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# NATURAL HISTORY

THE MAGAZINE OF THE  
AMERICAN MUSEUM OF NATURAL HISTORY

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*January-May*

1943

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*January*

# NATURAL HISTORY

1943

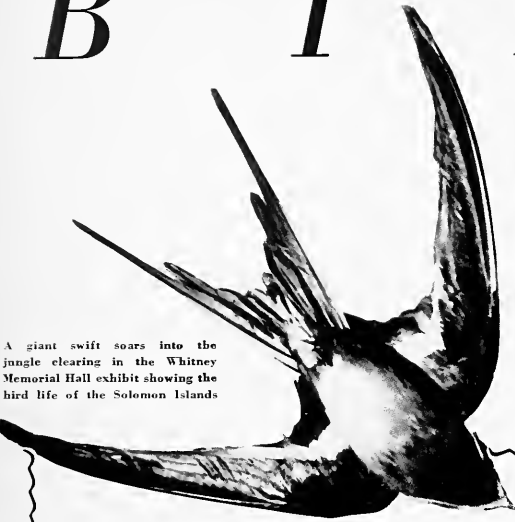
*Seals · Birds of New Caledonia · Insects in Winter*

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# B I R D

## BOOKS PICTURES CARDS

A giant swift soars into the jungle clearing in the Whitney Memorial Hall exhibit showing the bird life of the Solomon Islands



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## The BOOK SHOP

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# LETTERS

SIRS:

. . . I want to add that I think your magazine is the most interesting one of its kind.

I was introduced to it by a very dear friend, and several teachers at school are very much interested in it. The covers are always a great thrill to us, and some day I plan to frame them.

Your articles on archaeology and natives of Africa, the Solomons, etc., hold special interest for me.

Keep up the good work!

DOROTHY A. HILDRETH,

Colorado Springs, Colo.

[Separate cover designs from NATURAL HISTORY, suitable for framing, are available at 5¢ each, plus 5¢ additional for postage on any total order up to ten.—ED.]

\* \* \*

SIRS:

Glancing through the June, 1940, issue of NATURAL HISTORY, I have come across the article on Chichen Itza. Please accept my belated congratulations for these superb photographs. RENÉ DANIELS, New York, N. Y.

\* \* \*

SIRS:

Kindly let me take the opportunity of congratulating you upon the very high standard of printing maintained in NATURAL HISTORY Magazine. I have felt many times that most readers express complimentary remarks upon the interesting features of the magazine, overlooking the exceptionally fine printing which has always been maintained and which is difficult because of the varied demands occasioned by various types of photographs. P. C. HOLDEN, Boston, Mass.

\* \* \*

SIRS:

. . . I have read a copy or two of this magazine and like it very much.

Please start my subscription with the January, 1943, issue, as I bind the magazines into a book at the end of the year and wish to have a complete year's subscription. ALBERT C. LOOMIS, Silver Spring, Md.

\* \* \*

SIRS:

Your current Solomon Islands article recalls that long ago our family was instrumental in sending one of the first missionaries to the then cannibalistic folk there. On one furlough he recounted the dietary idiosyncrasies of an old Solomons

chieftain. The latter declared he much preferred the flesh of natives to that of whites. "Sailors taste too much of tobacco," he said. "The only missionary I ever ate had too salty a flavor. . . ."

One wishes every American voter could become a reader of your magazine. It would make our citizenry biologically-minded. This eventually would be reflected in wiser legislation.

C. M. GOETHE.

Sacramento, Calif.

\* \* \*

SIRS:

. . . May I take this opportunity to say that I consider your magazine one of the best available today, both as regards reader interest and in its general make-up.

MATHEW F. MCNERNY.

Rochester, N. Y.

\* \* \*

SIRS:

My name is John Ely Burchard, Jr. I am nearly eleven years of age and have been a member of the American Museum of Natural History for almost three years. So far, my principal interests have been insects and reptiles. But once in a while some other interesting animal comes our way.

We live in Princeton, New Jersey, and some weeks ago my father brought home from the fields a mammal which he had at first thought to be a mole and later thought to be some strange form of field mouse. Thanks to the article in NATURAL HISTORY Magazine, I was able to identify it readily as a pigmy short-tailed shrew. The article was in the issue for May, 1942 and was by Mr. George Goodwin. . . .

JOHN ELY BURCHARD, JR.

Princeton, N. J.

\* \* \*

SIRS:

I have been very much interested in the article, "Design for Swimming," in the October issue and have used it effectively in biology classes.

I wish there might be other articles of the same type, especially on aviation in relation to birds.

This magazine is one of the greatest helps available to the biology teacher. . . .

Do you have sound or silent movies for use outside of New York City?

J. ELIZABETH JACKS.

Lower Merion Senior High School, Ardmore, Pa.

The American Museum of Natural History maintains a large film circu-

lating library, consisting of approximately 650 sound and 200 silent subjects on travel, natural history, science, and related subjects. These films may be borrowed from the Museum by schools and other organizations for a nominal service charge. For further information regarding the films available and the service charges, write directly to:

Film Division, The American Museum of Natural History, Central Park West at 79th Street, New York, N. Y.

\* \* \*

SIRS:

. . . All of Frederick Pough's Strategic Mineral articles are on exhibit here. It is the best set anybody has written, so far as I know.

A. C. BURRILL,

Curator, Missouri Resources Museum, Jefferson City, Mo.

\* \* \*

SIRS:

It has been some time since I have written you of my enthusiasm and loyal support for NATURAL HISTORY Magazine of the American Museum of Natural History.

The subjects treated in the issues are becoming more varied and vitally interesting as the months pass. The illustrations are superb and the color ensemble in the texts beautifully rendered, which is no doubt to the credit of Art and Production under the guidance of Frederick L. Hahn.

The articles which have particularly appealed to me for some time are those entitled STRATEGIC METALS by Frederick H. Pough and those describing our natural wonders, such as "Rainbows of Rock—Our Natural Bridges" in the October issue, and "Devil's Tower" in the November number, by H. E. Vokes. I sincerely hope that Doctor Vokes will continue this most valuable and entertaining series descriptive of our scenic attractions here at home. Our people should know more about them, for they teach us to appreciate this great United States the more.

Your LETTERS column and BOOK REVIEWS are always interesting.

Wishing NATURAL HISTORY greater continued success now and in the future. . . .

E. B. POWERS.

Pacific Beach, Calif.

\* \* \*

SIRS:

. . . I should prefer to have my magazine sent to my home as usual. I keep every issue and I don't think any magazine will be worth keeping after an army of fellows get through with it. I intend to have all my NATURAL HISTORY Magazines bound, as they are certainly worth it. . . .

RUSSELL WESTER.

Nutley, N. J.

**NOTICE**—Readers are encouraged to submit their own photographs of natural history subjects. Those selected for publication on this page will be paid for at \$1.00 each, with full credit to the photographer. Return postage must be included.

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# NATURAL HISTORY

*The Magazine of the American Museum of Natural History*

FREDERICK TRUBEE DAVISON, President

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▲ IT is a lucky season when several of these small ships are not destroyed by storm and ice, often with the entire crew. Note the barrel on the foremast, from which the lookout scans the ice for seals or open water. With the invasion of Norway, many of the ships turned to patrol duty and mine sweeping for the United Nations

▲ SEALING SHIPS meeting at the edge of the ice for an exchange of news and plans. The author's work with the fleet for several seasons was part of a Norwegian survey to study the life of seals in relation to conservation problems

# WITH THE NORWEGIAN SEALERS

ALL PHOTOGRAPHS BY THE AUTHOR

Adventures while studying the ways of Arctic seals on the floating ice, where myriads of them gather annually for breeding: a personal account of life with the men who follow one of the sea's most perilous occupations

By PER HÖST

ONE of the most interesting experiences a naturalist can have is to visit a new region where there are thousands of wild animals. This is especially true in the Arctic, on the border of those realms where the ice king reigns supreme and where one does not expect to find much life.

The surprise is almost overwhelming when the dreary and barren background gives way to great colonies of mammals and birds. The northern shores where hundreds of thousands of birds congregate each summer and the immense herds of reindeer on the tundra present a spectacle not easily forgotten. But even these cannot compare with the fantastic adventure of finding one of the great breeding places of the Arctic seals. For there you will see seals as far as the eye can reach, a teeming life in the midst of the Arctic vastness.

The harp seal, which is by far the most numerous and valuable of the





Arctic seals, migrates thousands of miles each year to and from the breeding places where it gives birth to its young on the floating ice. These seals have been of great economic importance for years, but comparatively little has been known about their migrations, which are among the most interesting examples in the animal kingdom. Information of this sort is obviously necessary for the formation of sensible laws governing hunting. With modern methods, seal hunting can easily be overdone, endangering the herds. Unregulated and reckless exploitation of the Arctic has already threatened the existence of important animals. One sad chapter is Arctic whaling. Another example is the walrus, which was exterminated over large areas and is now found only in sections difficult for hunters to reach.

Some years ago in order to prevent a decline of the Norwegian seal industry, the Norwegian Government undertook a broad investigation of the harp seal. The committee commis-

sioned me to lead expeditions for the purpose of studying the ways of the Arctic seals, which I did for several seasons from 1931 to 1938.

Only three breeding places of the harp seals are known: one in the drift ice off Newfoundland, another between Greenland and Spitsbergen, and a third at the mouth of the White Sea north of Europe. The latter two especially have figured in the history of Norwegian sealing. Consequently our observations were chiefly in these areas.

One can easily imagine a more comfortable job for a naturalist than living for months in the Arctic but hardly a more thrilling and adventurous one. We usually started on these expeditions in the last part of February. Heavily loaded with several months' provisions and fuel, the little sealing vessel that carried us north through blizzards and polar fog had many a hard time on its way. It is certainly not roomy on board the Norwegian sealers. Few of them are more than

200 tons. They are strongly built to withstand the pressure of the ice, but even so they are like toys when the pack ice loosens all its destructive forces.

Among peacetime activities sealing in the Arctic is possibly the most perilous of all occupations at sea. From the moment the ship goes into the pack ice the sealer gambles with life, and it is a matter of necessity for him to take great risks if he wants to get a load. Hardly a season goes by without several of the ships disappearing as victims of storm and ice, often with loss of the entire crew.

On one of our trips aboard the "Polarbjorn" we were far out in the drift ice when we happened upon the crews of two shipwrecked vessels. They had been walking over the pack ice for several days. So we had to make room in our already crowded ship for more than double the normal crew. In my little laboratory, with a floor space 6 by 8 feet, three men had to sleep for several weeks.



**SMALL SEALER** crushed by the ice and abandoned by her crew. Several of the men take a last look at their ship before starting on a long journey over the pack ice

▲ **PUSHING** through the drift ice. To get the ship through a jam, some of the crew have had to scramble over the ice and push the floes aside with long poles. Sometimes dynamite has to be used to blast openings in the ice



When looking back on these trips, however, most of the hardships have left little impression on the memory. Much of what I saw on the great breeding places of the seals, however, stands out so, that I shall never forget. Especially is this true of my first meeting with the harp seals.

It was the beginning of March, where the White Sea joins the Arctic Ocean. For many days our little boat had worked its way steadily through the pack ice. The skipper had spent all his time in the crow's nest, scrutinizing every inch of ice for miles around with his binoculars. The atmosphere aboard was nervously expectant—where were the seals? All we could see was ice, lifeless and vast.

It is impossible to tell beforehand just where the seals will gather. Much time may be lost searching for the herds, and you may be too late for a good catch. Even in the Arctic there is competition. Every year ships return without a single pelt, while their rivals throw fuel overboard in order to store the sealskins.

On board the "Polarbjorn" we were optimists. The best part of the season was yet ahead. Ice conditions were favorable, and the ship behaved well in the many openings in the heavy ice.

➤ OLD MALE HARP SEALS are sometimes found in herds by themselves. They are usually shy and are hunted with rifles. The man in the background wears white to be able to approach the seals unseen

◀ WHEN THE ICE is too loose for the men to go on foot, they row and push the boats through in search of seals

which are white like the ice upon which they are born. But from the sound we knew that there were thousands of them around the ship. The cry of a single baby seal can be heard several hundred feet, and where thousands of them are gathered a powerful cry fills the air. As the ship advanced through the openings in the ice, the chorus swelled. They were calling for their mothers, who had run away. The whole scene was fantastic, as if we were on a strange globe.

At dawn I was over the side and out on the ice. There were seals everywhere. On a single floe about 1500 feet in diameter I estimated a herd of more than a thousand young. The mothers were difficult to approach and took to the water. But the beautiful snow white young stayed helplessly on the ice, so that it was easy to mark as many as I wanted in order to get information about their migrations. This was done by fixing metal tags to their short tails. The sealers were to spare the baby seals that were marked, but unfortunately in the beginning many were killed before the marking was noticed. To prevent this, I painted a big red cross on their backs. Of course this would last only a few days, but it served the purpose, protecting the seals until they were old enough to take to the water.

The mother seals, however, did not like to find their babies decorated in this way. When they came up from

A moonlit, starry night reigned over the polar ice, and the skies were trembling with a blue-white aurora borealis. Every detail could be seen in the fantastic ice formations.

Suddenly one of the crew came running forward. He had heard the cry of a seal. We listened, and before long we heard new sounds from out there. They were growing in strength and sounded like the whimpering of babies. The sound carried far on the frozen night air.

Soon we could see dark shapes moving swiftly over the ice. They were the mother seals who had been up to feed the young and were now leaving them, frightened by the vessel. But we were as yet unable to see the young,



the water and noticed the strange appearance of their young, they did not even recognize them at first. When a young seal, full of confidence, came crawling towards its mother, it was pushed away. But at intervals the mother would come up again, look the young over, and sniff at it. Finally she seemed to understand, and the normal relation was reestablished. Later I sometimes found the young quite icy on their backs, obviously because the mother had tried to remove the paint by licking.

### *Adrift*

This first morning I walked in the opposite direction from where the crew was working to study the seals undisturbed. I became so absorbed in marking the young that I did not pay attention to the drift of the ice. When finally my stomach told me it must be dinner time, I found that the current had carried me several miles away from the ship and from the men on the ice. Those on board seemed aware of my situation and were heading the ship in my direction. But it did not make much progress, as there was a bad ice jam in the way. So I had to accept the fact that it would be a long walk back, and—unexperienced as I was—it held plenty of surprises in store for me.

In the morning, solid ice had covered the whole expanse. Now great openings had come, caused by the current. It was a problem to find places to get across. Often I had to jump from one small floe to another, every

time risking a cold plunge. Once I was stranded for more than an hour on a floating piece that could hardly carry my weight, drifting slowly across what appeared almost like a lake in the moving pack, trying to paddle with my freezing hands to influence my course towards a promising area of more solid ice.

In a couple of hours most of the openings had closed and things would have been easier except that the short Arctic day was almost ended. I toiled as best I could toward the ship, against the gathering darkness, wading knee-deep through snowdrifts and climbing across huge barriers of ice blocks that had been piled up by the pressure and frozen together. When it was almost dark a violent movement started. Everywhere around me the ice was striving and cracking, giving all sorts of queer sounds. I was in the middle of a big floe when it suddenly started to give under the pressure of the ice packed against it on all sides. With a loud roar it cracked in several places, while many tons of ice fell in from the sides with a thundering noise. Then it was necessary to keep one's presence of mind and a steady foot while getting across to another floe on a quick run.

How the many clumsy and helpless baby seals, lying about on the open floes or in crevices in the piled-up ice, could avoid being caught in the grinding and killed, was a riddle to me. Every now and then I would stumble across one in the darkness, and what I thought to be a heap of snow would

wriggle between my legs—a bundle of soft fur and terror-stricken life. Its wailing cry would start a dozen or more invisible companions to calling from out of the darkness. On later occasions I found plenty of evidence that numerous young seals are killed by the movement of the ice.

Through the darkness now came the sound of the ship's siren. Repeated at intervals, this enabled me to keep my direction, which was fortunate, for it had started snowing and I could only fumble ahead. I had been walking like that for several hours when suddenly through the silence I heard the sound of a human voice. I was only a few hundred yards from the side of the ship.

After this I knew it was a good policy to keep reasonably close to the crew. We usually kept in groups of three or four as a guarantee against serious accidents in crossing difficult openings in the ice. Every day there were cases of falling through the ice. And I remember one day when not a single man of the ice-crew had been able to avoid an involuntary bath. I went in with my motion picture camera and had to sit up all night taking it apart and cleaning sea water from every little piece of metal. However, one rarely catches cold in the drift ice, and our unpremeditated swimming trips had no serious consequences.

Our expeditions started out from Norway early enough for us to see big schools of seals far out at sea, all swimming in the same direction

▼ A HALF MILE of steel wire connects these heaps of seal skins with the ship, on which a steam winch hauls the pelts across the intervening ice and snow



toward the drift ice. They could easily overtake our ship, which made 8 or 9 miles. The seals go far into the pack ice before settling down, because they want solid ice, where the young will not be washed off by storms or drifted into the open ocean.

The female seals arrive first, the males appearing in force only after the young have been born. The expectant seals place themselves about 20 to 30 feet apart and in positions which give them easy access to the water. When the water is freezing between the floes, they make holes in the ice so they can readily get in and out, both before the young are born and as long as they are suckling. They start these holes when the ice is still thin and keep them open while it thickens. I have found such bobbing holes in ice that is five feet thick. These holes are very common in the White Sea, where the floes may be a mile or more in diameter. But I have never found them between Spitsbergen and Greenland, probably because the ice there is more cut up.

The seal reproduces at a slow rate, each female producing only a single pup each year. Twin births are very rare; I have found no sure case in any of the breeding grounds I have studied.

Newborn seals are among the cutest creatures imaginable. The pelt has long, soft, yellow-white hair, which in a few days bleaches to snowy white, making it blend perfectly with the snow and ice around it. In striking contrast to the white pelt are the dark snout and the large, dark eyes.

One might think that so skillful a swimmer as the seal would be at home in the water from birth. Such is not the case. The chances are that the young harp seal would drown if it were to stay in the water for half an hour or more. Consequently, one never sees a young seal going voluntarily into the water. It keeps afloat if by accident it falls in, but cannot manage well during the first three to four weeks of its life.

During storms the young are sometimes washed off the ice and are drifted out into the open ocean. Several times I have seen the mother come to the rescue, and it is pathetic to see the care with which she handles her young as she swims under the baby and helps it up onto the ice again. Despite this, great numbers perish during storms.

It is a surprise to many people that

the seal does not freeze when the temperature reaches 20° or more below zero. But its long-haired fur and thick layer of fat, which increases daily during the first two weeks after birth, protect it. The blood temperature is practically the same as ours.

The growth of the baby is almost unbelievable. At birth it weighs about 15 pounds, but when it is two weeks old it has a two-inch layer of fat and weighs between 60 and 80 pounds—an increase of 400 or 500%. Fortunately for the seals, the fat is thickest just about the time when the warm pelt is shed and protection most needed. This layer of fat also serves as a food reservoir, because the mother leaves the young seal a couple of weeks before it is quite able to shift for itself, and during this period it has to rely on its fat alone.

During the first two weeks, the baby seal subsists only on the mother's milk, which is the fattest milk known. It contains more than 40% fat, in comparison with 4% in ordinary cow's milk.

The mother seal visits her young several times daily, but remains for long periods in the water. It is a mystery how she can find her own young after these long swimming trips, during which the floe may have drifted faraway and changed its position among other floes. The mother seal always finds the right floe and never fails to single out her own young from the hundreds of snow white babies that have been crawling about in the meantime. If I moved one of the young far from its original place in marking it, I could observe the mother through my field glasses searching confusedly about for half an hour or more until she finally found her own. Then she would settle down with it quietly.

### *Courting*

The males arrive at the breeding places several days after the females and can be seen swimming in large herds within view of the brooding mothers, making a sort of courtship play. Quite often a fight breaks out between them and blood is lost in honor of the ladies of the ice. When the females have nursed their young for a couple of weeks, they obviously become tired of it and are longing for a little flirt in the water. Then the young will have to shift for themselves as best they can; Mother wants her freedom. From now on she is

mostly to be seen in the water with her mate. In the meantime, the young, which has been lying quietly on the floe, has started to lose its white pelt and is growing a coat of shorter, stiff, gray hair. At about three or four weeks it begins to venture into the water in search of food. At first it is not very adept at diving and therefore keeps to the surface. Here it finds small shrimplike crustaceans in abundance, and these are its main food for the first weeks. After that the young seals leave the breeding places, and the ice is once more quiet and lifeless.

Once again in the season the older seals migrate into the ice pack, and this time it is a greater gathering than on the breeding places. By the end of April and the beginning of May the seals lose their winter pelts, and their skin is sore, so that they avoid going into the water as much as possible. The males arrive first this time, the females coming later, together with the one-and-two-year-old seals. The herds settle down on the ice and remain there for about three weeks without eating, and they do not enter the water voluntarily until they have gotten their new pelts. The number of seals is fantastic. From the crow's nest I have seen seal lying beside seal in a herd of several thousands, then half a mile or so beyond was the next herd, and so on as far as one could see through the field glasses. In the White Sea, countings based upon aerial photographic methods revealed that 700,000 seals had congregated in one area, at a density of up to 30,000 to a square mile.

Large scale hunting was formerly carried on in these seal encampments. However, in the last seasons before the war this was almost discontinued, because it was not profitable. The seal does not produce much fat at this time of year, and the skin is of reduced value as well.

In their westernmost breeding place, the harp seals gather off the coast of Newfoundland in the first days of March. They form two separate groups here, one in the Gulf of St. Lawrence and the other, the larger one, on the drift ice off the eastern coast. During summer the seals that breed here are spread over the great regions between Canada and Greenland, mostly in the western part of Baffin Bay.

In September or October they start their migration south. About Christ-

➤ HARP SEALS, overlooking an expanse of pancake ice. The characteristic pans of ice have their edges thickened by knocking against one another. Along the edge of the pack the ocean is sometimes covered with pancake ice for hundreds of miles

▼ AN OLD HARP SEAL, which has doubtless spent many seasons migrating thousands of miles back and forth between the open sea and the pack ice, where the young are born



mas they reach the coast of Newfoundland, but they continue farther south, clear out to the Great Banks. This migration is correlated with the food supply. When the seals leave Baffin Bay in the fall, they are very lean. But after their stay on the Great Banks from January to February, they have gained a heavy layer of fat.

In February they start moving north again to meet the drift ice beginning to form off the coast of Newfoundland. They bear their young here in the first two weeks of March. The pelts of the young are very valuable as fur, and it is important for the sealers to get there before the first long and soft hairs are shed. Consequently the sealing off Newfoundland starts about the 13th of March.

#### *Diminishing herds*

Seal hunting off Newfoundland is not as profitable as it used to be. Reckless hunting in former days has decreased the number of seals considerably. Commercial sealing started here as early as 1800 and had its most prosperous period from 1825 to 1850. The average catch for these years was about half a million seals annually.

The methods employed in these years were very destructive, because more seals were killed than the figures indicate. Great multitudes of seals escaped mortally wounded, or were shot in the water and sank before the sealer could get to them. Sometimes more were probably lost than were caught. This tremendous slaughtering of seals was doubtless the main cause of the rapid decline of Newfoundland sealing



◀ THE BABY SEAL is nursed several times a day by its mother, who comes up out of the water through this "bobbing hole." She keeps the hole from freezing over by frequently clearing away the ice

▼ THE AUTHOR with a newborn harp seal, whose face suggests why the seal is called a "sea dog" in some European languages





◀ SNOW-WHITE and three days old. Baby seals are among the cutest creatures in the animal kingdom. After the first two weeks, the young harp seal begins to lose its silky white fur

▼ FOUR DAYS OLD and growing fast. In its first two weeks the seal more than quadruples its weight. Its mother's milk has more than 40% fat, in comparison with 4% in cow's milk—a fortunate provision for the coming days when the baby seal will shed its coat, grow a new one, and venture into the cold water to fare for itself



▼ THE MOTHER, returning after a cruise in the sea, can unerringly identify her own baby among hundreds of others on the floating ice. When the author tagged seals to study their migrations, he sometimes painted a big red cross on the backs of the babies. The mothers did not approve. They would sniff at their young dubiously without recognition before accepting them as their own. Baby seals were later found whose mothers had apparently tried to lick the crosses off





▲ AT TWO WEEKS, young harp seals start to shed their baby fur. The new coat begins just behind the head (see left-hand seal). Until the seal is three or four weeks old

it may drown if washed into the sea by storm. Then the mother, if present, shows pathetic anxiety, swimming under the baby and helping it onto the ice again

around 1850. The average catch during the last ten years before the war has been around 170,000 seals annually.

The other great breeding place is found in the drift ice between Greenland and Spitsbergen. From different places in this expanse of ice, the seals gather every year on an ice jam which usually forms near the islands of Jan Mayen. The location of this breeding place varies some from year to year, because the distribution of the ice differs according to temperature, wind, and current.

Our investigations confirmed the belief that the harp seals breeding here form an independent population and do not interbreed with the seals off Newfoundland and in the White Sea. At Jan Mayen the breeding period comes about two weeks later than off Newfoundland and three weeks later than in the White Sea.

The seals between Greenland and Spitsbergen were the first Arctic seals to be caught from ships. As early as 1700 the whalers secured a few hun-

dred sealskins while in the drift ice along the southeastern coast of Greenland, and they soon started seal hunting with ships equipped exclusively for this purpose. In 1760 ships from Hamburg brought in 45,000 sealskins. Around 1850 British, Danish, German, and Norwegian sealers were operating in this area on a large scale, but in the last 50 years the sealers who have hunted seal in the Jan Mayen area have been exclusively Norwegian. In later years the total catch of harp seal around Jan Mayen has been 20,000 to 40,000 a year. This is not much compared with what were caught in the old days, and it is obvious that here also there has been a marked decrease of the seal herd.

In the third great breeding place, at the mouth of the White Sea, the seals congregate in great masses in the latter part of February and the beginning of March. They hail from the Barents Sea and the areas between Spitsbergen and Fridtjof Nansen's Land which lies towards the east in the Arctic Sea. This sealing ground

has not been hunted on a large scale as long as the others, and it is not yet known whether it has suffered in numbers. Originally only Norwegian sealing vessels operated in this area. But in the past 20 years the Russians have increased their seal hunting, and in the last years before the war they were dominating this sealing ground. During the same period the Norwegian sealing in the White Sea, which in 1925 brought 343,000 seals to port, was gradually discontinued.

What value do these Arctic seals represent, and what is it that makes thousands of persons go north to the drift ice and expose themselves to all kinds of dangers? The young seals, especially those just born or a few days old, are valuable primarily for their pelts. These pelts are made into very attractive and highly prized ladies' coats, though they are not to be confused with the fur seal. The hides of the adult seal are not used for fur, as the hair is too stiff and coarse. They are used in the leather industry. A special treatment makes



them soft and lustrous, and they find extensive use for gloves, handbags, pocketbooks, etc.

The fat of the seal produces a very fine oil for the soap industry and for creams and lotions, and it also serves as a lubricant.

Since the war started, sealing in the Arctic has of course decreased, like all trades depending on freedom of the seas. Most ships of the Norwegian sealing fleet went out as usual the first winter of the war, and in February, 1940, a number of them even crossed the Atlantic to the remote sealing fields off Newfoundland. As these ships were far away from Norway when the invasion came, most of them did not return to their country. Instead they brought their loads to British and American ports and joined the rest of the Norwegian merchant fleet, under the free Norwegian Government. Thus, the Norwegian sealer "Polarbjorn"—the ship I had followed on many expeditions in peaceful days—was the first vessel to unload a cargo of skins in the harbor of New York, in 1941. A number of

the small and sturdy sealing ships have been used in patrol duty and as mine sweepers in British and Iceland waters.

Despite the fact that the rich catches of earlier days are no longer possible, sealing in peacetime still represents one of the chief livelihoods of a large part of the population in Newfoundland and along the north and west coast of Norway. It also plays an important part in the economy of the Arctic regions of Russia. But it is of greatest importance to the Eskimos. To them the annual migrations of the different species of seals along their coast are a matter of life or death. Decrease of the seals is a serious problem to the Eskimo, and if the seal stayed away for good, it would be a catastrophe.

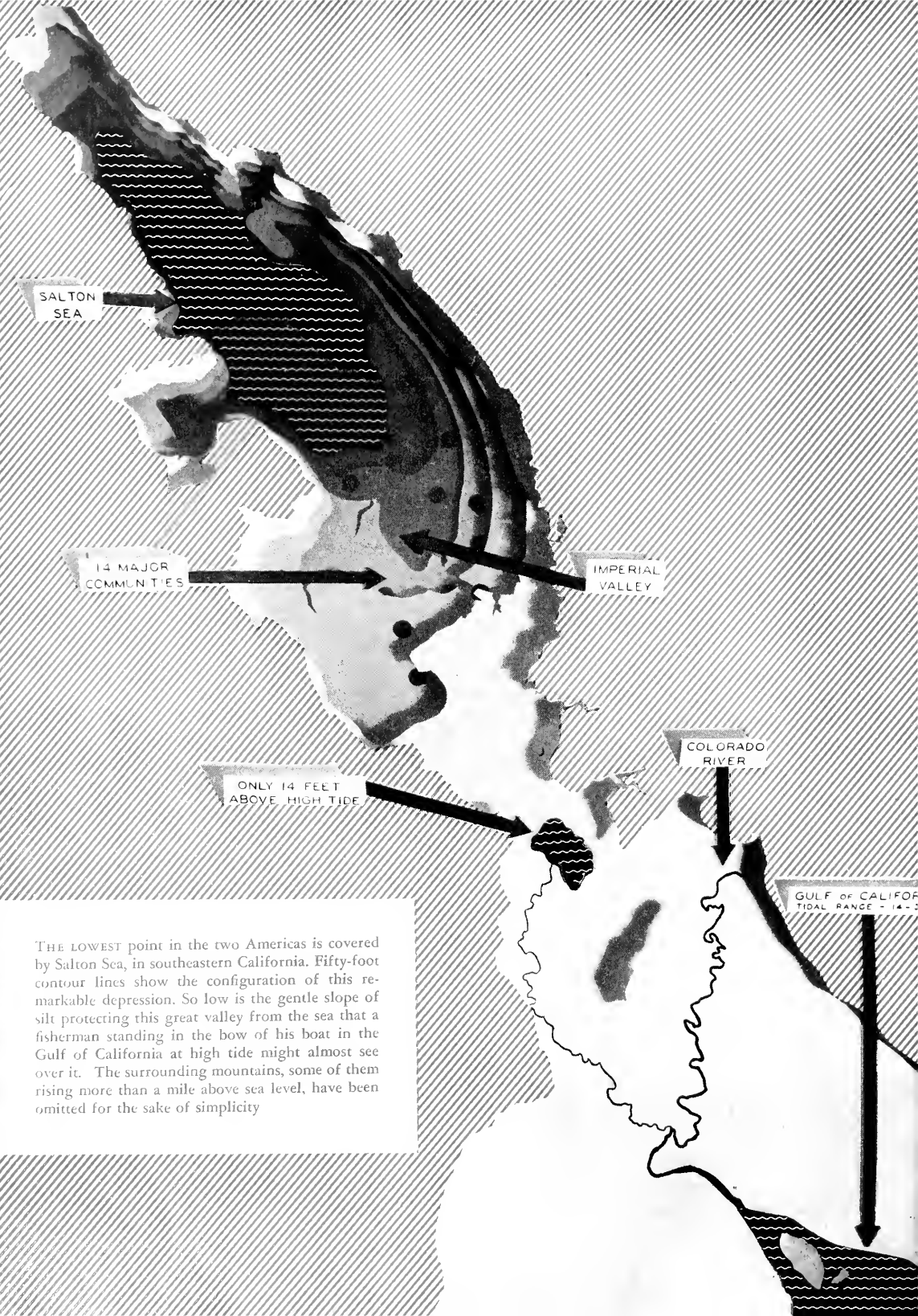
Exploitation of the resources of the Arctic has often been carried out without concern for the future, and this has been the case in the seal industry. When the Norwegian Government organized the investigation of the Arctic seal, it was meant to be a link in a plan to place seal hunting on

a more rational basis. The aim was to put into effect certain principles of conservation and game management. This, however, presented several difficulties. The seals do not stay in one place. Also the sealeries of the harp seal and the hooded seal are situated far out in the drift ice, in international waters. A really effective control is possible only through international rules and regulations, by cooperation between the interested nations. The future of the Arctic seal is therefore dependent upon the development of international understanding.

Fortunately, the hooded seal and harp seal will never be hunted to complete extinction, because a considerable number of seals are necessary if an expedition is to operate on a paying basis. If the catch falls below a certain point, hunting will automatically be discontinued. However, sensible administration and regulation of hunting in accordance with biological principles determining the seal population should enable Arctic sealing to continue as a lasting source of income to the interested nations. And the Eskimos will not have to change their mode of life, which would be a most unfortunate consequence of seal depletion.

▼ It is to such picturesque scenes as this, showing the home of a sealing captain on the west coast of Norway, that the ships return after their struggles in storm and fog





SALTON  
SEA

14 MAJOR  
COMMUNITIES

IMPERIAL  
VALLEY

ONLY 14 FEET  
ABOVE HIGH TIDE

COLORADO  
RIVER

GULF OF CALIFORNIA  
TIDAL RANGE - 14 - 20

THE LOWEST point in the two Americas is covered by Salton Sea, in southeastern California. Fifty-foot contour lines show the configuration of this remarkable depression. So low is the gentle slope of silt protecting this great valley from the sea that a fisherman standing in the bow of his boat in the Gulf of California at high tide might almost see over it. The surrounding mountains, some of them rising more than a mile above sea level, have been omitted for the sake of simplicity

# THE HOLLOW OF GOD'S HAND

A million acres and 50,000 busy people are protected from the sea by a natural "dike" only 14 feet high in America's "Little Holland"

By TOM HUGHES

THE Indians called it "The Hollow of God's Hand." Possibly they had some dim realization of the slender providential thread which held it from disaster. And the name is even more appropriate than Harold Bell Wright realized when he publicized it. For the natural dike that separates this million acres of California from the sea is so low that a pole vaulter could clear the vertical distance.

A large lake appears overnight in the middle of the desert! A place where such a thing can happen is surely touched with enchantment. Yet that is what happened in Salton Sink, and if you gaze upon the turquoise shimmer of this inland sea from any of the peaks that rim the vast bowl of the old Colorado Desert, that enchantment will grip you.

Will there come a day when another traveler, standing on the heights at Travertine Point, looks out across a brand new sea that spreads from his feet eastward to the Chocolate foothills and to the horizons north and south? Time itself withholds the answer—time and tide and the implacable elements.

Here in the southeast corner of California, sea and river and sun have toiled in a weird sort of harmony. In the beginning, the Gulf of California reached like a stubby finger far north of where it now ends, so that it approached the Chocolate Range on the east and the Santa Rosas and San Jacintos on the west,—a sea 30 miles wide and 1000 feet deep. The Colorado River, at work carving out the Grand Canyon, piled its muck in the form of a broad dike, which slowly pushed itself out across this finger of water. In time the Gulf was completely banked off; and the ardent sun had its way with the imprisoned waters.

Then the river started to spill its flood into the sunken salt desert. Now northward into the sink, now southward into the open Gulf, the wayward river poured from its high bed along the crest of the delta dike. And a new lake, which we call Cahuilla, rose and fell with the river's changing moods. The river's last prehistoric foray northward was so recent as to be caught up in legends of living desert tribes.

To speak of dikes is to be reminded of tiny, flat Holland. But, whereas those that were thrown up by the Netherlanders are buttressed with basalt and granite and wooden pilings, our desert's sea wall is little firmer than the loess hills of China. And the cities and farms on the bottom of the Imperial and Coachella valleys lie not merely 20 feet below sea like Holland's polder fields, but as deep as 200 feet. While not nearly so large as the region protected by the dikes of Holland, the Hollow of God's Hand embraces fourteen major communities and shelters 50,000 busy people.

Their fathers conquered the desert with the weapon of water, yet more than once the weapon has been turned against them. The fickle Colorado, since building its dike and spreading its wealth of fertile soil, has several times sought to undo it all. Once, in spite of the frantic efforts of skillful engineers, it came near succeeding.

In June of 1891 the river broke its north bank. From its raised channel a reddish stream tore through the silt and down into the hollow. At once wild rumors flew that the desert was filling with sea water. Fourteen years later the river went on the rampage again, carrying death and destruction; and yet another time, and still another—six times in all. Before the river's sodden banks had been made

safe with trainloads of rock, a lake some 300 square miles in area and 90 feet deep had formed at what was the lowest spot in the two Americas.

With irrigation drainage flowing steadily in, Salton Sea persists at a level that fluctuates around 240 feet below sea. Boulder Dam, however, with its desilting effect, has tamed the shrewish Colorado of her flood tantrums, and no more escapades are looked for. Not within the next few hundred years, at least.

But again we think of little Holland and of the greater water, the sea; and we recall how the Netherlanders have not dared to pause in their labor of pushing back the tides. Twenty-five miles south of the Mexican border rises our own dike. It is broad, with a long, comforting slope against the Gulf. But it is not high, and the Gulf tides are. They rise and fall as much as 32 feet. Their spring crests surge valley-ward until they reach within some fourteen vertical feet of the low place in our dike. A fisherman on the bow of his boat riding at high tide might almost see over.

Perhaps no real hurricane has ever roared up into the Gulf; but if some day one should, let us hope it will not choose the precise time of high tide. For if such a hurricane were to sweep inland, the sea would surely pour into the fertile valley.

Men of the Imperial and Coachella valleys have always been resourceful. That is why they were able to make the Colorado desert blossom like the rose. After 40 years of the most dramatic reclamation struggle in America, they have disarmed the river, forced it to do their bidding. And through it all they have been unafraid. Toward the balked enemy that daily bares its white teeth just beyond the low hill they hold a magnificent disdain.

# THE *American* EGRET

Near the Nest and on the Wing

By HUGO H. SCHRODER



▲ ABOUT TO MAKE a landing while flying over a South Florida rookery. One of the legs is dropping from its normal flight position, which is straight back

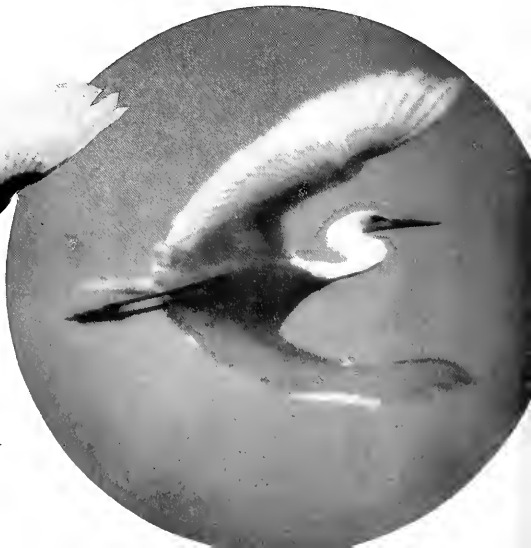
**T**HOUGH breeding through a wide range of latitude both north and south of the equator, the beautifully feathered American Egret was almost exterminated in 1913 when the millinery trade made tremendous demands on its plumage. Fortunately, the condition has improved since then because the United States Government forbade the shooting of the bird. It nests in large colonies in the heavy swamps along the Gulf and Mississippi River states, in the West Indies, and in Middle and South America to Patagonia

▼ WITH LEGS and toes extended it hurriedly takes flight at the sight of the photographer



▼ SHORTLY AFTER TAKE OFF from the tree. The neck has been drawn back, but the legs are not pulled up to the normal flight position

▼ WHILE TURNING, the bird completely unfolds the beauty of its plumage. When spread, its wings measure from 50 to 59 inches





▲ FEAR of the photographer made this member of the heron family spread its plumes impressively

➤ WITH NECK in a graceful S-curve this egret rests on the tree top above its nest. The American Egret's length is from 35 to 42 inches



▼ THE AMERICAN EGRET flies north to Oregon, Wisconsin, and New Jersey during its post-breeding wandering, even as far as Manitoba and Nova Scotia. Note the feather pattern of the wings on the down stroke



▲ THIS EGRET returns satisfied to the rookery, bearing a frog in its mouth. Chief foods of the American Egret are fish, crawfish, lizards, frogs, and insects

# HOW TO FINGERPRINT

By VINCENT J. SCHAEFER

*All photographs by the author unless otherwise designated*

WHETHER it be a November flurry, a January storm, or a March blizzard, there is always a fascination about falling snow, and its coming touches a responsive chord in young and old alike. Perhaps this feeling harks back to earlier, harder days, when deep snow meant greater struggles with the elements to obtain food, to move about, or to keep warm. Today, snow generally symbolizes sleigh rides, Christmas Holidays, ski runs.

With a goodly portion of the world's population living within its seasonal path, it is not strange that even among the early natural philo-

sophers there were those who pondered upon snowstorms and found much interest in them.

So far as I know, Aristotle, in the fourth century B. C., was the first to comment on the formation of the snow crystal. Many others no doubt made subsequent observations which, without the printing press to record them, have not survived the passage of time.

In 1555, Olaus Magnus, Archbishop of Upsala, Sweden (where they have fine snow—and skiers), depicted for the first time a group of snowflakes, in a book on natural phenomena published at Rome. One hun-

dred and ten years later Robert Hooke, in his *Micrographia*, published a full page of snowflake drawings, showing in accurate detail many of the characteristic forms that may be found (*see illustration*). Commenting on the pleasure he derived from exposing a piece of black cloth or a black hat to the falling snow and observing their infinite variety, he states that it would be impossible to draw the shape of every one of them. His "coarse draughts," as he states apologetically, referring to his drawings, were all that the coldness of the weather and the ill provisions he had for such a purpose would permit him to make. He observed that whenever the flakes had any regular shape "they were always branched out with six principal branches . . . each of them being inclined to either of the next branches on either side of it, by an angle of 60°."

Captain William Scoresby, the Arctic explorer, in 1820, published a considerable number of excellent drawings of snowflakes. In 1863, an elaborate book with the title *Cloud Crystals—A Snowflake Album* was published in New York, "edited by a Lady." Replete with scientific papers, prose and poetry, and containing 28 woodcuts depicting some 194 different crystal forms, this book typifies the spirit that led John Tyndall, while carrying on scientific observations in the Alps, to remark, "While I remained at the station a layer of snow an inch thick fell on a blanket used as a screen, the whole layer being composed of these exquisite flowers. . . . From the clouds to the earth Nature was busy marshalling her atoms and putting to shame by the beauty of her structures, the comparative barbarities of art."

In the past 50 years many observations have been made on snow and ice crystals. A score or more of scientific studies, using the electrometer, X-ray, and the microscope, have disclosed many interesting facts about them. The work that did most to popularize their exquisite beauty was performed

◀ A "FROSTED WINDOW" that is permanent. This flexible replica of "frost flowers" is made by applying the same process to a whole pane of glass

*A.M.N.H. photo by C. H. Coles*

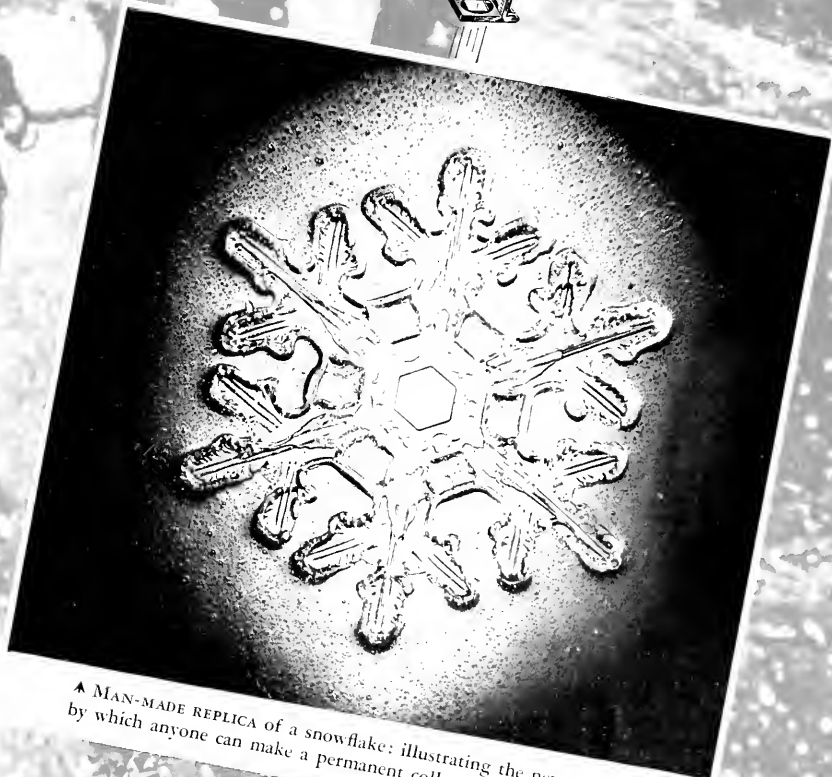




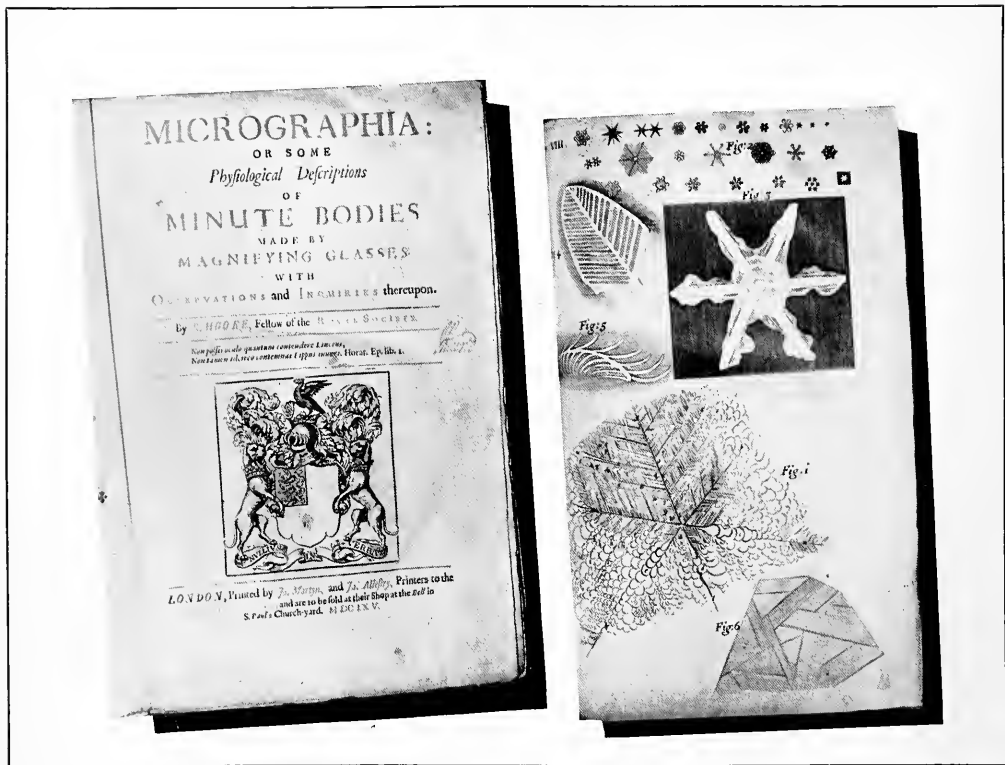
# A SNOWSTORM

Described for the first time by its inventor—A method by which you can quite simply “fossilize” snowflakes in all their infinite variety and beauty

PROGRESSIVE changes in the form of snowflakes during a storm can be observed by taking samples at regular intervals. The background panel here is one of these samples. The arrow points to the flake enlarged below. A magnifying lens adds greatly to the pleasure of studying snowflakes



▲ MAN-MADE REPLICA of a snowflake: illustrating the new method by which anyone can make a permanent collection of frost crystals



by Mr. Wilson A. Bentley, of Jericho, Vermont. Over a period of nearly half a century he made thousands of beautiful photomicrographs showing the endless variety one finds when observing winter storms.

