches, and the average temperature for July is 94°F.

Deserts exist because the prevailing winds are extremely dry due to mountain barriers. Hence, lack of water is the determining factor. The desert plants adapted to arid conditions (high temperature and little water) are different from other plants for they cannot squander water and survive. To meet these conditions the plants are noticeably well spaced to avoid competition for water and food. This is particularly noticeable with the saguaro, prickly-pear, and creosote bush whose shallow spreading roots quickly soak up water even if rain just dampens the soil surface. The roots of the creosote bush also give off toxins, which inhibit the growth of new plants, thereby reducing competition for available water and food. Some desert plants, however, are deep rooted. Mesquite, for example, has roots that extend down sixty feet or more for water.

Many plants of the cactus forest have no leaves to transpire water, and have thick, succulent flesh on the inside of fleshy stems which are also heavily wax coated. Water, when available, is quickly taken up by the cells of the succulent tissue, its loss being cut to a minimum. With chlorophyll present in the leafless stems, photosynthesis goes on without presence of leaves. The saguaro, prickly-pear, chollas, barrel, mammilarias

Wm. Schultz, Museum Artist, working on background



Elf Owl Nesting in a Saguaro

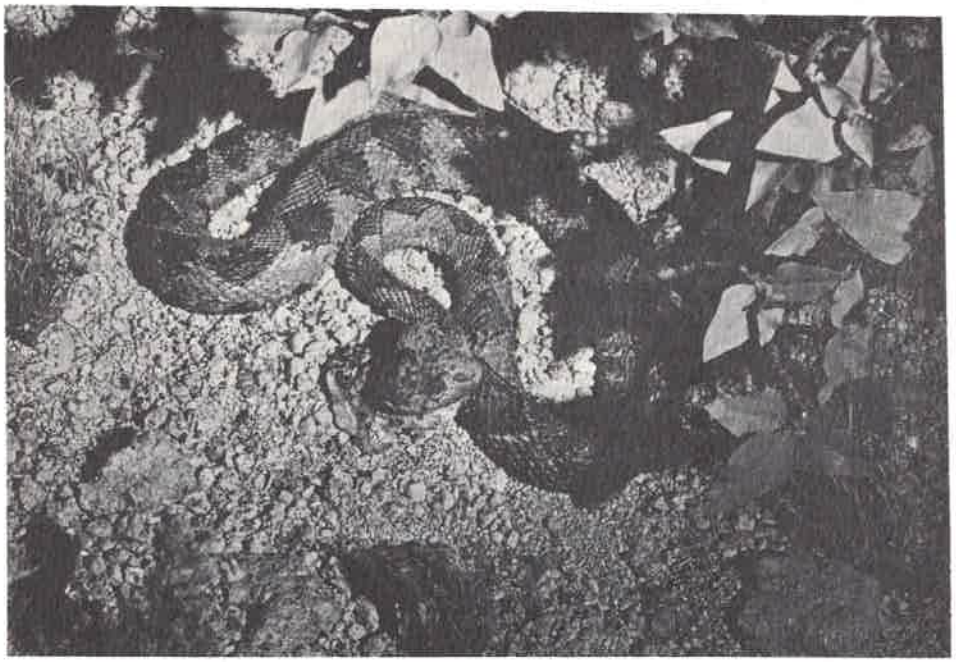
and hedgehog cacti are examples of the adaptation. The greenish bark of the paloverde also indicates the presence of chlorophyll. Some desert plants have small leaves, and even here, leaf shedding occurs periodically in times of drought to prevent loss of water (in ocotillo and paloverde). After rain, the small leaves appear again. There may be two or three crops of tiny leaves a year. In some plants the leaves are thick and leathery (jojoba); in others they are reduced to mere scales (joint fir of ephedra). The creosote bush has leaves coated with a varnish or wax to prevent loss of water. Still others have thick fleshy dagger-like leaves which serve as reservoirs for water (agave).

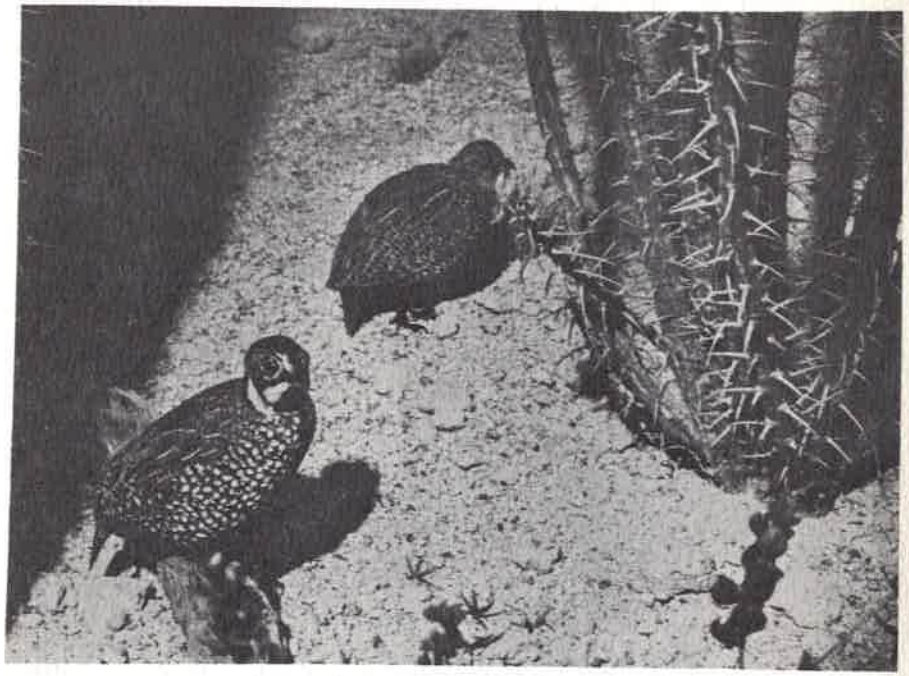
Most of the cacti have numerous long sharp spines which protect them from being eaten by animals or trampled under foot.

The giant saguaro is the largest cactus in the United States, and second largest in the world. However, its life begins as a tiny seed. It is estimated that only one out of 250,000 saguaro seeds produces a plant. Little saguaros (also true of barrel, pincushion, hedgehog, ocotillo and others) are usually dependent upon other plants (paloverde, mesquite, etc.) for some shade until they get well started. Growth is slow—only a few inches the first five years; by thirty years, a few feet; by seventy-five, probably fifteen or twenty feet tall at which time the first blunt branch appears. The fluted trunk and thick succulent inner flesh enable it to shrink in periods of prolonged drought and to swell when the rains come. Through its shallow root system a plant weighing six to ten tons will take up as much as a ton of water.

In May and early June, clusters of flowers (the state flower of Arizona) appear on top of the trunk and at ends of branches. With ten to twenty or more flower buds, only a few of them open at one time so as to prolong the flowering period. These flowers unfold at night and remain open until the following afternoon. They attract numerous insects which in turn attract birds. The flowers may be pollinated by birds, wind or moths, by white-winged doves (seeking nectar), or by longnose bats (feeding on nectar and pollen). The fruits and seeds of the saguaro when ripe are eaten by many animals, including birds, mule deer, collared peccary,

Diamondback Rattlesnake





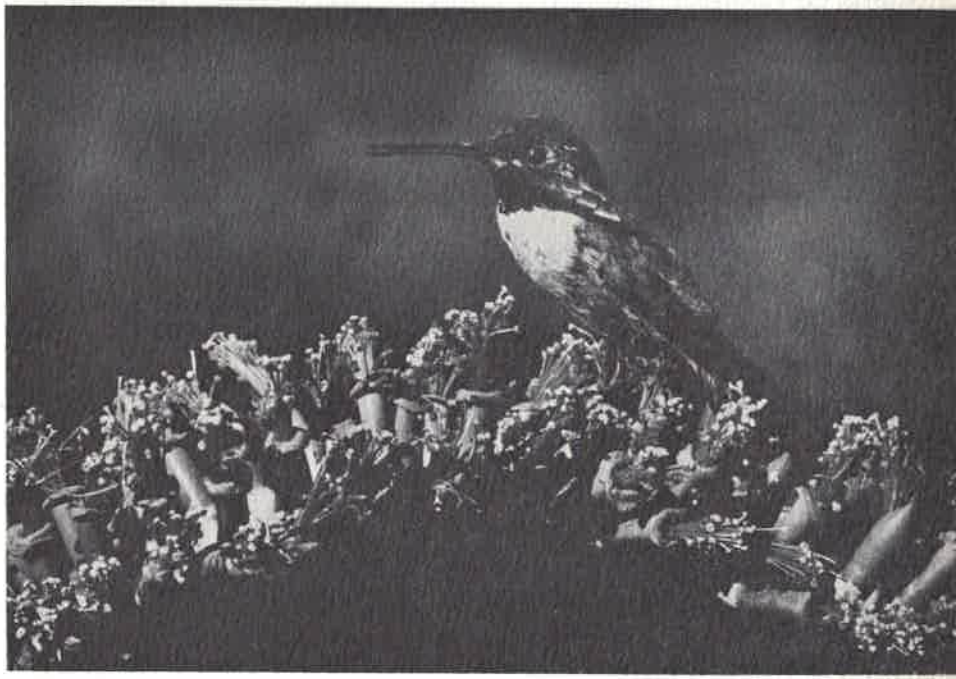
Harlequin Quail

kangaroo rats, pack or wood rats, and ground squirrels. Even the native Indians gather the fruits and use them for food. Indians in some areas eat the fruits fresh; ripe fruits are also gathered and prepared into pressed, dried cakes, and syrup is boiled from the juice.