Considering that during a single 10-inch fall of snow more than a million flakes may gather on a 2-foot square, and that no two flakes are alike, it is obvious that anyone can easily discover unusual new types of crystals formed in Nature's inexhaustible laboratory of the skies.

Yet with the slightest warmth, the orderly symmetry of the crystals is destroyed and one has only tiny drops of water. Naturally, the evanescent nature of snow crystals has always been a discouraging feature.

#### The method

During the winter of 1940, while watching some particularly fine crystals melt on my coat sleeve, the thought occurred to me that it might be possible to preserve these forms. If before the crystals had a chance to melt they could be coated with a sub-

stance that would harden, the exact design would be retained. As sometimes happens with hunches, the first attempt to perpetuate snowflakes worked perfectly. Though I have tried many other substances and solutions since that time, none as yet has worked as well.

For making replicas of snowflakes the equipment is quite simple. A complete kit would include the following items:

- two square feet of black velvet
- a card table
- a flash light
- a whisk broom
- a thermometer
- a supply of clean microscope slides
- a pointed glass rod or wire
- a solution of polyvinyl formal resin dissolved in ethylene dichloride.

This equipment should remain outside throughout the collecting period, so that it stays cold and is available at any time. If possible it should be kept in a place where it is sheltered from wind and falling snow.

When the flakes begin to fall, the black velvet, tacked to a broad board, is exposed to the sky. As soon as sev-

▲ ONE OF THE EARLY writings on snowflake designs: from an important book published in 1665 by the famous English physicist, Robert Hooke. Snowflakes have attracted the interest of students of natural science since Aristotle's day, and doubtless much earlier

▼ A pointed glass rod or a wire is dipped into a bottle containing a 1% solution of polyvinyl formal resin dissolved in ethylene dichloride





eral good specimens are observed, it is placed on the table. The glass rod is then dipped into the bottle of the resin solution and removed with about half a drop, which is transferred to the glass slide. Without delay the rod is brought into light contact with the selected snowflake, and since a little of the solution remains on the rod, the flake adheres to it. It is then touched to the drop of solution on the slide. The flake leaves the tip of the rod and is quickly engulfed by the solution. If the flake is particularly large, a second small drop may be added.

All of the selected specimens are treated in this manner, and after a group of flakes have been prepared, the slide is put in a protected place until the solvent evaporates. This takes only several minutes. As soon as evaporation is complete, the several specimens can be brought into a warm room, where they can be examined to better advantage with a hand lens or a low power microscope. If they seem to have considerable mass, it is best to allow them to warm slowly. This permits the water to pass through the resin film covering the crystal without distorting it. If this all sounds complicated, perhaps I should say that one of my best pupils has been a seven-year-old girl.

If a 1% solution is used, the thickness of the film covering the flake after the solvent has evaporated is only about 8/100,000 of an inch.

Another process is still easier to carry out than the single flake method.

Enough 2% solution is poured onto a sheet of glass to cover it in a thin layer. It is then held out under the sky until a considerable number of flakes land on it. The specimens are then treated in the same manner as just described, a small drop of the solution being applied to each crystal if necessary to cover them. The lower illustration opposite the title-page shows a sample prepared in this manner, and the panel photograph above it shows some of the other flakes caught at the same time. An arrow points to the flake singled out for enlargement.

This storm sample method permits the study of changes occurring throughout a storm. By taking specimens at regular intervals you can obtain a permanent record showing a true cross section of that particular storm, as revealed through changing size, type, and abundance of crystals.

In one March snow fall in the Mohawk Valley, for instance, 150 replicas that I was able to gather in a 30-minute period illustrated a rather typical series of transitions. As frequently happens in this section, the large symmetrical crystals fell at the close of the storm, which laid down a total of ten inches in this case. The barometer was falling at 29.70 inches, and a northwest wind was blowing. The thermometer was at 26° F. The big symmetrical crystals, which at first had a considerable amount of frost about them, were gradually replaced by the more common confused, unsymmetrical flakes. These continued

for several hours; then the wind changed and the skies cleared.

In regions near the edge of the snow belt the finest specimens often fall at temperatures above freezing. Under such circumstances, melting will prevent the replicas from being satisfactory, unless a freezing chamber is used. In such regions good specimens can often be obtained at night or early in the morning.

#### *Under a starlit sky*

Often beautiful crystals can be collected under a starlit sky. One night last February, for example, when I set my collecting board under the light of a full moon, I obtained crystals that were five to ten times smaller than the usual forms but which contained rare types common only to the far north. During this collecting period a very beautiful 44° halo could be seen around the moon. And it may be significant that one of the coldest periods of the winter followed this unusual crystal fall.

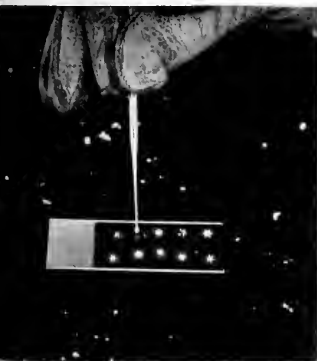
Winter sleet, the kind that rattles on the windows and is often mixed with rain, has the general form shown in the upper right-hand illustration on the next page. These icy pellets, unlike snow crystals, form from liquid water which would have fallen as rain except for passing through freezing masses of air. Their usual lack of symmetry is caused probably by the formation of an icy shell around most of the liquid waterdrop. Subsequent freezing of the water inside, accom-

## HOW YOU CAN DO IT

A half drop of the solution is then placed on a glass slide on which the snowflakes are being preserved. These materials must all be cold

▼ From the black velvet collecting board a snowflake of the desired design is very gently picked up on the tip of the still moist glass rod

▼ The snowflake is touched to the droplet, which engulfs it. When the solution dries, the replica is brought into the warmth and examined



panied by its expansion, possibly accounts for the protuberance on the upper side of this specimen. I have found identical forms of earthly origin early on a frosty morning where raindrops resting on fallen leaves have frozen.

Soft hail or graupel is common at the beginning and end of winter and is formed in an entirely different manner. It starts originally as a snow crystal formed directly from gaseous water vapor, without passing through

the liquid phase at all. The falling crystal passes through warm air with high moisture content and picks up secondary frost deposits on one of its surfaces, probably the under side. Eventually a pyramidal shape is formed, and if it continues to fall, further modifications in form occur and the surface becomes covered with rounded bumps, like miniature snowballs before they are tightly packed. I have storm sample replicas that show all of the formative steps described. Graupel forms a

most interesting snow for sküing. If it falls to a depth of several feet (as I once found it at Indian Pass in the High Peaks of the Adirondacks), the skiing is not fast but incredibly smooth.

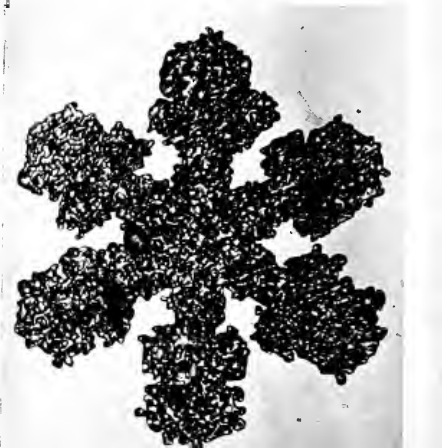
Speaking of sküing, perhaps the poorest "dry" snow for skiing is formed by a fall of ice spicules. One might have better sport sliding on coarse sand and gravel. The ones shown opposite are in a cluster. But some of the individual spicules have a six-

▼ THESE FLAKES were collected under a starlit sky. A number of types common only in the far north were found



▲ SLEET LOOKS like this when magnified

▼ SOMETIMES a flake loses its delicate crystal detail during descent, as illustrated by this curious example



sided cross section and are apparently twin crystals, in which the growth started in the middle and proceeded with mutual symmetry on either side of the nucleus. In the vicinity of Schenectady this form of snow is very common in the middle of winter and at times comprises the bulk of the fall.

As the reader may have noticed, many snowflakes falling in a storm consist of a considerable number of clumped particles. Often the particles comprising the clumps have lost most

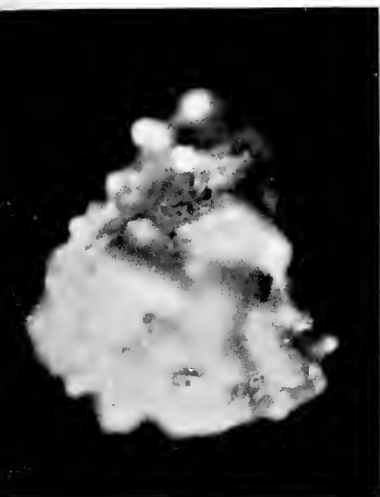
of their original crystalline form in passing through layers of relatively warm air. Some, however, retain their sharp symmetry and appear as at lower left on this page.

After snow has been on the ground for a time and subjected to alternate periods above and below freezing, particularly during the latter part of winter, the original form undergoes a change. The earlier part of this change produces particles with angular outline, like the central one at

the bottom of this page. Later this shape becomes rounded to exhibit fantastic forms such as that at lower right. These particles make up "corn snow," the delight of late winter skiers.

The most elaborate variations in snow crystals seem to fall from low-hanging clouds in local storms, like the first example on page 27. In the region of Schenectady, snow flurries often sweep down the Mohawk Valley with the prevailing west and northwest winds. With these short

▼ **SOFT HAIL (graupel)** makes interesting skiing—not fast but incredibly smooth



▲ **ICE SPICULES** like these make the poorest "dry" snow for skiing. One might as well ski on sand



▼ **UNDER DIFFERENT CONDITIONS** a whole cluster of fragile flakes will arrive at the collecting board intact



▼ **ALTERNATE melting and drying**, particularly in late winter, reduces a snow crystal to a rough, angular mass



▼ ... **UNTIL FINALLY** all the corners are rounded off and the once beautiful ice jewel assumes a curious shape



storms come flakes of which the first two illustrations opposite are typical specimens. Many arrive at the collecting board in a badly battered condition. Often this type of flake is very asymmetrical, with one of the six arms several times as long as the others. Solid hexagons (*center opposite*) come in cold periods when there is little moisture in the air, while the type at far right is often observed at temperatures near freezing.

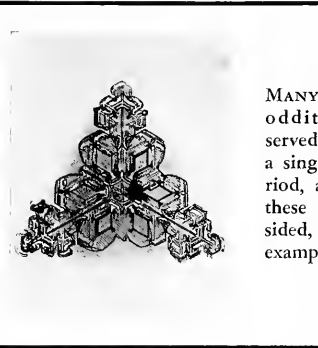
Perhaps the most interesting types of ice crystals are those popularly known as "wheels and axle," or "cuff buttons." These are twin crystals, growing as hexagonal columns from a common origin and terminating in a pyramid, more commonly with an extended capping similar in appearance to the solid hexagonal snow crystal. The illustrations at the bottom of this page represent typical forms photographed on December 13, 1941, at Schenectady, during a 10-hour storm which consisted entirely of these interesting crystals.

The frost that gathers in fernlike patterns on the window pane, as well as other terrestrial forms of crystallized water, can be preserved in replica form as readily as snow crystals. The frosted specimen can simply be dipped into a shallow tray containing the resin solution and then exposed to the air to dry; or the solution may be applied with a camel's hair brush or sprayed on. Afterwards the thin film is stripped off in a single sheet; and the beauty and delicacy of the continuous pattern recorded on its surface has to be seen to be appreciated. Many forms other than those shown will be found. Furthermore, most of them can be grown and treated in the freezing compartment of a home refrigerator at any time of the year.

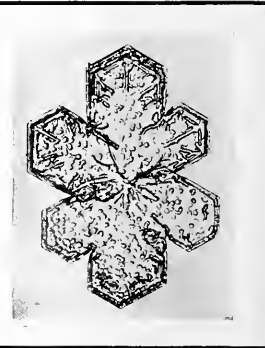
The preservation and study of crystals from winter storms, besides having interesting scientific aspects, will repay the observer in many ways. Since the process is so easy, it is inducement enough that in these troubled days the time spent looking at snow crystals makes one realize that Nature carries on serene and purposeful through all the troubles that beset the world, and that there is a never-ending variety of beauty awaiting anyone who will but search for it close at hand. In marvelling at these wonders, we may hope that next winter when people look to the sky it will be without the dread of seeing bombers, but instead of the sun and stars and snowflakes of a white Christmas.



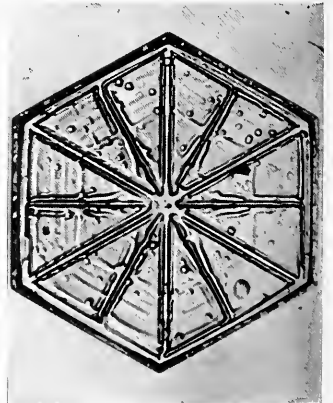
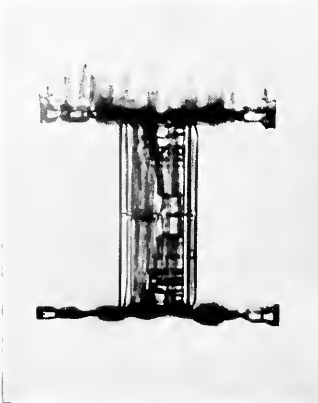
▲ THESE TWO FLAKES are typical of the snow flurries that commonly sweep down the Mohawk Valley, in New York State. Many of them have one arm several times as long as the others



MANY crystallographic oddities will be observed in the course of a single collecting period, as illustrated by these three-sided, six-sided, and twelve-sided examples



▼ "CUFF BUTTONS." This form of snowflake is perhaps the most interesting. A whole storm may consist entirely of these. They are twin crystals, growing as hexagonal columns from a common origin, and capped on each end with a crystal that may resemble a regular snowflake, as shown at right below





▲ LOCALIZED snowstorms with low clouds seem to produce the greatest variety and complexity in flakes



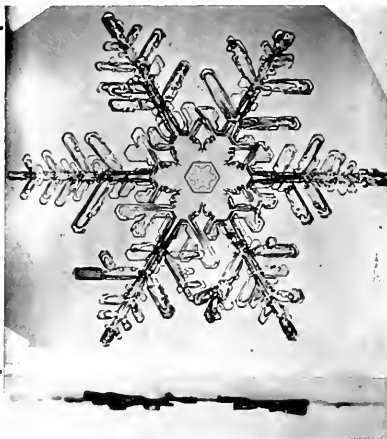
▲ SOLID HEXAGONS of this sturdy type usually fall in cold periods when there is not much moisture in the air



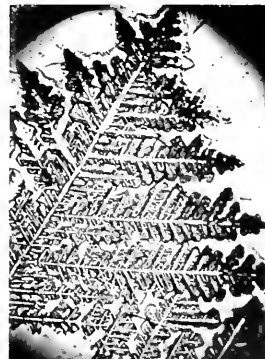
▲ THIS TYPE is often produced at temperatures near freezing, when the flake may melt before it is preserved



► NOTE how extremely thin a snowflake may be in cross section (*at right and below*)



FURTHER EXAMPLES showing how frost patterns may be taken from glass by applying the resin solution to the frosted surface. After evaporation, the pattern may be stripped off in a single film. The "snow fern" at far right was made at Lake George by Dr. Irving Langmuir, using the Schaefer method. Frost patterns of this type can be made and treated at any season in a home refrigerator



# WHERE DO INSECTS GO IN WINTER?

*By* EDWIN WAY TEALE



Beneath frozen pond or in snow-clad bark, what are the myriad members of the insect world doing to defy the silent enemy of life—winter ice and snow

ALL PHOTOGRAPHS BY THE AUTHOR



▲ THE FRAIL-LOOKING lacewing fly can survive low temperatures. When the mercury falls, it finds shelter in cellars and other protected places

◀ THIS MANTIS, preying on a bee, will not survive the winter; but a remarkable ball of froth, manufactured by the female, will carry the eggs over to the next spring

▼ CARPENTER ANTS winter in galleries of wood. One ant may wall itself up for the winter in a little sawdust room beneath the bark of a tree



**I**N a winter world of frozen earth, scudding snow, and bare, complaining branches, where are the insects which filled the autumn fields with sound and action? What has become of the grasshopper and the dragonfly, the ant and the cricket? How does a housefly spend the months of cold? Where is the firefly's light when snow piles high? In what manner do katydids and yellow jackets, monarch butterflies and whirligig beetles bridge the icy gap from fall to spring?

Each autumn, when Cold, the great scene-shifter of the out-of-doors, begins to alter the setting of my Long Island insect garden, I watch the small creatures around me preparing for this great ordeal. All the insects of northern states have this common problem. As species, they must survive through the months of cold. So, while the backdrop of the hillside changes from green to gorgeous gold and red and on to winter's brown and gray, the insects complete ingenious preparations which, in individual ways, solve the problem that is com-

mon to them all. In one manner or another, they insure that either themselves or their descendants will once more occupy the land when spring returns.

In all their forms—as eggs, as larvae, as nymphs, as pupae, as adults—the insects pass through the season of cold. Examination of the table which accompanies this article will reveal the winter ways of the common insects.

Those which lie dormant in the egg stage, occupy infinitely varied resting places. In days before the steely brilliance of frost silvers the grass clumps or there comes the night of the first freeze, the females of many species are busy depositing their eggs according to the age-old dictates of instinct.

With abdomens thrust into the soft soil, short-horned grasshoppers bury pods of eggs encased in protective layers of gummy secretion. Clinging head downward to weed stems and twigs, female praying mantises produce those remarkable, walnut-sized balls of froth which solidify to form the housing for between 125 and 350 eggs.



Lilliputians among the insects—the aphides, leaf hoppers, and tree hoppers—cement their minute eggs to plant tissues and to diminutive ledges and ravines of tree bark. Also inserted in bark of twigs of trees and shrubs are the eggs of those ghostly melodists of the summer night, the snowy tree crickets.

### *The robber fly*

One afternoon in mid-September, I noticed a movement in a tiny open space between small clumps of grass. At first it seemed that a hunting wasp was stinging its prey on the bare ground. Then I saw that the insect was a gray robber fly, one of those great-eyed, streamlined huntresses which dive like hawks upon flying prey and wrap long, hooked legs about their victims. The fly was stabbing the tip of its abdomen again and again into the loose soil. At each stab, its ovipositor was planting eggs as a mechanical corn-planter deposits the kernels of grain.

Katydid follow a different procedure in laying their overwintering eggs. Along a twig or around the edge of a leaf, the angular-winged katydid cements its eggs in overlapping lines. In one instance, a katydid, kept as a pet, embroidered its eggs along the edge of a stiff white collar found in an open bureau drawer.

One of the strangest stories connected with the depositing of winter eggs is that of the bagworm moth. The female spends her entire life within her pine cone shaped bag. Wingless and grublike, she gives off a perfume which attracts the male to her hiding place. After mating has taken place, the female fills most of the pupal shell with eggs. Then she plucks down from her own body to make a protecting plug for the eggs. After this is completed, her work is done. The eggs remain safely protected within their tightly secured bag to hatch when winter has passed.

In other instances, eggs hatch before winter comes, and the larvae remain dormant during the period of cold. The caterpillars of the viceroys butterfly, for example, eat until they are partially grown; then they roll themselves within leaves and hibernate for the winter. In the case of the Regal Fritillary, the larvae—black and yellowish-red, with two rows of black-tipped yellow spines running down their backs—hibernate when they are extremely small and emerge

to dine on violet leaves as soon as spring has come.

Probably the most familiar of all the hibernating larvae are the woolly bears, the caterpillars of the Isabella Tiger Moth, the "beareworms" of the Middle Ages. You find them, like upholstered doughnuts, curled beneath old boards and logs. Sometimes, during thaws, they revive and crawl about even in midwinter.

Among the beetles, a large proportion winter as larvae. As soon as cold weather comes, wire worms, the children of the click beetles, work their way down through soil or rotting wood to a depth of six inches or more. The white grubs of the May beetles always descend until they are safely below the frost line. Fireflies hibernate as larvae, burying themselves in log mold or leaf mold on woodland floors. Snug within their branching tunnels, engraver beetle larvae lie dormant through the inhospitable months of cold.

### *Winter in the water*

Other larvae spend the winter in a far different world—beneath the ice of ponds and streams. The black flies and midges of the next spring overwinter as aquatic larvae. Their habitat is also the home of those predatory underwater monsters in miniature, the nymphs of the damsel flies and dragonflies. Beneath submerged rocks in flowing streams, the larvae of the Dobson flies—the hellgramites of the angler—likewise endure a period of adversity.

Seventeen times in succession the nymph of one land dwelling insect passes through the season of ice and snow before it reaches its adult stage. This, of course, is the so-called seventeen-year locust, the celebrated periodical cicada of the New World. As a minute, molielike creature, it hatches during the summer from eggs deposited in the tissues of twigs. Dropping to the ground, it creeps into a crack or burrows down through the soil until it reaches a plant root. There, it begins sucking sap. Year after year it lives its damp, dark underworld existence; moving to larger and larger roots as it increases in size. During a succession of winters, it lies in comparative dormancy during the months when snow and ice-laden gales lash the bare branches of the trees overhead.

Almost entirely exposed to such gales are the chrysalids of several of the butterflies. The familiar white cabbage butterfly overwinters as a

chrysalis near the site of its food supply. Swallow-tail butterflies bridge the gap until spring in the same form. And so, oftentimes, does the doughty Red Admiral. Among the moths, additional protection is provided for the pupa, either by the spinning of a silken cocoon or by having the transformation from larva to pupa occur underground or in a protected cranny. Thus, the larva of the Sphinx moth burrows its way beneath the surface of the soil before it changes into the distinctive jug-handled pupa, in which form it passes the winter.

Among the bleak grays of a January landscape, the cocoons of the great silk moths—the Cecropia, Polyphemus, Luna, and Promethea—provide heartening sights for those who know the gorgeous insects which will emerge from them. They are like bluebirds—harbingers of spring.

On one small wild cherry tree, I once found more than a dozen Promethea cocoons, each attached to its twig with a reinforcing sleeve of silk. There is, in a single Polyphemus cocoon, upwards of half a mile of silk thread. Unlike the Promethea cocoons, those of the Polyphemus and Luna are only insecurely attached to twigs, so they usually fall like nuts in the grip of the winter gales. Among the drifted leaves, the cocoons are perfectly camouflaged and are rarely seen.

Also rarely seen are the insects which hibernate as adults. Each winter, in every shed and barn and attic, around every haystack and grass clump and mullein rosette, under woodpiles and fallen logs and flat stones, adult insects are lost in the long sleep of hibernation. Unconscious of the violence of the wind or the intensity of the cold or the sweep of the blizzard about them, they lie dormant. The Seven Sleepers of the mammal world find their counterpart multiplied many-fold in the world of the insects.

### *Hardy adults*

The housefly, many mosquitoes, the termite, the stink bug, the Colorado potato beetle, the chinch bug, the cockroach, and the elm leaf beetle—some of the least-loved insects—usually live through the winter months as adults. In one tussock of Sudan grass, a scientist in eastern Kansas once found more than 500 hibernating chinch bugs. Frequently, I have discovered, in the rosette of a mullein plant, a score or more of wintering



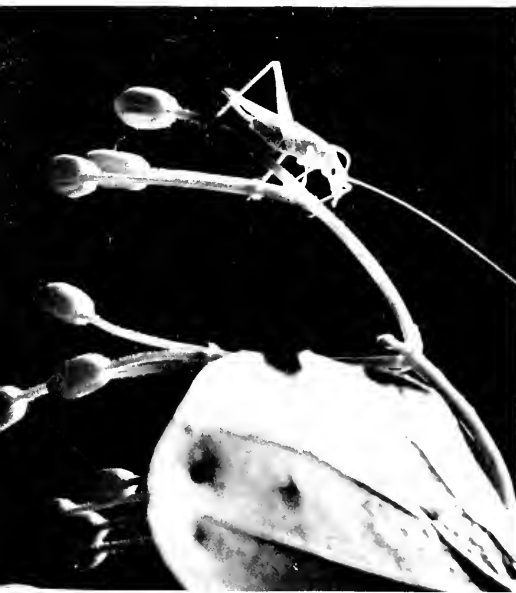


▲ A PREDATORY aquatic monster in miniature, the nymph of the damsel fly (above) survives the winter beneath the ice of ponds and streams



▲ A GREAT-EYED, streamlined huntress, the robber fly deposits her eggs in the ground like a mechanical corn planter. Winter rids the air of her prey; but on summer days you will see her perched as shown below, resting between hawklike attacks

▼ THE SNOWY TREE CRICKET has no liking for winter snows, despite its name. This ghostly melodist of the summer night hides its eggs in bark, and dies



WHERE DO INSECTS GO IN WINTER?



▲ IN FLOCKS sometimes numbering millions, the monarch butterfly migrates southward on its lightly loaded wings, to winter along the Gulf



HALF A MILE of silk thread is spun by the Polyphemus moth for its winter "blanket." The cocoon usually falls from its twig in winter gales

▼ THE ANGULAR-WINGED katydid cements its flat eggs in overlapping rows along a twig or the edge of a leaf. A pet one used the edge of a stiff collar



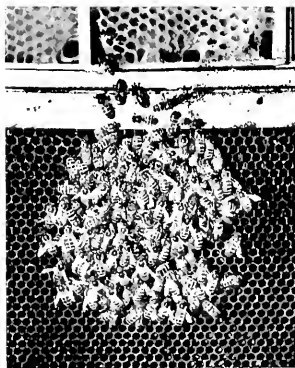
LADYBIRD BEETLES gather by millions to winter among the rocks in the West. Tons have been scooped up and shipped to orchards to consume pests



➤ **NO DRAGONFLIES** would live next summer's landscape in northern climes if their young nymphs could not survive the winter beneath the ice of ponds and streams



▼ **WHEN BEES** ball together to survive the cold, those at the center generate heat as they engage in a sort of dance. They change places at intervals with those exposed to the cold. The temperature within the ball may be as much as 65°F. above that of the air



**KEEPING warm** in winter by pooling their resources: a ball of honeybees displaying one of Nature's most interesting tricks to outwit winter



insects which had pushed their way down between the wooly leaves as though tucking themselves between warm blankets.

Ants often fall into their long stupor while clustered together in masses within the tunnels below-ground or in the galleries excavated in decaying tree trunks above-ground. Sometimes a single carpenter ant will build up a little wall of sawdust about itself beneath the loose bark of a dead tree. In this tiny room, it retires for its long winter sleep.

### *Ladybirds by the million*

In contrast to its solitary slumber, the ladybird beetles cluster together, sometimes literally by the millions, and spend the winter in masses among the rocks of western mountains. Tons of these insects have been scooped up and carried down to the orchard regions of the Pacific Coast where they have been "planted" in springtime to consume pests infesting the fruit trees. In the region of my garden, nothing so spectacular happens. But I do see ladybirds tucking themselves away under loose boards, beneath the bark of long dead trees, and under piles of discarded rubbish. Not infrequently, these beneficial beetles hibernate indoors, coming out of their hiding places on the milder winter days.

Another insect that spends the winter as an adult is the nimble, nervous, predatory tiger beetle, a creature so alert it darts into the protecting grass if the shadow of a cloud passes over the hot bare earth which forms its hunting ground. A protected place beneath some rotting log is its usual hibernaculum. Frail by comparison but surprisingly tough in its resistance to cold is the filmy winged parent of the aphid lion, the luna-green lacewing fly. This golden-eyed insect can fly at a temperature below 40° F., and it is said that it can walk at 20°—twelve degrees below freezing. In cellars, cracks in bark, woodpiles, and beneath loose boards, the lacewings find protection when the mercury descends and winter settles down.

Each spring, for half a dozen years, I have watched bumblebee queens coursing low over my hillside, investigating every cranny, grass tussock, mouse nest, and mole tunnel, searching for the best site for the summer's colony. I have seen some of the insect cities thus established flourish and prosper. During the same summers, I have watched the nests of

the paper-making wasps enlarge, ring by ring, starting with a single central cell which clung to its support like a tiny goblet placed upside down. From single queens, both of these types of insect cities expanded into communities with hundreds of busy inhabitants. Then, each year, as autumn cold gripped the hillside, every one of the insects in the teeming nests disappeared forever—every one except the young fertilized queens. They crawl into hollow logs or push their way beneath piles of rubbish and there, anchored by feet and jaws, fall into the deathlike sleep of hibernation. Through them, their species carries over to another season of sunny skies.

Similarly, the hornets and yellow jackets survive and reproduce their thriving commonwealths. Some of the parasitic ichneumon flies, allied to the wasps, also hibernate as fertilized females, while the small carpenter bees, both males and females, retire when winter comes to the protection of their tunnels in twigs and canes.

Unique among all the more than 600,000 kinds of insects listed by science is the method used by honeybees to maintain the life of the colony from fall until spring. They employ an efficient "muscular furnace" to heat the hive or the hollow tree in which they have stored their honey.

Gathering in a great ball, they cling together in a closely packed cluster. The bees at the center of the mass then engage in a sort of insect dance, stepping back and forth, flipping their wings, moving their antennae. From time to time, the insects at the outside of the cluster change places with the dancers at the center. Heat is radiated from the bodies of the bees, and the close-packed cluster acts as an insulating shell which keeps the warmth from being dissipated into the outer cold. Tests have revealed that the temperature within such a ball of insects is as much as 65° F. above that of the air outside the hive.

### *The migrating monarch*

Honeybees use up so much energy in flying that it would be impossible for them to migrate to the South when shortening days and increasing chill warn that winter is at hand. But the black-and-orange milkweed butterfly, the monarch, can follow the birds on its lightly loaded wings to find a warmer climate. In streaming flocks, sometimes numbering millions, these familiar insects drift down the North



▲ THE GRASSHOPPERS that skim over the summer fields perish with winter, but their descendants survive through carefully laid eggs or as nymphs

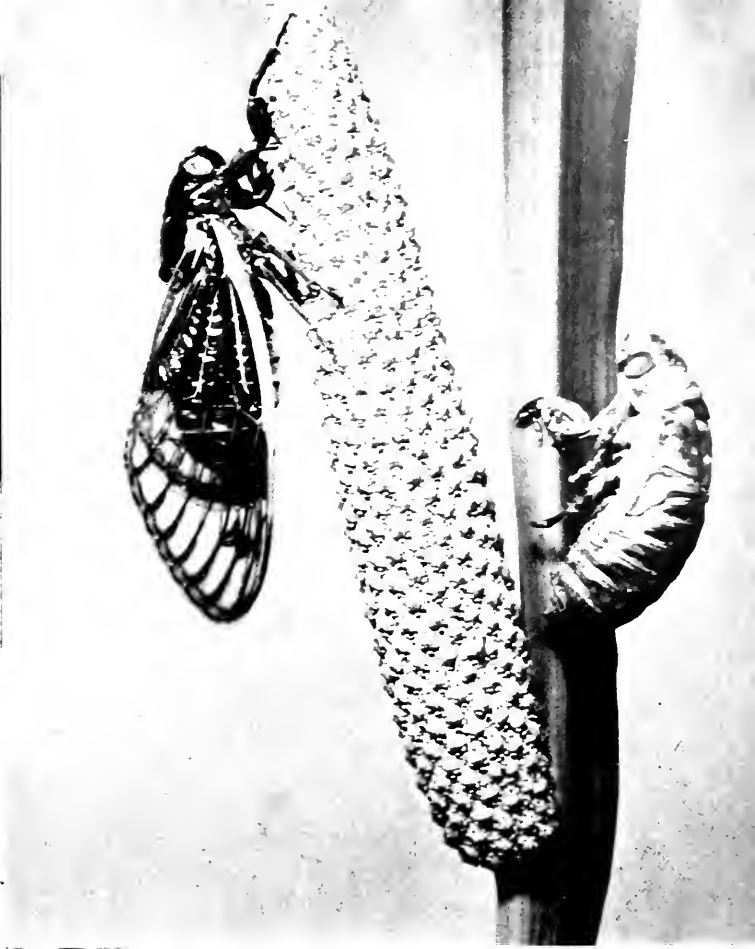
▼ AMONG THE HARDEST of the hibernating adults are the water striders. They may be seen skating across open water in streams in midwinter





▲ THE SHORT-HORNED grasshoppers thrust their abdomens into the soft soil and bury pods of eggs encased in protective layers of gummy secretion

► FOR SEVENTEEN YEARS the nymph of the periodical cicada lives underground. Finally emerging, the "seventeen-year locust" leaves its nymphal skin (*far right*) and appears as shown adjacent



▼ APHIDS on a rosebud. These lay "winter eggs" cemented in plants. Sometimes they are kept in nests of ants. The young that hatch out are all females; males are produced later. The generations are rapid



## HOW THEY SURVIVE THE WINTER

INSECT	WHERE	IN WHAT FORM
Ant	Hibernating in wood or soil	Adult
Ant Lion	In the ground	Larva or Pupa
Aphid	Cemented in plants, sometimes kept in the nests of ants	Egg
Bagworm Moth	Within the protection of a silken bag	Egg
Black Fly	In the water	Larva
Bumblebee	Hibernating in hollow logs or protected crannies	Young Fertilized Queen
Cabbage Butterfly	Near the site of its food	Chrysalis
Caddis Fly	Usually under water as a larva. A few winter as pupae. A few gradually transform into adults during winter	Larva, Pupa, or Adult
Carolina Locust	Buried in the soil	Egg
Carpenter Ant	Hibernating in galleries in wood	Adult
Carpenter Bee (small)	Hibernating in tunnels in twigs	Adult
Chinch Bug	Hibernating, usually, in grass clumps	Adult
Cicada	Beneath the ground	Nymph
Click Beetle	Usually as a larva. During the last winter underground, as an imprisoned adult	Larva or Adult
Cockroach	Hibernating in rotten wood and forest litter. In heated houses, as an active adult	Adult
Colorado Potato Beetle	Hibernating in groups	Adult
Crane Fly	In the ground	Larva
Cricket	Usually as an egg, sometimes as a nymph	Egg or Nymph
Damsel Fly	In the water	Nymph
Dobson Fly	In the water	Larva
Dragonfly	In the water	Nymph
Elm Leaf Beetle	Often in attics	Adult
Engraver Beetle	Within tunnels in wood	Larva
Firefly	In log mold or leaf mold	Larva
Grasshopper	As an egg usually; a few as nymphs	Egg or Nymph
Gypsy Moth	Cemented to bark and covered with moth scales	Egg
Honeybee	In a cluster, warmed by muscular activity	Adult
Hornet	Hibernating as a fertilized queen	Adult
Housefly	In attics and protected spots	Adult
Ichneumon Fly	In rotting wood, as an adult. In parasitized cocoon, as a pupa	Adult or Pupa
Isabella Tiger Moth	Under boards, stones, logs, and refuse, as a "wooly bear"	Larva

Katydid	As an egg cemented to leaves or twigs or placed in plant tissues	Egg
Lacewing Fly	Often hibernates with adult mosquitoes in dark cellars and similar protected places	Adult
Ladybird Beetle	Hibernates in masses, often at the base of haystacks, under loose boards, etc.	Adult
Luna Moth	Within a silken cocoon	Pupa
May Beetle	Below frost line for two or three years	Larva
May Fly	Semi-active, in the water	Nymph
Midge	Dormant	Larva
Monarch Butterfly	Migrates to the South	Adult
Mosquito	As a hibernating adult; sometimes as a dormant larva	Adult or Larva
Mourning Cloak Butterfly	Hibernates in hollow trees and protected crannies	Adult
Paper-making Wasp	As a hibernating fertilized queen	Adult
Polypheumus Moth	Within a silken cocoon	Pupa
Promethea Moth	Within a silken cocoon	Pupa
Red Admiral Butterfly	As a pupa and a hibernating adult	Pupa or Adult
Red-legged Locust	In the ground	Egg
Regal Fritillary Butterfly	As an overwintering larva	Larva
Robber Fly	In soil or rotting wood	Egg or Larva
Snowy Tree Cricket	In bark	Egg
Sphinx Moth	Buried in the ground	Pupa
Springtail	Often active in midwinter	Adult
Squash Bug	Hibernating in grass and under litter	Adult
Stink Bug	As a hibernating adult	Adult
Swallowtail Butterfly	As an exposed chrysalis	Chrysalis
Termite	In wood	Adult
Tent Caterpillar Moth	As an egg cemented to a twig	Egg
Tiger Beetle	Hibernating under logs or litter	Larva or Adult
Viceroy Butterfly	Within a rolled leaf	Partly Grown Larva
Walking Stick	As an egg dropped on the leafcover of the forest	Egg
Water Boatman	Usually as a hibernating adult; in one case, at least, as an egg	Adult or Egg
Water Strider	Semi-active	Adult
Whirligig Beetle	On mud of pond or stream bottom	Adult
White-faced Hornet	As a hibernating fertilized queen	Adult
Yellow Jacket	As a hibernating fertilized queen	Adult



American continent to winter along the Gulf.

Left behind by the departing monarchs, small aquatic insects prepare for winter in varied ways along the northern watercourses. The back swimmers and water boatmen gather together in glittering black clouds among the aquatic vegetation. Many cling throughout the winter to tangles of plants which give off oxygen by photosynthesis. Dr. Ann Haven Morgan, of Mount Holyoke College, reports one instance in which masses of from ten to fifty dormant water boatmen were found clustering about small air pockets beneath the ice. Whirligig beetles begin to disappear as soon as the temperature descends to the 50° mark. They drop downward to the mud of the pond or the stream bottom, there to lie dormant throughout the months of cold.

Among the hardiest of the hibernating adults are the spider-legged water striders. I have seen them emerging from debris along the banks of small streams to skate across the chill water of an open space during a mild day in mid-January. They belong to that extremely small group of insects which are seen between the first heavy freeze of autumn and the coming of spring. The most spectacular members of this group are the so-called "snow fleas," or springtails. Some winters they appear on the surface of the snow in such vast numbers that they resemble clouds of drifting dust.

### *Heralds of Spring*

As winter nears its end, one of the earliest of the hibernating adults to appear on the wing is the mourning cloak or "thaw butterfly." During the period of greatest cold, it remains hidden within some cranny or hollow tree. Sometimes as early as in February I have encountered one fluttering about among the trees of a sheltered glade. In March, when the first green grass is pushing up—braving the chill—mourning cloaks are sure to be abroad, their fluttering, cream-bordered wings adding a touch of life to the gray of the landscape.

They, like a host of other insects, have passed safely through the ordeal of ice and snow. They have achieved, in their way,—as other insects have in theirs—a victory over the silent antagonist of all insect life—the winter Cold.



▲ WHERE do all the flies go in the wintertime? Those that live, survive the cold in a sluggish condition in attics and other protected places

► THE FEMALE BAGWORM MOTH spends her entire life within this pine-cone-shaped bag. After luring the male and mating, she fills most of the pupal shell with eggs and makes a protecting plug from down plucked from her body



▼ MOST CRICKETS pass the winter as eggs, but some as almost mature nymphs. It would be difficult to think of any method that insects have not developed through the long ages to triumph over winter



# BIRDS OF NEW CALEDONIA

## The Whitney Hall Exhibit of the Month

The large island of New Caledonia lies some 900 miles east of Australia and about half way between that continent and Fiji. Aside from its strategic position, it is an important source of nickel and cobalt. American forces now hold it.

This exhibit portraying its bird life is one of four recently opened to the public in the Whitney Wing of the American Museum. The island has an area equal to Connecticut and Rhode Island, and it is

fringed with dangerous coral reefs. Some of these are visible under water in the scene below, which is on the northeast coast just east of the anchorage known as Tao.

New Caledonia emerged from the sea early in the Age of Mammals and seems to have had no connection since then with Australia or New Guinea. Among the 64 land birds found there, five exist nowhere else in the world.

*A.M.N.H. photo by Coles*



▲ A FRIAR BIRD flies in to perch against a background of blue sea and sky. The view is from an elevation of 1020

feet. New Caledonia has two parallel mountain ranges, which rise a mile high and enclose a central plateau



# DONIA

➤ A FRUIT DOVE is resting on the twisting smilax. To the left a triller is silhouetted against the sky. On this rugged island most of the plains are river deltas. The landscape is portrayed as it appears in September

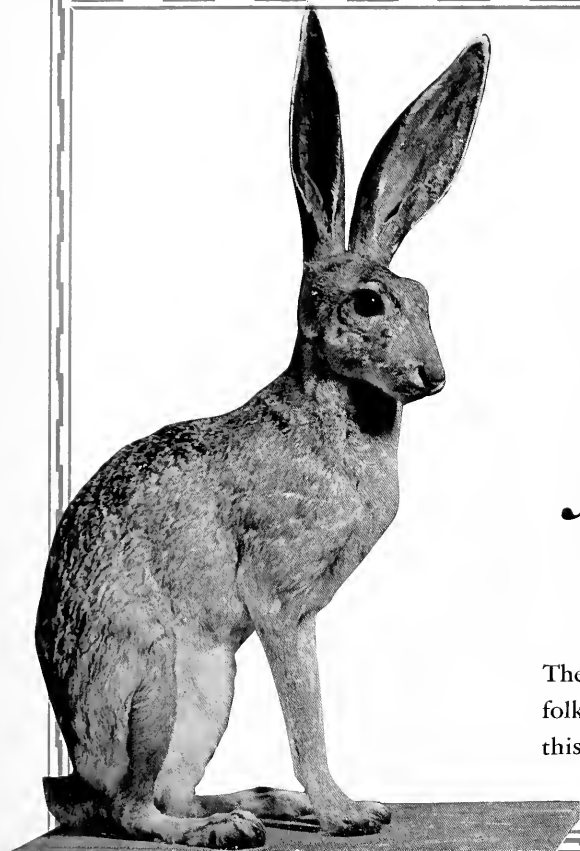
*A.M.N.H. photo by Coles*



*A.M.N.H. photo by Bierwort*



◀ A CLOSE-UP of the large flightless kagu, found only on New Caledonia and lacking any near relatives. Beside it is a parrot finch. Note the intricacy of the verdure, reproduced like the rest of the exhibit with artistry and positive scientific fidelity, under the direction of James L. Clark and Robert Cushman Murphy



*A.M.N.H. photo by Bierwert*

▲ BY SHEER PERSONALITY and force of numbers, the animal whose ears and leg action are prodigious has won renown as a symbol of the wide open spaces of our West

# The Jeepy Jackrabbit

By J. Frank Dobie

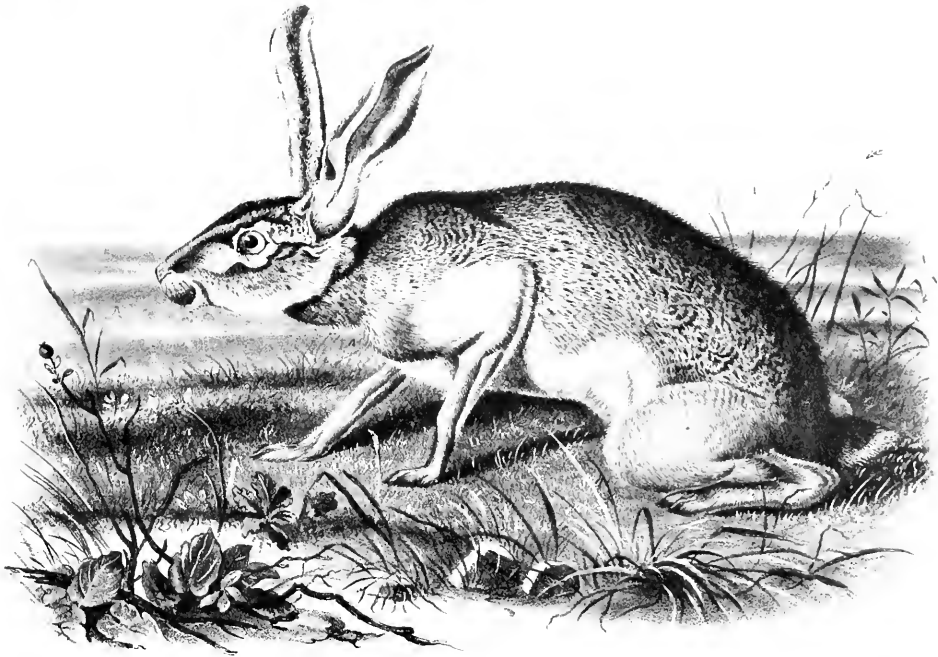
The facts almost vie with the amazing folklore that has grown up about this "lean, lanky son of desert sage"

THE most modern thing about the jackrabbit I have heard is that the jeep claims him for an ancestor. Both of them can hit just the high spots. The rabbits in Australia are no doubt making American jeeps feel immensely at home there. These Australian rabbits are an entirely different species from our jacks, but the two have much in common. Australia was as devoid of hares as Ireland is of snakes until about 1864, when somebody turned loose a pair of the European species on the island continent. Thirteen years later the offspring had become such a pest that 20 million of them were destroyed in South Wales alone, and the government had spent over \$5,000,000 up to 1887 in fighting them.