The saguaro occasionally reaches a height of fifty feet, with a half dozen or more arms, and an age of 200 years. Most of them die earlier from disease or injury; occasionally only the inner woody skeleton remains, either standing or lying on the ground, weathering in the dry hot desert air.

The saguaro is often referred to as the apartment house of the desert, for it provides a place for many birds to live. The gila woodpecker and the gilded flicker drill nest holes in the fleshy stems. After they finish rearing their families other birds move in. The small elf owl, sparrow hawks, purple martins and ash-throated flycatchers use the abandoned pockets for their houses. Such larger birds as the red-tailed hawk, white-winged dove and great horned owl also build their nests among the branches.

Other animals besides those already mentioned that make the cactus forest their home include the following: mule deer, collared peccary, bobcat, coyote, jack rabbit, spotted skunk, kit fox, roundtail ground squirrel,



Costa's Hummingbird on a Ocitillo Flower Cluster

desert kangaroo rat, wood or pack rat, cactus wren, roadrunner, gambel's quail, steller's jay, loggerhead shrike, gila monster, banded gecko, desert iguana, collared lizard, chuckwalla lizard, horned lizard, western diamondback rattlesnake, sidewinder, and spadefoot toad. Insects and other invertebrates play an important part in desert ecology, as food for birds and other animals, and in aiding plant pollination. Tarantula hawks —large, blue-black, red-winged wasps that prey on spiders, velvet ants, and leaf-cutting ants are also present along with several species of scorpions. In the latter, the sting of some species is very poisonous.

Most birds and many insects are active during the day—birds especially in early morning and late afternoon. During the hot part of the day, few animals are stirring on the desert. At night the desert becomes alive with animal activity, especially among the owls and flycatchers, snakes, ground squirrels, bats, pack and kangaroo rats and spadefoot toads. The white-throat wood rat or pack rat, rarely active during the heat of the day, makes its nest out of anything it can "pack" to its nest from sticks and miscellaneous objects to the treacherous spiny segments of the chollas and prickly pears. It often carries fruits and seeds of desert plants and stores them in the nest. The kangaroo rat, with its long rear legs for giant strides which enable it to escape its enemies, makes numerous burrows in the soil, especially in and about the roots of the creosote bush. It is

California Thrasher
Sitting on a
Chainfruit Cholla

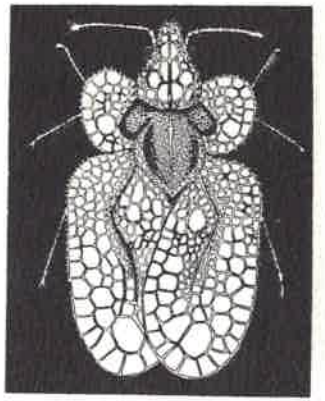
strictly nocturnal. It can go its entire lifetime without a drop of water, for it can synthesize the water it needs from the food it eats.

Plants other than those previously mentioned which are represented in the diorama include the following: desert marigold, prickly poppy, Mexican goldpoppy, lupine, desert globemallow, Goodings verbena, spreading fleabane, desert zinnia, pink hibiscus, white brittlebush, white-stem paperflower, barrel cactus, desert prickly-pear, pincushion or fish-hook mammilaria, hedgehog cactus, chainfruit or jumping cholla, staghorn cholla, teddybear cholla, and pencil cholla.

Man is the saguaro's worst enemy. Land-clearing activities destroy hundreds of big plants yearly. Also, the so-called "bacterial necrosis disease" (a misnomer), a natural process of bacterial tissue decomposition, in which periodic tissue freezing takes place during some winters, is causing death of many of the saguaros in the Tucson area. Also, if we are to continue to have saguaro forests, it is essential that such predators as the hawks, bobcats, owls, snakes, and other species are protected as part of the food chain so as to keep the rodents under control. Without them the rodent population would explode and ultimately destroy the cactus forest.

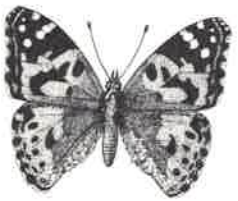
INSECTS AND AIR SPACE

by KENNETH MacARTHUR,
Curator of Entomology



Lace bugs (*Tingidae*) have been captured 3,000 feet above ground level.

Winged termites occur in countless swarms during their annual mating flight. Though weak fliers, they have occasionally been taken at 3,000 feet.



Butterflies, except for migratory species such as the painted-lady shown here, seldom travel above 600 feet. However, this widely distributed species was observed in migratory flight at 17,000 feet in Pakistan in the Himalayas.

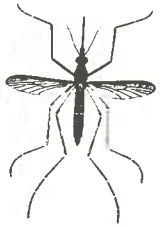
The tiny biting midges called "no-see-ums" have been

In the late summer of 1968, a North Central Airlines passenger plane coming in for a landing at Milwaukee's Mitchell Field collided with a small private plane at an elevation of 2,700 feet near Wind Lake some distance south of the airport. According to the testimony of the airline pilot, a contributing cause of the collision in which three individuals in the smaller plane lost their lives was the restricted visibility when great numbers of "bugs" were encountered and became plastered against the aircraft's windshield.

Recent airport congestion, requiring incoming planes to circle for extended periods, sometimes for hours, in holding patterns awaiting their turn to land, may from time to time expose them to an additional hazard, that of confrontation with airborne insects at altitudes up to 5,000 feet above ground level.

Not much has been learned in recent years about insects that occur as temporary residents at various levels of altitude. Today's jet planes, skimming through the air at hundreds of miles per hour, either deflect most insects because of their streamlining and great speed or cause such complete disintegration of the colliding insects that recognition and identification is impossible.

However in times past when aircraft flew at lesser speeds, entomologists with the United States Department of Agriculture made a special detailed study and analysis of insects occurring at various elevations above the ground surface



Aedes vexans, one of the most abundant and troublesome species of mosquitoes, known for its migratory capabilities has been taken alive as high as 5,000 feet.

The destructive cotton boll weevil has been taken at heights up to 2,000 feet.

Dragonflies, highly efficient aerial insects that can attain remarkable speeds in pursuit of their prey, can attain heights of 7,000 feet, but usually prefer lower levels where their prey is more abundant.

The beautiful green lacewings (*Chrysopa*) have been trapped 5,000 feet above the ground.

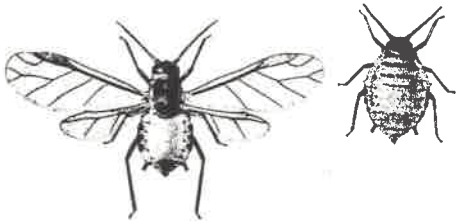
with some rather interesting results. In a comprehensive survey conducted from 1926 to 1931, relatively slow-moving post-World War I aircraft were used, such as the de-Haviland H-1 U.S. Army trainer biplane, outfitted with screens which slid out of tight-fitting compartments attached vertically to the plane's wings. The metal screens to which an adhesive was applied were manipulated by wires so that they could be exposed for definite periods (usually ten minutes) at given altitudes and thus provided a rather accurate means of determining the aerial insect fauna both from the standpoint of numbers and composition. These tests were conducted at altitudes up to 15,000 feet the year 'round near Tallulah, Louisiana.

Interestingly, the form captured at the highest altitude tested (15,000 feet) was not an insect but a spider. Altogether, 1461 spiders were taken at various levels of altitude. These creatures, though wingless, are well known for their aerial capabilities. Young spiderlings spin out long filaments of silk that function as a ballooning device, riding the air currents for long distances, a circumstance that provides an efficient means of species dispersal.

Another surprise was the trapping of a live dermestid or carpet beetle larva (*Trogoderma*) at an elevation of 9,000 feet above the ground. Apparently its dense covering of hairs served to buoy it upwards on rising air currents. A 42 mile per hour wind prevailed at that altitude at the time of its capture.

Aedes vexans, a very prolific and troublesome mosquito in urban areas of the U.S. and one which annually plagues the Milwaukee area, was trapped at up to 5,000 feet elevation, providing additional evidence of its migratory habits.