Australia seems to take kindly to imports. Australia had no prickly pear until about a hundred years ago, when some American varieties were brought in. Now prickly pear literally covers more than 60 million fertile acres. Rabbits and prickly pear go together like venison and honey.

The jackrabbit is as much a feature of Western life as the cottontail is of the South, though no Uncle Remus has arisen to make him talk. The people have done the talking, making the creature a kind of parody on the whole animal kingdom. In 1881 Governor O. M. Roberts of Texas, "the Old Alcalde," published a book entitled *A Description of Texas*. Among its absurd but naively delightful colored illustrations is one labelled, "Texian Hare." Nobody ever reads the book nowadays; it is to be found only in rare collections, but the fact of its existence is kept in mind by virtue of a tag that some wit hooked onto it—"the jackrabbit history of Texas."

The snipe has hardly been used as extensively as the jackrabbit to "take in" tenderfeet. Early day immigrants to the Northwest were "loaded" with the idea that the hares they saw running over the country were a new and extraordinary hybrid of equines called "Oregon mules." Genial Will Hancock, who ranched in the Alpine-Texas-country, married a wife whose sister came down from the north one fall to visit



See *Journal of Audubon*

*Texian Hare*

▲ JACKRABBIT À LA AUDUBON. If not a perfect likeness, this engraving of a "Texian Hare" is recognizable as a portrait of the jackrabbit and as the work of the celebrated bird artist of the nineteenth century

▼ THE SO-CALLED "Jackrabbit History of Texas" owes its nickname to this quaint drawing. The book was written in 1881 by O. M. Roberts, then Governor of Texas, under the title *A Description of Texas*. Note that the artist apparently borrowed freely from Audubon



them. On her first ride over the ranch she was—to use the Mexican phrase—in “a grand emotion” over the jackrabbits. Will Hancock told her various facts about the animal. Finally she concluded, “As I understand it, they do absolutely no harm beyond eating a little grass.” “No,” Will Hancock continued his process of educating the eager visitor, “they not only eat grass we need for the cattle but in the spring, when the calves are being born, they suck the cows and sometimes almost starve the little calves to death by taking away so much milk.”

The next spring Mrs. Hancock's sister concluded one of her letters from the north . . . “and I do hope the jackrabbits are not robbing the little calves.”

### *Eagle versus jackrabbit*

The jackrabbit can jump up as well as run forward. Despite public insistence on making him a joke, some facts about him are bound to come out. “I was riding along one day on the Staked Plains,” related Captain Frank Hamer of Texas Ranger fame, “when I saw a jackrabbit running full tilt parallel to my course. I expected to see a coyote after him, but when I turned in the saddle to look back I saw an eagle . . . overtaking the rabbit, dipping lower and lower, his talons extended.

“Just when the jackrabbit looked to be a goner, he stopped and squatted low on the ground. Then the eagle began to circle over him, swooping closer and closer until he zoomed groundward. I could see the whole thing, neither animal seeming conscious of my existence. Old Jack had his ears laid back flat and waited until the eagle was right at him. Then he sprang about six feet straight up, his feet fanning the air. The eagle passed under him.

“When he hit the ground he was running like an antelope. He made a full 300 yards before the eagle got over him again. The maneuver was repeated three times before the jackrabbit made it to a little catclaw bush, where he had protection from air attack and was safe.”

Every boy living in a jackrabbit country has had more than one dog that never outgrew his unrealized ambition to catch a rabbit. Greyhounds, which run only by sight and not by smell, are said to be the proper dogs for jackrabbit races. Captain R. G. Carter tells in his book, *On the Border with Mackenzie*, of a certain jack with headquarters on a knoll near Fort Sill, Oklahoma, that a pack of five greyhounds never did catch. He had a burrow, probably an old badger hole, on this knoll in which he could take refuge. When started by the greyhounds, however, he did not usually make for the burrow. Surrounding the knoll was a swale covered with coarse bunch grass and clumps of bushes and prickly pear. Any of this

growth was perfect camouflage for the jackrabbit's grey body.

One day while Captain Carter was with the pack, they sighted the often chased jackrabbit crouching near a bunch of grass about a hundred yards off. The tall thin ears were vibrating with excitement. Then there was a bound, a rush and a whirl of dust that almost enveloped the runner. The hounds could see only his ears and stub tail as he leaped over the prickly pear and fairly flew across the brown earth. They stretched out too. But presently they stopped. The jack had made for the swale and had stopped somewhere in the grass. The men, fanning out, jumped him again, not 30 yards from the hounds. This time he headed for his burrow, 300 yards away. The hounds quickly gained on him and would surely have overtaken him if he had not made a right angle turn in mid-air and once more gained the camouflage security of the swale, where the hunters had the sportsmanship to leave both dogs and quarry to their own devices.

When a jackrabbit is hunkered down with his ears laid flat on his head, he blends with his background as perfectly as a “fool” (Mearns) quail. One late fall in Montana I watched the jackrabbits of that country change their color day by day, gradually, yet so rapidly that by the time winter snows had come to stay the animal was perfectly white.

When the jack is hopping about feeding or traveling at ordinary speeds, he carries his long, thin ears erect. When he runs, however, the air pressure forces them back, and when he squats to hide they are flat. What sensitive antenna they must be when their owner erects them, testing for every sound vibration in the air! In spite of his bulging eyes, these ears are his chief informers.

It is well known that coyotes team up and relay each other in running down jackrabbits. I saw the finish of one of these races once but missed seeing enough of it to give such a first-hand description as Malcolm Mackay gives in his *Cow Range and Hunting Trail*.

“One afternoon,” he says, “while George Hoffman and I were riding over the divide between our ranch and the East Rosebud River, we noticed a coyote sitting on a hillside and intently watching something in the valley below. Looking towards the valley, we saw another coyote giving a jackrabbit the chase of his life. We pulled up to watch the race. The coyote took the jack for a lap of about a mile and circled it right back to where his partner was waiting. Then he quit and the second coyote dashed in.

“Going downhill the coyote would almost catch Mr. Jackrabbit. He would have caught him if Mr. Jack had not done some real dodging. Running up-

hill, Mr. Jack's long, springy legs gave him the advantage and enabled him to outrun the coyote. They were running in a country with many ups and downs. On a long downhill run we were sure the jack would meet his Waterloo, but just when his plight seemed hopeless he would squirm, flatten out, and dodge until he hit an upslope.

"We watched this race through three complete laps. Then the jack decided to quit circling and ran straight up a ridge toward the mountain. The last we saw of him he was doing well, both coyotes far behind."

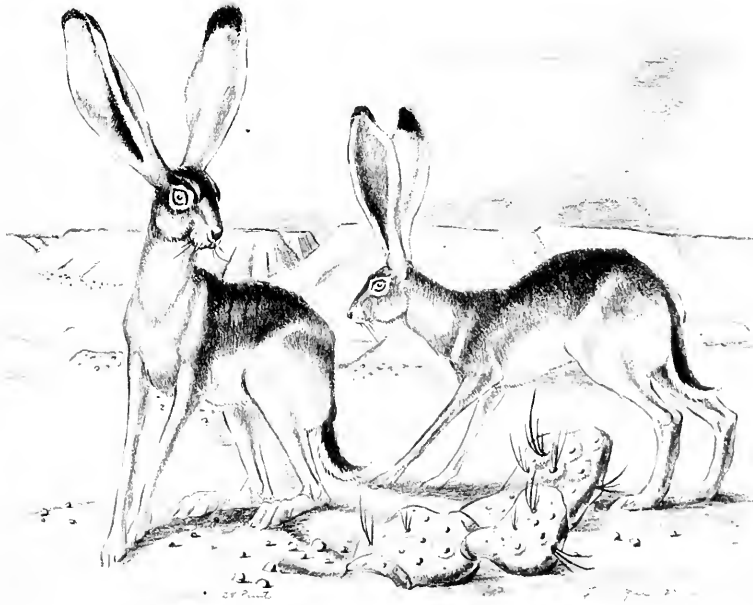
The jackrabbit thrives in many places where he cannot drink water, unless at rare intervals. He probably drinks very little anywhere. It has been surmised that he "licks the morning dew," but he is found on deserts where dew seldom falls and where hardly anything lickable grows for it to fall on. The black-tailed "antelope jack" of Arizona and adjacent regions gnaws into the water store of the thorn-armed

barrel cactus and other cactuses. The passion of any kind of hare for anything green is astounding. Of desert plants, only the greasewood seems to be immune from jackrabbit gnawing.

The Arabs call their hardy and thirst-defying horses "wind-drinkers." That is what the jackrabbit is. He must be one of the longest-winded animals in the world. He may be in good flesh at times, but he never gets rolling fat. People in this "hemisphere" have never regarded his flesh highly. The Plains recipe for jackrabbit stew is: "Put plenty of water in pot. Put in a brick. Put in jackrabbit. Boil four hours. Remove jackrabbit. Eat brick." Nevertheless, during some of the hard times that people in jackrabbit land have known, the meat has occasionally been a lifesaver.

"We lived in a half-dugout, ten by twelve feet," relates the wife of a Plains country homesteader. "Our furniture consisted of a stove, a table, and a bed. We planted wheat until we ran out of seed and money. The drouth came, and we could not raise

▼ JACKRABBIT AND PRICKLY PEAR go together: a more modern portrayal of the jackrabbit, by the Texas and Colorado artist, Otis Dozier





▲ IN 1932, Texas newspapers headlined a Jack-rabbit Roping Contest, in connection with a coming rodeo. Humane societies tried to ban the event, but on the appointed day the jack-rabbits were turned loose with the ropers after them. Not a single rabbit was caught. The net result of the contest was a series of spectacular jackrabbit pictures, of which these are examples

anything. At hog-killing time we mixed jackrabbit meat with pork to make the sausage go farther. We would go out at night and I would hold the lantern while my husband killed the rabbits with rocks."

#### *Jackrabbit plagues*

No matter how many jackrabbits are killed, there always seem to be plenty left. Driving early one morning on a road leading to San Antonio, I was recently astounded at the number of jackrabbit carcasses along the way that had been left by drivers during the night—astounded that after so many thousands of nights of rabbit casualties the nightly toll could still

be so large. I have read that rabbits are not so much blinded by automobile lights as in former days. I don't believe this. An old rabbit may learn to dodge lights, but this ability against automobile lights can hardly be transmissible to the young. The spread of rabbits in Australia illustrates how fast the young come on.

For untold generations the Pueblo Indians of the Southwest have been making rabbit drives. After California was developed and coyotes, always a strong check against rabbit population, were driven out of the populated valleys, jackrabbits were destroying millions of trees and vines by girdling the bark. Drives in that state used to account for as high as 20,000 jackrabbits in a single day. Drives are still made in different parts of the country.

George Bigford, who trailed longhorns northward right after the Civil War, was the most outstanding jackrabbit exterminator I ever talked with. In 1898, he told me, jackrabbits were taking the country. At that time he was living on the Rio Grande, between Eagle Pass and Laredo. Tom Coleman, far-spread rancher, offered him five cents for every pair of jack-rabbit ears brought in.

Mrs. Bigford was averse to bloodshed, but after Mr. Bigford taught her to shoot and provided her with a rifle, she became his partner in the campaign. Mostly they used old-time .44 Winchesters, loading their own shells at night, often sitting up late to load a day's supply. They camped, scouting in a buggy, moving camp as the stock of jackrabbits became depleted in one place. Some days they killed over 100. During the summer they killed over 10,000. When they began shooting in the morning, Mr. Bigford related, buzzards would immediately appear, seemingly called by the sound of the rifle. Just as crows patrol some Western roads in the early morning for rabbit carcasses left by night drivers, the buzzards apparently knew the Bigford rifles meant meat for them.

One valid argument against the extermination of coyotes is that when they are gone, jackrabbits tend to overrun the country. Tend, I say, as when after all the birds of Killsworth had been slain,

Hosts of devouring insects crawled, and found  
No foe to check their march, till they had made  
The land a desert, without leaf or shade.

When jackrabbits become over-numerous, however, nature usually takes a hand by spreading a plague among them. One common form of disease is a tapeworm that causes swellings, sometimes called "water boils," on the bodies of the hares. When a coyote catches a diseased jack and swallows him, he

also swallows the larvae and, at times, becomes infected himself.

From Charles J. Steedman's brightly-written book, *Bucking the Sagebrush*, I quote a description of a jackrabbit plague and migration in Idaho in 1878. This was before coyotes had been thinned out in that part of the world.

"We landed in a country east of the Snake River that must have resembled Egypt the morning after it had been visited by the plague of locusts. This plague was in the shape of thousands of rabbits and black beetles. These beasts and insects had appeared about a month previous in perfect swarms and were eating the country as bare as a board. They spared nothing that was green, not even sagebrush.



▲ TRICK PHOTOGRAPHY raises the jackrabbit to the proportions many Westerners feel he should have. Tenderfeet in the

"The rabbits were a species of Jack, brown in color, gaunt from hunger, and looked as though they had been pulled through a knothole. Like the locusts and grasshoppers, they moved as an army from north to south. The width of the column was about 40 miles, so I was told, and I believe it. The destruction became so alarming that the county offered a bounty of four cents a scalp in order to have them exterminated by the settlers.

"It was no trick at all for a man with a double-barreled shotgun to make four dollars a day, and one enterprising farmer near Boise City built a runway with brush, which ended in a big hole. He then

organized a rabbit drive which resulted in his killing 10,000, thereby earning \$400 at one clip. Payment of warrants nearly put that county into bankruptcy. The pest finally disappeared, no one knew how or why. One theory was that in their southward journey they brought up in the lava beds and just naturally starved to death during the winter."

I like to be in a country where coyotes preserve the balance of nature, where I can see jackrabbits congregate and run, where I can hear the coyotes at night, and where there is a chance to see a coyote-jackrabbit race.

Lean, lanky son of desert sage,  
Gaunt galloper of mesas,

Northwest used to be filled with stories of "Oregon mules," as though the hares were a new and extraordinary hybrid of equines

Speed king of Satan's acreage,  
Gray ghost of twilight places,

Long-legged bouncer of the plains,  
Long-eared cow country racer,  
Pray tell me what your legs contain  
That makes you such a racer?

Thus, S. Omar Barker apostrophizes "the frontier's clown and fool."

But say, gaunt racing prairie pest,  
There's one good thing about you:  
Although you're useless, our old West  
Would not be West without you.

# AN ESKIMO GIRL BUILDS A SNOWHOUSE

An unusual series of photographs by the Venerable D. B. Marsh,  
Archdeacon of Baffin Island

MEN are generally the builders of houses throughout the world, but the accompanying photographs show a girl at Eskimo Point on the west coast of Hudson Bay constructing one of the houses for which the Eskimos between Labrador and western Canada are famous. This is a smaller house than the typical snow hut which serves through the winter as a dwelling among many of the Central Eskimos. But the latter is usually a more am-

**1** CHOOSING AN AREA where the snow is compact, the girl cuts blocks about a foot and a half long and a foot wide. On a trip an Eskimo sometimes carries a special snow knife



**2** SHE LAYS the blocks around the hole left in the snow—an easy system for one person. But if the house is to stay warm when the door is open, the floor must be higher



**3** NOTICE that the girl has cut the blocks slightly curved. With thinner blocks the house could still be kept good and warm, and there would be less thawing during cooking



**5** THE BLOCKS are laid around in a rising tier. Most persons do not realize that a snowhouse can be kept much warmer than freezing. The cold outside keeps the snow from melting



**6** EACH BLOCK is now leaned against the next in order to keep them from falling in. The colder the weather the warmer you can keep the interior without weakening the roof



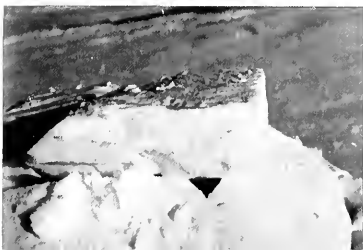
**7** LAYING THE BLOCKS is warm work, and the architect in snow pulls the hood of her fur jacket back



**9** THE LAST FEW BLOCKS can scarcely be angled up through the narrowing hole and are laid with care



**10** A FINAL BLOCK closes the hole in the center and the dome is completed—a masterpiece of ingenuity



**11** REMOVING A BLOCK with her knife, she emerges triumphant. The house is now quite substantial





bitious structure than one person can conveniently construct alone. The usual practice is for one man to stand on the inside and lay the blocks, while another cuts them from the snow outside and hands them to him through a hole in the lowest tier of blocks. The house pictured here is a convenient size for overnight shelter on the trail, and as shown, even a girl can build it quickly without any assistance from a second person.

**4** THE WALL slopes slightly inward, and at one point it tapers down to take the next tier in a continuous spiral. This snow would be called excellent for housebuilding



**3** SHE IS NOW almost hidden, and the hardest part is about over. The wall is curving inward sharply



**2** LASTLY, SHE FILLS the chinks with snow. In time, a snowhouse grows so strong you can stand on it



# INFORMATION TEST

A few high spots in this issue on which you can try your knowledge.

Correct answers on page 56

- |   |   |
|---|---|
| <p>1. Where in the United States would a tide 14 feet higher than its spring crest send the sea in on 50,000 people living below sea level?</p>                             | <p>6. Snowshoe rabbits have this name because<br/>(a) they provide the best gut for snowshoes<br/>(b) their enlarged feet support them on deep snow<br/>(c) the Indians used their fur for winter moccasins</p> |
| <p>2. Some Eskimos live in snowhouses all year.<br/>True..... False.....</p>  | <p>7. The colder the weather the warmer you can make it inside a snowhouse.<br/>True..... False.....</p>  |
| <p>3. Otters are noted for their habit of<br/>(a) sliding down snow banks for sport<br/>(b) breathing water as well as air<br/>(c) abandoning all but the coldest water</p> | <p>8. Although seals are renowned as swimmers, one never sees a baby harp seal enter the water voluntarily.<br/>True..... False.....</p>  |
| <p>4. By what ingenious method do honeybees survive the cold of winter?</p>   | <p>9. If the ceiling of a snowhouse starts to melt, you should make it thicker.<br/>True..... False.....</p>  |
| <p>5. A harp seal's milk contains ten times as much fat as a cow's milk.<br/>True..... False.....</p>   |   |

10. The creature below is (a) a fish from the Mississippi delta, (b) a reptile from Florida, (c) a rare pig from the Amazon, (d) a giant anteater

*Hugh H. Schroder photo*



# SEEING NATURE

## *through the* CAMERA'S

A GROUND SQUIRREL curled up in winter sleep

*Photo by Fisher, from Leon*





*Photo by B. Schocher, from Leon*

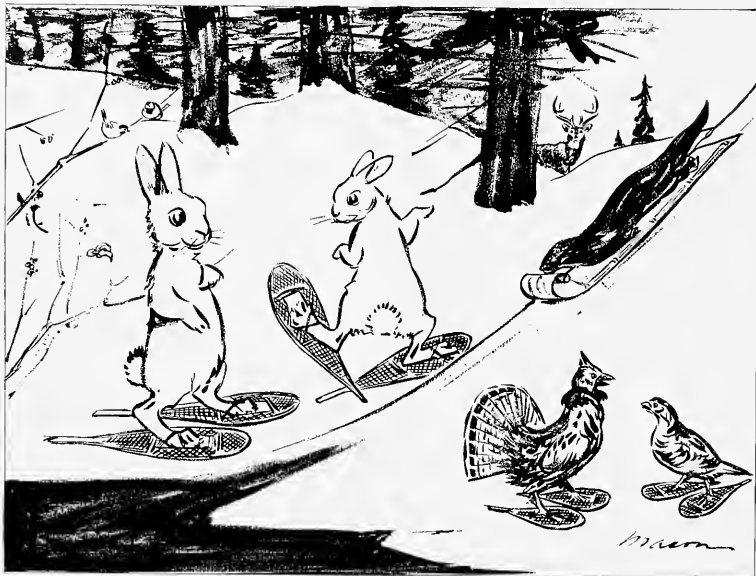
TWO SWISS MARMOTS in spring snow

CHAMOIS traveling through drifts in the Alps

*Photo by B. Schocher, from Leon*



# WINTER SPORTS



By JOHN ERIC HILL

*Drawn by*

G. FREDERICK MASON

**A**NIMALS that live in wintry climates have various ways of getting along in spite of the weather and its effects. Some more than survive the cold season,—they seem to enjoy winter sports.

The otter is one of the few mammals that, winter and summer, takes time off to play. In winter otters must stay near places where the swift current keeps a stream open in the coldest weather. They are nearly dependent on fishing, but if they can get in and out of the water, otters can usually satisfy their needs with part time work. They swim about under the ice on this business with none of the worries we would have. Swift running water catches air in the rapids, and bubbles are left under the ice. Along the banks there are places where water and ice are not in contact—freezing weather reduces the amount of water in a stream by tying up much of the moisture in snow and ice. Or, like the beaver and muskrat, an otter may blow out its breath in a bubble under the ice

and, when the air has been partly purified of carbon dioxide, suck it back in and swim off again.

When otters find open water near a steep bank, it is an invitation to go sliding. Even in summer they like to slide down steep banks, but snow is still more fun.

Long before snowshoes were invented a number of mammals and birds had feet that enabled them to walk on snow without sinking in. Indeed it is quite possible that men in northern countries noticed how these animals did this and were led to invent snowshoes. Varying hares, often called snowshoe rabbits, have big feet at all seasons, larger in relation to the size of their bodies than those of hares and rabbits living in warmer climates. In winter the foot-size is increased by stiff, long hairs. Food is no problem to these hares of the spruce and fir forest; they depend on the bark of trees and shrubs. They do so well, in spite of the cold, that they increase to immense numbers every so often. Then a disease of mysterious nature, called shock-sickness, causes them to die off like flies.

Their large relatives of the northern plains and mountain valleys, the white-tailed jackrabbits, have almost as large snowshoes in winter. A

group of these hares often can be seen at the edge of an aspen clump, nibbling the tops of the seedling aspens and apparently enjoying the social meal. They hop over the snowdrifts in the teeth of bitter cold and howling wind, and spend their hours of rest in the lee of some small bush.

Ruffed grouse and ptarmigan spend much of their time on the ground. Snow is both a help and a danger to them. They sleep under it, often diving into the soft snow to spend the night. Yet when the snow is wet and the night cold, a crust forms that the birds often cannot break through, and numbers of them perish. The ruffed grouse has "snowshoes" formed by the scales along the sides of the toes, which increase in size with the coming of cold weather. The ptarmigan produces "snowshoes" from feathers, much like the hairy ones of the snowshoe rabbit.

No winter scene would be quite complete without the acrobatic chickadee. He hangs upside down in the branches of small trees, picking the insects he finds hibernating in their tiny cases or eating insect eggs. His "tzicka-dee-dee-dee" song rings out over the still snow, and only the coldest weather daunts this winter sportster.

# YOUR NEW BOOKS

WOLF CHILDREN • GREENLAND • SCIENCE REMAKES OUR WORLD  
RACE, REASON, AND RUBBISH • GAME FISHING • EMERALDS

## MY ADVENTURES IN ZUÑI

----- by Frank Hamilton Cushing

The Peripatetic Press,  
Santa Fe, New Mexico, \$7.50

FOR the Bureau of Ethnology, Cushing first visited the Zuñi Pueblo in New Mexico in 1879, and this was his home for the next four and a half years. The story of his experiences originally appeared in the early 1880's in installments in the *Century Magazine*. It is now published for the first time in book form. Included is an introductory essay by E. De Golyer which sets forth the nature and importance of this pioneer work. A third part of the book is a most interesting account of the trip to Washington and Boston by a group of Zuñi chieftains, accompanied by the young ethnologist, Cushing. This was written by Sylvester Baxter, who was home secretary of the Hemenway Southwestern Archaeological Expedition of 1886-1889, of which Cushing was leader. Frederick W. Hodge was field secretary of this expedition, and this book is dedicated to him.

The volume is beautifully illustrated with line drawings of life in the pueblo, by Zuñi symbols as backgrounds for the initial letters, and by Zuñi ceremonial masks in color,—all by Miss Fanita Lanier.

Cushing was adopted into the tribe, wore native costume, ate native food, learned to speak the Zuñi language, and attained an important position in the tribal councils. Consequently he was well qualified to write this absorbing story.

THE ATA AND CLYDE FISHER.

## NATURAL HISTORY WITH A CAMERA

----- by L. W. Brownell  
American Photographic Publishing Co.,  
\$3.75

HERE is a book by one of the pioneers of nature photography. As the author points out, an important requisite for success in photographing plants and animals is a good working knowledge of their life histories and habits. Another requisite, which the author possesses in unusual degree, but says nothing about, is what this reviewer likes to call the "photographic sense." Naturally he would allow his photographs to proclaim, as they do, his equipment in this respect. It seems that photographers, like artists and poets, are born not made. And Brownell is a born photographer with fine talent.

Of course, if one believes in education, he must know that improvement in this

art is possible through practice and by carefully studying the results and techniques of those who do good work in the field. And the author in this volume gives his readers the benefit of his long experience. His first chapter is on equipment. In the remaining chapters one is conducted on a series of field trips with a camera, arranged chronologically through the months of the year, beginning with the spring season.

His selected illustrations include the greatest variety of subjects,—butterflies, moths, and other insects; life of the seashore; turtles, snakes, and lizards; birds and their nests; mammals and tracks in the snow; mushrooms, ferns, and wild flowers and fruits.

It is to be regretted that the plates do not do full justice to the excellent photographs from which they were made.

CLYDE FISHER.

## GREEN FIRE

----- by Peter W. Rainier  
Random House, \$2.75

THE general public has been well informed on the history and methods of diamond mining, they even know something of its geology; but they have never been exposed to much information about the recovery of that far rarer gem, the emerald. There are but few emerald occurrences in the world, and Colombian emeralds are by far the finest. The author of this book has been associated with both of the periodically producing Colombian mines.

The Chivor Mine was known to the Spaniards but was lost after its abandonment with the consequent rapid growth of tropical vegetation. Emerald mining is certainly a gamble, but Mr. Rainier shows that considerable common sense and mining experience are essential aids, even in such an unpredictable ore body as that in which the emeralds are found. This, however, is far more than a book on emerald mining alone, interesting as that aspect is. It also tells of his many years of experience in the wild interior of Colombia, his fights with bandits, his travels, and above all, of the interesting people he met, from pseudo Italian barons to very real Colombian Indians.

After a period of commercially successful operation of the Chivor Mine, Rainier became a consultant for the Colombian Government for their better known Muso Mine. Here too, he was successful in developing a profitable mine, but in so doing he gave up his dream of a consolidation of the emerald sources and a world control over emeralds like that over dia-

monds. The Colombians were not likely to part with a mine when it had been proved productive. His second love was his tea and coffee plantation, but he has yet to reap the fruits of his labors in that project. Just as success seemed assured he has had to leave Colombia, but one feels that his story is not ended, just continued. The mineralogist would wish for a little more detail about the Chivor and Muso occurrences; the general reader would have enjoyed the book far more had some photographs been included.

F. H. POUGH.

## SCIENCE REMAKES OUR WORLD

----- by James Stokley  
Ives Washburn, Inc., \$3.50

WE might turn the old adage around and say "In time of war, prepare for peace." That is exactly what the inventors are doing now. New discoveries, new processes, new materials are changing our world. War cuts off a supply of something and an inventor makes a substitute, which in the final analysis may be of wider application than the original article.

That is the story that Stokley tells in his new book, a Scientific Book Club selection. His experience has fitted him well for his task, and he writes with authority. He has searched here and there and found a wealth of interesting material. His book is a sort of witch's brew—explosives, fuel, plastics, chemicals, glass, vitamins, new metals, electrons. Stokley, with the skill of a magician, distills from these topics—they are chapters, really—new clothes, pictures of the future, communications, power, cures, and farming processes,—these, too, are chapters.

In his opening paragraph the author sounds an encouraging note to those who believe that the future is dark. "Today's most promising frontiers are those of science—those which are being explored by research workers in laboratories both great and small. They have largely replaced the geographical frontiers of the past. And these new frontiers have a great advantage over the older ones. After all, space on the earth's land masses is limited, but the scope of exploration in science is infinite. Whenever science, in the past, has seemed to reach a dead end, a new road has opened, generally far broader than that left behind. There is every reason to think that this will continue indefinitely—that we shall never reach a state where knowledge will be complete."

Pictures galore and interesting material abound on every one of its 300 pages. It

# EXCAVATIONS AT DEIR EL BAHRI 1911-1931

by

**H. E. WINLOCK**

*Former Director  
Egyptian Department*

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**M**UCH of the remarkable history of Egypt of 4,000 and 2,000 years ago comes to life in this book by one of America's outstanding archeologists, covering about twenty years of "digs" at the site of an early cradle of civilization.

As the work progressed, centuries, literally, of history unfolded. Models of farms were found which gave intimate details of daily life: models of boats and other conveniences showed modes of travel. Much of the book centers around the mighty queen Hatshepsut, of the XVIII Dynasty and Sen-Mut, an architect who seems to have something more than a friend.

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WM. H. BARTON, JR.

## THIS GREEN WORLD

----- by Rutherford Platt  
Dodd, Mead & Co., \$3.75

**H**ERE is a beautiful book for the lover of beauty in nature. It was written by a good, dependable, all-round naturalist, who is at the same time one of our best nature photographers. The illustrations include 135 superb photographs by the author,—27 of them in full color, from magnificent kodachromes. In addition there are 110 drawings.

Mr. Platt has set forth in enlarged photographs the surprising structure and color of tree buds and flowers, which the casual observer seldom sees. In the text he describes in a lively manner the engineering problems that trees must solve. He explains the cause of the rise of sap in trees. He explains how the tree, through its green leaves, makes carbohydrates from carbon dioxide in the air together with water from the plant. He discusses what happens to make autumn colors. He has made his own non-technical keys for the identification of trees in winter and in summer. He has also devised a simple and practical pictorial key to native evergreens.

In the section on flowers he describes, with excellent illustrative material, the fascinating devices for cross-pollination by wind and by insects—how trees and grass are equipped for wind pollination; how the orchids, milkweeds, butter-and-eggs, and others are adapted for cross-pollination by insects. He shows how the time of flowering of plants through the seasons "runs on a timetable keyed to the length of the day," and how plants of high mountains and the arctic regions and the deserts are "stunted by light." An attractive section is devoted to the varied and often bizarre flower forms and arrangement of parts.

Mr. Platt is a born photographer, and naturalists will be grateful that he has made a fine selection of his work available in book form.

CLYDE FISHER.

## WOLF-CHILDREN AND FERAL MAN

----- by J. A. L. Singh and  
Robert M. Zingg  
Harper & Brothers, \$4.00

**T**HIS volume is one of the most critical and extensive treatments of feral man, a topic which has always been of great interest to scientists and laymen.

The book is divided into two main sections, the first of which consists of "The Diary of the Wolf-Children of Midnapore (India)" by the Reverend J. A. L. Singh. Mr. Singh and his wife were in charge of an orphanage at Midnapore in Bengal, India. In 1920 when Mr. Singh was making a missionary tour, the natives of one village showed him a wolf den

which they believed to be inhabited by "man-ghosts." Investigation proved that the den did contain several wolves; and, in addition two human children. Upon capture these children proved to be girls approximately one-and-one-half and eight years of age respectively.

They were taken to the mission orphanage where the younger died after one year and the older lived for nine years. An account of the children's habits and of the results of attempts to humanize them constitutes the diary which makes up the first part of the book. Appended to the diary are various documents gathered by Professor Zingg in an attempt to authenticate the data recorded by Mr. Singh.

The second half of the volume is a compendium of previously unassembled accounts of feral man. Professor Zingg regards some of the reports as authentic and others as questionable.

Accounts of feral man are usually evaluated with a good deal of skepticism, because so many of the data involved are exclusively anecdotal. However, the factual material presented in Mr. Singh's diary of the wolf-children of Midnapore appears to be founded upon careful if not scientific observation. The author's theoretical interpretations may be accepted or rejected as the reader sees fit, but there is no question that Dr. Zingg has accomplished a worthy objective in bringing together in such useful form the sum total of existing knowledge regarding feral man.

FRANK A. BEACH.

## GREENLAND

----- by Vilhjalmur Stefansson

Doubleday, Doran & Company, Inc., \$3.50

**S**TEFANSSON'S latest book, *Greenland*, will surprise its readers. They will learn that Greenland was colonized by Scandinavians in 985 A.D., who were Christians in part and who kept in touch with the Pope in Rome; that Iceland, then a colony 200 years old, had a population of more than 20,000; that an adventurer, Erik the Red, founded a colony in the country he named Greenland because he thought such a name in contrast to Iceland would attract settlers. Anyway, settlers came and Greenland prospered; cattle, sheep, pigs, poultry, and horses were introduced, churches were built and priests established therein. Government was organized as a kind of republic, but as a dependency of Norway. The colony grew and prospered until about 1400, when a decline set in leading to extinction. Ships from Europe visiting Greenland after that date did not note the presence of white people. Their fate is unknown.

Thus the book presents a fascinating account of this lost colony of Christian Europeans, who lived in the New World for 500 years before Columbus discovered the West Indies and 600 years before the Pilgrims landed at Plymouth. The interpretations for historical facts on Greenland cited by Stefansson, are conservative and convincing. The reader will enjoy reading the numerous quotations from old Norse sagas, which are the chief sources of documentary evidence; he will be

thrilled over what archæologists can tell him of the old life in Greenland, and gripped by the author's speculations on the unknown fate of the lost colonists, as fascinating as a modern mystery story. The book closes with a timely discussion of Greenland as a defense outpost for the Allied Powers, especially its value as a gigantic air base for the North Atlantic, both in war and peacetime air transportation. C. W.

**EARTH'S ADVENTURES:  
THE STORY OF GEOLOGY  
FOR YOUNG PEOPLE**

----- by Carroll Lane Fenton  
The John Day Company, \$3.00

**T**HIS is the latest of the several popular geological works written by Doctor Fenton. Being a trained geologist, his books bear the imprint of his authoritative knowledge of the subject—a feature that has been deplorably absent in a number of the popular accounts that have appeared in the past few years.

As indicated by the sub-title, this book is primarily designed for the younger reader, but it will serve as an excellent introduction for the older person who is seeking to understand the fundamentals of geology. There are one or two "popularizations" made in the effort to reach the younger reader which seem both unnecessary and illogical to this reviewer. For example, I find it difficult to understand why it is that, in a geologic Time Scale which includes the correct scientific names of nearly all the periods, including among others Temiskaming, Keweenawan, Cambrian, Ordovician, etc., the Cretaceous should be slighted in favor of "Chalk Age," and the Pleistocene Epoch in favor of "Ice Age." The word "Cretaceous" certainly is derived from "creta" (= chalk) in allusion to its occurrence in the Dover cliffs, but by far the greater proportion of the world's Cretaceous deposits are of sandstone and shale. "Chalk Age" is a definite misnomer for this period.

I have two other objections, which however are the fault of the publisher rather than the author: the many well-chosen illustrations are in large part very poorly reproduced, and the price, \$3.00, seems excessive for a 207-page book.

H. E. VOKES.

**SCIENCE IN PROGRESS**

----- by 10 co-authors  
Edited by Geo. A. Batsell  
Third Series  
Yale University Press, \$3.00

**I**N this book there are ten chapters, most of which are based on the National Lectureships of the Society of the Sigma Xi. Each topic is by a leading authority, is highly technical, and has a good list of references.

(1) Harlow Shapley (Harvard) in *Galaxies* summarizes modern ideas on galaxies, the Milky Way, novae, supergiant stars. (2) Edwin Hubble (Mt. Wilson) in *The Problem of the Expanding Universe* discusses clearly this cosmological theory, offering the latest conclusions. (3) In *Energy Production in Stars* Hans

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# Natural History

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Above illustration—Nile River Group—Detail showing Antelope  
Akeley African Hall—American Museum of Natural History



A. Bethe (Cornell) offers a study in atomic physics, on the sun's energy, nuclear transmutations, the carbon cycle, the life of a star. (4) *Image Formation by Electrons* is a long illustrated description of the electron microscope, by V. K. Zworykin (RCA Research Lab.). (5) In P. W. Bridgman's *Recent Work in the Field of High Pressures* the author (Harvard) describes experiments and latest developments in this field of physics for the purpose of studying matter at exceedingly high pressures. He was unable, even under pressures of 100,000 kg/cm<sup>2</sup>, to change graphite into diamond. The unlabeled diagrams are not lucid. (6) *Recent Developments in Power Generation* by Lionel S. Marks (Harvard) is a clear account of the physics of sources of power, turbines, combustion engines. (7) James Franck (Chicago) in *Some Fundamental Aspects of Photosynthesis* outlines certain theories in physical chemistry on the synthesis of organic matter in green plants. (8) John G. Kirkwood (Cornell) has a short section on *The Structure of Liquids*, with a mathematical discussion on modern molecular chemistry of liquids. (9) *The Mode of Action of Sulfanilamide*, by Perrin H. Long (Johns Hopkins), deals with the present status of certain anti-septic drugs and their action. (10) The section by Hermann Mark (Brooklyn Polytechnical Institute) on *Some Scientific Aspects of the Synthetic Rubber Problem* is an organic chemistry study on polymerization and molecular structure.

HUGH S. RICE.

## WILDLIFE PORTFOLIO OF THE WESTERN NATIONAL PARKS

----- by Joseph S. Dixon

U. S. Government Printing Office, \$1.25

THIS volume offers 52 half-tone plates of mammals, birds, and reptiles, with an accompanying page of text for each picture. The animals are selected from those species most likely to intrigue the visitor to our Western National Parks which range from Alaska to the Mexican border. The field experience of the author covers the past 35 years and this same wide geographical expanse.

Important facts are presented in the entertaining and instructive text, and Dixon frequently draws upon personal observations for interesting incidents. With the limited space devoted to each entry in this Wildlife Who's Who, only the high lights can be developed.

This book can be read at a sitting, and many will buy it for an entertaining arm-chair visit to the National Parks. But the book has a broader use and will prove a valuable companion for one who goes into the Parks to see the marvels of Nature with his own eyes. With this Baedeker to the wildlife of the Parks, it will be possible to understand much more of what is seen, to realize the significance of these important sanctuaries for threatened species, and to appreciate more fully the principles of conservation.

One of the reasons for a better acquaintance between visitors and denizens of the Parks is the fact that "much damage to wildlife and frequent serious injury

to human beings has resulted from lack of information on the part of park visitors."

In addition to its usefulness in the Parks, this book will prove a handy reference for readers, juvenile and adult, for the species it covers.

The quality of the photographic reproductions does not always come up to the possibilities of the material selected and it is to be regretted that a text so commendable could not have had brilliant and vigorous plates.

H. E. ANTHONY.

## RACE, REASON AND RUBBISH

----- by Gunnar Dahlberg

Translated by Lancelot Hogben

Columbia University Press, \$2.25

THE title of this book is only partially descriptive of its contents. Of twelve chapters the first nine deal exclusively with the principles of genetics. Chapter 10 applies some of these principles in a description of the "isolate effect," which refers to certain factors that prevent free interbreeding in human society.

Chapter 11 is concerned with a special case of the isolate effect, namely inter-relations of racial groups. The difficulty of defining a race on the basis of any but purely physical characteristics is emphasized, and the myth of Nordic superiority is attacked. The twelfth and concluding chapter includes a discussion of the "Jewish question." It is pointed out that there is no scientific proof that, in so far as inherited traits are concerned, Jews represent a special type. In conclusion the author states his conviction that the extent of present knowledge is not sufficient to justify the widespread application of eugenic theories calculated to breed given quantities into or out of the human race.

This book has two purposes. Its first aim is to present for the layman a reasonably comprehensive description of the physical bases of heredity. The second goal of the book is to disprove various commonly accepted beliefs regarding racial differences; and, having disproven such misconceptions, to show that racial problems are not likely to be solved in the immediate future by radical programs of controlled reproduction. Both goals are well accomplished.

FRANK A. BEACH.

## PACIFIC GAME FISHING

----- by S. Kip Farrington, Jr.

Illustrated by Lynn Bogue Hunt

Coward-McCann, Inc., \$5.00

RECENTLY opened game fishing grounds of the Pacific have already brought in a rich harvest to sportsmen and ichthyologists. In this companion book to his *Atlantic Game Fishing*, Kip Farrington, one of the best known anglers in the world, gives an informative and exciting account of these fishing grounds and of conditions he found on them from Australia, the Hawaiian Islands, South America, Panama, and Mexico to our



own California grounds and the salmon grounds of Puget Sound and Campbell River, British Columbia.

The book is primarily for anglers, who will meet again many familiar people and places; particularly will they enjoy Mr. Farrington's animated discussion of light tackle versus heavy. However, like many anglers, the author is a keen observer of his prey and its haunts, and this book contains precise information about life in the waters and on the coasts he knows so well. For exciting reading, you cannot beat the account of a tussle with a huge broadbill, boated on the author's last day in Tocopilla, Chile. Equally interesting is the true "fish story" of the free marlin who swam for hours beside a marlin on the hook. Mr. Farrington has made every effort to keep his scientific facts correct, and to them he has added his not inconsiderable contribution from firsthand observations. The very beautiful illustrations and well reproduced photographs add greatly to the book.

The book is simply and directly written, with an enthusiasm that makes it pleasant reading. In fact, Kip can look on some of the world's most ugly spots and find them beautiful because he sees beyond oil tanks and grey sheds to blue water and leaping silver marlin.

F. L. A. M.

## BIOLOGICAL SYMPOSIA, VOLUME IX

----- Edited by F. C. Koch and  
Philip E. Smith

The Jaques Cattell Press, \$2.50

THIS most recent volume of the Biological Symposia is divided into two sections. The first portion of the book deals with the physiological action and metabolism of the sex hormones. The second treats hormonal factors involved in the inversion of sex.

Chapter One, by Professor Carl R. Moore, consists of a discussion of the comparative biology of testicular and ovarian hormones. This is the only chapter that stresses the total, organismic relationships of gonadal secretions. The remaining three chapters in the first section are as follows: "The Comparative Metabolic Influences of the Testicular and Ovarian Hormones," Dr. A. T. Kenyon; "The Metabolism of Estrogens," Professor Edward A. Doisy; and "The Excretion and Metabolism of Male Sex Hormones in Health and Disease," Professor F. C. Koch.

The second half of the volume consists of the following chapters: "Sex Inversion in the Plumage of Birds," Professor C. H. Danforth; "Sex Inversion in the Amphibia," Professor R. R. Humphrey; "Hormonal Factors in Sex Inversion: The Effects of Sex Hormones on Embryonic Sexual Structures of the Rat," Dr. R. R. Greene; and "Hormones and Experimental Modification of Sex in the Opossum," Professor R. K. Burns, Jr.

This publication constitutes a valuable addition to the library of the experimental endocrinologist. The most significant recent researches are critically reported and interpreted, and the bibliographical value of the volume is great.

It may be slightly disappointing to the reader to learn that a symposium entitled simply "Sex Hormones" is in actuality almost exclusively a discussion of the biochemical and morphological implications of the subject. However, as Professor Frank R. Lillie states in the foreword, "The symposium is comprehensive within a circumscribed area of the field of internal secretions with relation to sex."

It is to be hoped that in the future a complementary volume may be prepared wherein the broader aspects of the functions of the sex hormones, such as their relations to behavioral responses, clinical indications, etc., will be given equally intensive treatment. In the meantime the present publication represents an excellent compendium of available information with regard to two aspects of the study of the sex hormones.

F. A. B.

## STRUCTURAL GEOLOGY

----- by Marland P. Billings

Prentice-Hall, Inc., \$4.50

THE concept of structural geology evidenced by this book is truly a broad one. It includes several phases of geology not customarily considered appropriate to the field, but which very rightly belong there. In many branches of geology, one text, going through numerous revisions and new editions, ranks above all the rest, and it seems likely that the book discussed here may come to occupy that enviable position in this field. For Professor Billings thinks of structural geology as a subject that is of concern to all field geologists, not only those working in sedimentary or metamorphic rocks. After a discussion of the physical principles of stress and strain, and the results of laboratory experiments, we find the usual sections on sedimentary and metamorphic rock structures clearly presented with good line drawings and illustrations from well-known regions. Many of the better known scenic regions of the United States and the World are explained in the descriptions of the structural complications which must be interpreted by the field geologist.

The book is unique, however, in its inclusion of some of the more modern concepts of structural geology. We find here a discussion of the latest ideas of igneous rock structures, as preached by the Cloos school of workers in igneous tectonics. There is also a chapter on petrofabric analysis, as developed by Bruno Sander, which determines rock histories by a thin section study of the orientation of mineral grains. The closing chapter describes the various geophysical methods such as the torsion balance, the seismograph, and the magnetometer. Such sections make this text a truly comprehensive work, valuable as a textbook for geology students, but also an essential reference work for trained geologists, for it brings together in one place, with many references to more extended works, the latest thoughts on all the phases of structural geology. It is a splendid addition to this fine Prentice-Hall geology series.

F. H. PUGH.

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## BIRD LECTURES

Guests are welcome at the following lectures by outstanding authorities, which have been arranged by The Linnæan Society of New York:

January 12: "Distribution of Land Birds,"  
by Mr. John T. Zimmer

February 9: "Some Anatomical Characteristics of Birds," by Mr. H. C. Raven

March 23: "Distribution of Marine Birds,"  
by Dr. Robert Cushman Murphy

April 13: "Classification of Birds,"  
by Mr. C. K. Nichols

All lectures will be held at 8:00 P.M. at The American Museum of Natural History.