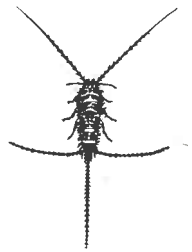
Dragonflies, among the most efficient of all aerial insects, were observed in flight up to elevations of 7,000 feet. They were rarely taken in the screen traps, however, because of their quick responses and excellent maneuverability, enabling them to easily avoid the onrushing plane. They were not only keeping abreast of the biplane, which was traveling at 90 or more miles per hour, but in instances darted ahead with



Although plant-lice are usually wingless, at intervals winged individuals are produced to allow for dispersal of the species. They have been captured alive up to 13,000 feet.

A carpet beetle larva (*Trogoderma*) was taken alive at 9,000 feet.

Winged ants have been taken as high as 5,000 feet during their annual mating flights when they launch themselves into the air in great numbers.



A silverfish (*Lepisma*), a primitive wingless insect, was taken alive at 8,000 feet.

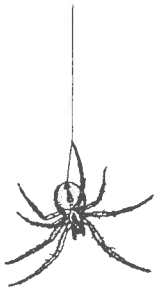
sudden bursts of speed, pursuing and feeding upon the insect life that was borne into the upper air stream on rising currents of air.

In the survey, approximately 180 different species of insects were trapped in the air at the 5,000 foot level. The results revealed that the density of the aerial insect population decreases as altitude increases; thus at 3,000 feet, the averages indicated that there were only about 1/5th as many insects as at 200 feet above ground, and at the 5,000 foot level the number had decreased to 1/20th of the 200 foot height.

Over the five-year period it was calculated that there was on the average one insect for every 18 feet of air space at all times, day and night at 500 feet, and at 5,000 feet the density averaged one insect for every 44 feet of air space. However, under actual field conditions, insect density varies considerable. At certain times of the year winged generations (sexual forms) of basically wingless insects such as the termites and ants, launch themselves into the air in mating flights and, since any given species usually swarm simultaneously over a large area, they may temporarily jam the air corridors with their countless hordes. Normally wingless plant-lice periodically develop winged individuals in enormous numbers that take to the air as a means of species dispersal. Fortunately, none of these insects normally achieve record heights, but the ascent and descent of planes near airports during the brief swarming periods could present real problems in the obstruction of windshield visibility.

The two-winged insects—flies, midges and gnats (Diptera)—proved to be the most abundant types of insect life at practically all altitudes. They were three times more prevalent than the beetles, the next highest group in numbers collected.

Thrips (*Thysanoptera*), minute insects that suck the juices of plants, have plume-like wings. They have been taken alive at 11,000 feet.



Although totally wingless, the spider has been taken at altitudes up to 15,000 feet above ground level.

Mayflies, emerging simultaneously in brief but countless hordes usually stay close to the ground, but have been trapped at altitudes of 2,000 feet.

Tiny Chalcid wasps which in the larval stage feed on the eggs of destructive scale insects have been taken alive at 5,000 feet. Fringes on the wings probably serve to bear them upward like the downy

Some of the insects trapped at the higher altitudes were useful forms from the standpoint of man. Tiny parasitic wasps that lay their eggs in the bodies and eggs of other insects were taken at altitudes up to 13,000 feet. Ladybird beetles that prey upon destructive plant-lice were found flying as high as 6,000 feet. Interestingly, during this survey, twenty species of wasps new to science were discovered. Butterflies were not taken higher than 600 feet above ground level in this particular survey, although in northern South America a pilot reported great numbers of migrating butterflies (the Great Southern White, *Asia monuste*) in flight at 3,000 feet.

The height to which insects fly or are carried is dependent upon various meteorological conditions. Temperature, humidity or dew point, vapor and barometric pressure, intensity and direction of air currents, convection and turbulence, all play a part in determining the density and makeup of the insect population in the upper air at any given time. The size of the insect in relation to its weight, especially as it affects its buoyancy, is also important in determining the height above ground that insects, spiders and related forms can attain. Paradoxically, it is mostly the poor fliers, insects with very weak flight capabilities, that cannot adequately control their flight, that are most likely to get caught in the updrafts and occur at the higher elevations.

Insects were the first creatures on earth to master the art of flying. They had a head start of some three hundred million years. It would seem that they are still in a position to challenge man's mastery of the air, at least for the first several thousand feet of air space.

Scorpionflies (*Panorpa*) have been taken alive as high as 5,000 feet.

KEDAM
THE PALAUAN KITE

by ADALBERT OBAK AND ROBERT K. McKNIGHT

Illustrations by Authors

The sport of kite flying would seem to be nearly world-wide in distribution. In many nations, individuals and groups have made kite flying a major recreation, constructing new styles or larger kites and forming clubs to make and fly them. Throughout eastern and southern Asia many countries have stylized kites and a rich background of custom and lore associated with the sport or, as it sometimes appears, the ritual of kite flying. On the Pacific islands kite flying, in one guise or another, seems to have been equally widespread. On the low, central Caroline islands of Micronesia a kite was fashioned from the large leaf of the breadfruit tree to carry a line and a cocoon-like cobweb lure over the reef in a specialized fishing technique to snare the sharp-toothed stick fish. In many locations of Micronesia, especially in Palau and Yap, but also in the distant Gilbert Islands, the sport was once a major seasonal event involving the entire young and old population of a village in the construction and flying of kites.

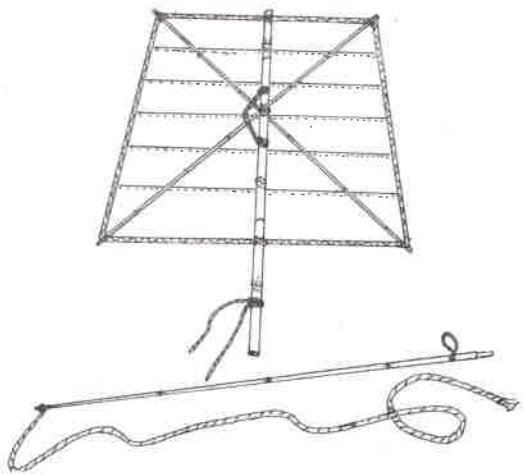
On select days, especially toward the beginning of the season when the east winds became strong and steady, entire villages of Palauans would pack lunches and picnic on a hill designated for the sport to watch various groups and individuals try their hand. The largest kites, reaching thirty feet in length, were constructed by the men's clubs. Smaller ones, in several shapes, were made by household groups or by a father for the amusement of his son.

The Palauan word for kite, *kedam*, is the name of a seabird, apparently the frigate bird. As suggested in the Palauan origin lore for kite flying, some of the earlier kites may have conformed in shape to the broad-winged *kedam*. Contemporary sources specify five conventional shapes.

Style and Construction

The essential materials for the construction of a Palauan kite are leaves of *buuk*, a pandanus-like bush with broad blade leaves, *lild*, a lightweight, native bamboo, and twine from the bark of *ermall* (hibiscus).

Long blades of *buuk* are selected for thinness, the stems cut out, and the lateral portions of the blade cut into useable sections. These sections,



Kedam el Belau "Kite of Palau," perhaps the most common style of Palauan kite, and (below) a typical kite tail.

Breadfruit Leaf Fishing Kite. Constructed from a reinforced breadfruit tree leaf, this kite was sketched from one such kite found on Tobi Island south of Palau. Similar leaf kites are reported from Ifaluk and some other low islands of the Carolines. The kite was used to carry the cocoon-like web of an orb weaving spider over the reef to catch the sharp-toothed stick fish. Because of the inturned structure of the teeth of this fish, no hook was used in this form of fishing.

three or four inches wide and as long as three feet, are dried and pressed flat prior to being sewn together to form the sail of the kite. The border of the sail (*ertochot*) is strengthened by folding a *buuk* blade over the edge and sewing it in place.

Lengths of *lild*, chosen for extra thinness and long sections, are cut to form the frame holding the *buuk* sail in shape. On the lower side of the kite, facing the operator, the bamboo sections are used in their round form. These sections are tied through the kite to parallel flat strips of bamboo which brace the upper side of the sail. Generally speaking, two such braces are tied diagonally to the kite sail and are termed *seches*. A heavier brace (*buadel*) runs down the center of the sail, parallel to the line of flight, and to this a halter (*lechotel*) is tied for attaching the string when the kite is in flight. The rear of the *buadel*, or center brace, extends several inches beyond the sail for the purpose of inserting the bamboo portion of the kite tail.

The fore portion of the tail of the kite consists of a length of *lild* approximately twice the length of the sail, which is inserted into the *buadel* and

tied in place by a string called the *okulausechil*. This forward section of the tail is called the *usechil*. To the thin end of the *usechil* is tied a length of braided *ermall* fiber which gradually thickens until it terminates in a knot. This after section of the tail varies in length according to the flight characteristics of the kite and is called the *ilamut*.

Twine used in the construction of the kite is, as mentioned, derived from the bark of *ermall*. For the *ilamur*, or tail, lengths of fiber are stripped from the inner surface of the bark, dried and braided without further processing. The twine for binding the frame to the sail, for making the *lechotel* and *okulausechil*, and the string on which the kite is flown (*ukereel*) derive from the same bark but with more elaborate processing. Thus, the strips of bark are soaked in water for about one week to rot the cellular matter around the fiber strings after which the strings are pulled free and bleached in the sun until they are almost white.

For the kite string (*ukereel*) individual fiber strands are rubbed between the palm of the hand and the flat of the thigh to smooth and round the string. The lengths are then tied end-to-end and wound on a tough stake (*otill*) to make up a bundle of string reportedly as long as 2,000 arms spans (*reiongel*) for larger kites. Of course the longer the string the higher and more successful the flight.

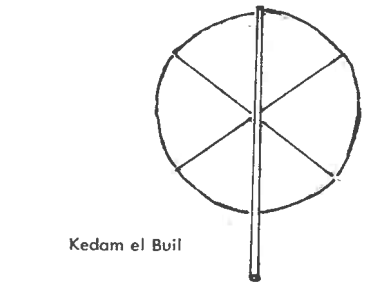
The various bindings on the kite are likewise derived from *ermall* bark but several fiber strands are rubbed and twined together to make a stronger cord.

The diagrams illustrate conventional styles followed in the construction of the Palauan *kedam*. In the initial diagram the *kedam el bekel* is drawn in detail, along with a typical tail. The remaining diagrams outline the shape and frame of four other styles.

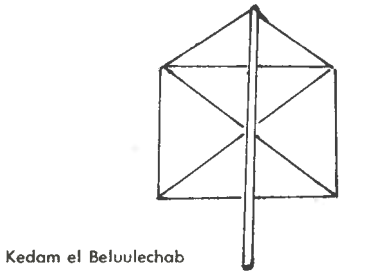
Kedam el Bekel:—the name of this kite might be translated "the kite of the group," *bekel* being a word implying a plurality of people or things. This was the largest of the kites and, in some villages, its construction drew upon the resources of all of the men's clubs combined. In other places, the men's clubs might split into two groups or into *bitaltaoch ma bitaltaoch* (side-estuary) divisions, and each try to construct and fly a *Kedam el Bekel* with greater skill and success. The kites reached from twenty to thirty feet from stem to stern, discounting the tail, and in some locations the first seasonal flying of them was marked by a huge village feast.

Kedam el Belau would seem to have been the most popular or common style of kite constructed by family groups or an individual parent for his son. Typically these kites reached about one arm span in length. The name simply means "kite of Palau," though this may be a fairly recent designation.

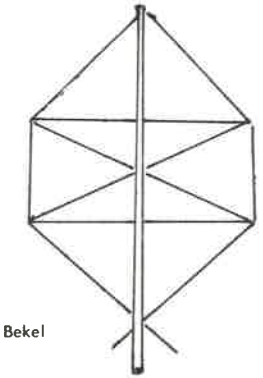
Elleiokl kite style differs little from the *Kedam el Belau* but, as suggested by the name, the sides of the sail were concave curves instead of straight. The term, *elleiokl*, has reference to this incurving of the sides and may also be used of a man or woman with a pleasingly slim waist.



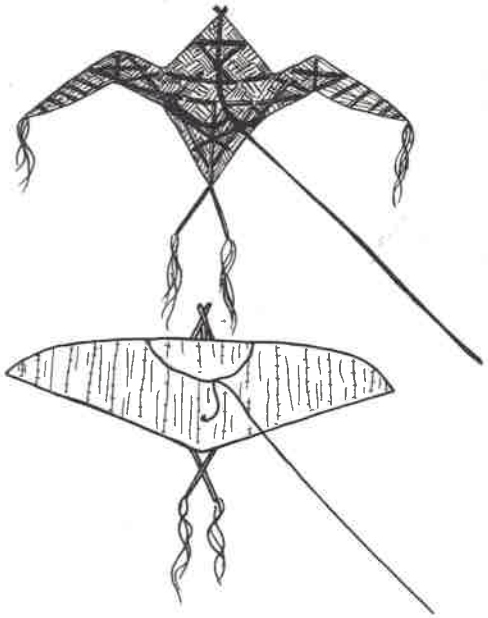
Kedam el Buil



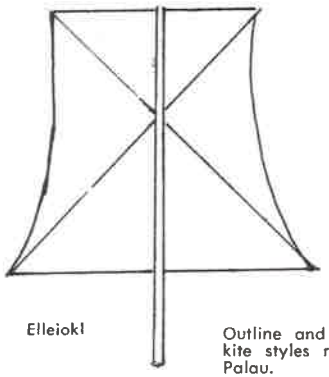
Kedam el Beluulechab



Kedam el Bekel



Bird-shaped kites: above from Yap, below from the Gilbert Islands. In Palau the original kites, as with that created by Mesubed Dingal, are thought to have been bird shaped. Similarly in the Truk District a legend is told of a man who devised a bird-shaped "kite" to search for his wife who had been abducted to Yap from Pulasuk.



Elleiokl

Outline and frame structure of four kite styles reportedly once flown in Palau.

Kedam el Buil, the name can be translated "moon-kite," was, as illustrated, round in shape. Since the edge of the sail was reinforced by a heavy seam of *buuk,* the circular shape was supposedly retained even in a strong wind.

Kedam el Beluulechab derives from a foreign source. According to elder sources a Palauan man named Erangas served as crew on Captain O'Keefe's trading ship, this would be in the 1860's or 1870's, and spent some time in Yap. On returning to Palau, Erangas taught this kite style which he reported to be common on Yap. The term *Beluulechab* is used in Palauan to designate Yap. One of the elders who described the kites illustrated here recalled that, when he was a boy, his father made a kite for him in this style which was about one arm span in length.

It seems reasonable to suppose that individuals and village clubs in Palau experimented with other kite shapes, but these seem to be the shapes that were evident in recent times. Some kite flyers would attach noisemakers, called *besebesechel,* to the edge of their kites. These were made from the core pulp of *sengall* and, when tied to the kite, they would bounce against the sail with a noisy effect that added to the general merriment of kite-flying.

Mesubed Dingal, Patron Deity of Kites

Ngardmau, north on the west coast of Babelthuap, is regarded generally as the "home" of kite flying in Palau. The following narrative concerning Mesubed Dingal perhaps justifies this view.

Long ago in the village of Ngardmau there was a demigod named Mesubed Dingal (meaning, roughly, "Ears that Report" and implying superhuman hearing sense) whose main occupation was fish-trapping. Unlike ordinary persons who made fish traps on the shore, Mesubed Dingal took the relevant materials with him out into the lagoon and, leaving his wife sitting in the canoe above, he would dive with his equipment to the lagoon floor where he would construct and place the fish traps.

One day Mesubed Dingal went as usual with his wife to his favorite fishing grounds, a place in the lagoon called Iuekakou. While he was on the lagoon floor, a fisherman of Ollei, in the employ of Techeocho who was giving a huge feast (*mur*), passed by and spied the woman alone in the canoe. Attracted by the woman, the fisherman forced her into his canoe and absconded with her, thinking to make a gift of her to his master, Techeocho.

When Mesubed Dingal eventually surfaced, he found that his wife had disppeared. Hurrying back to Ngardmau, Mesubed Dingal searched far and wide for a tree called *edebsungel* (craeteva). However, no matter how widely he searched, he could not find a single such tree. Eventually, for another reason entirely, Mesubed Dingal walked around to the rear of his house and there, in his own backyard, was an *edebsungel* of just the right size which he cut down. (From this search comes the Palauan expression: "Without looking far afield, it was cut down out back.") Using this tree, Mesubed Dingal shaped out a *kedam* (frigate bird), and

sent out a request to all the birds of Palau for a few feathers from each. Receiving these, he applied them to his wooden model which finally took on the appearance of a true bird. When the bird was thus fashioned Mesubed Dingal took the stem of a coconut branch and struck hard at the ground beside the model *kedam*. With this blow the bird flew into the air, circled around a while and came back to its maker. With this Mesubed Dingal realized that his vehicle was ready and, giving the coconut leaf stem to another member of his household, he instructed him to strike a blow to the ground and, climbing into the model bird, Mesubed Dingal flew off to look for his wife.

When Mesubed Dingal, in his *kedam*, eventually flew over the village of Ollei he noticed there was a huge gathering of people at one house attending a feast. Curious, he circled nearer and recognized the house to be that of Techeocho. He circled the house repeatedly, somehow suspecting his wife's presence, and eventually flew down to perch on a ti bush (*sisch*) which grew at the edge of the house platform (*odesongel*). The feasting guests admired the huge bird and Techeocho's new wife, formerly of Mesubed Dingal, urged someone to give it food. Food was taken to the bird in a basket and, surprisingly, the bird opened its beak wide and took basket and all. The guest who fed the bird was somewhat taken aback at this rude behavior so the wife, thinking the bird indeed hungry, volunteered to feed it again. Filling a huge basket with various foods for this purpose, she held the whole up to the bird's mouth. The *kedam* opened its beak again and the woman saw Mesubed Dingal staring out at her. And he said: "I'm in here, so prepare to leave and come back to this spot." With that the bird accepted the food and basket in its mouth. So again the woman assembled an even larger basket of food and returned; only this time the bird opened its beak tremendously and ingested not only the basket of food but the woman as well.