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## Answers to Questions on page 47

1. Salton Sink, in California. See page 17.
2. False. No Eskimos live in snowhouses all year, because the climate is not cold enough. See page 40.
3. (a) Otters are noted for their habit of sliding down snow banks for sport. See page 50.
4. By clinging together in a great ball. The bees at the center perform a sort of dance and change places at intervals with those on the outside. See page 34.
5. True. The seal's milk is the fattest milk known. See page 10.
6. (b) Snowshoe rabbits have this name because their enlarged feet support them on deep snow. See page 50.
7. True. The outer cold keeps the snow solid when the temperature inside is well above freezing. See page 46.
8. True. The young harp seal would probably drown if it were to remain in the water for half an hour. See page 10.
9. False. You should shave it thinner, so the outer cold will counteract the heat within. See page 46.
10. (b) This creature is a reptile from Florida, the southern soft-shelled turtle.



## ON YOUR RADIO

Programs of the American Museum and Hayden Planetarium, Fall, 1942.

WEDNESDAYS over WNYC  
from 3:30 to 3:45 P. M.

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Broadcasting System from 4:30  
to 4:45 P. M.

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## EVOLUTION OF BOOKBINDING

A special exhibition of books bound in wild animal skins, is being shown at the American Museum of Natural History, from December 2nd through January 20th. The books were bound by Hamonneau, master binder, who has utilized lion, rhino, elephant, skunk, and about 25 other skins. The exhibition demonstrates the development of the uses of various materials, from the parchment of 1,000 years ago, to present-day bindings.





February **NATURAL HISTORY** 1943

*New Guinea · Australian Birds · Bush Babies · Pearl*

*Stefansson: Greenland · Bird Cities of the Aleutian*

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Publication date—February 5, 1943  
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Photo by Charles H. Coles

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## The Wartime Role of Beauty in the Museum

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UNLESS the generations now in childhood come out of this war with a love for our ideals and our country at least as great as our own, the fruits of our victory may prove bitter indeed. To the extent that our acts or our possessions may contribute to the creation of such feelings among the young we are therefore contributing to the future happiness and security of our nation.

Love for country and ideals has many objects, and many causes and motivations. To attempt to explain such a complex feeling in its entirety would be very difficult and would lead to no agreement. But there can be little doubt that it may in considerable part be taken as a conscious expression of subconscious gratitude—gratitude for beauty seen or heard, for pleasures enjoyed, for kindness and inspiration, for shelter and security, for the blessings of peace and an abundant life. From the enjoyment of these things we learn to love the country and the society to which we belong. But it is extremely important to remember that only in the early years of our lives are we capable of forming the emotional attachments to ideals and abstract concepts which will enable us to endure hardships and deprivations without changing our faith in those ideals.

Because we ourselves enjoyed all the benefits of our way of life at the proper age, we feel so secure in our own love of the things we are fighting for that we become inclined to overlook that this love is not handed down to coming generations by some magic of heredity. Nor can it be transmitted by logical reasoning. Only so long as we continue to make available to our children emotional and esthetic experiences similar or equivalent to those we ourselves enjoyed will such love continue to live in our national soul. It is therefore of the utmost importance that we honestly face the laws of cause and effect also in the sphere of our emotions, and do not let

ourselves be blinded by sentimental beliefs without solid foundations. To meet our material needs we are successfully searching for substitutes with all means at our disposal. Our future may depend upon our willingness to do the same for the emotional needs of our young, when normal experiences fail.

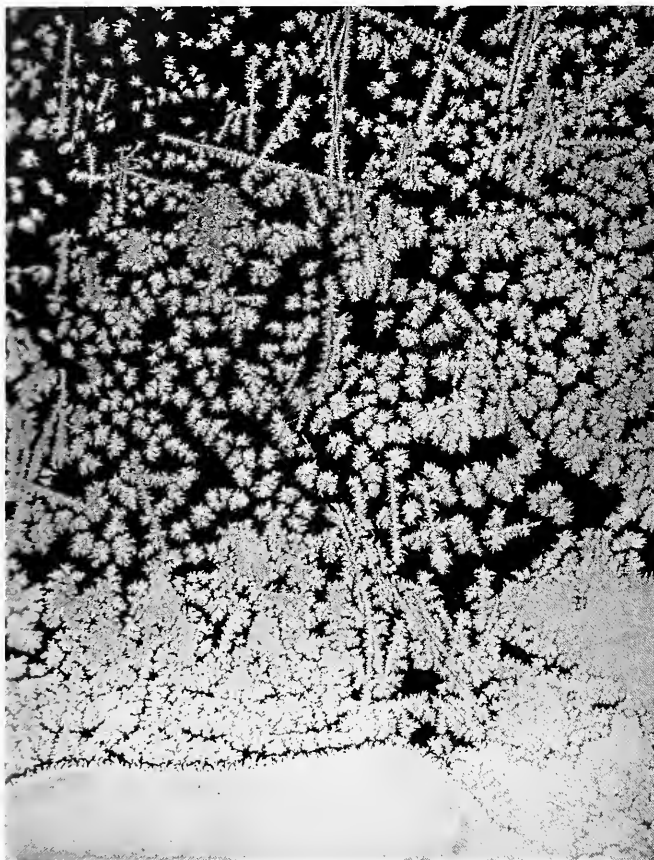
When we fully recognize this fact we also realize how difficult is the task before us. The blessings of peace are gone. The abundance of our life is going. Even the enjoyment of the beauty of our land becomes a more and more difficult and rare experience for the young of all our great cities. And this is the particular point at which we find a great mission for any metropolitan museum of natural history during these trying times. As the war progresses the task of inspiring those who live in cities with the beauties of our land will to an ever-increasing extent rest upon the exhibits and educational functions of these museums. This is especially true of the children, to whom only the artistically executed reconstruction of nature in three dimensions carries real conviction, while the beauty of even the best illustration still remains a picture only. Anyone of us looking back upon his own personal life will recognize how much of his devotion to his country has sprung from his experience of its beauty. By this realization he will also recognize how the importance of the city child's indirect experience of this beauty in our museums must increase as the opportunity for direct experience is curtailed.

In attempting to interpret the nature of our own country it therefore becomes our duty to strive for beauty as well as intellectual content in our exhibits, and beauty as such has a separate value of its own regardless of whether or not it adds to the factual knowledge or intellectual understanding we impart to our visitors.

*A. G. Barr*

*Director, the American Museum  
of Natural History*

# LETTERS



SIRS:

The accompanying photograph of a window pane was taken during the recent cold snap, when our attention was drawn to the subject of frost crystals by Vincent

J. Schaefer's interesting article in the January issue of *NATURAL HISTORY*.

THOMAS C. CUMMINGS  
New York, N. Y.

SIRS:

Your magazine is popular in our home, and just now we are very much interested in "How to Fingerprint a Snowstorm"—January, 1943, issue. We are at a loss, however, as to where or how to go about obtaining the necessary solution of polyvinyl formal resin dissolved in ethylene dichloride. . . .

FLORENCE DONALDSON  
(MRS. WARREN C.)

Pittsburgh, Pa.

The solution specified is the best that has been found for preserving snow crystals, but it has been put on allocation. The names of those who write in are being filed, and they will be notified when the material or a substitute is available.—ED.

**NOTICE**—Readers are encouraged to submit their own photographs of natural history subjects. Those selected for publication on this page will be paid for at \$1.00 each, with full credit to the photographer. Return postage must be included.

SIRS:

I would like to ask two questions after reading your magazine for January.

When reading the article about "The Hollow of God's Hand," I got out my "Century Atlas of the World (1897)" to look up the Salton Sea. It only has the Bed of Salton Sea. Could you tell me when this became a sea again? Apparently it has been since 1897.

Your article about the Norwegian Sealers is most interesting, but I am puzzled about what a "harp" seal is. I resorted to the Columbia Encyclopedia—1940 not 1897—and could find no mention of that species.

Your magazine is full of such stimulating and interesting articles that it opens up new horizons each month.

MIRIAM S. WALKER  
(MRS. LEE S.)

Montclair, N. J.

Around 1900 and 1901 water from the Colorado River was brought into the dry Imperial Valley, and much of the soil was found to be very fertile. Settlers hastened to the region in the next three or four years, and what had been regarded as worthless desert was gradually reclaimed. Cottonwood trees and fields of grain completely altered the landscape.

In 1905 high waters swept away the dams that had been built. The canal now was greatly enlarged by the tremendous volume of the Colorado River waters, and by the time the summer floods had subsided the entire Colorado had abandoned its former channel to the Gulf and was flowing into Salton Sink. The lake in the depression grew rapidly, causing extensive damage to agricultural lands.

The tremendous struggle that ensued to control the floods can be read in *Water Supply Paper 225* of the United States Geological Survey. The problem had become so serious by 1906 that extensive correspondence was being carried on between the President of the United States and the President of the Southern Pacific Railroad. Finally, with the Government lending its engineers for consultation and the Railroad throwing in equipment and facilities for a great effort, a levee was completed in 1907. This epic struggle perhaps represents the climax in the story. Today controlled irrigation drainage flows steadily into the depression. Evaporation in the valley is exceedingly rapid, and Salton Sea persists at a level of approximately 240 feet below sea level.

The harp seal derives its name from the pattern of its markings, which show some resemblance to a harp. It is also called the saddle-back and the Greenland Seal. The harp seal measures up to seventy-two inches in length, and old males weigh 600 to 800 pounds. It is one of several arctic seals classed as hair seals, as distinct from the family which includes the fur seal, sea lions, etc.—ED.

\* \* \*

SIRS:

I have been taking your magazine for three years, and believe it is one of the best in its field, both in format and content. I have been interested in all phases of nature for a number of years, and subscribe to several other magazines, but if I had to give them all up but one, that one would probably be *NATURAL HISTORY*. I have enjoyed especially your recent series on the evolution of the vertebrates, Frederick Pough's mineralogical articles, H. E. Vokes' geological articles, and your photographic reproductions of habitat groups, particularly those of the Hall of North American Mammals.

I note one small error that crept into your current issue, in the article on "The Jeepy Jackrabbit." You reproduce an engraving of the "Texian Hare," stating that it is by Audubon, "the well-known nineteenth century bird artist." Actually it is by John James Audubon's son, John Woodhouse Audubon, as indicated by the notation in the corner of the engraving, "Painted from Nature by J. W. Audubon." This was the second son of the bird painter, who, together with his elder brother, Victor, helped his father complete his second great work, *The Quadrupeds of North America*, the text of which was largely written by the elder Audubon's friend, the Rev. John Bachman, when the latter's health began to fail him. . . .

Your Book Department is especially useful. I like your reviews because they really are informative, giving the bad points as well as the good. Where I have been able to check them, I have found them accurate in every particular. In fact, accuracy and beauty seem to be the twin keynotes of your magazine. Keep up the good work!

ROBERT L. KENDIG

Bryn Athyn, Pa.

*NATURAL HISTORY* is grateful for Mr. Kendig's correction of an oversight which occurred through no fault of the author of the article in question. Audubon's son John, who was taught by his father, assisted the latter in his collecting and drawing and was a portrait painter. In some of the engravings it is not always easy to be sure how much of the work was John James Audubon's and how much was not. The name of Audubon's wife, Lucy Audubon, even appears on one picture (Audubon requested that it be

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United States Government Obligations (Direct or Fully Guaranteed) . . . . .	1,988,096,539
Obligations of Other Federal Agencies . . . . .	40,685,588
State and Municipal Securities . . . . .	157,477,345
Other Securities . . . . .	41,153,413
Loans, Discounts, and Bankers' Acceptances . . . . .	573,450,840
Real Estate Loans and Securities . . . . .	5,463,330
Customers' Liability for Acceptances . . . . .	3,630,239
Stock in Federal Reserve Bank . . . . .	4,650,000
Ownership of International Banking Corporation . . . . .	7,000,000
Bank Premises . . . . .	38,160,040
Other Assets . . . . .	731,142
<b>Total</b> . . . . .	<b>\$3,761,671,281</b>

LIABILITIES	
Deposits . . . . .	\$3,555,940,023
(Includes United States War Loan Deposit \$639,736,171)	
Liability on Acceptances and Bills . . . . .	\$ 5,949,927
Less: Own Acceptances in Portfolio . . . . .	1,492,112
	4,457,815
Items in Transit with Branches . . . . .	9,551,054
Reserves for: —	
Unearned Discount and Other Unearned Income . . . . .	2,226,619
Interest, Taxes, Other Accrued Expenses, etc. . . . .	7,602,320
Dividend . . . . .	3,100,000
Capital . . . . .	\$77,500,000
Surplus . . . . .	77,500,000
Undivided Profits . . . . .	23,793,450
	178,793,450
<b>Total</b> . . . . .	<b>\$3,761,671,281</b>

Figures of foreign branches are as of December 23, 1942, except those for enemy-occupied branches which are prior to occupation but less reserves.

\$775,828,299 of United States Government Obligations and \$13,564,326 of other assets are deposited to secure \$732,519,800 of Public and Trust Deposits and for other purposes required or permitted by law.

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this way), but whether she drew the finished picture or even the original sketch seems not certain. One biographer states that it was necessary for John Woodhouse to do practically half of the work necessary to properly illustrate the *Quadrupeds*.—Ed.

\* \* \*

SIRS:

I always look forward to receiving *NATURAL HISTORY*, but dislike seeing errors in it. In the December issue on page 242 there are range maps for several kinds of conifers used for Christmas trees. The one for white spruce is very much in error as regards this part of the country. No white or other kind of spruce grows

naturally in North Dakota or adjoining Montana or South Dakota. However, it does grow in the Black Hills of South Dakota. . . .

If this map were drawn for the Glacial Period, it probably would be true, as unpetrified spruce has been found in the gravelly soil in several places in the northern part of North Dakota. This has been identified by authorities as "glacial spruce" and apparently was growing at the edge of the glacier during its recession.

In one interesting instance, a farmer wrote in to the State School of Forestry sending apparently fresh pieces of wood about the size of one's wrist. Several holes had been drilled for water, without finding any. Later one of the holes caved in. Lowering a lantern the farmer discovered that the drill had gone down the side of a

standing tree, cutting off the branches. Pieces of the wood had been brought up with the clay and gravel. Evidently this tree had been growing in a ravine. A temporary advance of the ice field had apparently caused the ravine to be filled in and smoothed off. That section of the country is now more or less flat prairie.

Another incident was about 11 miles north of Bottineau, in the Turtle Mountains, where another man was digging a well. About nine feet down his spade struck a log, and he chopped a section of it out. It had been worn smooth but still had some of the bark on. Over 80 rings could be counted on the small section, indicating it must have been an old tree. This too was "glacial spruce." So spruce

*Continued on page 111*

SIRS:

As you will see, I took these three pictures of a tree growing out of a building over a period of years. I find it interesting to study things of this sort and have had fun showing the tree to people who hap-

pened to be with me when I was passing. I often wonder just how far the roots go into the bricks, but I hope no one will chop it down to find out.

MYRTON S. REED

Worcester, Mass.

▼ The first photograph of the tree was taken by Myrton S. Reed in 1938



In 1940 he had been passing the spot every day for two years and had acquainted many persons with its existence

A photograph taken in 1942 shows that the little tree is growing up





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# NATURAL HISTORY

*The Magazine of the American Museum of Natural History*

FREDERICK TRUBEE DAVISON, President

ALBERT E. PARR, Director

VOLUME LI—No. 2

★ ★ ★ ★ ★ ★

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Aviators who battle for America's "island bridge" to Asia share the skies with the inhabitants of some of the world's largest and most interesting colonies of nesting birds

By BEN EAST

**A**MERICANS have heard much of the Aleutian Islands in the months that have gone by since December 7, 1941.

Attu and Kiska, Atka and Unalaska, and other names with a strange Aleut or Russian flavor have become commonplace in our daily language, names that before Pearl Harbor not one American in ten thousand had ever heard. Even the native people of those far-off islands, the Aleuts, had their brief day in the spotlight of world news in June of 1942, when the United States Navy announced evacuation of the villages of Atka and the Pribilofs to a place of greater safety.

There is much that is fascinating about those green, treeless islands that form a curving land bridge from the tip of the Alaska Peninsula along the southern edge of Bering Sea almost to the Kommandorski group of Russia.



## SEA BIRD CITIES of

Each island is a peak or plateau of a submerged mountain range that is still building on the floor of the sea. Some are sheer, snow-capped cones rising white and beautiful out of the foggy ocean. Others are made up of rugged hills on which streaks and patches of snow lie throughout the brief Alaskan summer. Still others are live volcanoes, rumbling and smoking and steaming with the heat of their subterranean fires.

It would be hard to find anywhere a lonelier chain of land dots than the Aleutians. In all their 1,100 miles there is no timber. A few scattered clumps of stunted spruce were transplanted more than a century ago as

far west as Unalaska, but only a few. Westward for 800 miles, to Attu Island at the end of the land bridge, trees are unknown, and even the willow and alder shrubs are dwarfed clumps reaching no higher than a man's knees. Treeless and lonely and melancholy, but hardly barren or bleak are those bright green islands. For wild grasses grow above a man's shoulders along their beaches. Varicolored moss covers their rocky meadows with a soft, deep carpet. Wild flowers of countless kinds and shades brighten their windswept moors. And their sheer sea cliffs harbor the greatest bird cities on the North American continent.

The average visitor to Alaska in the years before the war voiced amazement at the smallness of its settlements. Juneau, the capital, was a busy, thriving town of only 5,000 inhabitants, the largest in the Territory. But the cities of the feathered world which the rare traveler encountered upon voyaging "to the westward" caused him to voice his greatest wonderment. Alaska is justly famous for its big brown bears, its fur seals, its salmon runs, its moose, caribou, and other game. But the crowning feature of the Aleutians is the bird colonies. Beside them the better known colonies in the north Atlantic cannot begin to hold their

◀ "SUDDENLY the whole face of the rock wall flowered with birds. They poured down in a living avalanche of white, and their din drowned out the steady sound of the surf along the rocky beach." Approaching a section of Whale Island's enormous colony of kittiwakes

own numerically, according to Dr. Ira N. Gabrielson, director of the United States Fish and Wildlife Service.

When the motorship "Brown Bear" of the Fish and Wildlife Service, patrol boat for the Aleutian Island Wildlife Refuge, went north from Seattle in May of 1941, I went along. From mid-May to late July we lived among such an abundance of seafowl as I had not dreamed of seeing in a lifetime, let alone in a single summer. Even before we reached the Aleutian chain we began to encounter the crowded, nesting colonies on the islands along the Alaskan coast.

The "Brown Bear" cast off her lines at Kodiak on a clear morning in mid-June and moved out into Raspberry Strait, separating Kodiak from Afognak Island. At the entrance to the Strait, Whale Island loomed ahead, small and green. On the sheer sea cliffs of that island lives probably the largest nesting city of Pacific kittiwakes in Alaska, if not in the entire world.

The ship ran in within a half mile of the shore and anchored. Above a beach littered with rocks as big as a livingroom, the island soared up a thousand feet or more in cliffs and a steep slope. In front of the cliffs a

sands. They drifted along the cliffs as snow drifts around a house corner. The air was filled with kittiwakes, and the din of the disturbed colony drowned out the steady sounding of the surf along the rocky beach.

A landsman who had lived inland all his life would have rubbed his eyes in disbelief at that blizzard of kittiwakes swirling before the cliffs. We estimated—and nothing more accurate than an estimate was possible—that there were ten thousand in a single band, hundreds of thousands in the whole colony, perhaps even a million or more. The bird colonies of our Great Lakes region, fascinating and spectacular in themselves, are but hamlets in comparison.

The kittiwake, termlike in many of his ways, is far neater and more trim in appearance than the larger members of the gull family. From what we saw on the cliffs of Whale Island he is also possessed of a sweeter temper. There was no evidence of the bickering and fighting that goes on endlessly on the nesting grounds of the herring gulls.

The kittiwake nests were flat, slovenly platforms of dead grass and sea weed on the narrow ledges of the towering cliffs. It appeared likely from their condition in mid-June that the birds return year after year to the same nest, making only necessary repairs each spring. We had no way of verifying that, however.

To reach the nests for close-up camera work we had to make our way up the cliffs 30 to 50 feet above the beach. The climb was far from

easy. We found a place where a sloping block of rock as big as a house provided a precarious path up to a grass-grown ledge. Helped and lifted from below, Cameraman Malcolm Greany of the Alaska Game Commission and I hoisted ourselves up to the ledge. We hauled our cameras up on a line and managed to find firm footing for the tripods on our narrow ledge. We were on a level with the nests of a score or more kittiwakes, and they proved friendly and cooperative models.

Unlike the herring gull and the great glaucous-winged gull of the north, they were utterly unafraid. We could rig no blind of any kind there on the face of the cliffs, but no blind was necessary. The birds perched beside their nests almost within arm's reach. They craned their necks, watching us with unruffled curiosity as if human company were an everyday affair. In half an hour they were coming and going almost unaware of the men clinging to the rock wall three or four yards away.

The name of the kittiwake comes from his cry, which seems to repeat the word in three syllables. For my part I prefer the native Aleut name, *gaverooshka*. It was to this gentle bird that the Old Seal entrusted his final message of despair in Kipling's poem, "The Beaches of Lukannon." The poet sings:

Wheel down, wheel down to southward!  
Oh, Gooerooska go!  
And tell the Deep-Sea Viceroys  
The story of our woe.

▼ THE KITTIWAKES perched without fear on their flat nests of dead grass and sea weed. To climb to this precarious spot on the sheer cliff with photographic outfit was no simple feat

# the Aleutians

*Photographs by the author  
and Malcolm Greany of the  
Alaska Game Commission*

few white birds eddied in the lazy, graceful flight of the gull clan. On the sheer face of rock, patches of white were visible through the glasses, hinting at clusters of perching birds, but at that distance the kittiwake colony hardly looked interesting, let alone exciting. The picture changed when our dory came near shore.

We drew close enough to make out solid ranks and masses of kittiwakes perched on narrow ledges from the beach to the top of the cliffs. And suddenly the whole face of the rock wall flowered with birds. They poured down in a living avalanche of white. They swooped, dived, and wheeled in mass formations of countless thou-





The sorrowing beach master of Lukannon could hardly have sent his cry for help by a more fitting messenger than the little gull who nests above the lonely reaches of those gray northern seas.

The bird city on Whale Island, however, proved to be hardly more than a curtain raiser. Our first murre colony, memorable for its interest rather than size, was on a sheer headland in the treeless Semides Islands west of Kodiak.

The murre is literally the penguin of the north. Although he is far from flightless as are the true penguins, there is much that is penguin-like and ludicrous in his make-up. He is a bird of the sea and comes ashore on the cliffs only to court and breed, nest and rear the young. In the water few birds excel him for speed and grace. On land he is awkward in the extreme. His legs are placed so far back on the body that "he does most of his sitting standing up," as one observer has remarked. He walks as erect as a man but far less readily, and on the sea ledges where he nests his gait is a clumsy waddle.

The murre makes no pretext at nest building. The single egg is laid on a bare ledge or shelf, and the hen murre bothers neither to choose a convenient hollow nor to seek out a location where the egg will be pro-

▲ LIKE LITTLE BLACK-COATED, white-vested diplomats in close-order drill, the murras crowd the ledges in solid ranks. When startled they power-dive into the water and swim beneath the surface using wings as well as feet

tected. On their crowded ledges the murras lay eggs within a few inches of each other, and no two of them are alike. The eggs vary from dull white through buff and pale blue to dark green, scrawled and speckled in an endlessly varied pattern with brown and black. All in all a nesting ledge in a murre colony looks much like a rocky table loaded with Easter eggs.

On the many ledges that slope toward the outer edge, one thing alone saves the eggs from rolling over the brink. That is their characteristic sea bird egg shape, sharply pointed at one end, big at the other like a top so that they roll unfailingly in half-circles. Time after time we saw murras, leaving or returning, kick an unguarded egg and set it in motion. But each time, it rolled right around and came to rest within a few inches of where it had started. In all the murre colonies we watched we saw but one egg rolled over the edge by the birds themselves.

The murras crowded the nesting ledges in solid ranks. Standing in straight rows on the face of the cliffs, erect as little men, they reminded us

of black-coated, white-vested diplomats in close-order drill. It was possible to approach within a few yards of them, and in the Aleutians and on the Pribilofs they were even tamer. There we lay at the brink of the cliffs and looked down into the upturned faces of Pallas murras on ledges only a couple of feet below. But a sudden noise unfailingly put them to flight. They pitched down from the ledges at a steep angle, power-diving toward the water with rapid wings. They plunged headlong into the sea, using wings as well as feet under the water. At the conclusion of a dive they emerge with wings still working and take off in full flight with little effort. They quest for food at the surface and at great depths with equal ease, overtaking and capturing small fish and other marine life. It was on the Fur Seal Islands that we found the greatest murre colony of them all. Along the northern shore of St. George, the smaller of the two main Pribilof islands, cliffs rise from the beach a full thousand feet at the highest point and extend for a distance of about five miles. On all the face of

this great rampart every ledge holds its close-packed tiers of nesting murre. It is absurd even to try to estimate the population of this great sea bird city. Its numbers must run well into millions.

We stood at the top of the cliffs one day in July and rolled a big block of rock down a steep ravine. It gathered speed as it bounded and crashed toward the sea seven hundred feet below, starting a score of small avalanches on the way. The roar of its fall suddenly startled the murre into flight for a hundred yards on either side. It was as if the face of the cliff had fallen away in a living waterfall. A veritable torrent of birds pitched down, wheeling and eddying above the sea in a cloud like swarming bees. I still wonder whether another bird colony in the world has as many inhabitants as that great murre city of St. George.

The sea birds we wanted most to

photograph in the great Alaskan colonies were the puffins. As often happens on a bird expedition, these proved the most difficult to stalk with a camera.

Two kinds of puffin, the tufted and horned, nest in fair abundance in the Aleutians and Pribilofs and elsewhere along the Alaskan coast. They are by no means as numerous as the murre, kittiwakes, fulmars, cormorants, and auklets, with which they associate in noisy communities, but they deserve more than passing mention for their appearance alone. If the world of birds has a queerer, droller, more grotesque citizen than the puffin, I have not met him. Sea parrot, Jew duck, bottlenose, and various other picturesque local names are applied to him, and he earns them all.

With the approach of the breeding and nesting season the sea parrot dons an elaborate nuptial dress. And he

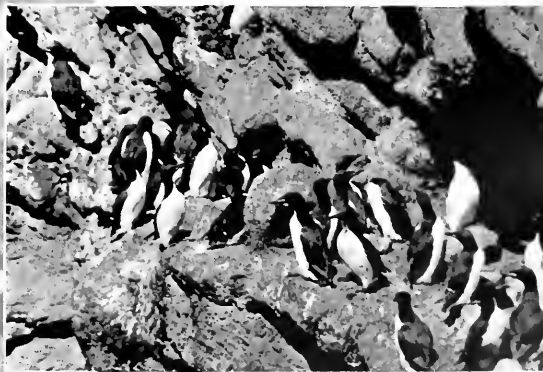
does a fair share of it on his bill. A total of sixteen horny plates add their bulk to that never dainty organ, and the bill becomes a bulbous crown of glory, a strange and laughable symbol of the puffin's springtime ardor. The tufted puffin simultaneously puts on a facial mask of pure white and two long "feather-horns" of straw yellow that stream back behind the white eyes. Both sexes wear these graceful bridal plumes and all the rest of the wedding dress. The feet and legs are coral red, the huge bill red and yellow and dull green, the back glossy blue-black, and the breast sooty brown. The sea parrot walks in solemn dignity to his courting, arrayed in a robe that would turn the biblical Joseph green with envy.

Unlike the murre and kittiwakes with which he consorts, the puffin hides his nest from prowling foes and the prying lens of the camera. A single dull white egg is laid far back at



◀ **LOOKING DOWN ON A NESTING LEDGE.** With no pretext of nest building, the murre lays its egg on a bare shelf of rock. Even if the surface slopes, there is little possibility of the egg rolling off. It is sharply pointed at one end and rounded at the other like a top, so that it rolls unflinchingly in a half circle

▼ **"PENGUINS OF THE NORTH."** Though the murre is able to fly with speed and grace, there is much that is penguin-like and ludicrous in his make-up. Nature has placed his legs so far back on the body that "he does most of his sitting standing up"







▲ THE TUFTED PUFFIN'S BILL is his crowning glory. In the breeding season it becomes bulbous and gaudy, a strange and laughable symbol of the "sea parrot's" springtime ardor. If a hand reaches for the dull black puffball that is the chick, this beak can inflict a painful wound

the end of a burrow which the birds excavate in a convenient bank or on the face of a steep, grass-grown hill. If there is too little soil for burrowing, the sea parrots content themselves with a cranny or crevice among the rocks, the deeper the better. Usually the burrow is long enough to defy the reach of a man's arm. And anyway, if you know puffins you will think twice before reaching into a burrow or nesting cranny in the hope of hauling out the egg or the down-covered, dull black puffball that is the newly hatched young. One of the faithful pair is almost sure to be on guard at the burrow's inner end. Your first warning will be a bite from a powerful, sharp-edged bill that is

capable of cutting a man's fingers to the bone. The sea parrot's burrow is his castle, and he does not surrender it willingly.

While the hen puffin broods in the sheltered darkness of the burrow, her mate rests on the sea below or stands, solemn and grave as a wooden bird, near the door of the nest or on a convenient ledge nearby.

It is difficult to describe the droll and silent gravity of the puffin on watch. Hour after hour he keeps his vigil, looking steadfastly down upon the sea, his only movement an occasional turn of his cumbersome head to survey the bank or cliff on either side. If he moves a few feet to a better lookout perch, he walks with de-

liberate care, like a slackwire balancer. He makes no sound. He only stands and watches like an aged judge of the sea cliffs, looking far wiser than any owl.

Let an intruder approach and he pitches headlong from his perch and hurtles down in churning flight to the safety of the sea. He is one sea-fowl that fears man. We went ashore time after time in the Aleutian bird colonies and lay for hours in cramped quarters behind rocks and among grassy hummocks. For weeks we failed to make a single picture of a sea parrot. They left the ledges long before we were within camera range, their short wings laboring like little paddlewheels, their feet sticking out behind, one on either side, like red rudders on small black monoplanes.

When the chance finally came to make puffin pictures, it was ridiculously easy. On the sheer sea cliffs not far from the village of St. Paul, in the Pribilofs, we found a small puffin colony nesting in company with murrets, red-faced cormorants, auklets, and the rare red-legged kittiwakes that breed nowhere else in the world. These puffins violated outright the code of their clan. Though mildly suspicious, they refused to quit the ledges until we all but touched them. The clicking and whirring of our camera shutters did not disturb them in the least. One pair took a position on a rock in the center of a crowded, bawling rookery of fur seals and even kept their place when we tried to drive them off for an action shot. It was necessary to toss pebbles at them to put them to flight. That is far from characteristic puffin behavior.

Next to the puffins the auklet colonies offered the most difficult problem for our cameras, not because of shyness but because of the location of their nests. The auklets are what the name implies, little auks. They are next of kin to the flightless great auk of the north Atlantic that provisioned countless fishing boats on the banks of Newfoundland four hundred years ago and won deathless but sorry fame as the first North American bird to be wiped out forever, when feather hunters invaded the auk islands shortly before the time of the Revolution. Luckily the rest of the clan, capable of flight and nesting in safer sites, has fared better.

Three kinds of auklets, fascinating and strange little sea-fowl, nest in abundance in the big Alaskan colo-



nies. They are the least, the parquet, and the crested. The smallest and the tamest is the least auklet, the *Chootchkie* of the Aleuts. He has one amusing habit. He never looks at you with both eyes at one time, but turns his head with a comical, nervous, jerking motion as he shifts glances.

The oddest looking bird of the three is the crested auklet, known to the Aleuts as *Kanooska*, the little captain. His plumage is dull-black and brownish-gray, relieved by the vivid coral of his bill, the white iris of his eyes, and a thin row of white plumes like little stiff quills behind and below each eye. His crowning glory is a crest of black plumes rising from the forehead, turned forward instead of back, curving gracefully down over his bill for all the world as if someone had combed a stray lock the wrong way.

All the auklets have one trait in common. They hide their nests in deep, inaccessible crevices on cliffs, beaches, or steep volcanic hills. The nests are easy to discover. You need only to walk over the rocks that hide them to hear the birds chattering and squeaking far below. We climbed a steep rock slide, sheltering thousands of auklet nests on the tiny volcanic island of Kasatochi, and the crested auklets underfoot sounded like whimpering fox puppies. But to reach the nests is another thing. In most cases nothing short of a crowbar or steam

crane will avail. The roof of an auklet nest often weighs a hundred tons. In the dark, cool crevices beneath those huge, seaworn boulders or square blocks of lava, the little auks brood their young in calm and seclusion, safe from all hunters of eggs or sea-fowl, furred, feathered, or human.

One of the biggest sea bird cities we saw in Alaska was an auklet colony on a green, boulder-strewn hill behind the village of St. George in the Pribilofs. The number of least auklets nesting beneath those moss-grown blocks defies estimation. In late afternoon each day they began coming in from their feeding grounds at sea, homing to their nesting ridge



▲ RED-FACED CORMORANTS dot some of the steep hillsides in the "foggy islands"

▼ CRESTED AUKLETS have curious plumes rising from the forehead, which look for all the world as if someone had combed a stray lock the wrong way



▲ A CLOSE VIEW of a red-faced cormorant reveals a vigilant sentinel, whose cliffside outlook is not limited by lack of a front porch

in endless flocks, turning the cliffs into a giant hive aswarm with overgrown bees. In many ways this daily gathering was like the evening flight of redwinged blackbirds concentrating by countless thousands in the cattail marshes of the midwest in early autumn. The auklets flew far more precisely than blackbirds, however. There were no stragglers. Each flock turned and dipped and rose in flawless precision like squads on an aerial drill ground.

For an hour or more, as the long Pribilof evenings came on, the flocks strung in from the sea, passing above the village in hurrying clouds.

The Aleuts prize the *Chootchkie* highly as a table bird. In former times, before the Seal Islands became a federal bird reserve, the natives used to lie at the top of the cliffs and net the auklets as they came in. The village youngsters, lacking nets, knocked down their quota from the close-packed ranks with stones.

There seems little need to worry about the future of the Alaskan sea-fowl cities. Murres and auklets, puffins and kittiwakes, fulmars and cormorants will be likely to hold their own as long as the summer surf washes the lonely sea islands of the north and sheer cliffs rise to afford

them nesting places. They have few enemies in those remote and foggy oceans, and it is not easy for those few to reach the inaccessible places where they nest.

At the head of the list of their foes stands man, as might be expected.

The Aleuts and Eskimos alike have long relied on the sea birds and their eggs as a major item of food in a bleak and inhospitable land that yields its strange harvest only sparingly. Too, the skins of sea birds figure prominently in the winter clothing of the Eskimos. The Aleuts have had less interest in bird hunting in recent years, owing to imported supplies, but there is still a time in winter when they hunt seafowl. Whites who have lived among them say that the hunting has its own rewards. Roast kittiwake is a genuine delicacy, they declare. Murres and puffins are tougher but easily edible.

The eggs of sea birds are still in high favor among the Aleuts, who make regular raids on the nesting cliffs and carry the eggs away by the basketful and boatload. Walrus Island, a low rock in the Pribilof group, has long been a favorite spot for the egg gatherers. We did not visit this island, but those who have seen it say it harbors the densest concentration of seafowl in Alaska. It rises only a few feet above high tide, and its storm-swept ridges are literally carpeted with birds nesting in a close-packed, feathered bedlam.

Neither the hunting nor the egg collecting of the natives, however, has made any apparent inroads on the teeming host of sea birds in the great cliff cities. The Aleuts are able to reach only a negligible fraction of the nest sites and they never raided more than an insignificant handful of the colonies.

The Pribilofs and the entire Aleutian chain are closed as federal bird refuges, or were before the war began. It would be absurd to assume, however, that a regulation, written on paper in far-off Washington and backed only by occasional patrols, was able to halt in the space of a few years the hunting on which these natives had relied long before the first Russians came. The war has driven more than three-fourths of the remaining Aleuts far from their ancestral homes. They do not raid the bird cliffs now. But up to the time they left they still knew the flavor of seafowl eggs and seafowl, and when they come back they will again.

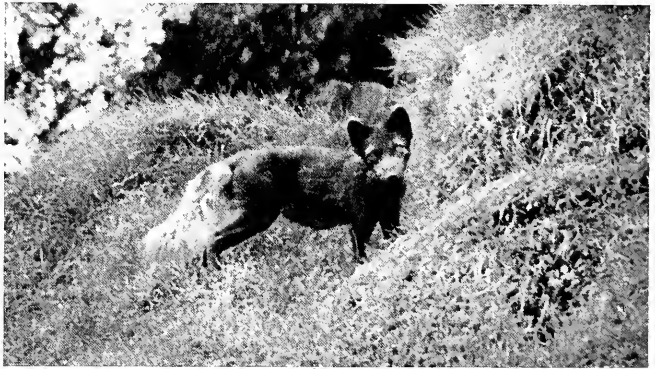
These birds have few natural foes. The arctic fox, the little snow dog of the north, stands high on the list. He is fond of eggs and is able to clamber down the steep, grass-grown, volcanic slopes here and there to reach a nesting ledge. But the bulk of the nests are beyond his reach. He takes an occasional auklet by lying in wait beside the nesting cranny, but that is lean hunting.

One enemy has better luck, but even his raids are possible only in favorable locations. He is the glaucous-winged gull of those cold northern seas. A born thief, he swoops down upon the murre colonies and steals eggs literally from under the

wings of the owners, but only where the nesting ledges permit him to drift overhead and make his attack from above. On the perpendicular cliffs he dares not face the rapier-like bills of the murres.

On Bogoslof Island we saw these gulls raid the murre towns hour after hour, riding the fierce sea wind and darting down to the attack like cruel-billed corsairs of the air. But the presence of a thousand murres to each gull on this ancestral nesting ground attested to the scanty toll the raiders have taken through the years.

Ravens abound in some sections and doubtless invaded the sea bird colonies, although we saw no evidence



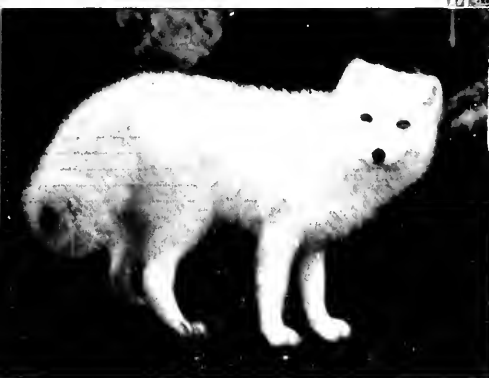
▲ THE BLUE FOX is fond of eggs and robs nests when he can, but the bulk of them are beyond his reach

▼ OCCASIONALLY an auklet will fall victim to the fox who lies in wait beside a nesting cranny in the rocks. No major damage is done, however, by this sly roger



of it. Bald and golden eagles nest through the long chain, and the sea-fowl are a staple of life for them, but the huge cities never miss the victims. All things considered, there seems little reason to fear for this primitive abundance of wildlife, unless men should find a way to make a profit from sea bird hunting. That would doom the great cliff cities, were it to be allowed, but the latter is a chance too remote to reckon with.

▼ THE WHITE ARCTIC FOX also takes birds or eggs when he can, but the bird cities of the Aleutians are mostly well protected from "invasion"



▲ ONE WOULD HARDLY EXPECT this downy chick of the sea to grow up into a marauder of other birds, but the adult glaucous-winged gull is a cruel-billed corsair of the air. On vertical cliffs, however, it does not dare face the murre's rapier-like bills

▼ BALD EAGLES nest throughout the Aleutians, and sea-fowl are a staple of life for them. But the huge bird cities never miss the

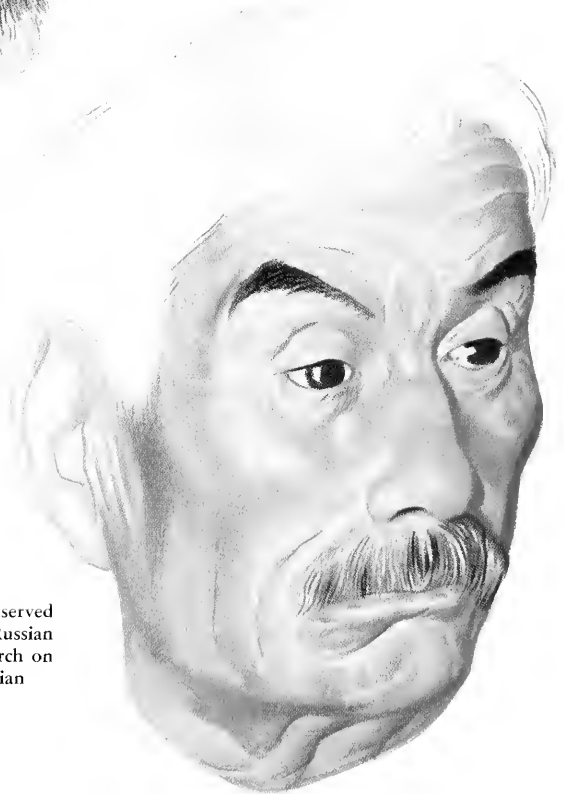
victims. All things considered, the amazing sea bird colonies of the Aleutians are assured of survival if conservation laws are upheld



# ALEU



MIKE MERCHEENAN saw his first movie the day he had this portrait drawn, which happened to be the Fourth of July, in his seventy-second year. A native of Atka Island, well out in the Aleutian chain, he had witnessed the bombing and machine gunning of his village and fishing camp by the Japanese. He flew out in company with 23 others on June 15 and commented, "Very good trip—fly out all the same duck." Once when marooned ten years ago he lived for three months on nothing but sea grass and seals, which he had to catch without spear or rifle



NICK PROKOPEOFF, served as lay priest in the Russian Greek Orthodox Church on Attu, reading in Russian

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# T FACES

Types recently sketched from life in the Aleutian Islands when the natives were evacuated from places of possible danger

*By W. LANGDON KIHN*

The chain of islands extending from Alaska almost to Asia has been inhabited for many centuries, as is proved by numerous archaeological excavations. The people of these foggy islands lived by fishing and hunting, and the abundant sea animals supported an aboriginal population that was not small for north-

ern latitudes. In the latter part of the eighteenth century, contact with the Aleuts was established by Russian traders and settlers, so that from then on there has been intermixing with Europeans. Natives from the nearest and farthest reaches of the Aleutian chain are represented in this series.



MARY SNIGAROFF, noted for her skill in weaving the fine baskets for which her island has always been famous, was born in Attu in 1901 and is left-handed

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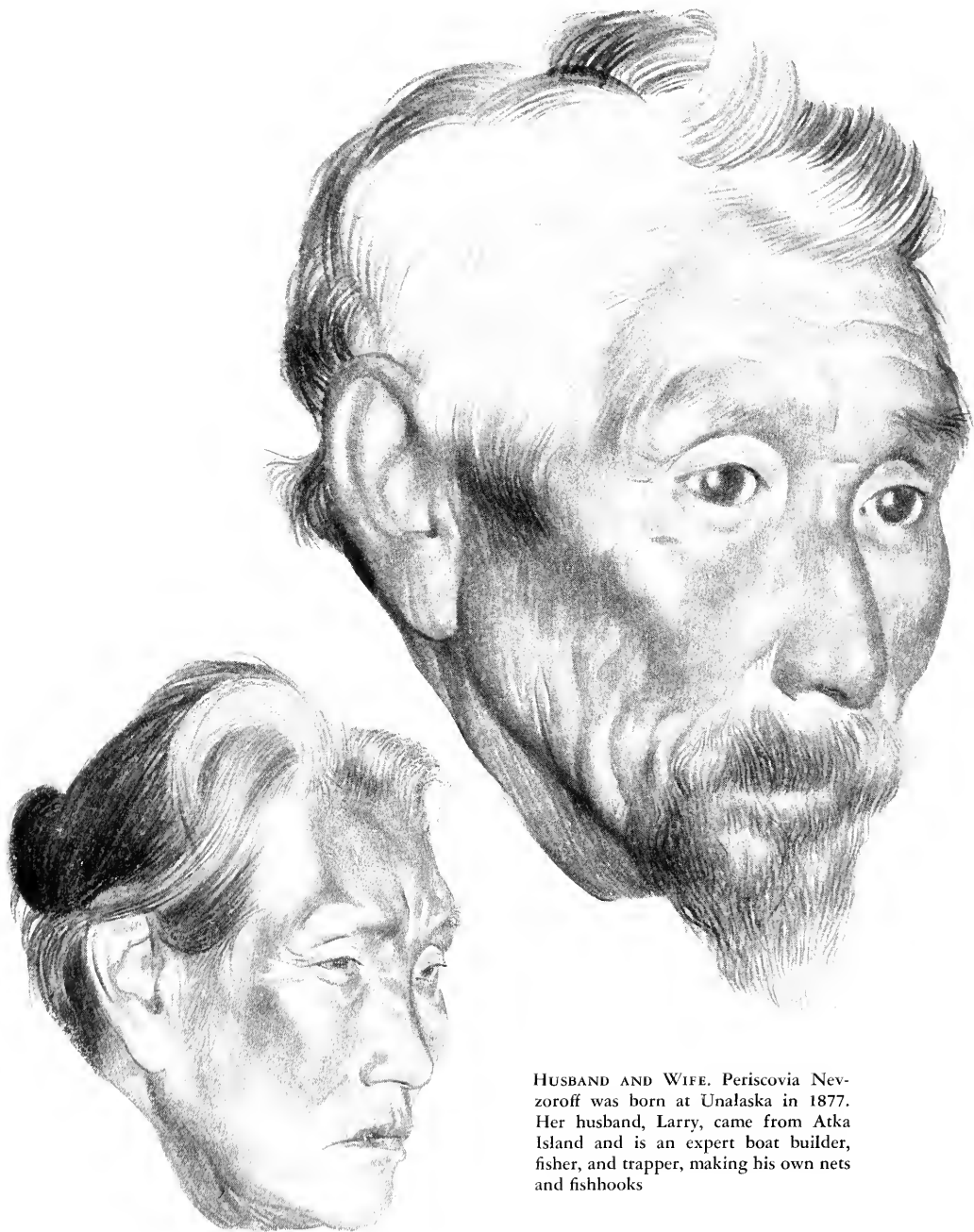
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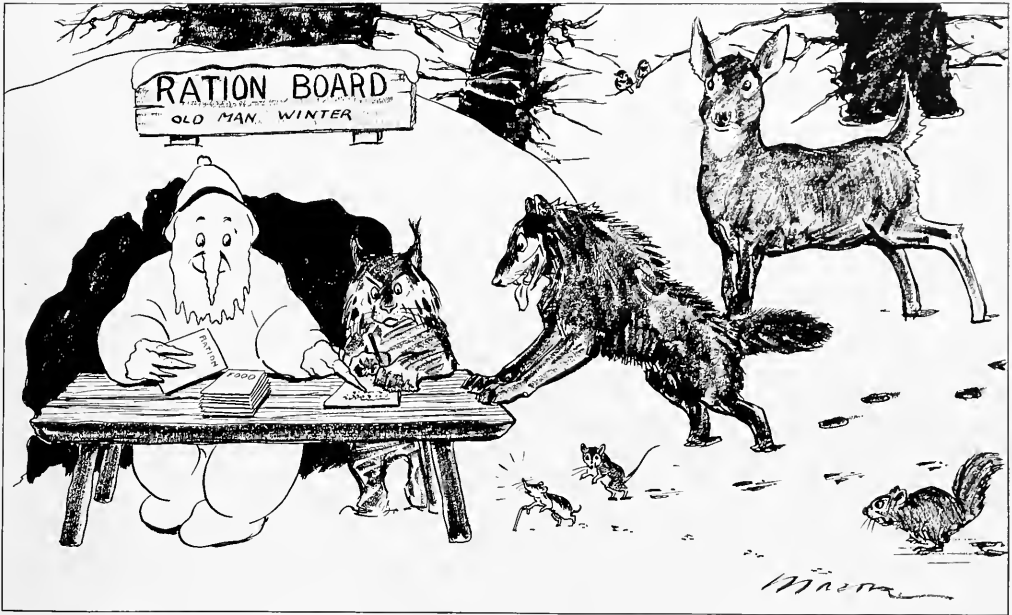
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HUSBAND AND WIFE. Periscovia Nevzoroff was born at Unalaska in 1877. Her husband, Larry, came from Atka Island and is an expert boat builder, fisher, and trapper, making his own nets and fishhooks

# RATIONING



By JOHN ERIC HILL

*Drawn by*

G. FREDERICK MASON

**F**EBRUARY this year brings to us food rationing, which, however little we enjoy it, is a product of the intelligence and social consciousness peculiar to civilized man. Many savages eat until they can eat no more when food is abundant, only rarely restricting their appetites in order to provide for the coming day. Among the animals the stronger frequently monopolize available food in time of famine, leaving the weaker to starve. In rationing we are not only trying to prepare for future needs but to divide fairly the essential goods among the members of the community.