To the spectators, the *kedam* had now become an alarmingly greedy and dangerous beast. In an effort to rid themselves of the menace, some of the braver men picked up sticks and beat the ground loudly near the bird. With this, the *kedam* with its passengers was enabled to fly away.

Mesubed Dingal with his wife flew safely back to Ngardmau and landed at a hill called Chuchulalei which subsequently became the place where the people of Ngardmau flew their kites.

Mesubed Dingal left the flying model of the *kedam* on the hill and returned to his home. Some days later, on an evening of the full moon, most of the children of the village went to play at Chuchulalei and, as children will, they climbed around the model bird and even threw stones at it and into its wide mouth. Mesubed Dingal scolded the children for molesting his bird which, as he said, he might again wish to use in flight. In turn, the children became impatient with him and some of them picked up sticks which they beat against the ground as though striking him. With this, of course, the bird began to fly. The final resting place of the model *kedam* was on the shore in front of Ngardmau village at a place called Ngerikedam (Kedam's Mouth) and it is for this reason that the shore near Ngardmau village is shaped like the head of a *kedam*.

Since that time the people of Ngardmau began to fashion kites, at first in the shape of the *kedam* bird, which they would fly upon receiving certain signs from Mesubed Dingal. Before flying these kites, however, the villagers always participated in a huge feast during which food was offered to the patron deity of Palauan kites.

The proper season for flying kites in Palau, generally around January with the arrival of steady east winds, is indicated in Ngardmau to the wife of Beiouch, chief of the village, through a special sign. This sign is a taro corm in the shape of a spiral which the chief's wife discovers in her marshgarden. This spiral conforms, in the image of the finder, to the appearance of string wound upon a stick as used in kite flying. The chief's wife, upon discovering that Mesubed Dingal has provided her with this sign, takes the peculiar corm to Beiouch who in turn announces to the lesser clan chiefs of the village that the sign has been given for the annual season of kite flying.

This announcement initiates the new season: old kites are brought out and repaired, new kites are constructed, and the village prepares for a huge *mur* or village feast. At this feast the most significant dish is *teleketokl kukau*. This consists of a huge vaselike bowl (*oleketokl*), generally the possession of a female village club, upon which are neatly stacked in upright position several decks of taro (*kukau*) corms. According to the recollection of some elders, more ambitious dishes of *teleketokl kukau* reached as high as fifteen or twenty feet and a light bamboo frame was used to support the stack. The shape of the preparation conforms, roughly, to an obelisk and suggests, in this conformation an offering to the gods. The offerings, in this case, would be to Mesubed Dingal and perhaps to the *kedam* bird, and as with similar offerings at other feasts the corms were finally distributed to various divisions of the village amid considerable merriment. The towering obelisks were pushed over and competing divisions in the village would scramble for their share of the spilled corms.

During this feast, the men of the village clubs would launch a single huge *kedam el bekel* amid the cheers and chants of the feasting villagers.

Stories can probably be discovered in each village in Palau concerning some unusual event that occurred during kite flying season. Among the more astounding of these stories is one from Ngardmau on the occasion of the flight of the *kedam el bekel* during the annual feast celebrating the opening of the season.

Upon test flying this particular *kedam el bekel*, the men discovered that it wavered back and forth in the wind, indicating that it needed a longer or heavier tail. So the kite was pulled down and relaunched with a small bunch of drinking coconuts attached to the *ilamur*. With this improvisation, the kite seemed to fly well. However, when the kite was out the full length of the string, perhaps 4,000 arm spans away, the wind failed and it drifted slowly down toward the ground.

The kite descended just over a woman who was working in her taro marsh. It was an exceedingly hot day and the woman's mind was entertaining thoughts of cool drinking coconuts when, glancing up, she found a

vision of her thoughts dangling just over her head. Leaping up, she grasped the coconuts, but just as she did so the wind gusted against the kite and carried her high into the air.

The feasting villagers were cheered to see their kite once more in the sky, but those with keener vision were able to distinguish something that looked disturbingly like a person clinging to the kite's tail. The men were persuaded to pull in the kite and, with considerable excitement, the unexpected visitor was brought to the ground safely.

While a feast and offering to Mesubed Dingal marked the opening of kite flying season annually in Ngardmau, and a few other villages appear to have imitated this practice, i.e., those on Peleliu island, on the whole throughout Palau there was no special opening of the season. According to some sources, the season was anticipated in the impatient efforts of children to fly small kites with the unsteady onset of the east wind, as early as November or December. Older persons, observing these efforts, would one day note the small kites flying steady in the wind and begin to bring out large kites with the village clubs eventually flying their huge *kedam el bekel* before the entire picnicking village audience.

The Lore of Kite Flying

Interestingly, most locations named as *olsebokl el kedam* are flat topped hills which have several broad terraces reaching down to the base on one or more sides. In Koror these terraces are especially evident on Roisekebesang, while most of the other locations named are overgrown with forests planted prior to World War II or have been vastly reshaped through recent landscaping. It seems quite improbable that the terraced hills were originally constructed as *olsebokl el kedam* and more reasonable that these hills, for some original reason, had a clear vantage which exposed many of them to the kite flying east wind. In Peleliu the kite flying places were simply non-wooded elevations on the island, such as the unterraced hillock called Omleblol used by Ngesias hamlet.

Aside from the emergence of a patron deity for the sport in Ngardmau, there developed a small body of lore or sayings associated with kite flying. Probably the following represents only a small sampling of this body.

With respect to the several groups that might construct kites, it is said that the solidarity of the group was revealed in the excellence of flight demonstrated by their kite. For example, if a household group constructed and flew a kite well this indicated that the household was characterized by internal cooperation and goodwill. A kite that flew badly, wavering low over the ground, indicated that the household was fraught with internal strife.

The good kite, or successful flight, in Palau was characterized by a steady climb over the operator's head. Thus, between two kites on the same length of string the best was the one that flew steady, without wavering back and forth, and reached the highest elevation. This was the competitive element. Ideally, the operator should be able to extend the kite to the full length of the string, pound the stake upon which the string was wound (this is the *otill* meaning "hook" or "clasp") into the ground, and relax while the kite sailed high and steady in the wind. One had to be on guard, however, against the jealous fellow-operator who might try to cut the string of the highest kite or slip a split reed over the string in such a way that it would climb out of reach and spin in the wind until the string frayed and broke.

Again, a wavering kite is one that has insufficient tail and this aspect of kite flying is compared to the behavior of a demanding child. For example, giving in to a child that pouts for more food or attention may be referred to as "adding more tail to the kite." Or a person observed to be flying a kite that wavers badly might jokingly be told that he was a "becherecher" child—a child that demanded too much.

Probably several chants and calls were used, along with cheers and general commentaries, during the flying of kites. Most older persons recall the refrain: "Telilililiiii . . . . Telilililiii . . . . ," chanted as the kite was given more string in ascent. The following kite flying song or chant, identified in Palauan as possibly an *oumachas* ("something between a *chesols* and a *kerrekord*"), incorporates this refrain:

Kedamra! Kedamra! Kelemerekureiou el mera Mengeremong ma medal a bai Rurar, Ebomngasch! Bomngasch!	Kite! O Kite! Don't fall before you reach Mengeremong and the front of the bai Ruarar, and go up! Go up!
Bomngasch ra ked el more bedul a chebdui el ngmai a chemelem el buuch ma kebui, Ebomngasch!	Soar up the mountain height to the chebdui tree; take your beetlenut and kebui leaf, and go up; Go up!
Kele merekureiou ea kim a ngarengii el mengchau Imeringel momchies rengii el kim! Kim! Ebomnasch! Bomngasch!	If you falter there's a clam that will bite you fiercely; don't get caught by the clam! Clam! And go up! Go up!

Telililiiiii . . . . . Telililiiii . . . . . .Telililiiii . . . . . Telililiiii . . . . . .

While there are groups, such as the Scouts, that might undertake to revive the sport of kite flying, and model kites of recent construction might be displayed in the Palau Museum, the sport has been on the decline since the latter part of the 1800's. According to elder sources there has been no flying of the large *kedam el bekel* by village clubs since the turn of the century. Smaller kites, constructed and flown by family groups, continued to be used until the First World War, but were rare during the Japanese administration. The Japanese, among whom there are kite enthusiasts, do not appear to have encouraged Palauan kiting, though light paper kites of Japanese style were flown occasionally, and small Japanese kites have been imported by trading companies in recent years for Palauan children. It would seem, though, that the people of Palau, like Mesubed Dingal, need only look in their own yard for the skills and enjoyment of flying well constructed kites.

Columns of basaltic lava resemble closely clustered pipes of an organ.

The polygonal columns vary in size, sometimes being a foot or more across.

by JULIA H. NELSON

Assistant Professor of Education, U.W.M.