Although nothing quite comparable to rationing is to be found among the beasts of the field, circumstances often reduce the amount of food that animals can get. The winter food that deer depend upon is apt not to be rich in nutritive values; and if the snow is deep, the animals have a hard time to find enough. Their small, sharp feet sink deep with every step, making travel both difficult and slow. Their enemies—wolf, lynx, and puma—do not sink into the snow to the same ex-

tent and have an easy time overtaking snowbound deer.

To avoid this hazard, when the snow is deep a number of deer band together and make a "yard," packing down the snow over a small area, usually in a sheltered location. Here they spend their resting hours. Well-beaten paths lead out from the yard to various feeding places. As the winter drags on, the trails must be made longer and longer as the near-by food plants are used up. Then if a bad storm comes in February, as often happens, the deer have great difficulty reaching their supplies. Many succumb to starvation each year.

Another circumstance that can seriously reduce an animal's standard of living is overpopulation. Many more deer are born each year than, added to the older generations, could find food in the periods of winter scarcity. Under natural conditions the animals that prey upon the deer kill enough each year to keep the numbers nearly the same from winter to winter. But if the predatory mammals are killed off by man and hunting is not wisely managed, the deer in a region may increase to numbers beyond the carrying capacity of the range. Many of the plants on which deer feed are destroyed by overbrowsing. In the resulting famine the badly nourished deer fall victims

to the bad weather and disease, until they are few enough to find sustenance.

In February the squirrels and white-footed mice have used up most of their buried stores of nuts and seeds, while the beavers are pretty well down to their bottom log in the sunken pile under the ice. Out West the pocket mice and kangaroo rats have reduced the piles of seeds in their underground storerooms, although they hoard so much that one winter would hardly empty their "cupboards." Like human hoarders, the pocket mice are antisocial, without thought of their brothers; another pocket mouse is only a competitor and possible thief.

The tiny shrews, which must eat their own weight each 24 hours, have already eaten many of the insects, snails, and mice that can be easily found. From now on it is harder and harder for them to find enough to keep the fires of life burning, and at this time of year the little bodies of shrews that failed are often found on the snow. Larger predators survive hunger better than the shrews, but they are sometimes forced to go for days without a bite or be reduced to eating moss and spruce tips and similarly unsuitable things.

Both plant-eaters and meat-eaters find their rations reduced now and then. Going without is not restricted to us.



# B U S H

*Wild and*



▲ LOOKING like a teddy bear, the galago is really a relative of the monkey



▲ HE EATS berries, fruit, and insects, and natives rumor that he enjoys beer



▲ HUGE EYES in a quaint face and very human hands make him an appealing pet. He is 18" from his inquisitive nose to the end of his bushy, gray tail

Their agility and curiosity kept a member of the East African Mounted Rifles busy when he shared his grass hut with these strange "prisoners of war"

"I SAY Loveridge, there's a fellow in the Calcutta Volunteers who's got a bush baby; you really should see it. I told him that you were interested in such critters."

The regiment to which my comrade referred was camped near the Msiha River in what was then German East Africa. "Shell Camp" we called it, for during the three weeks of our stay there in 1916 the German guns outranged ours and they shelled the camp six days a week with Teutonic efficiency. Only on Fridays—as a tactful gesture to their native Mahomedan gun crews—did they give us a respite.

I strolled over to the Calcutta Battery to see the little creature that I had been told about; it was a lemur, or more strictly speaking a galago (*Galago senegalensis braccatus*), a dwarf species which is less than eighteen inches in length from the tip of its nose to the end of its furry tail. About its woolly waist was a belt, for this prisoner of war was attached to a sapling in whose top it was sleeping at the time of my visit.

Its master called on it to descend, but it made no effort to comply. At the sound of his voice, however, it removed its head—till then buried deep in the gray fur—and peered down at us with great shining orbs, better adapted to seeing in the dark than in the glare of an equatorial noon.

"I'll soon get it down," said its owner confidently as he set off in search of a two-pound jam tin. It transpired that this particular galago had the distinction of subsisting on army rations. Its returning master rattled the tin, and in no time the little beast was at his feet where he had laid the tin. You would have said



# B A B I E S

ame By A. LOVERIDGE\*

that it was physically impossible for the animal to get into the tin; nevertheless it did so with apparent ease. Once inside, it revolved slowly round and round until the tin was as bright as the day it left the factory. Then the galago made a bolt for the tree, mounted to the topmost twigs, and then sat down at leisure to lick the jam from its fur!

This was the first live galago which I had seen. Impressed by its quaint face and very human hands, I decided that it would make an exceptionally attractive pet and that I would endeavor to get one at the first possible opportunity.

## *A cry in the dark*

Months were to roll by, however, before such an opportunity occurred. The column, moving south, occupied Morogoro, a town of some importance on the central railway of what is now known as Tanganyika Territory. We camped at the edge of the bush a few miles away, and there, after nightfall, we would sometimes hear a strange discordant cry, but some time elapsed before I discovered the creature that made it. As I was returning to camp one moonlight night, the noise broke out in some trees close to the road. Creeping cautiously to the spot, and after some difficulty, I located the vocalist silhouetted against the sky. Actually the animal was not very shy, for it continued to call at intervals, the calls being punctuated by a second noise somewhat resembling the low growling of a cat.

Still not knowing what the creature was, I fired, then found it to be a large-tailed galago (*G. c. crassicaudatus*), a species considerably bigger than a gray squirrel—its fur was brown, not gray, above, and much lighter beneath. On account of their nocturnal ways these mysterious little relatives of the monkeys are more often heard than seen. *Komba*, I found it was called by the natives to whom I showed my specimen after it was stuffed.

On inquiring of them as to the best method of securing one alive, I was told that it might be done by placing

*Continued on page 106*



*Photo by Don Selkone*

▲ THIS GALAGO from northern Rhodesia is of another species, but he is very much like the one opposite. Note the alert ears and large nocturnal eyes

\*ARTHUR LOVERIDGE, Curator of Reptiles and Amphibians at Harvard's Museum of Comparative Zoology, where he has been for the past eighteen years, lived in tropical Africa for nearly a decade. More recently as Fellow of the Guggenheim Foundations and, again, of the Carnegie Foundation, he has made four expeditions, each of a year's duration, to study the montane forest fauna of equatorial East Africa, visiting Ruwenzori, Elgon,

Kenya, Kilimanjaro, and many lesser known mountains. Before coming to the United States he held curatorial appointments at Manchester University, the National Museum of Wales, and the Natural History Museum at Nairobi. Interested from boyhood in animal life, his present article deals with galagos which he encountered during World War I, when for three years he served in the East African Mounted Rifles.

# Winter

## THROUGH THE CAMERA'

Photographs by JOSEF MUENCH

*"... black winter waters ..."*



E Y E



*“...the sober zenith of  
leafless trees...”*



*“Born of the soft and slumbrous snow . . .”*

*“There’s a certain slant of light  
on winter afternoons . . .”*



# LANDBIRDS DOWN UNDER

A sample of Australian landscape showing the wonderful bird life in the Blue Mountains, 100 miles west of Sydney

◀ THE COVER of this issue of *NATURAL HISTORY* Magazine shows in full color a pair of gorgeous Eastern Rosellas. This beautiful Australian parakeet was originally called Rose-hiller, from Rose Hill, the name of the Governor's residence near Sydney. Rosellas are often kept as house birds, their vivid scarlet head and neck, white throat, and red and yellow breast making them conspicuously handsome creatures. In the photograph below the two specimens are scarcely visible behind the vegetation in the left foreground



▲ THIS SECTION of Australia typifies the forested districts which are restricted to the more coastal regions. Most of the interior is open country with scattered trees. The drier parts are even desert-like. Twenty-one different kinds of birds are shown in this exhibit, a number of which one might see on a weekend trip from Sydney to the Blue Mountain district. The bird perched in the upper lefthand corner is the laughing jackass, so called because of its voice

► STAR among Australian birds is the lyrebird. Its spectacular plumage (hence the name) is effectively displayed by the male bird during the mating season on specially prepared dancing grounds. Scarcely less a claim to distinction is its remarkable ability to imitate the voices of other birds, even that of the laughing jackass

Materials for the group were collected by Henry C. Raven. The group was the gift of Archer M. Huntington



# The GREAT

The Whitney Hall Exhibit  
of the Month

*All photographs by C. H. Coles*

The largest coral reef in the world guards Australia for 1200 miles along its northeastern coast. At its southern end the barrier is 200 miles from the Australian coast, but it approaches the mainland much more closely toward the north.

This exhibit portrays a scene near the city of Cairns, Queensland, with the islets of the background brought somewhat closer than they actually are in order to encompass more within a single scene. The foreground shows Michaelmas Cay, about 22 miles from Cairns, and in the background are islets of the neighboring Franklin group

◀ The birds that frequent the Great Barrier Reef are widespread types, as is typical of tropic beaches and small islands. Most of the flying birds in the view at left are sooty terns, the darker ones being part of a noisy colony of brown noddies. Sooty terns are nesting in the foreground

▶ Perched on a branch of driftwood, a sooty tern faces the camera in this close-up. Overhead fly two nutmeg pigeons. In the background the observer sees the Australian coast as it appears in November, under the characteristic rain clouds of that season. The birds in the foreground are silver gulls, and at the water's edge on the right are two reef herons. The group was constructed under the artistic and scientific direction of James L. Clark and Robert Cushman Murphy, respectively; it was collected by the Fahnestock South Sea Expedition





# BARRIER REEF



LOCATION  
OF GROUP





# P A P

## I have kn



# the people

▲ A GRAND VALLEY MAN, complete with boar's tusk nose ornament, bark string head net, and cowrie shell necklace. An old arrow wound showed on his side



➤ TWO MEN OF GRAND VALLEY who visited the camp at Lake Habbema and marveled at first sight of the white man and his ways. The stone adzes over their shoulders are essential parts of their "dress" when traveling



# PAPUANS

By A. L. RAND\*

Photographs by Archbold Expeditions



(Upper right) GRAND VALLEY in the unknown interior of New Guinea, where the expeditions of Richard Archbold for the American Museum discovered a population of 60,000 people. Here the Balim River flows through pleasant farming country, with stone fences enclosing the fields and Casuarina trees dotting the landscape

◀ FENCES were necessary around the explorers' camps to keep out the Grand Valley natives who had never before seen white men. They wanted to examine and handle everything and spent hours here watching their strange visitors. The head ornament on one man is from a recently acquired tin can



▲ GAILY COLORED SHRUBS are often planted near New Guinea villages, and the natives deck their hair or arm bands with little bouquets of flowers

An excursion into the minds of the Stone Age natives of New Guinea, whose little known island is now the scene of violent fighting

INCONGRUOUS as it may seem, the combats between Allied and Japanese airmen over New Guinea are watched by unclothed, Stone Age people. Civilization has touched only the fringe of that great island. In the interior, the natives still exist by their Stone Age methods, making fire by rubbing sticks together, using stone axes and fighting with bow-and-arrow and spear. Many thousands of them have never seen a white man.

I was in southeast New Guinea shortly after a series of plane flights had been made over the area for the first time. A patrol officer there told me about asking the natives what they thought the planes were. The natives had fitted them into their cultural background easily enough. They said that their grandfathers had told them about such birds; that, long ago, before their time, such birds had been common in the valley. But only now had they reappeared. What must these people think of the air combats now raging over their peaceful gardens?

I did my work in New Guinea during the last decade before the war. But the headline news of the war in

the east brings New Guinea to mind each morning; first the raids on Port Moresby, then the attempted crossings of the island by the Japs from Salamaua, and finally General MacArthur's assault on Gona and Buna.

New Guinea has some wealth. Coconuts yield their crops of nuts along the coast. A fabulously rich dredging area for gold exists in the northeast, where the fighting has been concentrated, about Lae and Wau. Geologists have hopes of a reservoir of oil in the extreme western part of New Guinea.

But for the rest of the island, New Guinea is a land of rugged mountains, dense forests, and tropical swamps. To penetrate it at all is difficult, and there is little reason for penetrating it now. At most, its coast serves as a strategic outpost for warring armies.

Most of the country is much the same as it was when first seen by the Spaniards 300 and more years ago, and thus it will remain for many years. The natives will continue their primitive lives untouched by the war that encircles their island. Most of them will not even know about it.

\* A. L. RAND, who was born in Nova Scotia in 1905, began his explorational career when he interrupted his zoological studies at Cornell to go to Madagascar for the American Museum in 1929-31. There he collected birds and mammals as a member of the international Mission Zoologique Franco-Anglo-Américaine à Madagascar. He completed his work for a doctor's degree at Cornell in 1932.

During the ensuing years he was active in the area of which he writes in the present article. Under the auspices of the American Museum he accompanied Richard Archbold to southeast New Guinea in

1933-34, to south New Guinea in 1936-37, and to the Snow Mountains area in 1937-39. Between expeditions he wrote up the scientific results of his work, particularly with reference to the birds of the region.

Owing to world conditions, Doctor Rand remained in the United States during 1940-42. He directed his attention chiefly to the life histories of birds and mammals, in Arizona in 1940 and in Florida in 1941, where he helped found the Archbold Biological Station. In 1942 he returned to Canada to take a position with the Biology Department of the National Museum of Canada, at Ottawa.—ED.

When I first went into the tropics the natives all looked alike to me. I saw the characteristics which made them different from white people. But soon as I got used to these differences, the various types stood out. Gradually they emerged as individuals. They had their characteristics, good, bad, and indifferent as have my white friends.

The tribes and languages of the New Guinea people are numerous. In the eastern ports are the brown-skinned, wavy-haired types, probably comparatively recent inhabitants of the country. Over the rest of the island are many Papuan tribes, with darker skins and more tightly curled hair. Their physical characteristics vary greatly, from the tall, thin Goaraberi native, with huge feet that serve him well on the mud of his native coastal swamps, to the short, thickset mountain people, with thighs and buttocks greatly developed from their continually climbing the rugged slopes of their forested homes.

At a cursory glance, the dress of a native perhaps identifies the general section from which he comes more quickly than his build and features. A civilized boy in black singlet and khaki shorts is surely from the Gulf

of Papua; a woman with many layers of "grass" skirts, progressively shortening from the inside, is certainly from the eastern ports.

The life in New Guinea villages seems to allow the individual to develop as far as his personality permits, which is not the case in many other societies. In many regions of New Guinea there are no hereditary chieftainships. A man is an important figure or a nonentity, not because of birth or social rank (if any) but because he has force of character enough to become important. A man of wisdom may become a counsellor for a large village of hundreds of people; or he may show skill and bravery in organizing raids, or by cunning and treachery he may reach prominence over a district of several hundred people through the exercise of magical arts.

When I first arrived in New Guinea, an old timer told me that at the end of one year in the country he had begun to understand the natives but that by the end of ten years he had begun to realize that he would never understand them. It is true that when you delve deeper and deeper into their devious ways of thought, you

inevitably come to something that you cannot understand. This something depends upon a deeply engrained racial background, so different from ours that words fail to bridge the gap. But in many ordinary little incidents, they are just like us.

One of the most impressive men I've ever met was old Gira, of the Bele River. His people had never seen white men before. We came to them from the sky, having flown our equipment into a mountain lake high above his village on the slopes of the Snow Mountains. We were encamped near timber line. To avoid trouble with the natives who visited us we had bought the land with several sea shells and built a fence about the camp. The local natives were truculent folk, and since we understood hardly a word of their language, the easiest way to avoid quarrels was to keep our people inside and the locals outside. But the natives did not understand this. It was especially advisable not to let them stay the night, for in crowded tents a gesture might evoke a quarrel that would end in bloodshed. We had to evict them from the compound, and they became quarrelsome.

It was then that Gira came to us.

## where they live



◀ FARMING was carried on intensively in the country along the Balim River. Trenches dug between the fields served several purposes. They took the place of fences in keeping out pigs, they helped control the water level, and the earth from them was spread over the fields as a top dressing. The natives did all this work with flattened sticks

(Left, below) CULTIVATION reached its highest altitude at 8,000 feet on the slopes of Grand Valley. Here erosion control was practiced by the primitive natives. Beds of sweet potatoes were laid out so the water would run between them, and here and there terraces of brush and earth broke the force of the water and allowed silt to accumulate



➤ OUT ON THE BOTTOM LANDS where wood was scarce, stone fences were used to enclose the gardens. But on the slopes, trees still had to be destroyed. The natives either chopped them down with stone axes or ringed the bark. Fences there were of wood



An elderly stocky man, nearly naked, he had a serene and dignified countenance. All was not quiet then certainly. But when Gira stood in front of our tents on the big log, his toes individually gripping the bark, and jabbered and gesticulated, the natives did what he said, even though reluctantly. We came to regard him as one of the best friends we had.

We had bought this camp site, as I say, with little sea shells called cowries. These were the currency of the country—flattish, glossy white shells, an inch or two long. They were also used as ornaments. Their value, as with our gold and precious stones, lay in their rarity. When you consider the years it would take for a shell to be traded from tribe to tribe from the coast into this remote interior, you can appreciate their value and understand how it remains high and constant.

When we moved camp, hundreds and hundreds of loads of goods were carried by these natives at the rate of a load a day in exchange for a shell. Sometimes the natives demanded their pay in advance. But to remove the temptation to abscond and to avoid any demands for a second payment at

the end of the day, we always refused this. Sometimes, halfway along the route the local carriers would strike for their pay on the spot. When we took a firm stand, they would disappear into the bush, leaving their loads by the trail. If we went on, there would not be the sign of a native for a time. But when we stopped to rest a moment, the whole line of them would reappear behind us, with their loads. Outbluffed, they would call off their strike and creep back to their loads, for our scale of pay was high.

In some areas nothing will persuade the natives to carry loads. On one occasion an offer of more than a month's pay in steel knives, a prized article there, would not induce a native to guide us a day's journey, through friendly country. Carrying anything besides weapons is really woman's work to the New Guinea native. The men stride along with their bows and arrows; then come the old women, the young women, and finally the children. The women will be carrying sacks of sweet potatoes weighing 40 or 50 pounds each on their shoulders, some woven mats stacked above them, and perhaps an infant perched on top. When we

traveled through Grand Valley with 70 laden carriers, the local natives took them all for our wives. Men must be rich in food and land to keep 70 wives, so they undoubtedly thought us important people.

When we moved down into the settled, agricultural part of Grand Valley, we were surprised to find how friendly were some of the old men who dwelt on the hills overlooking the Valley. One in particular I remember. I was hunting far up the slopes when I first met him. He called me over to where he was working and indicated in pantomime that he and his son were doing some planting. Pointing apologetically to a bow and some arrows leaning against a stump, he explained that some bird lurked thereabouts and he hoped to get a shot at it. He invited me to his home nearby and offered me some refreshments of sweet potatoes, which he started to dig up in his front yard. When I left, he shook me warmly by the hand. For all the world it was like meeting with a farmer who had a gun leaning in the fence corner to get a shot at a chicken hawk, and some apples or hard cider in the cellar to be sampled. Later, upon leaving this camp, when the old man stood on the edge of the clearing and shook my hand, he appeared to weep real tears of sorrow at my departure. Yet we spoke not a word of each other's language. Mind you, they were not all like that; some of the younger men were making a rush to loot our abandoned camp.

Kilasac, from the lower end of the Grand Valley, is another who sticks in my mind. He was quite a different type, an open faced, engaging rascal, whose shrieked orders rang over the hills. One of his eyes was almost popping out of his head, a disturbing sight at first. Our camp doctor diagnosed a tumor which would reach his brain and finish his career in three months. Even a major operation, if it had been practical, would not have saved him. But Kilasac had life in him yet. Though he had seven wives, he was said to still bother the women in the fields.

Though these people seem to prefer to settle their quarrels by screaming insults at each other from opposite hill-tops, their disagreements sometimes end in violence, as their scars testify. Yet it is amazing how many of the wounds are on the back or legs. I once saw part of one quarrel. We had stopped to rest on the bank of a stream, accompanied by a score of natives.



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# how they live

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▲ THESE MOUNTAIN MEN of southeast New Guinea are going to a dance. The frames they carry will be decked with bird of paradise plumes and strapped to their heads and shoulders when they dance

▼ HIGH IN THE OWEN STANLEY MOUNTAINS, which were recently crossed and recrossed by armed forces, these natives are offering food in trade with the explorers





▼ THE MOUNTAIN PEOPLE go practically naked. These natives are bringing sweet potatoes and yams to the expedition's camp at Mt. Tafa in southeast New Guinea to trade for yellow pigment with which to decorate themselves



▲ THE EXPEDITION saw men like this one set out on a war party, decked out in dog skin "busbies," shell neck ornaments, and blackened faces. They returned that same day after a bloodless encounter, apparently content with having shouted insults at the enemy from an adjacent hill top



▲ THESE NATIVES of the upper Fly River were always shy and kept a sharp watch to see that there was always a path open between them and the forest behind them. The many woven shoulder straps were characteristic decorations of the people in this part of New Guinea

◀ LITTLE YELLOWISH MEN from the forest of the upper Fly River. They are bringing a pig, a bird of paradise, and other specimens to trade. Small white beads for making necklaces and headbands were prized by them in return

Strident voices broke out. I heard the twang of a bowstring and looked in time to see one man with a four-foot arrow in his thigh, another with bow and arrow in hand disappearing into the bush. The wounded man plucked the arrow from his leg, walked into the stream and sank into it. His comrades twisted their fingers in his hair and held his head above water, but no one was excited. They told us not to be alarmed, it was nothing. It recalled the accounts of gun fights of the old West. A man takes exception to some remark, and weapons are drawn. I wondered if the shot was not intentionally in the leg. It seemed impossible to miss a man's body at 6 feet, with a four-foot arrow. But perhaps speed on the draw counts. We didn't try to dress the wound; not in a country where witchcraft or superstition is dominant and complications in recovery might be blamed on us.

These primitive people quickly adopt and cling to some of the white man's ways, which make them feel civilized. Once when camped high in the mountains of southeast New Guinea, we had an old guide called Martino. During his first days with us we fed him rice and furnished a spoon with which to eat it, instead of having him gobble with his hands, as they all do. A day or so later, he came into camp late. We were eager to be gone, and the cook thrust a plate of dried, caked rice into his hands. Martino would not be hurried but demanded a spoon to eat in a civilized fashion — this naked man who had eaten with a spoon perhaps half a dozen times in his 60 years.

What the natives prized of what we could give them was often a surprise. Empty tin cans were always treasured, for many of these people have no cooking utensils. It was amazing to see a dignified old man of importance scramble for an empty meat tin and stuff it carefully away in the little woven bag he carries in his armpit, a pocket without the coat, or perhaps a primitive version of a lady's hand bag. Or he might stand about for hours with the empty meat tin under his arm, all unconscious of the incongruity.

Sometimes it is steel knives and axes they value, and then they will steal and kill to get them. The little-known Kukukuku people, who kill humans for food, are said to be the worst in this respect. They have killed prospectors for their goods, and later, when pieces of the looted shovels have been



▲ MOST NEW GUINEA houses are built on supports like this one, which was found in a deserted garden on the upper Fly River

► A MEN'S CLUB HOUSE, or *Dabu*, in the Gulf of Papua. Here the dance ornaments are stored, and no women are allowed inside. The tall door is needed to permit passage of the high ornaments the men lash to their heads and shoulders for their dances

▼ A COMMUNAL HOUSE on the lower Fly River in which more than a score of families had lived. The house was empty when the expedition visited it, and some mystery surrounded its inhabitants, whose identity was unknown to the local administration



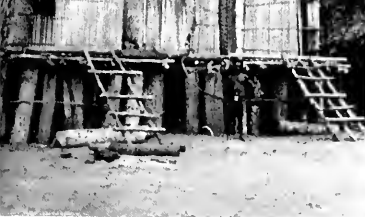


# their houses

➤ A MOUNTAIN VILLAGE overlooking the Ononge Valley. As in our own southern states, the pigs are fenced out of crops. This fenced sweet potato patch supplies the occasional needs of the families between trips to the main crops in more distant fields



▲ ANOTHER DUBU like the one at left



➤ A CIVILIZED VILLAGE on the edge of Hollandia Bay. The tide comes up under the houses and "boardwalk." The men and women wear clothing, but this is considered unnecessary for the children

PAPUANS





▲ THIS RATTAN SUSPENSION BRIDGE is typical of those built by the New Guinea natives. In the foreground are Dyak and Javanese servants of the expedition, washing cooking tins in the stream



▲ ON THE MARCH in the mountains of southeast New Guinea, one of the expedition's shooting boys pauses with a group of local natives to survey the valley ahead. Long spears, stone-headed clubs, and bows-and-arrows are these people's weapons



# how they travel

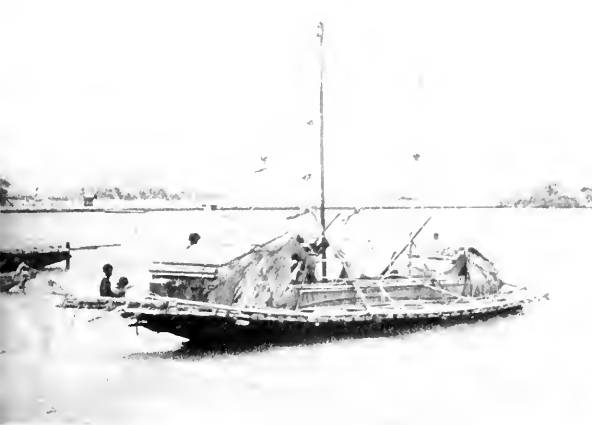
◀ THE AUTHOR in one of the long, slender canoes of the middle Fly River, which can make up to ten miles an hour. They were ideal for collecting trips through the marshes, or hunting excursions. The natives always stood to wield their long paddles



◀ THE WOMEN carry the burdens. This mountain girl from southeast New Guinea has sweet potatoes in the sacks on her back and household possessions wrapped in bark on her head







▲ A DOUBLE CANOE from the Gulf of Papua moored at Port Moresby. These are copied partly from the old-time trading *lakatoi*, partly from white men's boats. These wandering canoe loads of Gulf boys indicate a break-up of the old social structure and a new administrative problem

▼ AN ELABORATE PIECE OF WOOD CARVING: the bow of a Biak Island canoe



recovered, they have been found cut into narrow strips for knives. But how the steel could be cut by these people, almost without tools, remains a mystery.

In the Grand Valley, however, knives and axes could not be given away. A few which were accepted as gifts were later returned, and Papuans do not often spurn gifts. Here cowrie shells with the tops removed alone have value. In other localities it is beads, small white ones, or larger colored ones, depending on the locality.

The Snow mountain people travel practically naked across the top of the range, where it freezes hard and snows. You would expect them to be eager to get clothing to keep warm. But we found cloth and clothing worthless as a trade item. We once gave an old tunic to Bayo, one of the camp hangers-on. He wore it for a time, but it was discarded with its newness and given to the children. They, in turn, soon tired of it, and the last that I saw of it, two little boys had it down in the stream bed. The coat was spread out on a smooth flat stone, and the boys were pounding the fabric about the pockets so that these could be torn out. The pockets then appeared without the encumbrance of the coat and were worn on a short string looped over one shoulder. The rest of the coat was thrown away. And this happened in the mountains where I was wearing heavy wool trousers, a shirt, and jacket.

Sometimes after a match goes out and they find it will not light when struck for a second time, they are surprised or even annoyed; perhaps they think it inferior goods. Sometimes they seem to consider matches toys, lighting them one after the other to see them blaze. Why should they depend on these little sticks, which only light once, are so easily injured by



(Left and right) IN HOLLANDIA BAY the small canoes have carved designs on their sides. The letters show mission school influence

water, and must be handled so carefully! They already have or can easily make an apparatus in which the rubbing of two sticks together will cause friction enough to make a fire.

And similarly they are not too deeply impressed by our most elaborate devices. The semi-civilized natives near the coast listen to a radio for a while and soon dismiss it as a "fashion belong along white man." After all, how many of us are interested in knowing how a radio works?

Our airplane interested the inland people, but they were not greatly impressed even by this. They gathered about because its presence meant the going or coming of people. They did not fear it, nor its coming or going. It was just one of our things. The sort of things that really interested them were the fact that we had another skin under our shirts, that our boots came off, that we had hair on our arms, and that our watches ticked.

The native attitude about time is one that brings him into conflict with white man's ideas. It has caused New Guinea to be called the "Land of Dehori," *dehori* being one of the New Guinea words meaning "in a little while," or "wait a bit."

Of course, even white residents in the tropics tend to take things easier than men in more northern climes, and there is not the rush to get things done that we see elsewhere. But the natives sometimes carry the unimportance of time to a degree that is irksome. Once in southeastern New Guinea the natives brought me a live long-tailed lory. Or at least it should have been long-tailed, but the tail had been pulled out. I wanted the bird for my collection, but its worth was greatly impaired by its lack of a tail. This I explained to them. They flattered me by pointing out how astute I was to have discovered this, and waited, beaming, for their pay. When they understood that I was lowering the payment, they became concerned, but in a moment the solution was clear. Beaming again, they assured me it was all right, that I had only to "dehori," or wait a bit, and the tail would grow out again. As though I had nothing in the world to do but wait for a parrot's tail to grow out.

Another time when the second cook was officiating as barber, he cropped my hair to the scalp in places and left the rest of it much longer. He pointed out that the annoyance I showed was unwarranted. After all I had but to wait a bit and it would grow out

again. Finally after years in the tropics we reach a compromise. We agree to go more slowly than we would like to, and we get the natives to go faster than they want. It is wearing on both of us, but the expeditions are usually short and all we can do is to get as much work done as possible in the time available.

The reasoning of the natives is so simply logical at times as to be startling. As when they argue that a hospital is a bad place for a sick man to go, as more people die in a hospital than elsewhere; or that a sick person should be forced to eat quantities of food, because if he can eat well he isn't sick.

Then there is the case of the first missionaries to convert the natives of a certain island, telling them of the second coming of Christ, and getting them to put aside one-tenth of their coconuts. These the missionaries would collect in due course. An unscrupulous trader heard of this and, dressing in a long white gown, stood on the bowsprit of his cutter as it came to the island. He claimed to be Christ in person, come for His coconuts, and he got them, much to the anger of the missionaries when they returned. Despite missionary explanations, the natives could not understand how they were to distinguish between true and fake Christs, nor how his authorized agents could identify themselves without fail. Indeed, to unsympathetic eyes the matter seems difficult.

An incident showing the point to which blind, unreasoning belief can carry a native occurred in southeast New Guinea shortly after I first arrived in the country. It has always stood out in my mind. It was at the mosquito infested camp of Baroka, in the lowlands. Just before dark the government officer arrived on his way to Mondo, his station, seven days inland. Carriers under police escort were following with his gear.

Yet to the waist from wading the swampy trail, he hurried to change, but a native corporal came up with news that could not wait. It had been dark when the last carriers had crossed the largest swamp in the trail and a snake had bitten one of them. He now lay dead a mile back. What was to be done with the body? The patrol officer told him to bring it in, so he could certify to the death and attend to the formalities of reports on the death of a government employee.

We had supper. The mosquitoes became worse and the heat and smoke

of a smudge became nearly as bad, so that early we decided to seek the protection of our mosquito bars. But the black sergeant reminded the patrol officer there was a corpse to dispose of. Was it to be buried at once? No, said the officer, it had to be examined first.

Silently we fled out and stood around the quiet brown form. Natives hovered all about, just outside the dim light cast by the hurricane lamp. They were silent or spoke only in hushed whispers, perhaps thinking how this death might have taken any one of them.

The corpse lay on the blanket on which it had been carried. The sergeant pointed out the wound, a short gash on the ankle. It looked like a snake bite. The grotesquely sprawled body looked dead. There was no perceptible breathing. The man's eyes were closed.

There was a bubble in the froth on his lips. Poked in the eye, he quivered. His eyes rolled open.

"He's faking," cried one of the police boys who had helped carry him. Someone seized an arm and jerked him to a sitting position. A jolt in the ribs helped to rouse him. He was pulled to his feet. He took a few dazed steps.

"A funny business," the patrol officer said, as we re-entered the camp. The revived "corpse" was turned over to the police to be walked up and down. With the trouble he had given them in mind, the police boys promised he would get exercise. The next day he was as well as ever and continued the journey.

But what was this? Had a mildly venomous snake bitten him? In the darkness had a scratch on the leg made him believe he had been bitten by a snake? He certainly acted as if he had been bitten. If left undisturbed, would he have died? Is this perhaps what gives a witch doctor his power among these people, this ability of a native to believe in a thing so that it happens? In any case, without white man's intervention this native undoubtedly would have been buried.

I have since talked this over with a medical man in this country. He labeled it hysteria, and said it occurs here, too. I agree with the patrol officer, "A funny business."

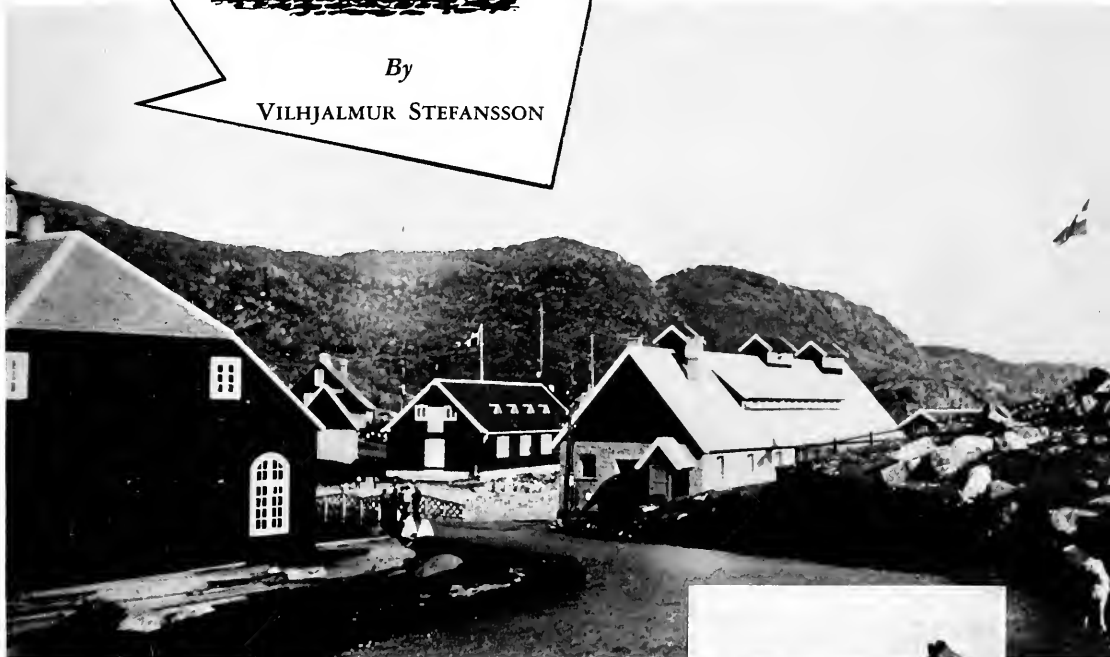
After more than three years in the jungles of New Guinea I look back on the Papuans not as natives, not even as tribes, but as individuals, and when I return again, I hope that some of them will be there to welcome us.

# Do you know THIS GREENLAND



By  
VILHJALMUR STEFANSSON

▼ HUNTING is the activity popularly associated with the inhabitants of Greenland, whose flag is the Danish flag with the addition of crossed harpoons. But farming was practiced in Greenland before the discovery of America and is today. Beneath the flag below stands the sheep slaughter house at Julianehaab



All photographs by K. N. CHRISTENSEN. Courtesy of the State Department

Farm scenes recently released from the world's largest island take some of the ice out of "Greenland's icy mountains"

TO many, Greenland has remained the land of the kindergarten song which tells of the dear little Eskimo in his house of ice and snow who never saw any grass because "In Greenland there is nothing green to grow." The real Greenland does have snow all over it in winter, like Montana or Vermont; but in spring all of it disappears from more square miles than there are in Scotland, England, and Wales combined. However, vast quantities of snow remain in the interior, the so-called Inland Ice. This is in many places so

far from the ocean that you cannot see it. The summer greenness of the land visible from the coast induced its first known European explorer, Erik the Red, to name the country Greenland.

On the basis that Greenland is green in summer, the Icelandic farmers of the tenth century colonized it, bringing their horses, cattle, sheep, and goats. This pastoral community lived at first mainly on the flesh of domestic animals, on milk and milk products, the people dressing in woolen cloth. After the Christianized Greenlanders



▲ A MILK COW on a Greenland farm

received their first resident bishop, in 1126, they paid taxes for several centuries to the Church of Rome in the hides of domestic animals, in wool, and apparently also to some extent in butter and cheese.

But the Europeans gradually discovered that it was easier to make a living in Greenland by hunting than by stock farming, and the seal, walrus, and whale gradually took the

place of the cow and sheep. This meant that the culture changed gradually from husbandry to hunting and became more and more like that of the Eskimos, until in the fifteenth or sixteenth century the blending of the European colony with the Eskimos had become complete, with most of the elements of European culture gone.

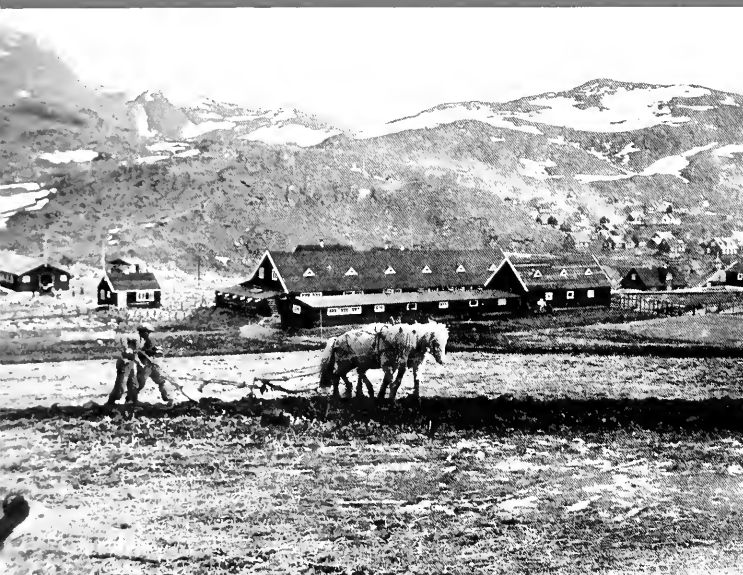
The Danes, who took possession of western Greenland following 1721, were fond of milk, so they began raising cattle in 1782—and in the very locality where Erik the Red had made his homestead, the present Juliane-

haab district. Cows have done well enough, but dairying has never been pushed even to where Greenland could supply all her own butter.

The sheep is obviously a better animal for Greenland. The modern sheep industry there began in 1906, with a few head imported from the Faroes. The "real beginning" was in 1915, when 170 were imported from Iceland. Greenlanders who are to be sheep farmers are sent to Iceland for an apprenticeship. On return to Greenland they receive breeding stock from the Royal Danish Trading Company, for which they pay eventu-

ally by returning the same number of animals. In twenty years the herds increased to more than 7,000. Wool was exported to Europe before the war; salted mutton was also shipped to Europe but much of it was sent up and down the Greenland coast and sold locally.

The sheep of Greenland feed out most of the winter, which is hardly strange since the weather is not as cold as in some places where sheep customarily feed out in Wyoming, Montana, and Idaho. It is usual to provide a certain amount of hay against particularly difficult periods.



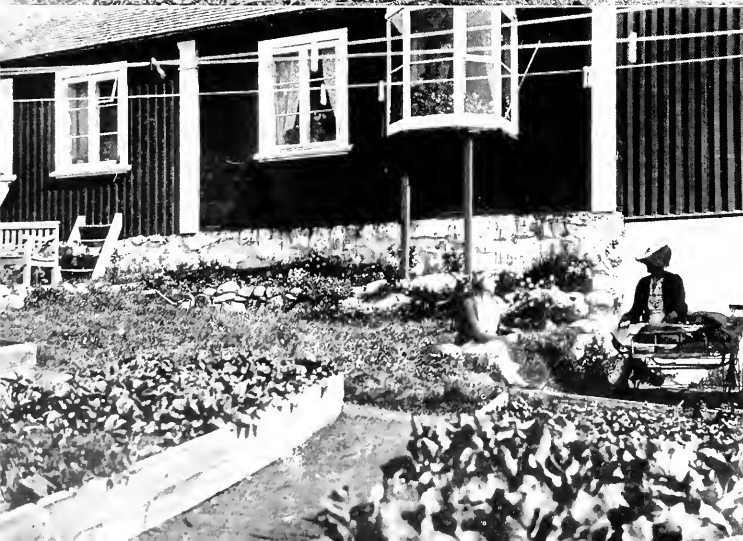
▲ GREENLANDIC sheep barns, Icelandic system. Apprentices study sheep raising abroad and return to set up pioneer farms in new districts

◀ PLOWING with Icelandic horses at the sheep station



◀ GARDEN at the Doctor's residence, in North Greenland

▼ THE HARVESTING OF BARLEY at the sheep station





▲ GARDEN at the Manager's house at the sheep station

► THE HOME of a Greenland shepherd. Greenland's sheep are divided among 200 farms, 45 of which make sheep raising their main occupation



◀ WAVING FIELDS of barley are scarcely what the average person thinks of in connection with Greenland



SHEEP in mountain pasture



THE DIGGING of a draining ditch through a bog at Narssak

FIVE-MONTH-OLD LAMBS



SHEEP being brought home by boat from the summer grazing ground



## Products of GREENLAND



**SHEEP.** During the Middle Ages, West Greenland paid tithes to the Church partly in wool, milk products, and hides of domestic animals. Sheep raising has been reintroduced in the past 30 years. Salt mutton is one of the products.

**SALTED** codfish, salmon, and halibut are among the most important products of the Greenland fisheries.



**FEATHERS AND EIDER-DOWN** from a region where it gets no colder than it does in 20 of our states have helped to keep the rest of the world warm at night.

**FOX SKINS.** Blue and white fox skins are among the products handled by the Royal Greenland Board of Trade, a sort of "government-operated Hudson's Bay Company."



**BLUBBER** is the chief product received from Greenland's hunting and fishing stations. Turned into oil at the settlements, it was formerly shipped to Copenhagen for manufacture into soaps, etc.

**WALRUS HIDES AND SEAL SKINS** are produced by Greenland in quantity, but their exploitation was not encouraged by Denmark partly because, like blubber, they are vital in the native economy.



**CRYOLITE.** Greenland is the only known commercial source of cryolite, used in the manufacture of aluminum. Taxes from this one mine have yielded Denmark twice as much money as the Territory of Alaska cost us.



▶ A CULTIVATED MEADOW at Julianehaab

▼ A GREENLAND SHEEP FARMER drying hay at Narssak. Greenlanders stall-feed their sheep to some extent in winter, but the climate here is not as cold as in sheep country in the Rocky Mountains



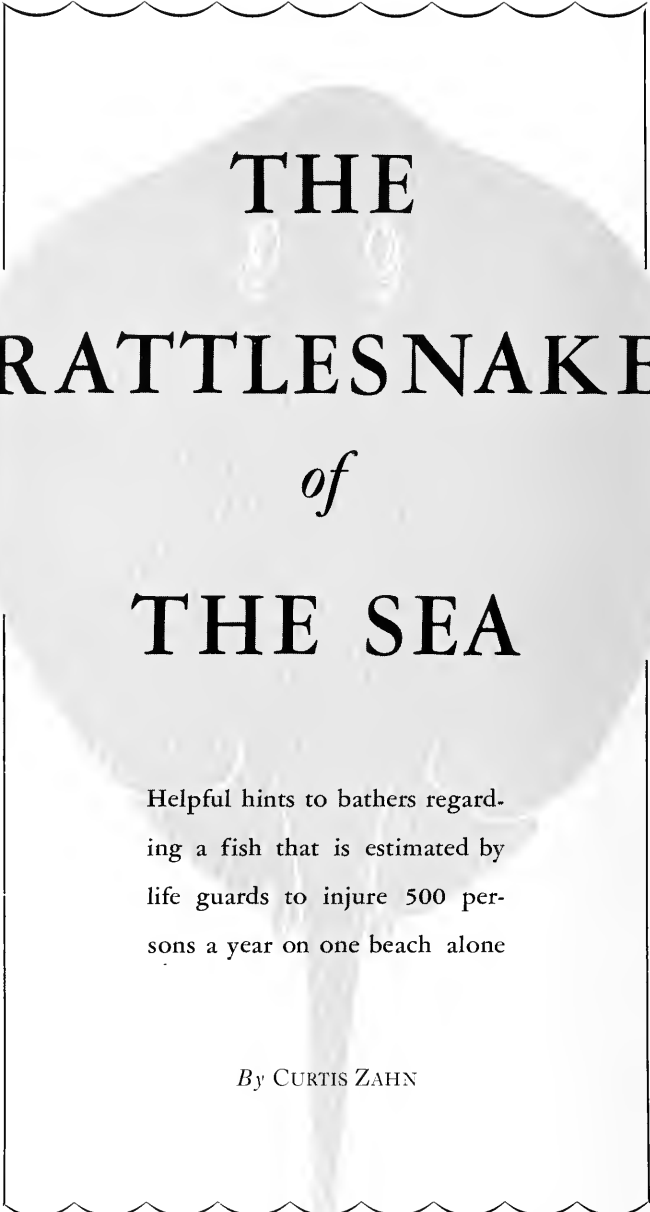
▼ A SILVER FOX FARM near the sheep-breeding station at Julianehaab



THE story of the sting ray is handed down, from person to person, bather to bather. Sometimes it is embellished and often it is belittled. Seldom are authoritative statistics divulged. Seaside colonies jealously guard the news, probably feeling that the less said, the better for their clientele. First aid stations admit the presence of *Urobatis halleri* with a fatalistic shrug. They handle dozens of its victims daily in some localities, but their lips are mysteriously sealed. Although millions of bathers know the sting ray as a character of questionable reputation, hundreds make its acquaintance the hard way each season. The wound from its barbed stinger is painful, varying from an easily healing scratch of an hour's discomfort, to one that causes injury for weeks, and in rare cases, death. The result is that many people forego surf bathing entirely, leaving it to uninformed tourists who stride innocently into infested water. Again, there are the fatalists who would wade anyway, taking their chances. The truth of the matter lies somewhere between. It is possible to safely invade the waters of *Urobatis halleri* once one learns about the habits and limitations of this most formidable of flat fishes.

According to David Starr Jordan, the round sting ray was first discovered off San Diego, California, in 1863 and named for a young man who was "stung at the time of the discovery." Undoubtedly the fish was unofficially known before that. The California Indians are said to have used the barbed stingers for arrowheads. This family of *Dasyatidae* is abundant in Asiatic and Australian waters, where natives utilize the dried skins for various purposes. The species is one of the easiest to find on California coasts, and there is reason to believe that sting rays are on the increase. The reproductive rate is vast, one to eight young being hatched "alive and very healthy." The death rate, on the other hand, is not at all reassuring. They have few if any enemies. Large fish cannot invade their shallow water environment. They are inedible and are not used commercially in any way. Pleasure fishermen avoid them for obvious reasons.

*Urobatis halleri* might well be called the rattlesnake of the sea. This creature is to bathers what the reptile is to hikers. What it lacks in viciousness, it supplants with its very abundance. And in addition to its scorpion-like defense apparatus, the sting



# THE RATTLESNAKE of THE SEA

Helpful hints to bathers regarding a fish that is estimated by life guards to injure 500 persons a year on one beach alone

By CURTIS ZAHN

ray has the ability to become one with its surroundings. All such flat fishes are mud colored, varying only in shades to match the environment. While corbina, croaker, perch, and other surf fishes flee from approaching bathers, the sting ray lies serene and camouflaged. It will often cover itself with silt and refuse to be dislodged from its mudhole. When the unsus-

pecting victim places a foot upon its back, the tail flips up in an arc, burying the stinger usually about the ankle. Charges have been glibly made that poison is injected from fangs or sacks. This is not true. The infection results from an acid slime coating the bone barb. It is undecided whether the slime gets its toxicity from pollution around bay and sea bottoms or from



the skin of the fish, but certainly it does not come from an interior source. Treatments vary from hot water and salts to other medication. The main thing is that the victim go immediately to a first aid station or a doctor. From this point on, time is the only healing factor.

Certainly the ray's living habits make it one of the most unsanitary of all fishes. It feeds on dead or living mud organisms, never taking live minnows or surface baits. It prefers bay ooze to sandy bottoms and dwells by preference in hot and stagnant waters. The body structure is fragile. Its mushy softness is comparable almost to that of a jellyfish. It is incapable of prolonged activity and spends most of its time resting prone on the bottom. When "flushed," it will dart with an undulating, fluttering gait for a distance of usually but a few feet. Then, skidding to a stop, it becomes enveloped in its own dust which finally settles over, completely hiding the fish from enemies.

Few victims have ever seen the fish that stung them. The swirling, sandy waters of the surf and muddy bay conditions make it nearly impossible. The round, tapered shape of *Urobatis halleri* makes him fit into the landscape. Often, in six inches of water, the fish remains hidden from the sharpest eye.

Interviews with life guards and first aid workers bear out the theory that rays generally prefer conditions not altogether similar to those desired by swimmers. True, both seem to want warm water. The bather, however, stays away from ooze and slime. Nor does he like the dead and stagnant water of bay shores. If he did, the guards assure us, thousands of people would be stung. For every sting ray in the ocean surf, there are dozens in the bays. Statistics show us that most casualties are suffered in the ocean, but statistics also show that few people wade bayshores and millions wade the surf. This same observation applies to the theory that the chances of getting stung in a crowded surf are as great as when bathers are few. Actually the risk is cut down when the bather wades to sea in the midst of hundreds of other splashing bathers. Prolonged activity by people will eventually drive out nearly all sting rays, but they will return shortly after quiet has been restored. Sting rays are commonest at low tide, when beaches are apt to be flat. If the

waves break far out, rolling in so that there is always a constant body of water one foot deep or more over a large area, sting rays will be abundant. Add to this soft sand and warm water and the conditions are "ideal."

From the above remarks, it should be obvious that safety in swimming lies in finding the opposite conditions from those enjoyed by the sting ray. High tides, heavy breakers, and coarse sand beaches with steep shores harbor few of them. Cold water plays a part. In winter and early spring, the rays will be concentrated in the warm shallows of bays and sloughs. It is here that they breed and live in their most suitable environment. The ones that frequent ocean environments are, comparatively speaking, the exception.

Yet sting rays are so numerous that despite hundreds of casualties it is safe to assume that the great majority of bathers walk through their territory in safety. Most of the rays dart away from the path of the intruder. The few that cannot be dislodged are stepped upon by unlucky individuals who are victims of the great law of averages.

#### *How the bather should walk*

In order further to cut down chances of injury, there is one more important step. It is the step the bather takes as he walks into waters abounding with *Urobatis halleri*. For if one drags or slides his feet over the bottom, it is nearly impossible to get stung. The ray's sting apparatus is designed in such a way that he cannot inflict a wound unless the victim's foot is over the center portion of the body. Thus, when the water drags his feet, his toes will strike the side of the resting fish. In any case, this will cause the sting ray to dart off, and the tail carrying the barb will be unable to describe enough arc to touch the foot. It is true that most bathers fail to drag their feet so that the toes dig into the sand. It spoils some of the pleasure and spontaneity of surf sport. Yet, this is an almost infallible way to avoid painful contact. At the same time, stamping or thumping the feet, thus splashing the water violently, helps some to drive out the majority of rays. The main risk involved is when the individual swims around, then touches land. The odds are small that one will happen to place a foot squarely upon the waiting back of the unwelcome inhabitant. But it can be

lessened if the swimmer allows the wave to carry him high up onto the beach before touching. When he does touch bottom, he should try to do it in the midst of a group of bathers. If neither condition is possible, it helps to kick the feet violently, churning the water as close to the bottom as possible—without touching. Do this for a few moments before placing both feet on the ground. Once the bather's feet are on terra firma, they should remain there.

It has been rumored, from time to time, that people are stung while actually swimming. The writer has never found a case of this kind, nor talked to anyone with proof of its happening. On the occasions when sting rays do swim, they keep within inches of the bottom. Besides this, they are more alert when away from the protection of mud, and more wary. Another point is that they cannot get enough leverage when swimming to drive the stinger sufficiently hard.

The many kinds of rays range from the round sting ray, averaging six inches in diameter, to the manta ray with a spread of 25 feet. There are the skates and eagle rays and various cousins, all related to and descended from the sharks. There is even the guitar fish, which resembles these flat fishes in design and habits. Yet, only two California rays are dangerous. The small round sting ray and the rat-tailed sting ray are the only ones able to use their stingers. Both are round as saucers. The latter differs in its large size (often being two to four feet in diameter) and in its whip-like tail, which attains a length surpassing that of the fish. The rat-tailed sting ray is rare, however, and frequents deeper water. It is also more difficult to approach than the smaller species. The eagle ray has winglike flippers, a huge head and eyes, and a whiplike tail. He is a fraud, however, for his stinger is fastened securely to the base of his body and cannot be used. The true skates (Kajidae) may have more or less enlarged prickly "thorns," but do not have a long serrated stinger. They are the gopher snakes and lizards of the shallow waters. Only *Urobatis halleri*, the rattlesnake of the sea, is to be feared. He can drive his barb to the bone. But if the individual learns the sting ray's habits and watches his step, he will not have to make the creature's acquaintance the hard way.

THE END

# Freaks

▼ THE CANNING PEARL: A large baroque which took the shape of a human torso as it grew in the shell. As set, it is valued at £10,000



# Among Fresh-water Pearls

By LAPLACE BOSTWICK

SINCE the dawn of history pearls have been a source of joy and wonder to man. They were known in ancient China and Egypt, spoken of by Pliny, and brought back from the Orient by Marco Polo. Pearls were among the treasures of the Mound Builders and other Indians long before America was known to Europeans.

Real "freak pearls" occur only under extraordinary conditions. While the average person probably thinks of "balls," "pears," or "buttons," those thoroughly conversant with the pearl business know that there are other unusual shapes or classes habitually produced by certain species of mollusks. Furthermore, these are all in reality natural. Our fresh-water mussels grow pearls of many forms, such as "petal," "lily," "arrowhead," etc., and these forms are just as natural as the more common "balls" and "buttons."

The curious natural shapes mentioned above occur in particular parts of the anatomy, and different species of mussels produce the various forms. This is because shape is governed by location and movements relative to the part of the anatomy in which the pearl customarily grows. Muscular and organic movements mould the growing pearl into its natural form by exerting pressures upon it while the secretion for each layer is still soft. Such pearls are in no way "freak pearls." Special shapes are common to certain species of mussels, while other shapes are common to others.

"Petal," "lily," and "arrowhead" pearls are usually of excellent quality. Whereas in the "balls" and "buttons" a foreign substance is apt to instigate the growth, the other forms mentioned are genuine pearl material throughout, because their growth in the mollusk starts from the hardening of true pearl-forming secretion.

Almost any of our numerous kinds of fresh-water bivalves may mother a "ball" or "button" pearl, but only a favored species (out of about 600 found in the United States) can produce a "petal," "leaf," "lily," or "snail." When one of these queer shapes is common to a particular species, it is always found in exactly the same part of the anatomy and may be said to constitute a characteristic class. It is natural for "button pearls" to be flat on one side because they occur in the outer edge of the mantle, close to the lip, and the side which is flat is only

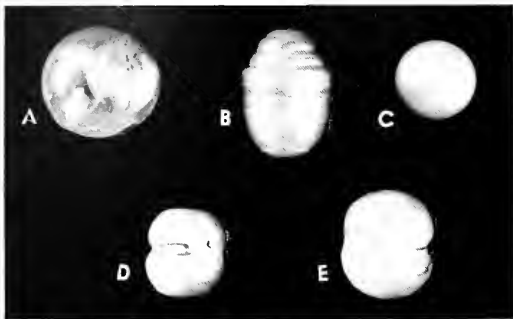
kept from resting on the shell by an extremely thin sheet of mantle skin. Constant pressure from above pushes down on the growing pearl and forces out the soft secretion around the edges. In this way all "buttons," "haystacks," and "half-balls" are formed. A sphere pearl can occur only in a part of the anatomy that is entirely free from movement such as could cause pressure.

On account of the button factories and the lack of proper regulations and control, the streams and lakes of our country are fast becoming "shelled out," and these classes of wonderful and out of the ordinary pearls are now hard to find. During 1907, I received from Newport, Arkansas, a box containing 50 ounces of "arrowhead pearls" which had been carefully selected as to size and color, but today it is difficult to secure enough of them even to make one pearl flower such as a daisy or marguerite.

When a "button" or "ball" bursts its sac while growing (which often occurs), it is usually lost, but once in a while one slips from its pearl-sac and lodges in a different location—thereby becoming a nucleus for a baroque. Hence it was not uncommon during the great pearling days in the Mississippi drainage system to find a specimen from which the outer layers could be removed, and the "ball" or "button" recovered. If the "pearl peeler" really understood his work, the enclosed pearl was not injured by the operation.

There are numerous causes for the growth of pearls in our fresh-water mussels, and pearls of some class or other may be discovered in almost any part of the anatomy. At one place on the Iowa River a certain kind of mussel known as "buckhorns" were common. No "buttons" or "balls" were found in them, but ten miles down stream, just below a dam, these classes of pearls were often found. The water rushing over the dam caused dirt and sand to drift, and when small particles lodged properly on the mantle (between the lip and the "water-line") and worked in, a pearl was born. Secretion was quickened by irritation, and the foreign substance became enfolded in pearly nacre.

Mantle pearls are often started by parasites; fine quality baroques can result from hardening of internal secretion, but seldom can a "ball" or "button." Groups of small baroque pearls owing their origin to parasites are often found in the hinge-

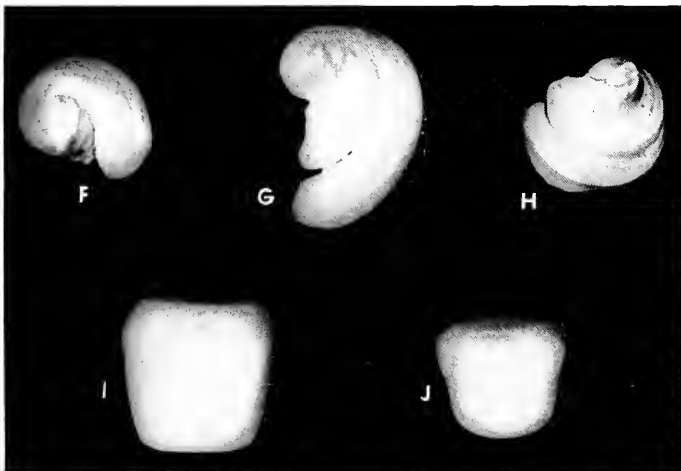


▲ **A.** A TRANSPARENT HINGE PEARL

**B.** AN ACORN PEARL: a type that may be mounted effectively with chased burr, green gold oak leaves, and stem

**C.** A FLAT "BUTTON" PEARL: one of the shapes produced naturally in certain kinds of mollusks and in certain parts of the shellfish's anatomy. Pressures exerted during growth give the distinctive shape

**D & E.** "DOUBLE-HEADERS." A pearl expert will peel away one layer of pearl substance to remove flaws. A gold or platinum band around the middle of a double-header makes an attractive mounting



▲ **F, G, H.** "SNAIL PEARLS," which show the natural effect of muscular action and pressure during growth. Note that all of them spiral in the same direction, because similar forces governed their development

**I, J.** THESE TWO PEARLS belong to the class called "barrels." They are turned by muscular action as if in a lathe. Occasionally they are found in perfect barrel form, even to the loops

muscles, but what might be called strings of exceptionally bright barques that occur in a region near the heart are undoubtedly due to hardening of pure secretion.

Real freak pearls may be either attached to the shell or free, but they occur only under extraordinary conditions and usually where pressures are not regular. Sometimes very curious forms result, and these may simulate a bird, insect, animal, or even a face. A Minneapolis jeweler owned an absolutely perfect Madonna, which was in fact an "attached pearl." Such a thing will, of course, never occur again, and 200 or 300 years ago it would have been looked upon as a miracle. On the desk where I am writing is a rather amazing pearl boot, one inch in length and of iridescent white. At Muscatine, Iowa, I once saw a perfectly shaped pearl in the form of a top, which would spin merrily on a glass showcase.

The large baroque pearl in the Canning Jewel is a fine example of what an artistic designer with real ability and imagination can do with a "freak pearl." He visualized it in a proper setting, and almost entirely on account of his ability it has been valued at £10,000. As no other baroque pearl is ever likely to have the same shape, it was possible to create an "exclusive piece."



► **THE GREAT HOPE PEARL**, owned by a London banker and valued at £9,000. This pearl, a baroque, was attached to the shell when found

Apparently the same can be said of the great Hope Pearl, valued at £9,000, which is in reality a pearl baroque. Being attached to the shell when found, it was necessary to release it and then shape and polish the back. It would seem that the vision of an artist gave it the exceptional value. His dream was a mounting close to perfection for a pearl of that shape. The value of these two pearls when mounted certainly proves that a great source of profit in the pearl business lies in artistic designing for strangely formed pearls—the “freaks.”

The “petals,” “lilies,” “leaves,” etc. found in our American fresh-water mussels are natural forms and in no way freaks, and they can be utilized to great advantage in the creation of exquisitely beautiful pearl flowers and sprays. By careful selection as to size, color, and tint, delicate violets, pansies, apple blossoms, etc. can be made with the genuine pearls in their natural forms. Genuine pearl “leaves” may be used (or green gold leaves) to suit the taste. Pearl “lilies” are usually milk-white and grow in the form of a calla. Therefore, a mounting of green

gold leaves and a diamond center sets them off effectively.

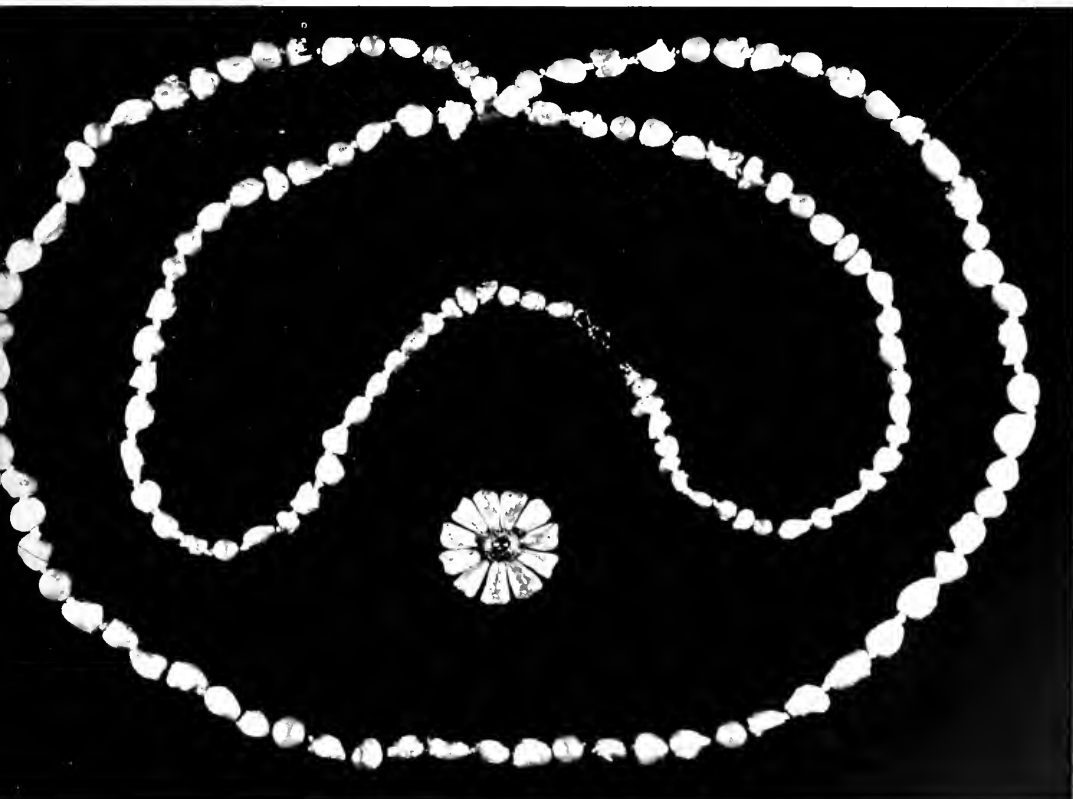
Carefully selected baroques of the right shapes, colors, and tints lend themselves to the creation of exquisite butterflies, hummingbirds, etc. This finer class of artistic work cannot be done properly with “balls,” “pears,” or “buttons.” While this has often been attempted, and some extremely valuable pearl flowers have been formed of them, they certainly lack the natural beauty of design that can be obtained by using the right shapes and tints.

One class of jewelry derives its value from the big, highly priced pearls, the other from its realistic effect and artistic merit. Who can doubt that a violet or a pretty apple blossom composed of pearls of correct natural color and shape has more beauty than a big, highly priced flower that is incorrectly made of large “pear pearls?” Some people, of course, prefer exceptional size and great value, even at the expense of artistic merit—others enjoy and delight in delicate perfection.

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A NECKLACE of fresh-water baroque pearls, with a daisy brooch wrought of selected “arrowheads.” The center of the daisy is of chased gold and is set with a diamond. Apple

blossoms, violets, and lilies are only a few of the many realistic flowers and other designs that are reconstructed of various pearl forms, carefully chosen as to size and color



*pombe* (native beer) in half a coconut shell, the latter to be fastened in a tree known to be frequented by the animals. *Komba*, I was told, show such a liking for the beverage that they drink themselves into a state of intoxication. Then, if the tree be visited early the following morning, the galago will be found in such a befuddled condition that it falls an easy prey. Normally it would escape by making prodigious leaps to safety, but in an inebriated state its judgment fails, so that, missing the objective, it falls to the ground.

So the story ran, and I provided my informant with money to get the liquor and try the scheme. Next morning he reported that all the *pombe* had gone but that the galago had made off as he ascended the tree. He suggested that the amount consumed had evidently been insufficient, but, undaunted, he was willing to try again if I would only increase the amount of money so that more *pombe* might be made available for the thirsty creature. Suspicious that I might be providing free drinks for an artful relative of the galago, rather than for the creature itself, I refused, fearing that it was I, and not the galago, which might be caught.

#### *A chase through the tree tops*

Shortly afterwards, however, word was brought me that a full-grown galago had been discovered asleep in one of the acacia trees which formed an avenue along the road. It was noon-day and scores of natives were trooping back to camp. I dispatched several to climb the tree as well as adjacent acacias, instructing them to shake the branches violently wherever the galago managed to leap. As it sprang from tree to tree there was usually a boy ahead of it ready to agitate the branch upon which it alighted. This process was repeated until the harassed little creature lost its grip and fell to the ground. A sack was thrown over it before it could reach the nearest tree for which it made a dash.

This galago was placed in a cage measuring twelve feet by six feet by six, but could not be called a pet by any stretch of the imagination, for it remained savage and morose. Though provided with jam, pawpaw fruit, leaves and milk, on two occasions it attacked a 20-inch chameleon—which shared the cage—and chewed the rep-

tile's tail to pulp. From this I learned that these creatures require a certain amount of fresh meat to compensate for the insect food which they would capture in a wild state. Eventually I gave this galago to a friend who felt sure that he could win its confidence, but later I learned that after months of fruitless attempts, he had liberated it in the grounds of the Governor's Palace at Dar es Salaam.

#### *A real pet*

One day, however, Salimu, my Mkami gunbearer, came into camp saying in Swahili: "Master, I have something you want very much, something you will be happy to see." Smiling with satisfaction at the surprise he was about to give me, he put a hand into one of his pockets and, carefully withdrawing it, revealed a baby *komba* curled up like a dormouse as it lay, a little furry ball, upon his palm. Salimu told me that he had been out in the bush when he had discovered a pair of galagos high in a prickly euphorbia. He had thrown stones into the tree until they departed, leaving the little one behind. Then Salimu had swarmed up some lianas and, reaching over to the euphorbia, picked up the baby galago and brought it down in his pocket. When curled up it was scarcely larger than a tennis ball and, apart from its long bottle-brush of a tail, was not unlike a tiny teddy bear.

By day it slept a great deal, its large ears folded up in a fashion characteristic of galagos. At daybreak and dusk it was fed on milk and sugar, which it licked from my finger tips. Besides the cry of the adult, which it made every time the mess bugle was blown, it emitted a queer little noise like the rattling of dry peas in their pod. Still more closely it resembled the sound which a big longicorn beetle makes when it rubs its thorax against the wing cases. This cry was apparently one of hunger or dissatisfaction.

A week after its arrival it performed a trial jump of seven inches: to watch it taking little kangaroo-like hops was an amusing sight. The hind legs were out of all proportion to the forelimbs. By this time it no longer required feeding from a finger but lapped its milk and sugar from a saucer. At the end of a fortnight it commenced carrying its tail over its back, squirrel-fashion. If it were placed on a table and I but gave the signal by snapping my fingers, it

would take a flying leap of eighteen inches or so and land neatly on my outstretched palm. It ate dates but consistently refused other fruit and even jam. One day as I was skinning a goshawk, to my surprise the young *komba* descended from my shoulder where it was fond of sitting, and greedily ate the brains of the bird. Then, seizing a leg bone, it held it aloft in its wee hands and chewed at the meat with evident relish. Taken in conjunction with the adult's craving for blood—as shown by its attack on the giant chameleon—it is evident that captive galagos require something of this nature in their menu.

From the time the little creature first tasted the brains of a bird, it would rouse from its slumbers whenever I sat down to skin an animal. Then, springing from horn to horn of the trophies which decorated the walls of the *banda* (grass hut), it would eventually land on my shoulder, to run down my arm and help itself to whatever brains it could find. I fear this freedom led to its untimely end, for it died suddenly with all the symptoms of arsenical poisoning, the assumption being that it must have got hold of some preservative.

I might well have shared the same fate one night, owing to my possessing but one cupboard, though that a large one constructed from a packing case. The two top shelves were reserved for food and crockery, the third devoted to books and papers, while circumstances necessitated my keeping scalpels, forceps, and preservatives on the lowest. One evening, since my personal servant was away, Salimu was performing his duties and waiting at the table. On account of the numerous flying insects, the lamp had been turned low. Soup had been served and Salimu was about to leave the *banda* to fetch the next course when, noting its absence, I remarked: "You have forgotten the salt." Silently he returned to the cupboard, then placed a little glass dish in front of me. Mechanically I put out my hand to take it, drew it towards me, then paused and looked more closely, for it contained not salt but white powdered arsenic! "What, tired of your master already!" I said. For a minute the lad was puzzled, not comprehending his very natural mistake until I pointed out to him what he had done!

Everything possible was done for the little galago and I doubt if I ever regretted the demise of any creature more.

# YOUR NEW BOOKS

MOON • CATS • LATIN AMERICA • OCEANS • SOLOMONS  
MATHEMATICAL RECREATIONS • MAN'S POOR RELATIONS

## THE STORY OF THE MOON

----- by Clyde Fisher  
Doubleday, Doran and Co., Inc., \$3.00

FOR several years preceding the publication of Doctor Fisher's most interesting volume, our nearest celestial neighbor has suffered an ill-deserved neglect. Doctor Fisher's book fills the gap in a manner that should please all groups of readers who are interested in the Moon. Every question that the non-astronomer is likely to ask about the Moon is answered in a delightful, up-to-date, and authoritative fashion that should be readily understood. Technical phraseology is generally avoided while simultaneously the reader is introduced to many of the "terms of the trade."

All of the lunar associated phenomena, such as tides and eclipses, as well as the direct lunar phenomena, such as phases, etc., are fully covered. The problems of the origin of the Moon and, particularly, the origin of the lunar craters are discussed extensively. Doctor Fisher's account of his personal experiences in search of meteor craters and at eclipses make excellent reading. His exposition and explosion of lunar myths should please even the superstitious. The lecturer or teacher in astronomy will find the book filled with interesting lecture room material and will especially appreciate the precise and prolific historical material.

Doctor Fisher's book not only answers the non-astronomer's questions about the Moon, it should also stimulate him to ask many more questions that the astronomer is also seeking to answer.

FRED L. WHIPPLE.

## MATHEMATICAL RECREATIONS

----- by Maurice Kraitchik  
W. W. Norton & Company, \$3.75

HOW many colors would you have to have in coloring the countries on the most complicated map so as not to use the same color on two adjacent areas? How can you divide the face of the earth into 120 triangles of equal area? Problems of this sort will appeal to geographers. What is the shortest stalemate in chess, or your chances of finding trumps in the dummy? These and hundreds of other questions will fascinate anyone who likes to explore the magic of numbers.

Today more than ever it is borne in upon us that mathematics is a sort of master key. If this were merely a symptom

of a mechanistic approach to life, it might be regrettable. But Maurice Kraitchik's book will convince one that the realm of mathematics far transcends the bounds of material things and represents one of man's most marvelous purely mental achievements. He points out that when two chess players face each other, the number of different games possible through the interplay of their wits is a figure that dwarfs the distances of astronomical space.

Many games are analyzed; also there are innumerable puzzles in story form, like the "monkeys and coconuts" and the "missionaries and cannibals," which will win the hearts of readers who remember the posers of Sam Lloyd in the daily papers. It would seem better, however, to have given the answers at the end of the chapters rather than next to each problem. And just as mountaineering may be fun for some and labor for others, everyone will not call all the problems recreational. The range is great.

The author, an eminent mathematician from the University of Brussels and formerly editor of *Sphinx*, is now on the faculty of the New School of Social Research in New York.

E. W.

## THE PIROTECHNIA OF VANNOCCIO BIRINGUCCIO

Translated from the Italian  
----- by Cyril Stanley Smith and  
Martha Teach Gnudi

The American Institute of Mining & Metallurgical Engineers, \$5.00

ALMOST all scientists and technicians develop an interest in the history and progress of their science after they have acquired enough experience to realize that some of their predecessors were not so ignorant after all. The enforced language requirements of the American Ph.D., however, rarely supply the ease of reading necessary for pleasurable consultation of the old classics, and as a rule historical interests lie dormant. Only occasionally do we find a scientist with sufficient persistence to read the older works, still more rarely do we find one of the works translated by a competent authority and re-issued so everyone may read it. Such translations involve an interpretation by a qualified specialist as well as the literal word for word translation. Doctors Smith and Gnudi are to be congratulated for their splendid accomplishment, as evidenced by this volume.

Biringuccio's Pirotechnia is a neglected classic which has suffered in part by in-

adequate earlier translations into other languages. The Hoovers, in their translation of Agricola's *De Re Metallica*, were lead into this error and felt that the book was unimportant. As a matter of fact, this work, first published in 1540, was apparently the source of much of Agricola's information on mercury and sulphur distillation, glass and steel making, and the recovery by crystallization of saltpeter, alum, salt, and vitriol. It is only natural that such an extensive work published sixteen years before *De Re Metallica*, should have influenced the writing of that book. The latter chapters of Biringuccio deal with such matters as gun and bell casting, wire drawing, goldsmithing, and some of the military arts. It is interesting to find here the descriptions of primitive versions of mines and incendiary bombs, 400 years ago.

In addition to its being a most interesting work, ably and creditably translated, something should be said for the book itself. It is a beautifully composed book, published by the American Institute of Mining and Metallurgical Engineers with the assistance of the Seeley W. Mudd fund, and is worth much more than the price asked. We can rarely give so unqualified a recommendation as in this case.

F. H. HOUGH.

## MAN'S POOR RELATIONS

----- by Earnest Hooton  
Doubleday, Doran and Co., Inc., \$5.00

DRAWING freely from many wide fields of the biological sciences, Professor Hooton has surveyed the sociology and zoology of all the primates other than man, drawing well chosen samples from these branches of knowledge, fortunately, not without benefit of his own well-seasoned comments.

An appreciative public is well aware that Professor Hooton does not belong to the dry-as-dust school, so that even the solid meat of science is graced with the piquant sauce of his wit. Thus, after "An Anthropologist looks at the Primates," he naturally "then looks back at himself."

To the "Ape aristocrats"—the chimpanzee, gorilla, orangutan, and gibbon—he devotes almost half the book. The treatment of each species is reflected in sub-headings such as: "Habitat," "Maternal care," "Intelligence," "Vocalization and gestures," "Locomotion," and "Land tenure among the gibbons." The lesser apes and monkeys are discussed as the "Totalitarian Monkeys of the Old World," and the "New World Democrats and Proletarians." Finally, the tarsiers, lemurs, and



galagos become the "Backward Primates of the Old World." The political ideologies implicit in these headings are not frequently carried out in the text, and the roots of the incredible crimes and violence of individual human beings are thus laid bare.

Although other monographs on the systematics of the primates have been written, this seems to be the first attempt to bring together in easily digested form the immense technical literature on the ecology, sociology, and psychology of the primates. The book is largely "psycho-biological" and most of the dry details of anatomy are in the form of fine print appendixes. The illustrations are splendid, well chosen, and excellent portraits.

Altogether *Man's Poor Relations*, besides providing a happy hunting ground for general readers, may well serve as the textbook of a course which is missing from the curricula of most colleges—primatology.

W. K. G.

## BIRD DISPLAY. AN INTRODUCTION TO THE STUDY OF BIRD PSYCHOLOGY

----- by Edward A. Armstrong

Cambridge: At the University Press  
New York: The Macmillan Co., \$5.50

THE great advances made in the study of animal behavior in recent years have thrown new light on many old problems and opened entirely new concepts. The earliest observers interpreted much of what they saw in terms of intelligent human reactions and assigned the rest to "instinct," a term never satisfactorily defined. There are still many puzzling activities, but many sorts of behavior patterns are now fairly clear. Mr. Armstrong's book brings together a wealth of details regarding these and the natural laws that are thought to govern them.

Since the most conspicuous and varied of birds' activities are those of display, the larger part of the volume is devoted to them, as may be surmised from the title; but other, less spectacular ones are not wholly neglected, since the threads of a bird's life are interwoven in a web of related reactions to internal and external stimuli.

The author takes up the different types of avian behavior and describes them as they have been observed in various species, often discussing their counterparts in other animals or even human beings, if the relationship is real and not merely fancied. Cause and meaning find their places in the discussion. The text is copiously documented so that it becomes a convenient source book for the reader who may wish more details on particular statements. At the same time it is a readable account, and those who may not care to go into the underlying causes may still find the descriptions of the many curious activities of considerable interest. Mr. Armstrong has wisely kept his text free from the specialized nomenclature that makes so many technical dissertations unintelligible to the uninitiated, and the terms used are both simple and precise.

Separate indexes are given of the birds

and other organisms, the subject matter in general, and the authors quoted. A checklist of the birds, a bibliography, and 40 excellent photographs from varied sources add much to the utility of this interesting and important account.

JOHN T. ZIMMER.

## LATIN AMERICA. COUNTRYSIDES AND UNITED REGIONS

----- by Robert S. Platt

Whitlsey House (McGraw-Hill Book Co.), \$5.00

ANYONE desirous of a better understanding of the human geography of the countries south of the United States will find some use for this volume. In it Professor Platt has combined the results of many years of geographic research. What he terms "microgeographic field studies"—detailed descriptions of varied, specific units of land occupation, or utilization—are used to illustrate the differences and similarities between the countries. Some of these have been published individually in geographic journals but are combined here to provide a background for the generalized summaries he presents.

For example, in treating the southern portion of South America—Chile and Argentina—eleven field studies are described. They cover such diverse subjects as vineyards, a copper mine, a nitrate plant, an arable valley in a desert region, a north Patagonian sheep ranch, and various types of farms and estancias. Twenty-nine maps and twenty-two photographs are used to illustrate them.

The accompanying generalization on these two countries occupies about one-eighth of the space devoted to the specific studies and utilizes two additional maps. This is fairly representative of the treatment of the other geographic regions. As the author states, the book is "not a complete geography of Latin America, though its purpose is to enlarge geographic understanding." The successful achievement of this objective is its major contribution.

JUNIOUS T. BIRD.

## HEADHUNTING IN THE SOLOMON ISLANDS

Around the Coral Sea

----- by Caroline Mytinger

Macmillan, \$3.00

EVERYONE has his eye on the news from Guadalcanal, so this book should mean something to the readers of NATURAL HISTORY. Headhunting is not used literally, for the author is an artist who went out to capture heads on canvas. Most of the time was spent in Guadalcanal, where the author made a series of paintings showing natives (formerly headhunters literally), some of which were exhibited for a time in the American Museum of Natural History. An illustrated article, "With Brush and Palette in the South Seas" was published in NATURAL HISTORY in July-August, 1930. Incidentally, Miss Mytinger met Dr. Margaret Mead in New

Guinea and gratefully acknowledges her assistance.

The artist was accompanied by a capable woman whose chief accomplishment was singing and playing a ukulele. You will enjoy the narrative from the first chapter to the last. The many adventures of these two lone women are treated with exaggeration of the Mark Twain variety, but through it all you come to feel how it might be to rough it in the tropics, and are better able to read between the lines of the war news from that front. Every now and then you will meet with most vivid realistic descriptions of jungle, storm, native life, and the trials of the Europeans and the Chinese trying to live in that country. Among the best bits of descriptive writing are the great sea turtle hunt in canoes; the farewell dance the natives gave a beloved missionary; chewing betel nut; winning the confidence of native women until they would pose for portraits; the "house boy" who saved coin for the artist by shoplifting and begging the food he was supposed to purchase, but who when reproved, merely pocketed the coin yet produced as much food as ever; and the native who spent hours gazing enviously at his portrait admiring the wonderful scars decorating the shoulders and back, without realizing that they were copies of his own beautiful scars.

C. W.

## WAYS OF THE WEATHER

----- by W. J. Humphreys

Jacques Cattell Press, \$4.00

THE past year has seen the appearance of so many popular works on meteorology that the reviewer approaches any new one with a definite feeling that it must needs have some special merit to justify its appearance at this time. The authority of Doctor Humphreys, for so many years Meteorological Physicist of the U. S. Weather Bureau, would in itself seem ample justification for the present volume. But even a cursory reading discloses so many phases of meteorological phenomena, so many answers to everyday questions as to the ways of the weather,—so much, in short, that has not been treated in the other recent accounts of this subject, that the book assumes the proportion of an investigation of an entirely new field of knowledge rather than just another popular work on meteorology.

In addition to the discussion of such factors as the origin, composition, and structure of the atmosphere, the distribution of temperature, water vapor and atmospheric pressure, and kindred subjects, the book contains most interesting and informative accounts of such features as "weather perceptions" (the measure of the effect of weather on our own senses), "weather music" (why the wind howls, wires hum, or sounds carry better just before a rain), "weather control" (savage ceremonies and "modern" rainmakers), as well as a summary of the practical value of meteorology, and a summary of important milestones in the history of the science of meteorology.

There is no subject that is more generally cursed and discussed than the weather



... and probably no field of science that is subject to more misinformed, inept experting. This superlatively interesting and lucidly written account should be on the "must" reading list of all who would know whereof they speak when they speak of this atmosphere that surrounds us all.

H. E. VOKES.

## CATS AND ALL ABOUT THEM

----- by L. H. Fairchild and Helen Fairchild

Orange Judd Publishing Co., \$2.00

THE practical value of this book can scarcely be overestimated. Written by two individuals with extensive experience in raising cats on a commercial scale, the volume naturally contains many useful suggestions regarding the breeding and care of the animals. However, this is much more than an account of the personal experience of cat fanciers. L. H. Fairchild is an M.D., and as such has contributed much that is strictly scientific concerning diets, diseases, etc.

The scope of the work is comprehensive. The reader will find complete instructions for all phases of cat care from the construction of living quarters through the technique of successful breeding, the raising of kittens, the care of adults, the treatment of diseases in kittens and grown animals, and the approved methods of showing prize animals.

Thirty-four full page illustrations of the various breeds add to the attractiveness of the book, and a complete index increases its usefulness.

Purchase of this publication would be a sound investment for anyone interested in raising cats whether it be for pleasure or profit.

F. A. B.

## THE ROSEATE SPOONBILL

----- by Robert Porter Allen

National Audubon Society, \$2.50

PRIOR to the time of Audubon, the roseate spoonbill appears to have been little affected by man's presence, but during the period between 1850 and 1890 it was virtually extirpated within the United States, reaching its lowest point between 1890 and 1910. By that time, efforts to preserve its dwindling numbers began to show results, and repopulation from more southern parts of its range was in progress. It had once been a common breeder in suitable habitat in Florida, Texas, and part of Louisiana, but the repopulation has been effective only in Texas and Louisiana; in Florida the species still rarely breeds on the mainland. In order to find the causes of the former extirpation and the reasons for the failure of re-establishment in Florida, Mr. Allen spent sixteen months in the field in the South, studying the spoonbill in its native haunts. The present report, *Research Report No. 2* of the National Audubon Society, gives the results of this study in the most complete

# INFORMATION TEST

A few high spots in this issue on which you can try your knowledge.

Correct answers on page 111

1. Where in the Western Hemisphere did white men farm before Columbus discovered America?

2. What is *cowrie*?

- (a) sea shell money
- (b) a pinaceous timber tree of New Zealand
- (c) a large African bird

3. Not all pearls come out of the sea.

True..... False.....

4. Where is the largest coral reef in the world?

5. Why won't a murre's egg roll off the ledge of rock on which it is laid?

6. A shrew eats its own weight every 24 hours.

True..... False.....

7. In the latter part of the 18th Century contact with the Aleuts was established by:

- (a) Followers of Rousseau, practicing their "back to nature" philosophy
- (b) Russian traders and settlers.
- (c) Persons fleeing from the rigid rule of the Massachusetts Bay Colony

8. The lyrebird is so called because

- (a) its call resembles the sound of a lyre
- (b) its long tail feathers, when spread during courtship, are arranged in the form of a lyre
- (c) its quills are used as plectrums in playing a lyre

9. Where does a murre "fly" with its wings besides in the air?

10. What is the largest island in the world?

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account of this species that has appeared anywhere to date.

There are notes on distribution, migration, and post-season wandering, and descriptions of the various plumages and molts. Considerable attention is paid to the behavior of the species, its sexual activities, the role of the sexes in nest-building and incubation, display, and similar interesting topics. Feeding activities are discussed, with studies of the community of which the spoonbills are a part. Examination is made of the factors inimical to the birds' existence in one area or favorable to it in another. Although the final key to its distribution was not determined, enough was learned to make certain recommendations possible through whose practice it may be possible to restore this fine species to a more favorable position than it now occupies. The report is well illustrated with photographs and line-cuts and a colored plate by Roger T. Peterson as frontispiece. It may be highly recommended both for the solid information it contains and as a basis for future work.

JOHN T. ZIMMER.

## CRAZY HORSE: THE STRANGE MAN OF THE OGLALAS

----- by Mari Sandoz  
Alfred A. Knopf, \$3.50

MARI SANDOZ, the author of *OLD JULES*, a biography of her father, was admirably qualified to write the life of this great warrior. Her childhood home was in the sandhills of northwestern Nebraska at the edge of the Indian country. Growing up near the great Sioux reservations and the Black Hills of South Dakota and not far from Fort Robinson, Nebraska, where Crazy Horse was killed in 1877, she heard many stories from the pioneers and the old Indians. It is evident that she has also done an immense amount of research in the archives of the War Department, the Indian Bureau, and elsewhere. Besides this she has interviewed scores of persons who had something to contribute, including He Dog, Crazy Horse's brother-in-law, who was with the great Sioux warrior when a white man's bayonet ended his life. The care with which she has sifted the truth from all these sources deserves high praise.

This story is very different from Stanley Vestal's fine biography of Sitting Bull, in that it is full to overflowing with the figures of speech and idiom of the Indian. Miss Sandoz says: "In it I have tried to tell not only the story of the man but something of the life of his people through that crucial time. To that end I have used the simplest words possible, hoping by idiom and figures and the underlying rhythm pattern to say some of the things of the Indian for which there are no white-man words. . . ." It is an unusual biography, seeming to come directly from the Indian mind or consciousness.

It is a grand hero tale of a modest, unselfish man of steadfast character and indomitable courage—one of the fightingest Indians of the Plains, leader of real warriors.

CLYDE FISHER.

## SYSTEMATICS AND THE ORIGIN OF SPECIES

----- by Ernst Mayr  
Columbia University Press, \$4.00

THE last decade has seen a revival of interest in evolution in general, and in particular in the central problem of evolution, the origin of species. This revival of interest has been due in large part to the illuminating influence of the rapidly expanding science of genetics. It has become increasingly evident, however, that the principles of evolution can be elucidated only through the co-operation of various branches of science. Among these branches systematics (taxonomy) occupies a prominent position.

The Jesup lectures delivered by Doctor Mayr at Columbia University in the spring of 1941 constitute the foundation of this book. Doctor Mayr, who is Associate Curator of the Whitney-Rothschild Collections at the American Museum of Natural History, is an outstanding ornithologist and student of evolution. He is modern in outlook and fully aware of the implications of findings in related fields of research.