Photos by E. R. Nelson

The summer of 1967 may well be remembered in Ireland for its bumper crop of tourists. The season brought hundreds of literary scholars on a pilgrimage to Joyce's Dublin. Streams of Irish-Americans converged on the ould sod to make the acquaintance of their Celtic kin. Antiquarians and fishermen pursued their hobbies in a land still relatively unspoiled by commercialized tourism. Hikers and cyclists from the continent enjoyed the quiet of the gentle, green countryside. To my geologist husband and myself, the quaintness of Dublin and the charm of the countryside were merely cherished bonuses. Our real objective was a stretch of North Atlantic coastline, blackened by basalt, and though visited by relatively few, it is numbered among the world's most spectacular natural phenomena. This lonely stretch of coast was our destination as we set out one early, misty morning last July in a rented car of dubious dependability, the only one available in a season unexpectedly over-run by tourists. We prayed that the car and the capricious Irish sun would support our one-day mission. Both the car and the sun kept us in suspense the day long.

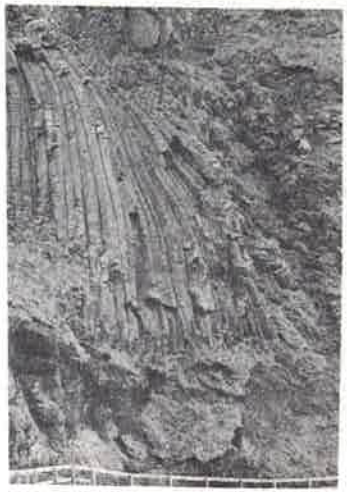
Some columns end in smooth, shallow saucers, holding a cupful of last night's rain.

Other columns present gently bulging surfaces thus completing the lens-like joint.

Straightaway we went, north from the airport at Belfast, through the sleeping village of Ballygally, past roadsigns announcing access to the seven lovely glens of Antrim. With each sign, the temptation to visit the glens grew stronger, but the missing motor of our car-for-the-day and the weak promises of a few rain-free hours spurred us on. We passed through the village of Cushendon and went on to Ballycastle where we stopped for a breakfast of toast and marmalade and hot, strong tea. By the time we reached Bushmills our anxiety, transportation-wise, slacked off, for Bushmills, famous for its Irish whiskey and its trout streams, to us meant welcome proximity to the rocky coast of County Antrim and the Giant's Causeway.

Here the black columns of basaltic lava resemble the closely clustered pipes of a monumental organ, all 40,000 of them rising tier upon tier out of the rolling, thundering surf to the tops of towering cliffs. The columns vary in diameter from a few inches to a foot or more, and in height from a few feet above ground to structures of magnificent proportion. Most of the columns in cross-section are roughly six-sided polygons, but many have five or seven sides. Here and there are a few with five and, even more rarely, eight or nine. At quite regular intervals each column is jointed horizontally. The "road bed" of the causeway is a vast pavement of exposed joint surfaces which turn out to be flat for an inch or two at the periphery, while the center is lenticular. Some of the columns terminate in smooth, shallow saucers, receptacles for a cupful of last night's rain. The rest present the gently bulging contours, the convex surfaces of the lens-like jointures. Why the exposed cleavages alternated between the concave and the convex, the text-books do not say. It is known, however, that the cooling process of the molten basalt accounts for the polygonal cross-sections of the columns as well as for the regular, lenticular joints.

In addition to vertical jointing, the columns also are jointed horizontally, somewhat resembling stacks of children's blocks.

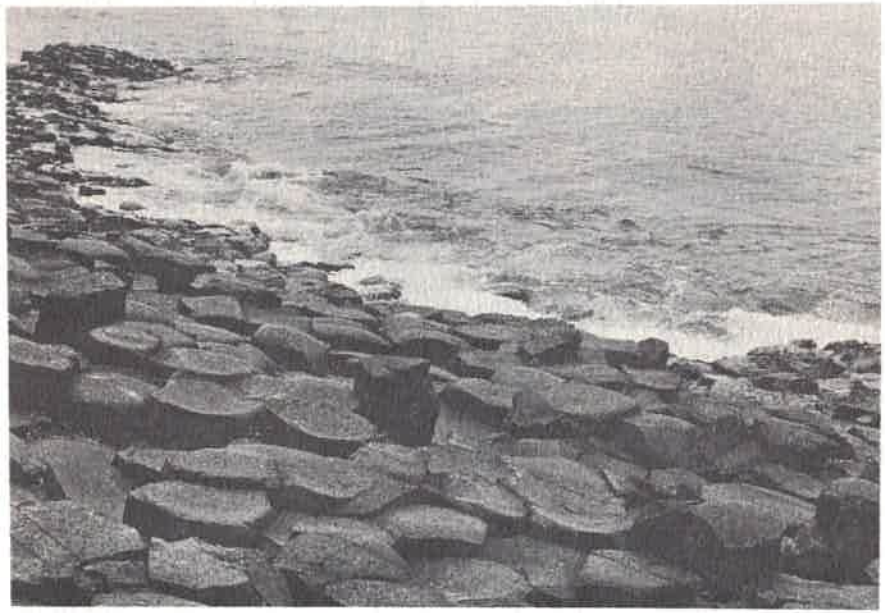


Hot, molten magmas welled up into openings, producing the greatest lava flow known to geologists.

It was on these parting surfaces that we scrambled, stepping from column top to column top. Though we didn't set foot on all 40,000 columns, we did make contact with a great many as we explored the outcrop vertically some hundreds of feet and horizontally some two or three miles along the wild Irish coast. The walking was rough and the sea air brisk and invigorating. The fleeting sun tried our patience as we waited, cameras in hand, for the needed highlights on the otherwise drab, black stone. Now far below us, now right beside us the North Atlantic lashed against the resisting rock ledges. The sea predates the causeway and will survive it. While their union lasts, they make an awesome sight.

The geologic origin of the Giant's Causeway goes back some fifty to sixty millions of years when prehistoric life was relatively placid and the Emerald Isle not yet an isle, but along with Britain it was a part of Europe's western hinterland. The north Irish terrain was then gently rolling, made up of chalk beds resembling the present day Downs of southern England. The idyllic calm was disrupted by the gaping of great fissures which laced the chalk beds. Hot, molten magmas welled up into the openings, flooding a tremendous area from Greenland to Ireland and Scotland and reaching such far away places as Spitzbergen, Iceland and the Faroe Islands. This is the greatest lava flow known to geologists.

A long period of quiet set in over most of the North Atlantic region, now consisting of a lava plateau overlying the chalk beds and possibly bridging the European landmass and the North American continent. In

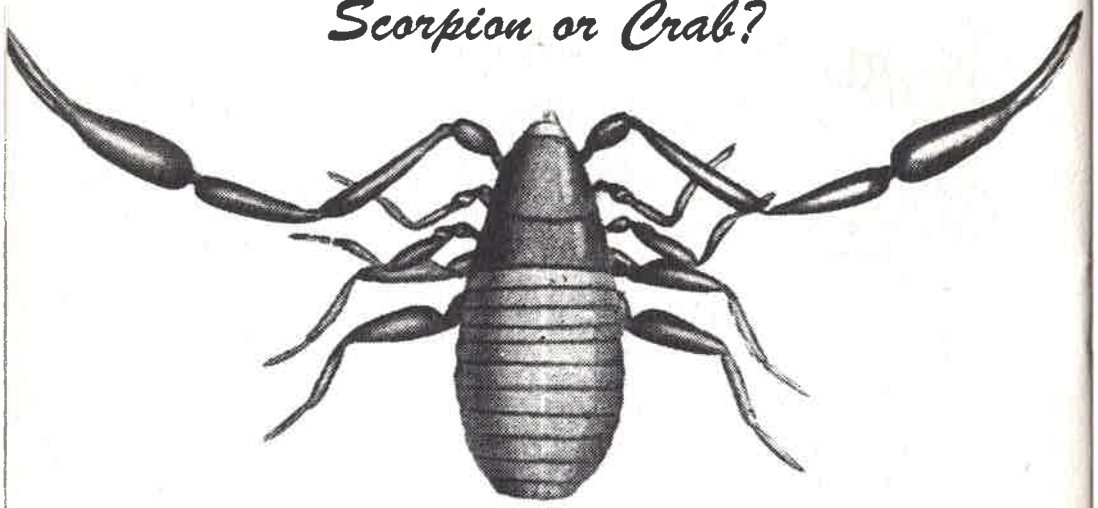


Downwarping of the earth's crust brought these lava beds into contact with the sea.

time the lavas weathered into soil that once again supported plant and animal life. The types of fossil plant remains and the thickness and ruddy color of the soil indicate that a moist, tropical climate prevailed for some twenty million years. And then, once again the lava flows resumed. It is the lava of this latter episode, long since cooled and solidified, that forms the basaltic columns of the Giant's Causeway. Later downwarping of the earth's crust brought these lava beds into contact with the seas, which now incise the coastline with long inlets whose names roll melodiously on the Irish tongue—Mulroy Bay, Lough Swilly and Lough Foyle. Most of the plateau sank beneath sea level and now constitutes the basin of the cold North Atlantic. With the sinking, the seas invaded the valley of Logan, cutting off Ireland from Britain. On the horizon castle-like structures rise out of the sea to give credence to the geologist's claim of the vastness of the lava flow.

We haven't run out of causeway, but the growing murkiness of the sky tells us that we're running out of time. The expanse of the scene, its loneliness and the rhythmic beat of the sea have been conducive to the daydreaming that reconstructed in our mind's eye the events of a remote geologic past. Now, underfoot the basaltic columns become the stairway back to today's reality and the rented car of dubious dependability. Somehow, having spent a few privileged hours in fulfilling our day's mission, we are able to relegate the car and its missing motor to a properly minor role.

Scorpion or Crab?



This was the question asked of me when four such oddities were brought to the Museum's Entomology Division recently. They were found in homes in the Milwaukee area. From their appearance, as shown in the illustration, one could easily mistake these minute eight-legged, pincher bearing animals for either miniature scorpions or crabs. They are called *pseudoscorpions*, and as their name implies, one might consider them "false scorpions." The walking legs (four pair) and modified front pair of food gathering claws are very similar to those found among the scorpions. However they lack the "tail" and "stinger" common to the true scorpions and thus are harmless to man. Due to their round or oval bodies which bear large extended claws that arise at the head area, they resemble miniature crabs. Actually they are close relatives of the scorpions, belonging to the same class, *Arachnida*, which also includes the spiders and ticks. Pseudoscorpions are a mere eighth of an inch in length, with the clawed arms extending again as long. The ones brought in for identification were creamy white in color with reddish-brown appendages and head.

Most pseudoscorpions live in forest debris, under the loose bark of trees and similar places, but one particular species, *Chelifer cancroides*, is quite cosmopolitan in its habits, being associated with man in his dwellings. At times it may be seen walking about the walls, especially in kitchens and bathrooms. However, because of its secretive habits, small size and comparative rarity, this small animal is seldom seen. When disturbed it can travel quite fast, rapidly jerking either frontwards, backwards or sideways. Some species frequently hitch rides by attaching themselves to large insects or birds, and are thus transported to other areas. Although it presents a ferocious appearance, the pseudoscorpion is in reality man's friend, roaming about the home searching for and preying upon small insects and mites.

JAMES LAWTON, *Assistant Curator of Entomology*

THE LIFE OF THE BURLINGS IN AFRICA 1888-1893

by IDELLA BURLING

Mrs. Beverly Burdette Burling, born Idella Potthast, was married to the younger of the two Burling boys. He grew up to become the Dean of the Engineering School at Decatur. The older Burling boy is a geologist in California. Mrs. Burling still hears from the girl Florinda who is now 88 years old and still lives in Luanda.

Romance and adventure comes to people in strange ways. Father Burling, whose given names were Lancaster Coventry, was born in Pennsylvania and received his first call as a Methodist circuit rider in Iowa, preaching at three small towns, the largest of which was Anita where he lived. Bishop Taylor who occasionally preached on Father's circuit was looking for a mechanically inclined preacher to serve at an African mission. He induced Father and Mother Burlin, (born Terry Demorest) to go to Luanda, then called St Paul de Loanda, with their two sons, Lancaster Demorest and Beverly Burdette (five and four years old respectively), to preach the gospel on a self-supporting basis. The Bishop said, "A man could make a living there and preach on week-ends."

Father Burling, a very active man, grew restless on the long trip to Luanda. Irritated by the inactivity and confinement of ocean travel, he created great excitement one day by diving over the side of the ship into the ocean and swimming under the boat, coming up on the opposite side. The shocked captain of the ship put an end to this sport, saying, "These waters are infested by sharks."

On arriving at the mouth of the Congo River, the ship rammed into a sand bar. In order to save the cargo which consisted of a great deal of rum, the Burling household goods were dumped overboard to lighten the load. It was here that the first contact with African natives occurred. Tribal chiefs would row out to the ship in dugout canoes loaded with slaves to be sold for the rum which the natives called "fire-water."

From this point of the journey onward, the family was able to go ashore at various stops by mail boat, for these boats met the ship at every port. At one place along the African coast, Father went ashore with the mail boat and walked up the beach among the trees. Suddenly he was chased by a small elephant. The mail men missed Father and found him dodging from one tree to another, not knowing how he would ever get back to the boat. Someone produced a few bananas and distracted the elephant who made for the food. It seems it was a tame one who spent his time around the mail house. Father was indeed very grateful for his rescue.

Upon reaching Luanda, Father and the family met two other ministers, the Reverends Withey and Dodson, who were located there while studying the local Kimbunde language with the intention of translating the

AMERICAN INDIAN TRIBAL NAMES

by ROBERT E. RITZENTHALER
Curator of Anthropology

When Columbus arrived in the New World, an estimated one millon Indians representing some 300 different tribes were living in North America. How these tribes came to be known by the modern names by which we refer to them is the subject of our concern. We shall explore the variety of ways in which tribal names were acquired rather than attempt to account for the origin of each name. For our purposes a tribe may be defined as a group of people living together as a political and/or linguistic unit, and identifying themselves as a distinct group.

As the early white explorers, missionaries, and traders encountered the various tribes, they found they not only had names for themselves, but they had additional names by which they were referred to by neighboring tribes. The white man selected one name or the other by which to call them, or he sometimes invented a new name. Thus, through historical times, the tribes often acquired names not used by themselves but by which they are known to the world.

In some cases the tribe's own name for their people has persisted, like the *Pomo* of California, and the *Haida* and *Tlingit* of British Columbia. These names can be translated as "the people," "our people," or simply "people," and many other tribal names can be thus translated. In quite a few other cases, to the term "people" was added a descriptive element. Examples of these are *Potawatomi*," people of the place of the fire"; *Papago*, "bean people"; *Hopi*, "the peaceful people"; *Sauk*, "people of the yellow earth"; and *Menomini*, "wild rice people."

In some instances tribes are known not by their own name for themselves but by names applied to them by neighboring tribes. The *Sioux* (Dakota) were called "Nadowisiw" meaning "snake" and thus "enemy" by their traditional enemies, the Chippewa, and Sioux is a French corruption of this term. *Arapaho* was probably adapted from the Pawnee word for trader. The name *Cheyenne* was applied to them by the neighboring Sioux in whose language the term meant "people of alien speech." The *Ottawa* (traders) were named by a neighboring Algonkin tribe because of their propensity for intertribal trade. The *Maricopa* were so called by the Pima. Each of these tribes, of course, has its own and different name for themselves.

The white man has also been instrumental in bestowing tribal names. The English, French, and Spanish origins of such names are a reflection of the impact of these colonists on the American Indian. The English

contributed such names as *Delaware* applied to a group living along the Delaware River (named after Lord De la Warr) whose name for themselves was Lenape. The British named the *Creeks* for the many streams in their homeland of Alabama and Georgia.

Names in English, but not necessarily given by the British, have come into common currency. The *Flathead* tribe of Montana seems to have been named by Canadian voyageurs in referring to the flattened heads of the Northwest Coast slaves found among them, although the Flatheads never did deform the skull. *Crow* is a translation of the Indian term for themselves, "Absaroke," meaning crow or bird people. The origin of *Blackfoot* is disputed, but it is commonly believed to refer to their black moccasins discolored by prairie fires.

The French applied the suffix "ois" to an Algonkian word meaning "real adders" to refer to the *Iroquois*. The French applied the name *Nez Perces*, (pierced noses) to a group in Idaho, although there is no evidence that this tribe practised nose piercing. *Gros Ventre* (big bellies) was given by the French to a tribe now living in North Dakota, and *Montagnais* (mountaineers) to a tribe in eastern Canada. *Osage* is a French corruption of "Wazhazhe" the tribe's own name for themselves.

Spanish colonists and missionaries were active in the Southwest and California during the sixteenth and seventeenth centuries and left behind a legacy of tribal names. The Pueblo peoples along the Rio Grande River in New Mexico are especially rich in Spanish names, some after saints: *San Ildefonso, Santa Clara, Santa Ana,* and *Santo Domingo*. Other Spanish names are *Isleta, Laguna,* and *Sandia*. Tribes in Southern California with Spanish names include the *Luiseños, Gabrieleños, Serraños,* and *Diegueños*. These Indians were originally members of tribes grouped around various missions. They were referred to collectively, for example, as *Diegueños* (after the first mission in California, San Diego) or *Gabrieleños*, (for the San Gabriel mission near Los Angeles).

Indian derived names were also used by the Spanish. The term *Apache* seems to be derived from a Zuni word for enemy referring to the Navaho. The early Spanish called the latter "Apache de Navahu" (*Navahu* is a Tewa Indian term referring to a former Tewa village), and called the Apache proper by their band name, for example, *Apache de Jicarilla* and *Apache de Mescaleros*.