Few people are aware that taxonomy has changed radically, both in method and aim, within the last few years. Doctor Mayr's book is concrete evidence that this change is for the good and that taxonomy has an important contribution to make to the study of evolution.

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A discussion of the principles which form the subject matter of the book is beyond the scope of this review. Doctor Mayr develops his subject logically, not taking for granted that the reader is conversant with the literature of taxonomy and evolution. As a result the book is understandable to the reader with a general biological background. It should be read by all biologists, professional and amateur.

A. P. BLAIR.

## THE OCEANS. THEIR PHYSICS, CHEMISTRY AND GENERAL BIOLOGY

----- by H. U. Sverdrup, Martin W. Johnson and Richard H. Fleming

Prentice-Hall, Inc., \$10.00

A QUARTER century has passed since the publication of a comprehensive text on oceanography, namely the Russian volume of Schokalsky. Within that period, development of new instruments, of which the echo-sounder is but one of many, and the extended application of dynamic or indirect methods of interpretation, have modified the whole approach to the subject. Furthermore, Schokalsky's work is limited, except in its historical section, to physical oceanography, whereas the authors of *The Oceans* stress the almost obligatory interdependence of that science and such cognate branches as marine biology and the geology of the ocean basins.

No one could be better qualified than Professor Sverdrup and his colleagues at the University of California to co-ordinate the whole vast field, and this they have done in 1087 pages of a massive tome (weight, 4 lbs., and all muscle), illustrated by 265 well drawn figures and seven folding charts. Mathematical definitions and solutions are provided wherever applicable, emphasizing the close coincidence of physical oceanography with the modern discipline of meteorology. As a result, hundreds of pages bristle with equations, which will be as welcome to practitioners as they are forbidding to lay readers.

The topography of the ocean basins, physical properties of sea water, the theory of the distribution of variables, marine chemistry including its alteration by living organisms, biological environments and populations, techniques of observing and collecting, nature and dynamics of ocean currents, waves and tides, ecology of marine life, organic productivity, and sedimentation are among the broad subjects covered in 20 chapters, each followed by a copious bibliography. Certain headings, such as that dealing with animal populations, receive no more than summary treatment and are not lacking in deficiencies, and even errors, as exemplified by the paragraph on the sirenians. But such items are peripheral to the main theses, and this sound and exhaustive monograph not only satisfies an important timely need but will likewise prove, for many years to come, a vade-mecum for all who inquire into any department of the science of the sea.

R. C. M.

LETTERS

Continued from page 60

has grown at one time in North Dakota, though not at present.

F. E. COBB,  
Forestry Specialist,  
U. S. Dept. of Agriculture  
Jamestown, N. Dak.

Gratitude for a valuable correction—ED.

SIRS:

For the last two months I have missed the explanation of your front cover design. . . . Please tell me the name of the species of monkey on your January issue. Let me know if they are hardy and if they make good pets. . . .

I have been reading your fine magazine for the past few years and spend many an enjoyable hour with it. It is without doubt the most outstanding publication of its kind in the world.

Yours for continued success and more bird stories.

EDWARD INDRIKSON  
Helmetta, N. J.

The conspicuously marked monkeys referred to on the January cover are the White-mantled Colobus (*Colobus polykomos matschiei*). They are found in most of the forested regions of Africa, the animals in the exhibit having come from the Aberdare Mountains, in Kenya. They live almost entirely in trees, where they feed on leaves and probably also fruit. These monkeys remain far from human habitations and so are rarely seen. The young are at first almost pure white. Colobus monkeys have not been kept long in captivity.—ED.

SIRS:

. . . NATURAL HISTORY is a splendid magazine and one for which I should not like to be put on ration.

ELIZABETH H. BRODIE  
Los Angeles, Calif.

SIRS:

. . . Last April I purchased two extra copies of NATURAL HISTORY for Bridgton Academy at North Bridgton, Maine. Its article by Ethel Cutler Freeman on the Seminoles was used by the students in the Indian Essay Contest. . . .

I have the issues of NATURAL HISTORY for many years in bound form. They are a joy forever and highly prized in my household.

GLOVER S. HASTINGS  
W. Newton, Mass.

SIRS:

I have recently become a subscriber to your magazine, NATURAL HISTORY, and have been struck not only with its beauty but with the tremendous fund of knowledge it imparts, and I am very much interested in obtaining as many back issues as possible. If you do not have them for

sale yourself, will you please refer my inquiry to interested parties who may have them for sale? Please let me hear from you in this regard.

LEONARD GORDON  
Los Angeles, Calif.

Back issues are ordered through the Library of The American Museum of Natural History, at 50¢ each; but some numbers are out of print, in which case dealers in secondhand books and magazines may be of assistance.

—ED.

Continued on page 112

Answers to Questions on  
page 109

1. In Greenland. In the Middle Ages Greenland paid tithes to the Church in wool, hides, etc. See page 95.
2. Cowrie is shell money. However, there is a bird called a kori and a tree that is known as the kauri (see NATURAL HISTORY for October, 1942). See page 87.
3. True. Our fresh-water mollusks grow pearls of many forms. See page 103.
4. In Australia. The Great Barrier Reef extends for 1200 miles along the northeast coast. See page 82.
5. Because it is pointed at one end and big at the other, so that it rolls in a half circle like a top. See page 66.
6. True. Its high rate of metabolism obliges a shrew to eat its own weight every 24 hours. See page 75.
7. Russian traders and settlers. See page 73.
8. The lyrebird gets its name from the shape of its tail when displayed. See page 81.
9. Under water. The murre uses its wings as well as its feet when submerged. See page 66.
10. Greenland. See page 95.

ON YOUR RADIO

Programs of the American Museum and Hayden Planetarium, Winter, 1943.

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Akeley African Hall—American Museum of Natural History



SIRS:

Mr. Norman D. Harris' account of his pet fox in the November issue of *NATURAL HISTORY* Magazine leads me to feel that readers of your "Letters" department might be interested in a pet screech owl I had for several months last year.

The owl, scarcely out of its down stage, was captured by schoolboys in Schenectady after they had killed the mother owl by throwing stones at her as she perched in a tree on a school playground. The playground instructor took the young owl away from the boys and turned it over to officials of the city Education Department. After two days of fruitless efforts to make the tiny creature eat they asked me if I would take it to my home in the country.

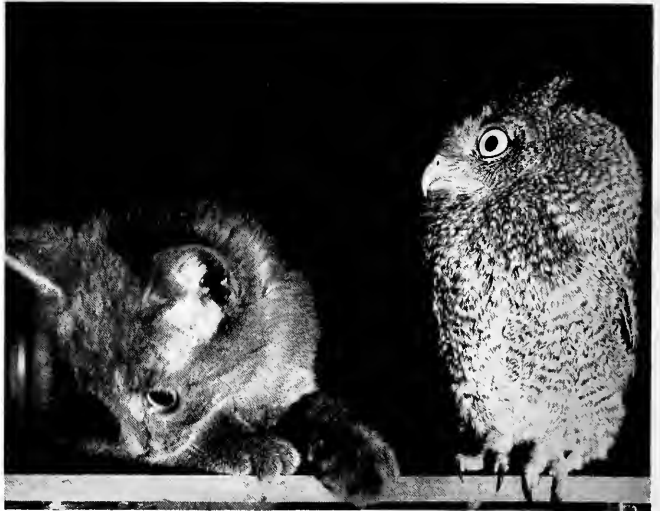
Though little, Swampfire, as I named the owl because of the glow of its eyes, was savage. He would strike with his beak at anything thrust close to him and he continued to refuse food. On the third day, however, he accepted a bit of ground meat, and from that moment the feeding problem was over. Within another week he would accept food from my fingers, and within two weeks it was evident that he was becoming tame.



By the time Swampfire was ready to fly he was a real pet. He would perch atop a door and swoop down to my shoulder for food. He had learned to pick pieces of meat from between my lips and would engage in a tug-of-war if I held the food too tightly. The little owl's chief delight was teasing the family cat. He would wait until the cat, a big tom, would pass under his favorite perch. Then he would swoop down on pussy's back, grabbing its fur in his beak and pulling. The cat evidently had designs of making a meal out of Swampfire, but a few samples of the power behind the owl's beak and claws ended those ambitions.

It was now about three months since I had acquired the owl, and he was as tame as any creature could possibly be. He had never been kept in a cage, and when I sat down to read or write he would come and perch on my shoulder or nestle in my lap. His savage disposition was gone entirely. He loved to have me lift his wings up and scratch his back, and he would cluck like a well pleased old hen as I did so. He had half a dozen distinct calls. I learned to imitate one that sounded

▼ "THE OWL AND THE PUSSYCAT." When Swampfire became tame, his chief delight was in pouncing upon the family cat, grabbing its fur in his beak and pulling it



◀ AT FIRST Swampfire would snap savagely at anything held close. The piece of meat that P. Schuyler Miller is offering here is viewed dubiously, but the owl soon learned to take food politely from hand or mouth

▼ SWAMPFIRE in full-length portrait



something like *trrrrrrrrr*, apparently a mating call, and he would come flying from any part of the building when I gave it. I always rewarded him with a bit of meat.

By the end of June, Swampfire seemed capable of taking care of himself, so I determined to give him his freedom. I took him into my bedroom one night, placed him on the sill beside the open window, and waited to see what he would do. He simply sat there and watched me undress, and after I had gotten into bed he came over and perched on my head.

He may have left the room during the night but he was perched on the sill when I awakened in the morning. On the third night he flew out of the window to a near-by tree. He remained there a little while, then flew back to the bedroom. It was more than a week before he would venture from the house for more than a few minutes. Finally, Swampfire began leaving the house at dusk and staying away all night. I could hear him calling about the woods, and once in a while another owl would answer. I tested him by calling from the house at various hours of the night. He would always answer and in a few minutes would appear at the bedroom window for food. He came back to the house at about sunrise each day and stayed until night. During this period, the owl remained just as tame as he had ever been.

One night I heard Swampfire "talking" with another owl close by. It was evidently a female, and he apparently was trying to bring her to the house. Failing, he flew over to beg for food. Then he flew back to his mate and they disappeared into the night. A month passed before I saw him again. I had heard an owl calling and, thinking it might be Swampfire, called in return. There was an answer to the call, and in a few moments the owl flew in the window and perched on my shoulder. He was just as tame as ever. He spent that night and all the next day at the house and then flew off into the night again. I saw him once or twice more during the late fall before I moved to the city for the winter.

In March I made my first visit to my farm. I found the owl's broken body under the bedroom window. He had evidently tried to beat his way into the house during the winter and had broken a wing and frozen.

DUANE FEATHERSTONHAUGH  
Duanesburg, N. Y.



*March*

# NATURAL HISTORY

1943

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AMNH photo of a quartz crystal

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# The Time and Place for Teaching

---

THESE are few institutions or activities in which the impact of war has been as strongly felt as in our system of education. The reasons are obvious. In other lines of human endeavor the new demands are either for a redoubling of output without significant change in kind, or for a drastic change-over relieved by a permission to discontinue the normal type of production.

Since nobody would like to recommend a lowering of our cultural level while we are fighting to preserve our civilization, education is asked to undertake the double burden of teaching for war and for peace at the same time. With no desire among those who believe in the ideals of our country to see either educational function reduced below the maximum attainable, both educators and laymen would appear to have felt a natural hesitancy to face the problem frankly and seek a rational solution in public discussion. Since any museum is part of the educational system, the problem also concerns us very deeply.

In spite of the greatest efforts, it is perfectly clear that extensive curtailment of normal activities is necessary. But it is not evident that education for peace is the only function capable of being subjected to narrower limitations than its most enthusiastic proponents would advocate. To build a useful philosophy for education in wartime, two particular aspects of the problem might profitably be given greater attention in our thoughts and in our public discussions.

Since curtailment is thought of chiefly in terms of postponement, this introduces the question of which aspects of education are postponable in the life of the individual, and which are not. Secondly, we have the problem of achieving the most effective division of labor among institutions,—a question which has been obscured by the anxiety of all institutions to be able to point to their own particular contribution to education for war.

This competition for war education certainly does not contribute to the effort of keeping the cultural damage to a minimum. On the contrary, it is clear that if the institutions best fitted to give cultural education for peace actually increase their efforts in that direction, they will enable those more suitably equipped for teaching the arts of war to be less concerned about possible harm done by increased concentration upon their particular duties in wartime education.

Among the many distinctions that would have to be drawn to achieve a rational organization of the

educational system one particularly concerns the museums. This is the distinction between classroom teaching and the general education of the public based upon unscheduled, voluntary attendance. Since education for war obviously requires classroom discipline, it follows that public museums of all kinds should recognize and accept an increased responsibility for the liberal arts aspect of education in all subjects within their scope, from anthropology to astronomy, from art to biology. When instruction intended to create an understanding and appreciation of art or of nature must be curtailed in the classroom, the loss to the individual can be greatly reduced by increasing the benefits he may receive from museums, galleries, and similar institutions.

This argument gains further strength from a consideration of our second question: the problem of the age for learning. It is the function of professional education and technical training to impart to the student the factual knowledge and skills which will particularly serve to increase his value to himself. Social and national aims are more incidental and secondary, although always present. In the liberal arts, and in education for cultural purposes generally, we address ourselves more directly to the task of improving the individual's value to his nation as a reasoning member of a democratic society governed by his opinions and his vote. The achievement of this aim rests less upon the mere acquisition of factual knowledge than upon the development of sound habits of thought and of a mental readiness to accept the logical foundations of the reasoning necessary to solve our social and national problems.

Up to an age of about 20 years, we develop our opinions on the basis of what we learn. After that age, we tend increasingly to fit what we learn into our opinions and our ways of thinking, or to reject it uncritically if it will not fit. The creation of a sound mental basis for dealing wisely with the problems of the world is therefore the least postponable task of education, while it is well known that our ability to absorb new factual information remains with us till late in life. Nevertheless, the necessities of war must unavoidably make the greatest inroads in the general subjects of formal classroom teaching, while immediate stress must be laid upon the aspects of education which would normally be more capable of postponement. A clear recognition of this situation lends final emphasis to the increased obligation of museums and similar institutions in the field of general education.

*A. G. Barr*  
Director, the American Museum  
of Natural History

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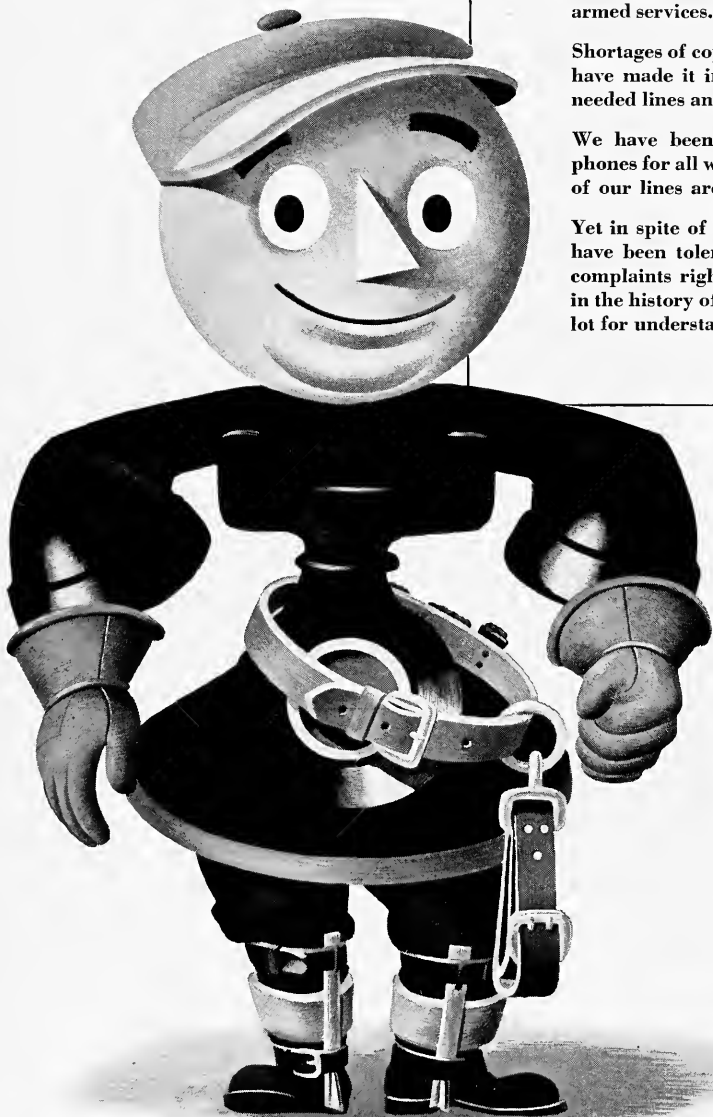
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# NATURAL HISTORY

*The Magazine of the American Museum of Natural History*

FREDERICK TRUBEE DAVISON, President

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VOLUME LI—No. 3

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MARCH, 1943

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# Ivan and

Showing what it is like to raise two super-curious albinos in the home, and proving that Br'er 'Coon may change his coat, but not his tricks

By CLIFFORD H. POPE\*

All photographs by the author

**C**OME quick, come quick! Sis is having her babies."

This announcement was made excitedly by Hal and Whit in the late afternoon of April 24 just as my wife and I were tardily dressing for a dinner party. In spite of "signs" reported by the boys, I had remained skeptical about the condition that Sis was supposed to be in. Her long fur had completely hidden any change in size, and she was so young, having but recently passed her own first birthday. My doubt and preoccupation with a hurried shave made me send the boys out to be doubly sure something actually was happening. Three minutes later Whit rushed in again to announce, "Da, Sis really is having babies; I can hear them crying inside her. You *must* come now."

This was a challenge for a naturalist, so I stopped fixing my necktie to explain to my six-year-old son how impossible it would be for Sis's babies to cry inside her. However, before my explanation had penetrated his excited brain, Hal reappeared for an instant to shout breathlessly, "Sis has *had* babies, I can hear them crying in the box. Hurry, hurry!"

Convinced at last, the party and my dressed-up state vanished from my mind as I ran out to the cage, where I found three excited boys and a still more excited father coon, Pops by name. The cries of the newborn were coming from the box, and a quick

glance showed that all was well with Sis and her two almost naked babies. We humans were excited but our condition was mild compared with that of Pops, for he was climbing about the wire in a state of nerves we hadn't believed him capable of. His one desire was to get on our backs, something he almost never wanted to do except when lured by food. No expectant father waiting at a hospital could have been more beside himself than was this daddy 'coon just over a year old.

In spite of the party, I decided to obviate any tragedy by at once shutting Pops off from his mate and offspring, as I had read that captive male raccoons sometimes kill their young. Alexander, my oldest son, and I then spent an hour making the separation, and I left Sis well protected by heavy wire. When I did finally arrive at the party I found my hosts and the other guests anxious to hear about the new arrivals and I felt like the father of twins instead of only the foster father of a pair of 'coons.

Examination the next day convinced me that Sis had given birth to albinos, and we were not surprised because Pops and Sis were brother and sister with at least one albinistic parent. Their own coats were rather light, though with the typical raccoon pattern. We decided to name the two cubs Abdul Abulbul Amir and Ivan Skavinsky Skavar, but when Abdul proved to be a female, her name was changed to Abdulla. She is light tan

\*CLIFFORD POPE spent four years in China as a member of the Central Asiatic Expeditions, under the leadership of Roy Chapman Andrews. There he collected reptiles, amphibians, fishes, and mammals, acquainting himself with the life and language of China as readily as with its animal population. Thus the foundation was laid for his book, *The Reptiles of China*, published in 1935. He was associated with the American Museum's Department of Herpetology for over fourteen years and since 1940 has been Curator of

Reptiles and Amphibians at Field Museum of Natural History, Chicago. He is also the author of *Snakes Alive* (Viking, 1937), *Turtles of the United States and Canada* (Knopf, 1939), and *China's Animal Frontier* (Viking, 1940).

It would seem the crowning triumph of coincidence for albino raccoons to be born into the home of so ardent a naturalist and animal lover. As this goes to press it is hinted that Ivan and Abdulla themselves are to become parents.—Ed.



▲ POPS SURVEYS the world calmly from his cage, but he displayed quite a case of "nerves" when his albino young were being born. He has a normal, though light, raccoon pattern

▼ IVAN reaching for candy at the age of three months. He is pure white without a trace of pattern and will eat almost anything



▼ THE JAWS will snap a finger if you grab suddenly during feeding. But if you do not pull away, the bite will not draw blood. Ivan's owners disciplined him by holding his snout firmly for several seconds after each offense. Now after snapping he often grabs his own snout in both front paws, as though "beating them to the punch"



# Abdulla

with faint rings on the tail and therefore is not wholly albinistic; Ivan is pure white without a trace of pattern. Both have pink eyes and noses. Their sight doesn't seem to be good, although testing a raccoon's vision is difficult because the nose and paws are depended on when another animal would use the eyes. A 'coon will carefully investigate something with a paw while casually gazing off in the distance.

Sis was allowed to take full care of Ivan and Abdulla for about a month, and then she and Pops were sent away so that their babies could be thoroughly tamed through hand-raising. When we took them over they could just crawl around and cling desperately with their needle-sharp claws. Putting them down was like putting cockle burs down when you are wearing woolen gloves. We placed their box across the downstairs bathtub and henceforth fed them cow's milk out of a bottle every four hours through the day. Feeding required the co-operation of two persons since the little 'coons completely withheld theirs. Instead of sucking quietly away they either backed up and refused to suck or else sucked so vigorously for a few moments that their fat tummies became inflated with bubbles rather than filled with milk. Gentle patting made them "burp" and go down like a pricked rubber bladder. We finally solved the difficulty by repeatedly squeezing the nipple with both fingers, all but forcing the milk into a firmly held infant. Ivan, being the more stubborn and the stronger, was harder to feed, and it was impossible to tell whether more of the milk went in his belly or on us.

After a few weeks had passed we decided that the cubs should be taught to lap. Abdulla learned quickly but Ivan merely poked his snout into the milk or upset it by walking or lying in it. No matter how hungry he got he steadfastly refused to lap. He did learn to guzzle it down from a spoon and for several weeks he was spoon-fed. His father had never learned to lap either but had taken liquid food by licking it off his paws, a slow and laborious process which made him finish long after Sis. Ivan also went through this paw-licking stage. Learning to eat solid food was

another hurdle that Ivan cleared with great difficulty, but once over it, his appetite grew and he now gulps his food, often holding his head up, allowing gravity to assist. His sister is more lady-like and eats slowly and carefully.

Since they were a little more than a month old the babies have been taught regular toilet habits. After each meal they are placed on a shallow pan with paper on the bottom. It is surprising how quickly they learned what was expected of them. Complete regularity came only after weeks of patient teaching and coaxing, but now the bed box is never soiled and the pans (or their immediate vicinity) are used for all toilet purposes. Ivan can hardly wait to reach a pan after each meal but of course uses them between meals as well.

Although Pops and Sis were born and raised in captivity they were shy and never did get used to being in an open space. When let out of their cage they liked best to hide in bushes, and moved from one part of the yard to another by following along a building or hedge. Only if suddenly frightened would they dash across the yard to the safety of their cage. Such behavior was natural enough for a forest animal, but we were determined that the young ones would learn to enjoy themselves in an open space. As soon as they were able to walk well, we fed them across the yard from their cage and tried to get them to come to their food when called or else to follow one of us to it. This was no simple task because, once out of the cage, they had an overwhelming urge to enter the large hedge and dig around or to get as near to their food as possible by following the hedge. After much effort, Alexander trained them to come straight but the slightest unusual noise or the appearance of a strange object or person sent them scampering for safety. It was clear that each kind of noise had to be dealt with separately. For instance, the slamming of a door alarmed them less each day until, after a few days, they were entirely unconscious of it. The appearance of a boy on a bicycle had the same effect at first, but was soon ignored. Now they carefully investigate and climb on every bicycle that they encounter, and even ride in a handlebar basket.

After getting them used to the back yard, it was necessary to repeat the same process for the front one and the



▲ **TAIL RINGS** and light tan fur prove that Abdulla is not a pure albino. The facial mask can be made out only by close scrutiny

▼ **IVAN PAUSES** in his climb, showing clearly how he grips a tree. Abdulla is by far the better climber, and at three months climbed eighteen feet above the ground.



▼ **IVAN LICKS** his paws after emptying the contents of a honey jar. Brother and sister both have pink eyes and noses, and their vision is apparently poor. However, this does not suppress their natural 'coonlike curiosity, for they will thoroughly and destructively investigate almost anything they get their paws on





◀ IVAN BECOMES WILD with excitement when scrambling for tadpoles in a pan of water. For he is satisfying a raccoon's passionate love for wading and enjoying an intermittent meal at the same time



▶ A LARGE RAT SNAKE puzzles Ivan but does not excite him like the tadpoles

street, since they had to become familiar with each new set of surroundings. Obviously, it would be prudent to teach them to go on a leash so that they could be led along the street without being chased up some tall tree by a dog.

When leashed, Abdulla objected mildly but soon succumbed and followed anyone. Her way of resisting was simply to rear and pull on the chain with her front paws. With Ivan, leading was difficult because of his stubbornness. As soon as the slightest tension was put on the chain, he flattened out with four legs extended and a tough look on his pointed face. If the tension was released he slowly arose, but a slight pull flattened him instantly. I had been advised to pay no attention to his unwillingness but to drag him along willy-nilly, the theory being that the roughness of the ground would take the edge off his temperament. So we dragged him over grass, where he gripped desperately at each little blade, and over rough gravel and stones, where he simply "took it." Actually, every day, twice a day for two weeks, Alexander made wide paths down the gravel driveway, as he literally dragged poor Ivan around the house before feeding time. Food was the reward. Finally he decided to give in a little and take a few slow and deliberate steps between drags. The number of steps increased as the length of the drags diminished, and before Ivan realized it he was parading up the street a short distance and back to his food. But to this day, when he feels tension on the leash, he flops on his belly with all limbs extended and will not rise until the tension is released.

Fortunately, he walks along well,

halting only at long intervals, and one can take him on a walk of a mile or two with no difficulty. With nose to the ground he proceeds in a straight line, sniffing at every object lying in his path and often gobbling up some dainty but dirty morsel. He has become thoroughly used to pedestrians and pays little attention to anyone unless he senses food in the offing. When a little boy, coaxed by a younger sister, hesitatingly proffered a pre-sucked lollipop, Ivan sat up, took the stick in two paws, and stuck the candy in his mouth. After a few licks he decided that licking was too slow and his teeth made short work of the hard candy. The boy's emotions were somewhat confused as he saw his sweet disappear but his sister's joy was boundless—she had had no lollipop.

Ivan's white coat mystifies people and provokes wild guesses, the commonest being that he is an opossum. He has also been called an anteater, a bear, a cat, a skunk, and a rabbit. One lady went so far as to lean out of a car to ask what kind of a dog I was leading. Even this last insult did not ruffle Ivan's temper. Although dogs once made him assume a threatening pose and he'd sometimes even attack them, he now pays little attention to them. Recently, after carefully smelling a pup's muzzle through a fence, Ivan exhaled in one long noisy blow and walked away in disgust as if he had just exchanged smells with the devil himself. With the dogs, on the other hand, it is different. Not many weeks ago, one sighted Ivan from afar and hurtled toward him at top speed, barking with all his lung power. Ivan held his ground clamly, and the canine was only eight

or ten feet away when it put brakes on all four wheels and almost skidded right into Ivan. In a flash it had turned and bolted away even faster and noisier than it had come. That white cat had turned out to be something unspeakably terrifying.

It was Abdulla that put up a real show when suddenly confronted by a half-grown cat. She arched her back, down which a narrow crest of fur suddenly arose, lowered her head, and charged by leaping high into the air as well as forward and swinging her already widely separated front feet to either side. Her appearance was truly alarming, and the poor cat didn't know what to do until I pulled my infant warrior back by the leash.

The raccoon's most striking characteristic is its insatiable curiosity, a trait not easily explained. What purpose does this exaggerated curiosity serve in the wilds? 'Coon trappers know that any bright object will attract their prey and practice various tricks such as wrapping the pan of steel traps with tin foil before making the set in shallow water. The incautious 'coon cannot resist the lure of such an object shining on the bottom. Sometimes a piece of polished metal is hung above the trap.

Ivan investigates everything that he can find. In the house he reaches in scrap baskets, opens boxes and trash cans by cleverly forcing the lids with his nose; he pokes and pulls at every small object encountered, and chews everything chewable. As his probing continues, his excitement mounts and soon he is running about looking for more things to "go over." In the cellar he frantically scrambles up the side of the large trash can after pushing the lid off. Getting up its smooth



◀ **IVAN AND ABDULLA** make lively playmates. Abdulla has always been extremely fond of people

▶ **IVAN LEARNS** to walk across a "bridge." A favorite trick of the albinistic rogues is to climb on top of their cage and race back and forth, always evading capture



sides is no mean gymnastic feat for him, but he struggles until up and over. If the lid is put on after him, he grows panicky and leaps up and out in one bound, sending the lid clattering across the cement floor. In two minutes he is ready to scramble in again, the lure of trash being irresistible. The churning of ice cream always gets him "down," because he smells the ice cream but can find only salty ice, which he fishes out repeatedly and chews. This is a game that keeps him busy for minutes on end since his faith in his nose is so great and the smell of the ice cream so enticing.

Although not as bad as a bull in a china shop, a raccoon in the home has peculiar disadvantages. One pet that I know of had to be banished from the house because its master liked to take afternoon naps from which he invariably awoke to find his pockets thoroughly picked and their contents scattered over the floor. Ivan, too, is a born pickpocket and searches to the bottom of all available pockets, but his sister is even more adept and has a system perfectly worked out. First she climbs to my right shoulder and walks around back of my neck, then anchors with her hind feet and lets herself down to all leftside pockets. She had to be firmly taught that the ears and mouth are not pockets; that spectacles belong to a human face, not between a 'coon's teeth. Buttons, wrist watches, and jewelry, though always fascinating to her, are rarely improved by her attentions.

When released in the yard, Ivan and Abdulla promptly show what the basis of this pocket-picking tendency is. Each makes for the hedge or the bushes and there noses and digs, digs

and noses, ad infinitum. As they work they grow excited and dig and scratch faster and faster until they look like piece workers or animals in a speed movie. This is undoubtedly the technique used in procuring food in the wilds. Such active noses and paws could not fail to discover countless grubs, slugs, worms, and the like in rich woods. Raccoons are omnivorous and will devour almost anything that man will, which is saying a lot. One of Abdulla's gustatory foibles is to refuse tomatoes included with her meals but rush off at a moment's opportunity to devour those growing in our neighbor's back yard.

Another favorite backyard trick of this pair of albinistic rogues is to climb to the top of their cage, which is six feet high, and race back and forth over it, always evading capture. At such times their play habit asserts itself and, if both of them ever get up there at once, they have a high time dashing about. From the time they could just toddle they have played with each other, their play being a highly variable activity. In their box they used to jump and wrestle until its sides resounded with the thuds of their heads and bodies. We were reminded of kittens.

When older, they showed a regular play pattern: one assumed a challenging posture and leaped upward with head down and back arched before actually launching the attack. The opponent sometimes held its ground and sometimes retreated before the onslaught. In close quarters good wrestling holds were used, one seizing the other with both arms and throwing it down. Again, the aggressor would take a mouthful of hair and vigorously jerk it, or bite at

ear or foot, getting squeals of pain from the victim. The boys found that the height of the opponent had a good deal to do with this play; neither 'coon would assume the characteristic pose against a boy standing up, whereas a boy on all fours provoked it at once. Abdulla has always been especially fond of human playmates and to this day will charge at me with arched back and lowered head from a distance of ten or fifteen feet, leaping upward as well as forward. When she arrives she pretends to bite and chew whatever part of me she can reach, but she never bites hard enough to hurt.

Abdulla, the better climber, is always ready literally to run up a small tree in our back yard. We are afraid to let her go up a big tree, because once in the branches, she climbs out on the small ones that bend under her weight until I am sure she will fall. When only three months old she was climbing eighteen feet above the ground. Just as Alexander remarked, "Boy, look at her climb! When she slips she catches on with her hind feet and hangs like a sloth. I bet she can't fall!" We heard a thud and I saw her land belly-down on hard ground. But she walked right back to the same tree for another climb. Sharp claws and a hind foot that can turn to grip a tree on opposite sides enable raccoons to climb so well. When actually running up a small tree, only the front feet grip the sides of the trunk, the hind ones being kept in the position they take when on the ground. Thus the 'coon is really running straight up in the air, using the front feet largely to keep from slipping back. The raccoon inherited

*Continued on Page 134*

# HOW SCIENCE DEC

▼ A 3400-year-old safety pin, of bronze



## The Archaeologist's Articles of Faith

**A.** That wherever man disturbs the earth as laid down by nature, the scar remains forever, or at least until nature re-deposits that portion of the earth's surface. Nature alone can wipe the slate clean, ready to record the next series of human events.

**B.** That when a group of people lives for a time upon the same spot, a deposit of refuse or debris accumulates, mostly ashes and bones, among which are scattered lost and discarded useful objects. If this deposit has not been disturbed unduly, the oldest objects will lie near the bottom, the latest at the top. If the original community abandons the site, nature spreads a coat of soil over all, and when another community makes the same site its home, a second layer of telltale refuse is laid down upon this black-soil cover,

and so on, ad infinitum.

**C.** If the same people live on the same spot for centuries, the tools and other products of their workmanship—artifacts in the archaeologist's language—will show significant changes from the bottom of the refuse upward. Especially is this evident among those which are ornamented. The idea that we alone of all peoples and ages progress, or change, is pure conceit. It is the universality of change in the ways of human living which makes archaeology possible; these changes register the march of time.

**D.** Human communities are never isolated for long. They watch their neighbors and imitate them. So the order of artifacts in one refuse heap can be checked by another in a near-by site.

A rapid trip through the story of archaeology reveals how the Sherlock Holmeses of science have developed methods for solving the greatest mystery story of all

By CLARK WISSLER

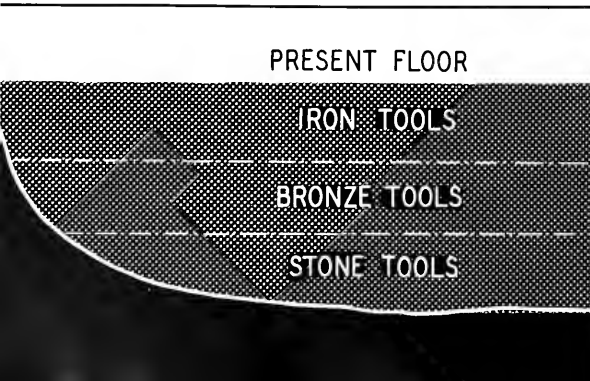
*Curator Emeritus, Anthropology,  
American Museum of Natural History*

**A** SKILLED archaeologist is the Sherlock Holmes of anthropology. The uncanny use he can make of faint traces in the earth where unknown human beings once lived is more fascinating than detective fiction. We believe you will enjoy looking in upon archaeologists at work.

The archaeologist has confidence in his methods. Some of his basic articles of faith are given at left.

With these principles in mind, the archaeologist faces his job, which is to discover what types of community living have existed in the world, where they existed, and in what time order. If the reader can keep these simple statements in mind he should have little difficulty in understanding the remainder of this article and in interpreting the pictures.

▼ CROSS SECTION of a peat bed showing relative positions of objects belonging to the Iron, Bronze, and Stone Ages of Denmark. This principle of stratigraphy is the scientific basis of archaeology, first demonstrated by C. J. Thomsen in 1836



▼ SECTIONS IN A SHELL HEAP showing alternate layers of shell refuse and sand. The man-made shell layers indicate time sequence from below upward. (Pickwick Basin, Tennessee River, Ala., T. V. A. Project, excavated by Major W. S. Webb)



## When Archaeology Became a Science

ABOUT 1830, C. J. Thomsen, curator in a Danish museum, was busily receiving and cataloguing curious objects turned in by laborers digging peat for fuel. These objects were of iron, bronze, and stone. There were axes of these three substances, shields of bronze, and swords of both iron and bronze, not to mention hundreds of small objects. In course of time, Thomsen began to wonder which of these objects were invented first. He knew that peat deposits were built up slowly from the bottoms of ponds and swamps.

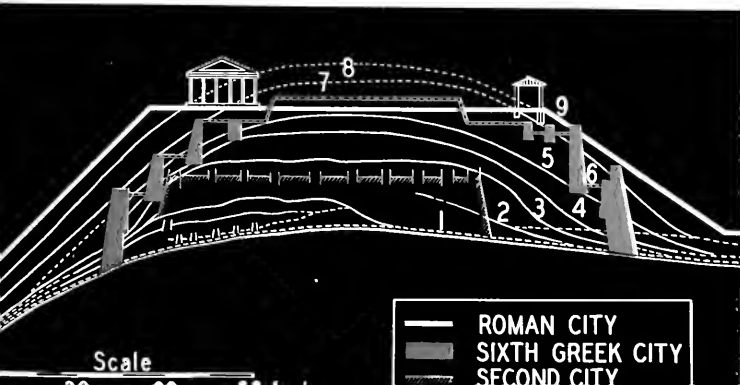
One day it occurred to him that the depths of the objects found in the peat should tell the story. After keeping such records for a few years he had the answer: iron above, bronze objects next below, stone near the bottom. He published a paper about as long as this article telling how he knew once and for all that the historic age of iron in Europe followed a prehistoric age of bronze, and that the latter was preceded by an age of stone. On that day scientific archaeology was born. Armed with such a

logical tool of crystal truth, the archaeologist could revolutionize the knowledge of man and the way of thinking about him.



A. M. N. H. photo  
THE MOST PRIZED Bronze Age relics are large bronze trumpets in such perfect condition that folk music can be played upon them. This one is in the American Museum of Natural History

▼ THE NINE CITIES OF TROY excavated by Schlieman in 1870-1875, the first use of scientific methods in a large site. His Sixth City proved to be Homer's Troy, 1500 B. C. See, *Troy, a Study of Homeric Geography*, by Walter Leaf. Also, *The Discovery of Man*, by Stanley Casson



## Pottery as a Time Marker

BEFORE 1912 many museums and amateur collectors had ransacked ruins of cliff-houses and prehistoric Pueblo Indians in New Mexico and Arizona, because they were rich in beautiful pottery. The burning question was, when were these ruined structures built? The professors who lectured on the archaeology of the Old World were enthused by Thomsen's discovery of time sequence—Stone Age, Bronze Age, Iron Age—but here in New Mexico were neither bronze nor iron—merely things made of wood, bone, shell, stone, and pottery. The most conspicuous was pottery. In the neighborhood of every ruin one could see bits of broken pottery upon the ground—potsherds of many colors, all mixed together in profusion. Most of these sherds were





*A. M. N. H. Photo*

POTSHERDS from a room in the Pueblo Ruin at Aztec, New Mexico. Over 2700 sherds were found in the debris filling this one room. Sorting and assembling revealed eight nearly complete vessels and parts of 423 others from which restoration could be made. The ruin was excavated by Earl H. Morris for the American Museum of Natural History

➤ ABOUT 40 POTSHERDS from excavations at Sambahyeque, Peru, appeared to belong to the same vessel. After a study of these and a number of broken vessels from the same site, a restoration was made in the American Museum of Natural History by Mr. Paul Richard, as shown at right.

The procedure was to place each sherd in its proper position according to shape and decoration. The sherds making contact at any point were fastened with "Duco." The empty spaces were filled in with plaster, which appears in the photograph as the lighter areas

of thumbnail size and so numerous that a quart could be gathered in a few minutes.

There was a young curator in the American Museum who thought there should be some way to find the answer as to the age of the ruins. He consulted the then famous archaeologists of the country, but they said it could not be done, that they had tried and failed. Yet his faith was stubborn. He spent several seasons going about among these ruins. At first, he dug industriously within the walls of promising ruins, where he often found fine unbroken pots such as collectors prized, but the answer was not there. Then he noticed that immediately outside each ruin there was always a pile of ashes where the tidy prehistoric

housekeepers dumped the sweepings from the family hearth, including other trash and especially potsherds.

This young curator was N. C. Nelson, now the Museum's distinguished senior archaeologist. We suspect that by this time the reader has guessed what Nelson had in mind; he believed that if he could find even a small section of an ash heap undisturbed by his pot hunting predecessors, the answer would be forthcoming. So Nelson went up and down the country picking up samples of the different kinds of sherds scattered round about a ruin, and doing a careful job of digging wherever he found the proper spot. In 1916 he published a short paper containing a time sequence scheme for five types of pot-





tery common to a large group of ruins in New Mexico. The consistent position of each pottery type in refuse heaps made the time sequence certain.

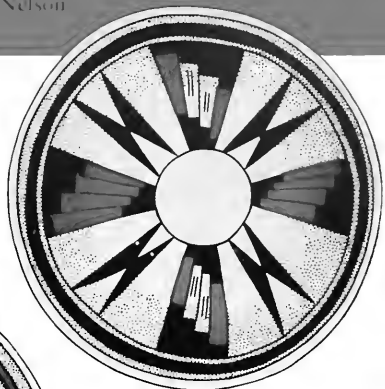
The effect of Nelson's paper can be easily imagined. It gave scientific archaeology in America a new birth. The younger archaeologists in the museums of the country were enthusiastic. What they saw was a new research tool, which if carefully used, could not fail. Ingenious guesses need not be regarded; let the potsherd speak for themselves. More and more field work would eventually solve the problem. Arizona and New Mexico soon became the main field for archaeological research; 20 years after Nelson's discovery of the basic scientific method an average of 40 archaeologists were making yearly excursions to that area.

In 1914 the American Museum initiated the use of a supplementary method for dating ruins. Professor A. E. Douglass, University of Arizona, was using growth rings of the Big Trees of California and other large trees to date changes in the annual rainfall. When rainfall is abundant trees grow thick rings, in dry years, thin rings. Many of the ruins in Arizona and New Mexico contain large ceiling and floor beams, sections from the trunks of trees. It occurred to the writer that if these could be dated by Douglass, the ruins could be dated. Douglass thought he could do it, if sample cuttings from logs in ruins could be sent to him. Earl H. Morris, then a staff archaeologist for the American Museum, was requested to collect the samples. The method worked from the start. Today the actual cutting years are known for beams in several hundred different ruins. The oldest so far is a small structure near Flagstaff, Arizona, dated 217 A.D.

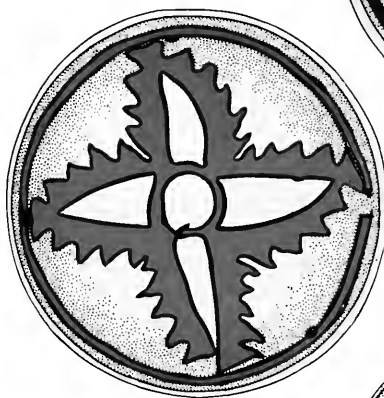
The tree-ring method did not approximate the value of potsherds, because the timbers in many ruins have decayed. Further, once tree-ring dates are found for a type of pottery, they can be transferred to the records secured by excavation. Finally, where tree-ring dates were to be had, it was observed that the durations for many pottery styles ranged from 75 to 150 years. This in turn gave a check upon time estimates in places where no wood survived. So it is easy to understand why archaeologists pay so much attention to potsherds. They aptly speak of them as "the fossils of culture."

In this instance the key to chronology was discovered to lie in color and surface finish, not in shape or design.

► Modern Ware. Black-on-pink and black-and-red-on-pink. 1680-1850



◄ Historic Two-color Glazed Ware. Brown or green on either gray, red, or yellow. 1450-1680



► Three-color Glazed and Painted Ware. Black-glaze-and-red-paint on either gray, yellow, pink, or red. (?) -1450



◄ Two-color Glazed Ware. Black or brown on either red, yellow, or gray. Date not known



► Two- and Three-color Painted Ware. Black on either white or red, and black-and-white on red. Date not known



## Caves and Shell Heaps

**M**OST people believe the first human beings were cave dwellers. This is more fanciful than true, but there is no denying that archaeology has learned a lot by the study of rock shelters and the entrances to caves, for the reason that such ready-made shelters were indestructible and so were occupied off and on by whatever people happened to be around. They were ideal defense positions against unfavorable weather as well as against animal and human enemies. Roomy rock and cave shelters were doubtless fought over time and again. Today archaeologists seek them because they contain precious beds of refuse, accumulated in orderly sequence and conserved, from which the past can be reconstructed.

Many of these shelters had such high ceilings that there was room to build up deep deposits of refuse. In

Europe, for example, there are one or more cave shelters, the refuse in which reveals in time order all the main periods in the Old Stone Age, the New Stone Age, the Bronze Age, and the Iron Age. Rock and cave shelters are less conspicuous in America, but when found are highly prized by archaeologists. Several classic studies have been published by the American Museum, as for example Mammoth Cave, Kentucky, by Curator Nelson in 1915, and such caves as Cerro Sota and Fell's Cavern, Straits of Magellan, Chile, excavated in 1937 by Assistant Curator Junius Bird and his capable wife.