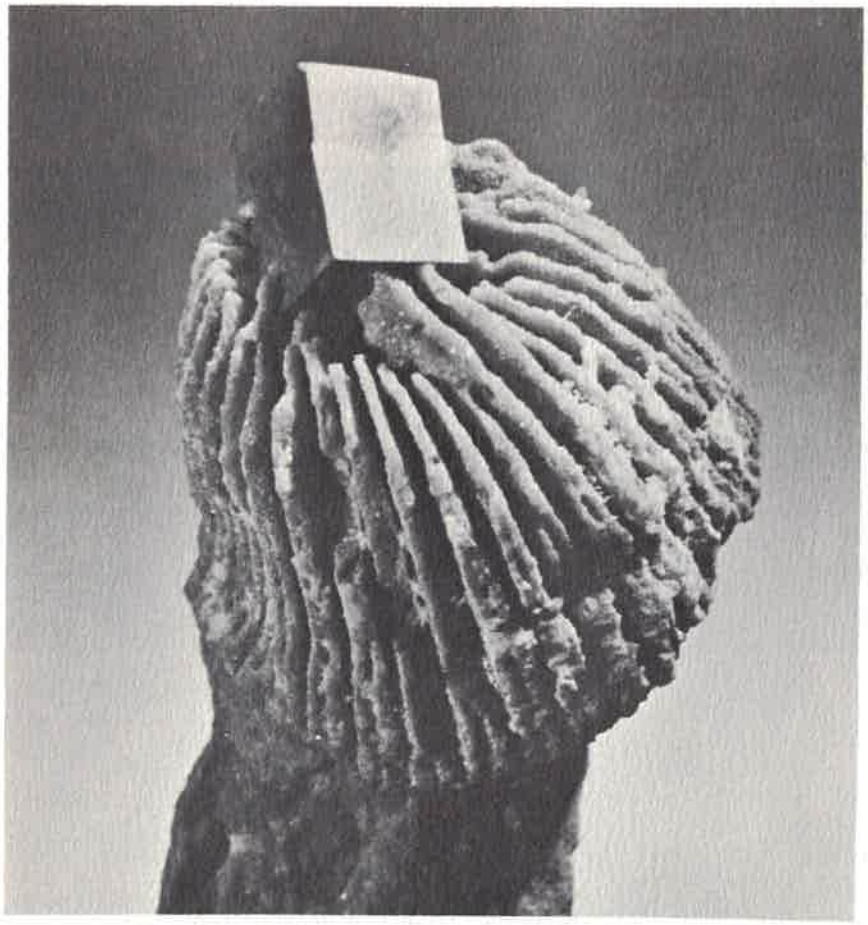
There is a variety of other ways by which a tribe received its present name. When asked by a French party who they were the Indians responded with the name of their clan . . . *Fox*, and so they are called today, although their own term for themselves means "red earth people." The Seminole broke away from the Creek ultimately to settle in Florida. By about 1775 they began to be known as *Seminole* the Creek term for "runaways."

While the derivations of most Indian tribal names have been determined there are some whose origin and meaning are unknown—for example the *Shoshoni* and the *Dogrib*, or disputed—as in the case of *Chippewa* and *Blackfoot*.

That such different sounding tribal names are to be found not only reflects the variety of different sounding Indian languages used by the American Indian, but also the impact of the various languages used by the Europeans.

It should be noted that even today many tribes have two names: one by which they are known to the outside world and their official name in dealing with the Federal Government, and a second name used among themselves when they are conducting their own affairs in their own language.

The Indian today is reconciled to the fact that very name "Indian" is misnomer resulting from Columbus' belief that he had found India and therefore called the American natives "Indios."



GEOLOGIC ODDBALL

I'm a tag-along rock hound. When the picking of marine fossils is good, I'm most enthusiastic with chisel and rock hammer. But as anyone in the Wisconsin Geological Society could tell you, when my enthusiasm wanes, I pick up my binoculars and probe the area for the local avifauna.

So it is not unusual for my wife to hand me a good sized boulder when my interest is subsiding, with a challenge to see what I can extract from it that might be worthwhile for our collection.

It was while at a Schullsberg, Wisconsin quarry a few years back that a chunk of limestone with several horn corals visible was placed in my care to see how many "good" ones I could extract. I settled down on a "comfortable" heap of rocks and started chipping at the limestone with fair enthusiasm as I could see there might be some reward.

As happens in any form of science, an oddball shows up once in a while. Usually for me excitement rises when I see a Cerulian Warbler or one of my banded birds returns after seven years. But what I extracted from that drab gray piece of stone that day, I must admit, gave me as much pleasure as a rare bird sighting or a report on one of my banded birds from some remote part of the world.

Pictured is what I found: a galena cube resting majestically atop a horn coral fossil!

Of course, it sounds like the credit for the find is mine, but in retrospect it would seem that an alert wife noticed a bit of boredom creeping upon her husband. The chunk of rock proved to be an elixir.

* * * * * *

Now how did this cube of galena unite with this horn coral specimen? It is my understanding that the fossil and the galena cube were formed in two different geological times, but Joseph Emielity, Acting Curator of Geology, can explain it better than I:

The horn coral is an Ordovician fossil having the scientific identification of *Streptelasma corniculum* Hall and is commonly found in Platteville dolomite of southwestern Wisconsin. The Galena cube crystal that rests on top of the coral is a lead sulfide mineral having the chemical elements of metallic lead and nonmetallic sulfur, and the mineral, Galena, is an important source for the metal lead.

The living coral animal of the fossil once lived on the bottom of a large, inland sea that covered much of Wisconsin some 450 million years ago. The calcareous, conical-shaped skeletal structure of the living coral animal was later covered by limy muds which finally accumulated to thicknesses of over thousands of feet. The seas retreated from Wisconsin sometime during the Mississippian period about 280 million years ago, and the great thicknesses of limy muds had changed to hundreds of feet of limestones and shales.

As the rock strata in Wisconsin began to be cut by erosive powers of rivers and wind, in southwestern Wisconsin there were diastrophic forces that brought earthquake tremors and hydrothermal mineral fluids to flow up from the depths of the earth. The hot mineral fluid seeped up slowly through the fractures in the limestone and shale strata and deposited respective mineral materials, such as chalcopyrite, sphalerite and galena with other associated minerals in cracks, cavities and porosity of the rock strata.

In a small cavity occupied in a limestone, not too far from the surface, a small cube crystal of galena was deposited on a horn coral fossil. This mineral crystal may have been formed some time before the close of the Paleozoic era—possibly 225 million years ago.

by Jos. G. Emielity & W. N. MacBriar

F.O.M. FULLER BOWL AWARD

At the annual Christmas party, the 1968 Fuller Award was presented to C. Keith Gebhardt, Chief Artist of the Museum and Robert G. Frankowiak, Artist in the Preparation Division. The Award was established in 1964 by the Friends of the Museum and named for its first recipient, Albert M. Fuller, former Assistant Director of the Museum. It consists of a silver bowl which is a perpetual trophy, and a check for $100. It is presented each year in recognition of an outstanding contribution to the progress of the Museum. This is the first time the Award was presented to two individuals.

DONATION

A rare silk scroll, 12 feet long and 11 inches wide, conferring the "third rank of nobility" on Ho K'un by the Chinese Manchu Emperor Ch'ien Lung in 1770, was recently donated to the Milwaukee Public Museum by an anonymous Chicago collector. It is believed to be the only one of its kind in this country—unusual because the calligraphy of the original decree is woven in the fabric instead of painted on. Later decrees are added, painted between the figures of the weaving, and are marked with seals of Emperors Chia Ching, 1799, Hsien Feng, 1851, and Kuang Hsu, 1882. The decrees tell of the fortunes of Ho K'um who became governor of Manchuria and prime minister of China. He was beheaded by Emperor Chia Ching who found him guilty of embezzlement. The later posthumous decrees concern apologies for his crime and reinstatement of his honor, probably sued for by his family. The scroll is appraised at about $25,000.

BOOK REVIEW

This fictionalized juvenile version of Black Hawk's life carries the reader from one episode to another in the experiences of the kindly warrior, beginning as a small boy and ending when the death song is ready to issue from his lips. While casually referred to, the involvement of the hero in the Fort Dearborn massacre, not to mention the other recorded examples of savage butchery by the Sauks in the Black Hawk War, are so simply glossed over that the uninformed reader might be led to wonder why the militia and army which ultimately pursued and nearly annihilated Black Hawk's band overreacted so completely.

There is little doubt but that Black Hawk and his people did not get a fair deal, but the concept of real property hardly extended to Indians who, over generations, wandered from place to place, in this case from Canada to western Illinois. To be told to get out and to stay out obviously was enough to cause trouble, but Black Hawk did more than refuse. The Black Hawk War resulted.

The book, covering as it does, the misfortunes of Black Hawk, develops well the points on the kindly side of his character as told by him in his autobiography. For the juvenile reader it is probably better to show this than the more savage side of his nature. At a later time in life the reader may be able to absorb the otherwise forgotten facts, unless there has been too much emasculation of history to make digestible pap out of fact.

PROUD WARRIOR, The Story of Black Hawk, by Marion Lawson; Hawthorn Books, Inc. New York, 1968; $3.95.

ELDON G. WOLFF