Yet if America does not lead the world in cave deposits, it does possess a grand series of shell heaps. These refuse heaps or kitchen middens line our coasts from Newfoundland southward, around the West



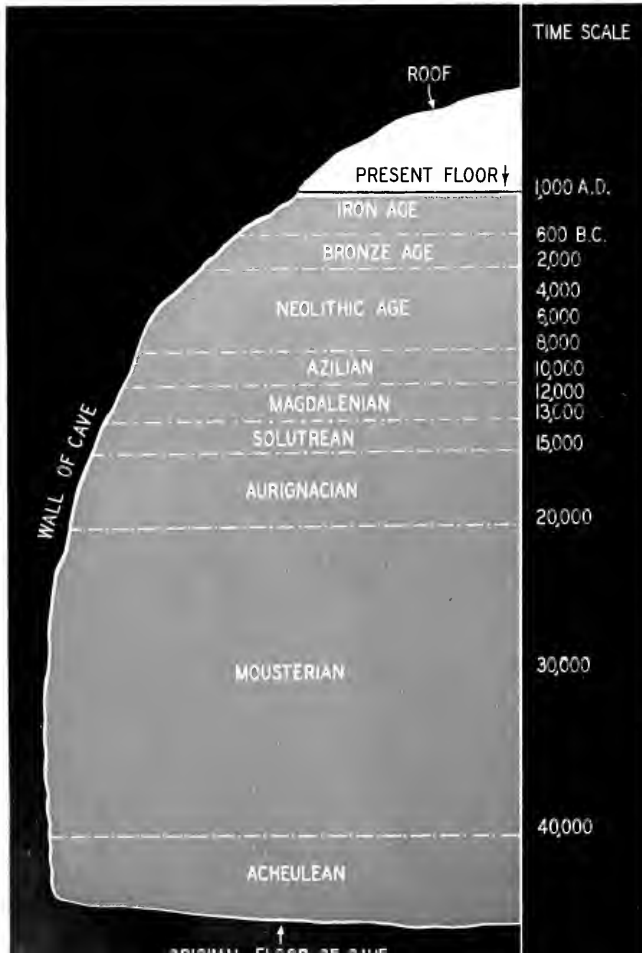
Indies, down the east coast of South America to Cape Horn, thence up the Pacific side to Panama and on northward to the Arctic Circle and beyond. Shell heaps are not unknown inland. They are found, for example, along the Tennessee and the Ohio rivers, in fact, wherever edible freshwater shellfish are abundant. Some shell heaps, or shell mounds, are of amazing size. The largest so far reported in the United States is about 30 feet high and covers 35 acres.

The reader need not be told how such shell mounds originate; they accumulate around the primitive cabins of shellfish eaters, together with bones, pottery, and discarded implements. As the level of refuse rises, new cabins will be built on the higher levels, and so on. Excavations in a large shell mound near Oak Hill, Florida, by Curator Nelson, showed that the Indians who started the mound did not make pottery, but eventually crude pottery does appear, which passes through several successive styles, culminating in ornate pottery.

It is expected that an archaeologist will save samples of the shells and bones for identification, to determine which of the animals are still living, which extinct. But for time sequences the chief dependence is upon the relative positions of the artifacts found in the refuse.

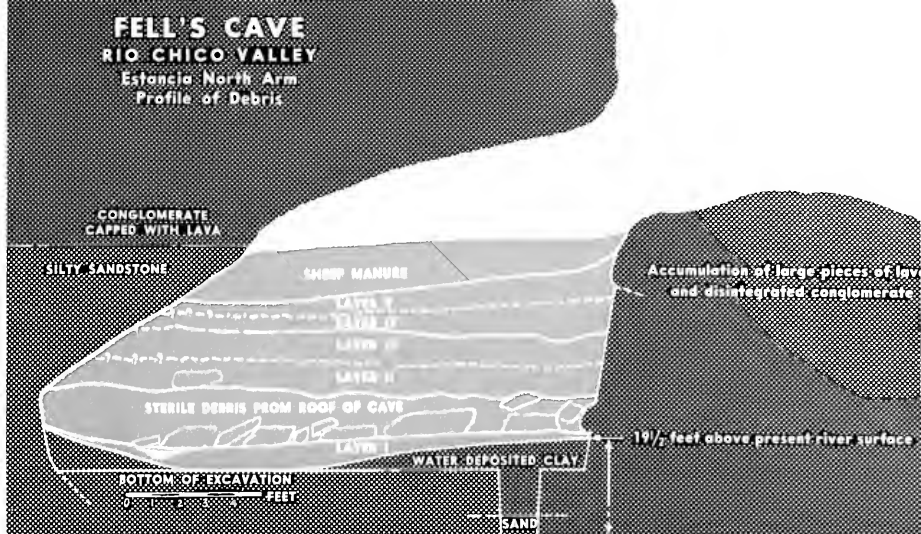
**HAD EUROPEAN CAVE MAN** lived in the same shelter for 50,000 years the debris would tell this story. Cultural changes are the archaeologist's key

*After Sir Arthur Keith; Courtesy William H. Wise and Co.*





**FELL'S CAVE**  
**RIO CHICO VALLEY**  
 Estancia North Arm  
 Profile of Debris



*A. M. N. H. photo*

▲ A CAVE IN SOUTHERN CHILE excavated by Junius and Margaret Bird, American Museum of Natural History. In the last layer in this cave were found artifacts and human bones associated with the bones of extinct animals

▲ FIVE PRE-COLUMBIAN PERIODS of occupation revealed in a Chilean cave. In Layer I were bones of the extinct wild horse and the sloth, the first sure evidence that man lived in South America before these animals disappeared

▼ NOT A CAVE but a cross section of an Ohio mound under excavation. Several burials have been exposed by clearing of the mound floor. They were covered with log tombs, the decay of which caused a settling in the original fill

*Ohio State Museum photo*



## Digging in a Village



Chicago University Field Station  
A WORKING OUT A SKELETON is an exacting test of skill. Tiny trowels, awls of small sizes, fine brushes, and a hand bellows are the important tools. Shellac or other fixing solutions should be at hand

### Why Burials Are Important

ARCHAEOLOGISTS are fond of digging up the prehistoric dead. People who do not like archaeologists often show their contempt by calling them "grave robbers." Two important kinds of information come from graves. The skeletons tell us much about the people who lived at the time and place, and the man-made objects in the burial give information as to their mode of life. If time sequences are known for some of these objects, a given skeleton can be dated relatively. The better preserved skeletons can be distinguished as male and female; even the age at death can be determined within an average error of five years. The most thoroughly excavated prehistoric cemetery in America was connected with the Pecos ruins in New Mexico. More than 1800 skeletons were excavated. The ages at death were determined for a large number, the details of which cannot be given here, but we note that while a few of these Pecos Indians

lived longer than 80 years, only 20 out of every 100 reached the age of 55 years. In a modern white community 50 out of every hundred live to be 55 years of age or more.

The successful removal of a skeleton often calls for unusual skill and an inordinate expenditure of time and patience. In damp ground bones may be so soft as to defy movement until hardened by drying or by special treatment with fixing solutions. An inexperienced digger may tear away a skeleton without being aware of its presence. Since the teeth are less likely to take on the color of the damp soil, a bungling amateur may report that he found no bones, merely a few teeth.

Burial is an old, old custom. The most important invention is fire, but archaeology shows that burial is almost as old and that with it came the custom of placing tools, weapons, and food in the grave. It is usual to infer from this that the belief in a life after death is still older.

As an example of the right way to work in a village site we have selected excavations by the Rochester Museum, Rochester, New York, directed by Dr. William A. Ritchie. Three field photographs are reproduced by permission of the author. The site of a former prehistoric village was located near the town of Brewerton at the eastern end of Oneida Lake, New York State. Refuse and burials resulting from this village covered a flat about three acres in extent. Eight trenches were used in exploratory excavations, and two "test blocks" were carefully worked out. Some 1700 recognizable stone artifacts were uncovered. There was some pottery but it was all on or near the surface, so it is clear that the first generations to occupy the site did not make pottery. Further, they lived there long enough to make some changes in the kinds of stone implements they used.

#### *The scientific objective*

The reader may wonder why all this trouble. Doctor Ritchie has specialized in the prehistoric cultures of New York State. In the United States archaeologists identify cultures and classify them systematically. Doctor Ritchie saw in certain sites from the same part of the State what he suspected were traits of a new culture. Objects picked up from the surface made him hopeful that this site at Brewerton might qualify as a type for such a new culture. His excavations indicated that he was on the right track. In the high-sounding language of the profession, he named it the Robinson site, or component, in the Brewerton Focus, Laurentian Aspect, Northeastern Phase, Woodland Pattern. If you had any doubts as to archaeology being a science, this should silence you. Should you wish to know what all this means, you must consult the technical books on the subject; it is as intelligible to an archaeologist as (robin) *Turdus*, syn. *Merula migratorius* is supposed to be to an ornithologist. Doctor Ritchie's achievement is about equivalent not

merely to the discovery of a new species but a new genus as well.

Incidentally your curiosity may be appeased by outlining the standard scheme of archaeological classification, as:

*Component (Site):* Associated complexes of artifacts found in a village site or in a camp site

*Focus:* A group of components or sites which approach identity in their dominant types of artifacts

*Aspect:* A group of foci with important similarities

*Phase:* A group of aspects with fundamental similarities

*Pattern:* A few artifact types, widely distributed, common to a large number of components

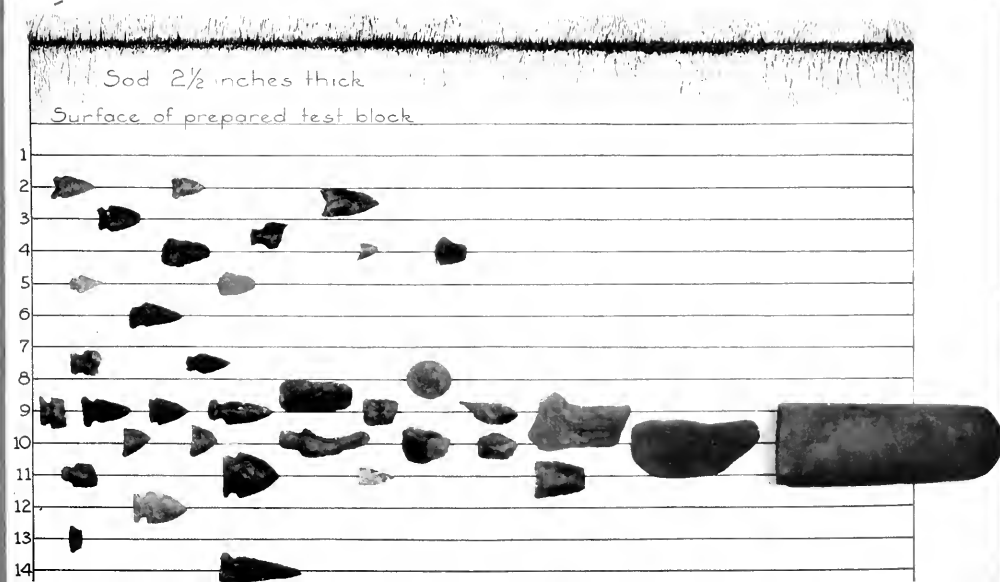
(Above, right) TEST BLOCK NO. 1 has been cut around for careful excavation. The sod has been removed and stakes set to guide the excavators

► REMOVING THE EARTH in horizontal layers. Holes at the side mark storage pits beneath the village refuse

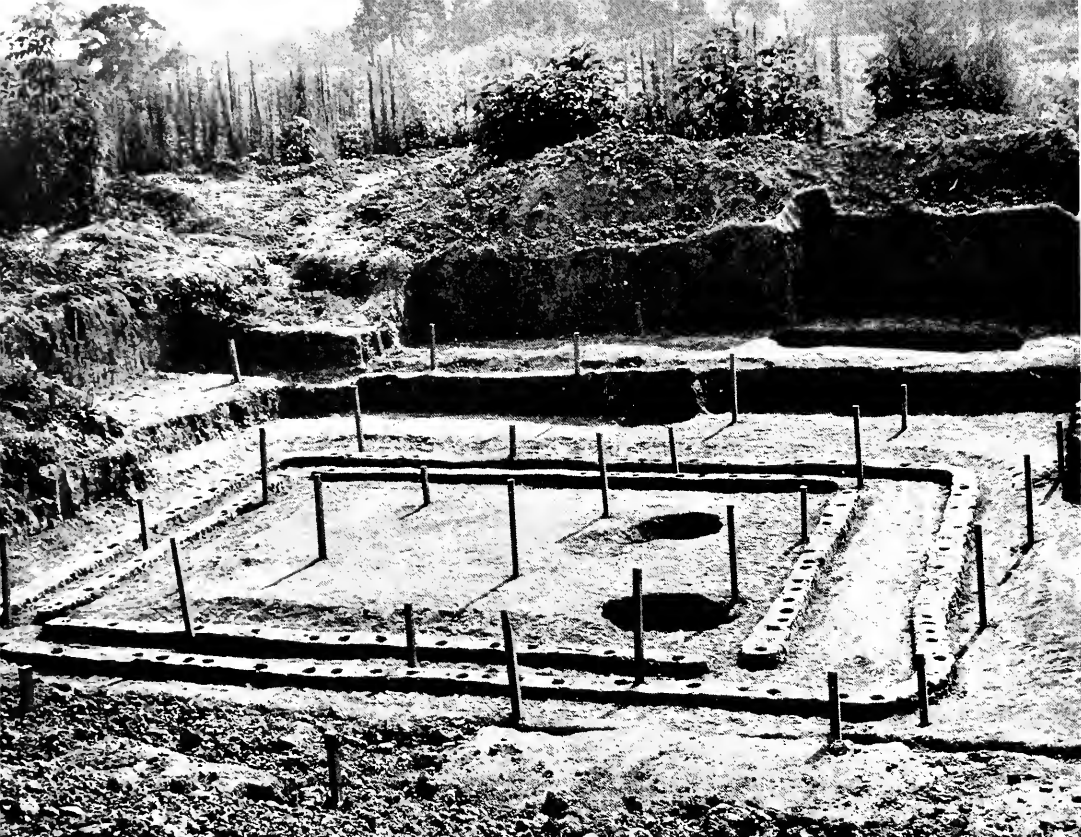
▼ WHEN ALL ARTIFACTS were arranged in order, it was clear that most large projectile points lay below the ten-inch level, most small points above. Similar differences for other artifacts were noted, showing the general time sequence in culture during the period of occupation. Pottery occurred on the surface only



Photographs by courtesy of the Rochester Museum







*Chicago University Field Station*

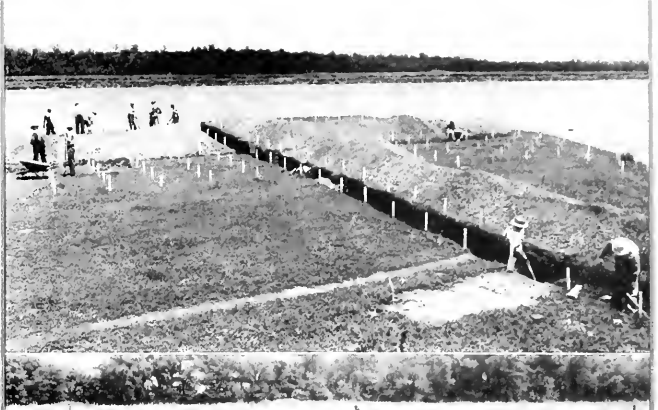
▲ POST HOLES reveal the layout of houses, defense palisades, scaffolds, etc. To overlook them when digging is inexcusable. With practice they are easily dissected out. In this instance there seem to have been two successive houses on the same site

▼ BY SLICING down below the original house floor the depth and direction of the post holes can be shown. The parallel lines have been marked according to the intersecting lines on a plan of the site, for ease in reading the photograph

*Major W. S. Webb*



► THE POSITIONS of all objects uncovered are plotted on the base map in relation to stakes previously driven into the ground. Exploration of a burial ground begins with the digging of trial trenches, usually at right angles, as at right. Test blocks are then selected for thorough excavation. In this instance the burials were in a part of the accumulated village refuse, probably because graves were easily dug therein



► THE TRENCH at this stage shows burials partly worked out. A careful record will be kept as the material is removed and studied. This is the same site as above on Seven Mile Island, Tennessee River, worked under the T. V. A. Archaeological Project by Major W. S. Webb, Director, 1936-38



► VILLAGE SITES are explored by removing the debris down to the original hard surface of the ground. The material is carefully peeled off in thin horizontal layers. For the most part small trowels are used. (Chicago University Field Station)



► IN THE REFUSE of this village site there were many pits. The archaeologists cut around these so as to leave the original blocks for dissection and study. Some pits were lined with clay but were found filled with loam containing a few artifacts of stone, copper, and galena. This is at Pickwick Basin, Tennessee; Major W. S. Webb, Director



**1** ARCHAEOLOGISTS must be patient, industrious, and resourceful. Major W. S. Webb's trenches and camp were flooded one night. Records were damaged and equipment lost, causing delay and extra work. (Tennessee River T. V. A. Project)

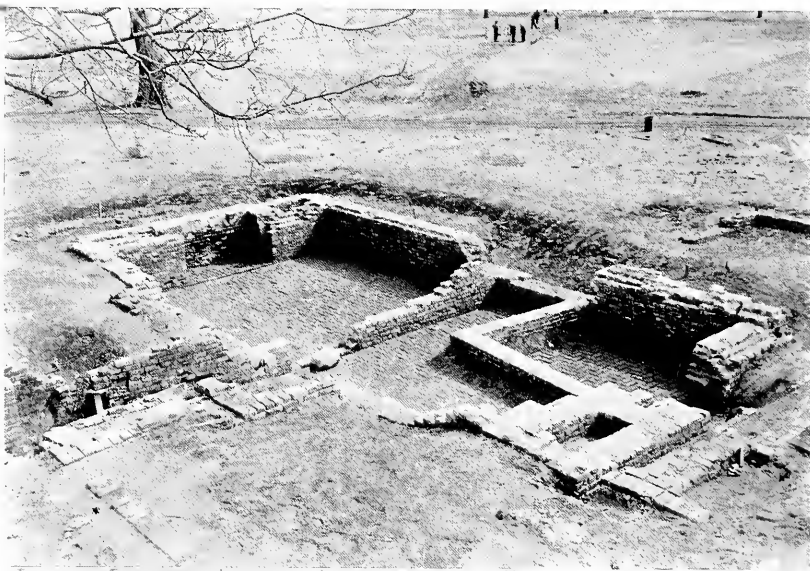


**2** MRS. JUNIUS BIRD on shift at Palli Aike cave in Chile. Dry caves preserve perishable materials, but the fine powdered dust rises with every step, and masks must be worn. As the debris is removed it should be screened to save tiny objects

**3** MR. AND MRS. BIRD found peace-time gasoline shortages in southern Chile an aggravation. The expedition Ford responded to both wind and man power, but ultimately a yoke of plodding, time-consuming oxen was found the best solution

1

➤ ARCHAEOLOGY can recover lost history. Jamestown, Virginia, was settled in 1607, but the town was destroyed in 1698. Recent excavations by an archaeologist have given new information. Foundations of forgotten houses with cellars filled with debris were uncovered. The streets of the old town were traced. (Archaeologist, Jean C. Harrington, National Park Service)



➤ THOUSANDS OF POT-SHERDS and objects of glass, iron, and stone were uncovered. These were cleaned and repaired in the laboratory at Jamestown. Most of the objects were brought from England between 1607 and 1698, so this dates them, even though their history in England has been lost







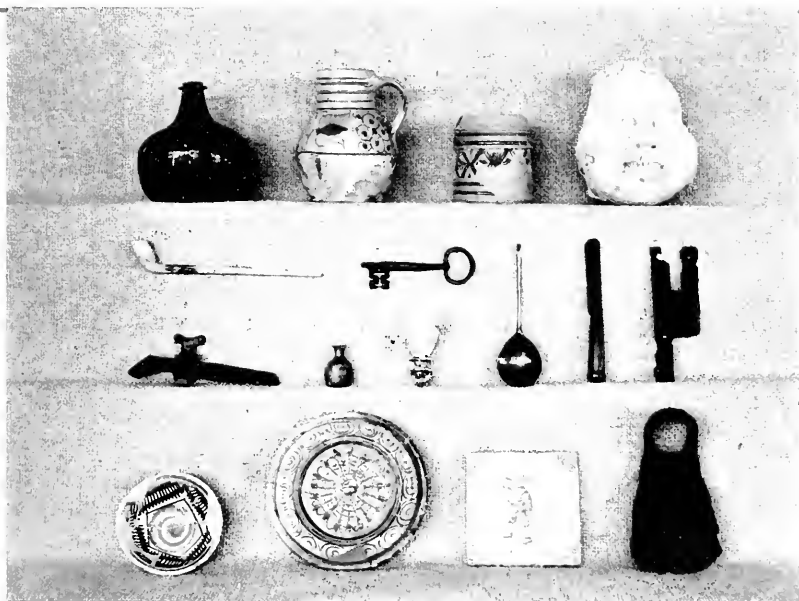
A. M. N. H. photo



A. M. N. H. photo

2

3



◀ TYPICAL OBJECTS from excavations at the site of Jamestown. The number and variety of glass wine and rum bottles is impressive. Household pottery is abundant. Clay tobacco pipes of many styles were found. Some fine decorated tiles probably came from Holland

EQUALLY INTERESTING are the objects of iron and steel (*at bottom*). The National Park Service has used archaeological methods in St. Augustine, Florida, Roanoke Island, North Carolina, and many other historic sites. In Canada archaeologists have found the correct locations for a number of old fur trading posts. Recently archaeologists from Harvard began excavations in Plymouth, Massachusetts. Obviously the future will see our own history greatly enriched by archaeological research

TOOLS FOR FARMING AND BUILDING



## Step By Step



**1** **PLANNING THE PROJECT:** the Director of Excavations and graduate students in conference, Chicago University Field Station. After a careful examination of a site a detailed plan for its excavation must be made. A temporary building may be erected as a field laboratory, where drawings can be made, notes and photographs filed, conferences held, etc.



**2** **A VIEW OF THE SITE:** two mounds before excavation. If a mound has not been cultivated or otherwise greatly disturbed, it will be covered by trees and underbrush. This coverage must be cleared away before excavations begin

*Major W. S. Webb*

**5** **EXCAVATION UNDER WAY:** a view showing a cross section of a mound. The blocks of earth contain burials to be worked out later. The base of the mound is shown in the foreground

*Major W. S. Webb*



**6** **AN ALTERNATIVE METHOD:** step-trenching a mound instead of beginning at the base. The planes defined in the survey plan must be followed to record objects found. Note the stakes

*Chicago University photo*



*Chicago University Field Station*

**3** THE SURVEY. Before digging, a survey must be made to establish the horizontal and vertical planes needed to record the positions of all objects found. Meanwhile, clearing of the surface may be under way



*Major W. S. Webb*

**4** THE BASE PLAN of the mound is divided into squares marked by vertical stakes. These are driven down as excavation proceeds. Usually each stake is numbered to assist in recording the objects found

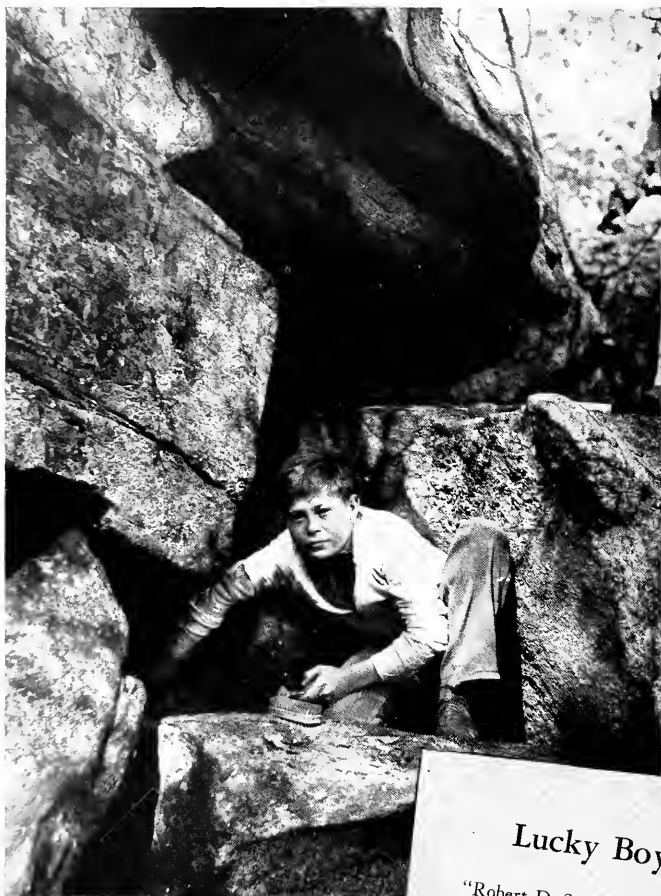
**7** ▼ THE MOUND CLEARED AWAY. The original floor of the mound usually approximates the basal horizontal plane. The stakes, now at a much lower level, are still in their original relative positions

*Chicago University Field Station photos*



**8** ► CLEANING THE SPECIMENS: students of archaeology washing potsherds before assembling them in their original order as excavated for determining time sequences





Trailside Museum photo

## What to Do When You Discover A New Site

IN some of the pictures you may note post holes which have been cleaned out to show the positions and sizes of the posts originally standing there. These holes tell us something about the buildings once occupying the site. Even a piece of matting may leave an imprint in the earth which can be worked out to reveal the weaving technique. H. C. Shetrone, Ohio's leading mound expert, is able to trace out the individual loads of earth dumped down by the carriers, in building the mound, even finding the imprint of a basket which one of them failed to empty. Not all archaeologists are so skilful, but many of them are. It is clear that an ignorant care-

less digger would not only fail to see these important things but would destroy all traces of them.

The archaeologist is pleased when so many people take an interest in his subject, but he cannot be happy over their enthusiasm to dig things out, because he knows too well how blind they will be to what should be recorded. We hope the reader has acquired some idea of the responsibility he assumes when he digs into a rock shelter or a prehistoric grave.

We have but space enough to mention how a boy, Robert D. Scott of Fort Montgomery, New York, noticed a small hole in the face of a cliff. Entering, he found himself in a small cave, upon the floor of which he saw bits of pottery. He reported his find to the archaeologist in the Trailside Museum at Bear Mountain. Young Scott was rewarded by assisting in the excavations, was heralded in the press as "the luckiest boy in the United States," and duly praised for his good sense in not trying to dig out the "relics" secretly. The *New York Times* made his achievement the subject of an editorial (May 11, 1941), reprinted below:

◀ MASTER SCOTT finds door to a hidden cave

### Lucky Boy

"Robert D. Scott is 13 years old and in the seventh grade of the Fort Montgomery grammar school. At this moment he is the luckiest boy in the United States, having just done what every normal boy in the United States wants to do. He found a hidden cave with a treasure inside. Nobody had been in that cave for unknown hundreds of years. Robert wormed his way through a boy-sized hole, which had been left when an ancient earthquake closed the entrance. Inside he found Indian pottery, arrowheads, medallions of slate once worn around Indian necks, and an old pipe of red clay.

"It seems a shame to reveal the location of Robert's cave, but its picture has already been in the papers. It is not far from the Bear Mountain bridge. Archaeologist

From the *New York Times*

James D. Burggraf of the Trailside Museum believes that it was used by Algonquin fishermen before the time of Columbus. To an archaeologist it is tremendously exciting to get evidence that the Algonquins were in this part of the Hudson Valley before the Iroquois pushed in and established a kind of corridor between the two great sections of the Algonquin race. The Iroquois, in short, weren't old settlers at all. They happened along after the pioneering was finished.

"Robert would be richer if he had found a couple of kegs of pieces of eight. But Indians are more fun. They teach a useful lesson, too. Robert can tell his elders with some assurance that ten or twenty years of big noises in Europe or China aren't all there is in the history of the human race. If we have to go back to living in caves it won't be the first time. We can stand it."

# MARCH MADNESS



By JOHN ERIC HILL

Drawn by

G. FREDERICK MASON

**M**ARCH, the beginning of spring in much of the Northern Hemisphere, may have much cold weather, even blizzards. The nature of the lion and that of the lamb are traditionally supposed to share the March weather. In the country inhabited by the varying hare, or snowshoe rabbit, the snow begins to melt. By the end of the month rivulets of strong-smelling water, essence of leaf mold, come gushing from the snow banks of the forest. The gullies fill and the small streams swell, overflow and roar, whipping up foam over rocks that most of the year were above water. Fords where a man on horseback needed not lift his feet are quite impassable; the current takes away bridges and cuts highways and railroads.

The increased intensity of the light and the lengthening days cause many changes in the animal world. The first spring migrants are seen. The hares that were white as snow in the

winter begin to shed their fur and grow new coats of grayish brown. They are patchy at first, piebald brown and white, but the white gradually becomes less and less while the brown increases until the uniform summer coat is attained.

The same increased light produces changes in the reproductive glands of many mammals, including the hares.

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## ON YOUR RADIO

Programs of the American Museum and Hayden Planetarium, Winter, 1943.

WEDNESDAYS over WNYC  
from 3:30 to 3:45 P. M.

*Science For the Seven Million*

FRIDAYS over the Columbia  
Broadcasting System from 4:30  
to 4:45 P. M.

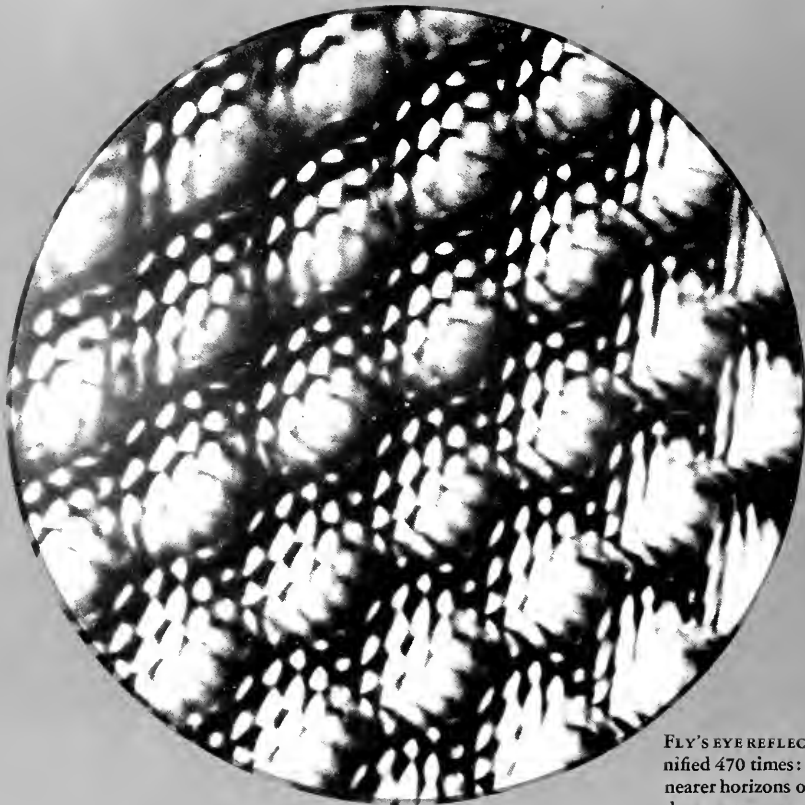
*Exploring Space. Science in the sky.*

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The mating season begins, a period of antics and fighting among the male hares that led to the old saying, "as mad as a March hare."

The fights that occur are unbelievably ferocious for combatants so mild in appearance. Rival bucks fight with no concern for the niceties, kicking, biting, and scratching. Both attempt to secure a hold on the other, then lie down and bring into play the full force of the hind feet and claws, as the case may be. The fur flies and the loser may well be killed.

Another sort of behavior, also probably connected with mating, is the "dance-frolic" of the hares, which has been reported several times by observers. On a bright moonlit night a large number of these usually unsociable animals congregate in an open glade in the woods. They thump the ground with their feet, chase one another, jump over one another and high in the air, behaving much like jitterbugs and reveling as if they had not a care in the world. All the while, however, one or two hares are on guard, with ears cocked and noses working. At the first sign of danger the warning is communicated to all present and they vanish and scatter.



FLY'S EYE REFLECTIONS, magnified 470 times: one of many nearer horizons opened up to the amateur experimentalist by the simple new method

A new discovery evolves out of the snowflake-preserving method described in *NATURAL HISTORY* for January. First views of a process that promises extensive uses in the electron microscope

A SATISFYING view of Nature's surfaces often requires the use of a microscope to reveal the intricate and beautiful detail which she has designed for some particular purpose.

Since many such surfaces are of objects which are not transparent, illumination by reflected light must be used. This often needs an involved optical system, especially if photomicrographs are to be obtained. Sometimes the specimen is too large to get under the available microscope or is afield where an instrument is not available.

For these and other reasons there is definite advantage in preparing surface replicas by a method similar to that for snowflakes, described in the Janu-

ary *NATURAL HISTORY*. By this means transparent, permanent records are procured which may be examined at leisure.

More than 50 years ago Dr. J. B. Haycraft proposed and demonstrated the use of temporary casts of soft collodion for studying muscle structure.\* Other replica methods have been used since that time, but apparently they have lacked the simplicity necessary to make them popular.

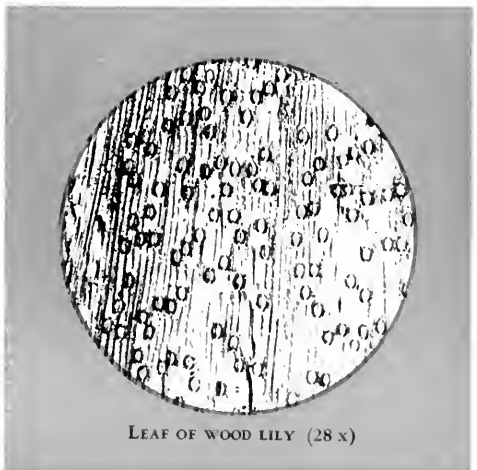
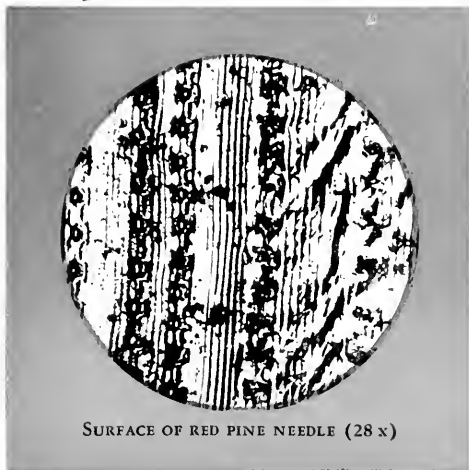
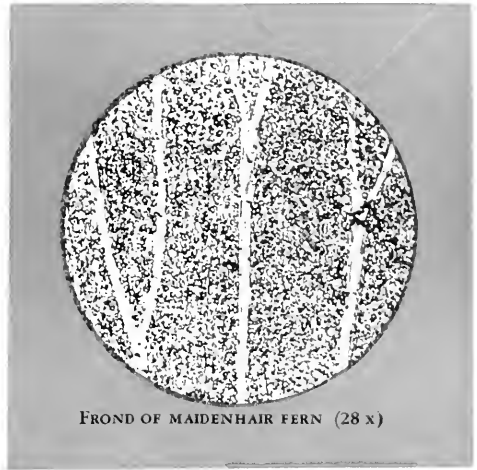
By using some of the newer resin materials such as polyvinyl formal, structural detail is apparently recorded to the resolving power of the electron microscope (30-50 Å. U.). Polyvinyl alcohol, a water soluble resin, produces excellent replicas of delicate tissues often injured by the regular organic solvents. It is particularly useful for all types of replicas on humid days and with moist specimens, both conditions causing "bloom" deposits with other resins. Most of these newer resins will again be available after the war. Fair results can be achieved, however, with material still obtainable in ten-cent stores.

\*Proceedings of the Royal Society of London, 49 (1891), 287.



# Getting Close to NATURE'S SURFACES

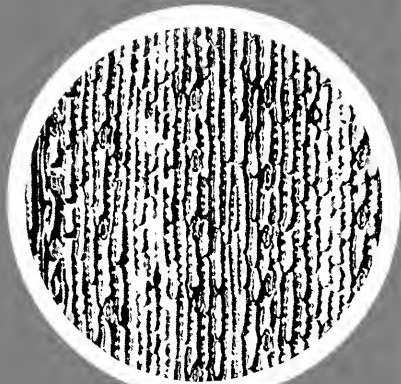
By VINCENT J. SCHAEFER







TOP SURFACE of a green worm (28 x)



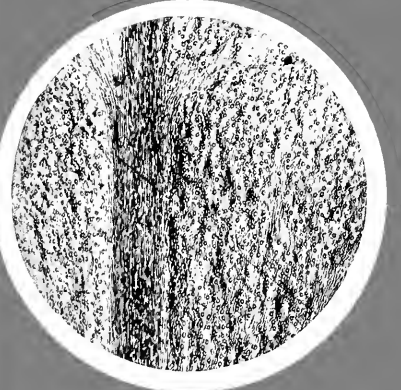
LEAF OF CORN (28 x)



UNDER SIDE OF WILLOW LEAF (28 x)



TOP SIDE OF WILLOW LEAF (28 x)

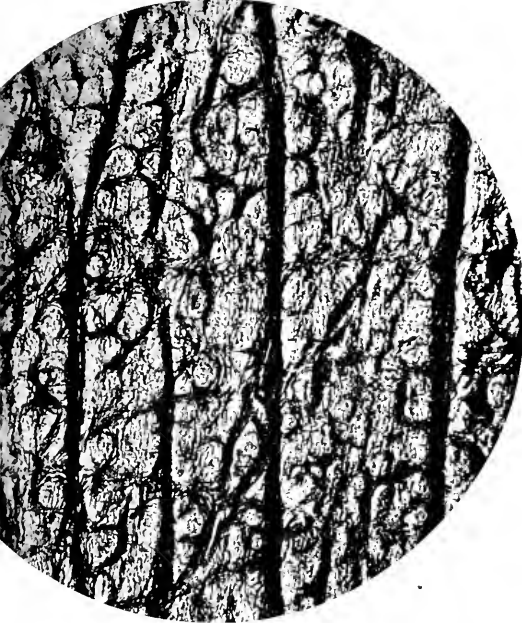


LEAF OF GOLD THREAD,  
a North American herb (28 x)



BLACK LOCUST SEED POD (28 x)

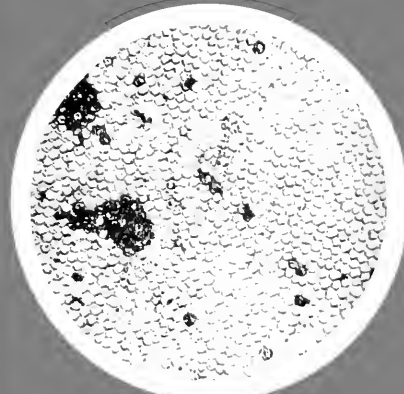
The materials needed are a bottle of clear, transparent lacquer, such as that sold for "nail polish," a roll of transparent cellulose scotch tape, and a few sheets of glass. The specimen is coated with the lacquer and allowed to dry. Scotch tape is pressed into optical contact with the coated specimen and then peeled away. The replica adheres to the tape and is then peeled onto a glass slide. The accompanying photomicrographs are of replicas most of which have been made in this manner.



IF A DROP of the solution is allowed to dry on one's forearm and stripped off, a surface like this will be seen under the microscope. (Enlarged 48 x)



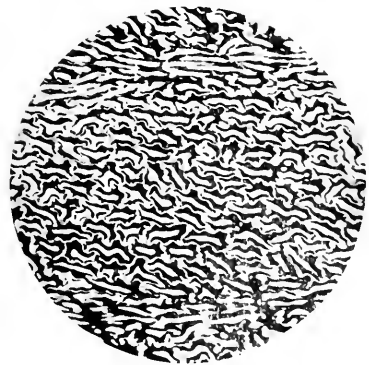
SKIN OF TOMATO (29 x)



PETUNIA PETAL. Dark areas are adhering pigment cells (73.5 x)



ETCHED METEORITE (18 x)



PETAL OF BUTTERCUP (73.5 x)

# What good are DOG FISH?

By ELON JESSUP

IT HAS BEEN SAID that a beginning zoologist can learn more anatomy from a dogfish than from any other backboned animal, not excepting man



Frink, Monkmeyer

**N**OBODY loves a dogfish. Among sports and market fishermen alike you'll find that this smallest member of the shark tribe has earned by its troublesome endeavors the reputation of being the most generally despised salt water fish that swims.

Compensation, however small, to offset its nuisance value has long been a dream of utilitarians. Even a sports fisherman will kick a "dog" over on the beach and reflect more in sorrow than anger: Too bad, the darn thing can't be put to some good use. But who can tell, perhaps it can. By no means have the utilitarians given up hope.

With most fish the common complaint Down East nowadays is, too

few. In the case of the dogs, it's too many. Bigger sharks are destructive enough. But there are thousands of dogs for every bigger shark. Total accounting of dogfish work can put surrounding fish population into the red in more senses than one. How southwestern Cape Cod, to name a single locality, feels about it can be judged from what happens to some of the lobsters it doesn't get.

A two- or three-foot dogfish may not be the type of vertebrate you'd expect by taste or capacity to get very far with a sizeable hard-shelled lobster. A pair of pliers or at least a nutcracker is usually required for that. Yet within the confines of Buzzards Bay alone it has been estimated that at least 600,000 lobsters will be an-

nually devoured by dogfish, to say nothing of about a couple of million crabs, countless squids, and a huge number of fishes of assorted forms and sizes. Drop into Sam Cahoon's fish market and ask why the price of lobsters has skyrocketed lately. Too many dogfish. Or, try to get some squid bait to go fishing. Too many dogfish.

The average sports fisherman considers himself in a position to talk about dogfish. Yet, he will greatly underestimate their numbers. He fishes the surf of Long Island and Jersey beaches, ties into an occasional wanderer, curses it for a nuisance, and thanks his stars they aren't running in schools. He doesn't know the half of it. Here is a row of figures

that may cause him to feel even more thankful. Some time ago when an attempt was made to utilize dogfish as fertilizer, the Massachusetts catch alone ran to a total of about 27,000,000 dogs each year.

It is not until you see them hunting in packs that you really come to know the meaning of dogfish. Ask the skipper of any trawler plying out of a New England port about that. Cap'n Ted, fishing out of Woods Hole, says to stand clear of patches of oily, grimy water. They often speak for schools of dogfish. There was one New England skipper that apparently failed to stand clear. Later he estimated his seining at a total of fifteen tons—nothing but dogfish. Lines parted under the strain, the end of a valuable net. The highest figures I have heard quoted for an individual catch was 20,000 dogfish. That ought to be enough.

There are a few days in the spring and fall when the dogs will literally drive some of the trawlers off the seas. It's costly business having a net torn to shreds. Even when the net remains fairly intact, there's not much else to enter it. And what good are dogfish? Similarly, inshore sports fishermen find it a waste of time to set up a rod; that is, unless in need of physical exercise or a wish to clean up the dogs. Their only chance in connecting with other kinds of fish is that rarity, a bait the dogfish doesn't like. That's why the cockle has always rated high along the New England coast as bait.

For sheer panic and murder on the briney, witness a pack of dogs run amuck in a school of mackerel. You then realize why the fish kingdom in aggregate tends to skeddaddle for a better hole. Any size fish within reason will do and some that are not. Market fishermen say they've seen dogfish harry and drive fish as big as cod and haddock. One of my acquaintance insists they'll devour a pot of lobsters, including the pot. I'm not sure about that. I have seen abundant evidence of lobster in the stomachs of dead dogfish but not as yet the pot. Still, I don't know that I'd put it past them. A dogfish stomach is a zoological museum.

They average about three feet in length and might be called (for that's what they are) pocket-edition sharks. Cynically minded persons have been heard to suggest they make you think of certain people you've seen. I don't

know exactly who. Unless perhaps, a Japanese diplomat. Stand a dogfish on end, shove a plug hat on its snout, add a pair of spectacles, and you might get something like that. The teeth are there already, far too abundantly; that is, in the spiny variety of dogfish. The slaty graveyard color of hide suggests dirty work to be done.

Two varieties predominate in our Atlantic coastal waters. The spiny dogfish, *Squalus acanthias*—named from vicious spikes in front of the dorsal fins—is the one that hunts in packs. The other, known as the smooth dog, *Mustelus canis*, snouts more on its independent own. The spiny is a hawk of passage. The smooth dog will locally stretch out its work to last through the summer, thereby demonstrating its versatility in fields ranging from the lobster industry to vacation fishing. That is to say, anywhere south of Cape Cod. Summer waters north of the Cape are the territory of the spiny dog.

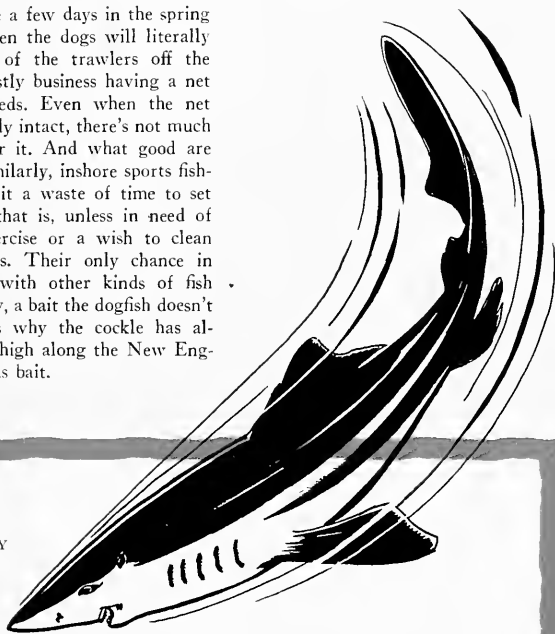
Schools of spiny dogs hit southern Cape Cod waters some time in May, torment our complacent fish population for a few days, and then, save for a scattered few, leave, thank heaven. As these spring visitations are almost concentric all the way from Cape Cod to Hatteras, it is thought by some observers that they have wintered in the deeper, offshore waters, rather than in southern waters, as others hold.

They arrive again in our Cape waters in vast numbers usually in late November, thereafter to vanish completely for the winter. Where they go, no one can definitely say. It's as good a mystery as the salmon and the eel. Touring schools of mackerel might throw light on the subject. But where do the mackerel go?

Old time market fishermen on the Cape declare that dogfish have increasingly become a pest. It's scarcely to be wondered at. The dog is one of the few fish swimming the seas that isn't wanted. That is to say, isn't generally wanted. Yet, the hopes of the utilitarians seem to be looking up. For in a somewhat specialized sphere the dogfish has gone into complete reversal and come out an extremely useful biological entity.

Less successful has been a far more comprehensive plan for the dogfish. Scientists for some time have been doing their best to tempt us to eat it. They haven't had much luck. The British have responded to a limited extent. The inevitable and economical

*Continued on page 153*



Drawn by  
JOSEPH M. GUERRY

Even a creature that has no friends can claim some usefulness. This "pocket-size shark" has a scientific story to tell and may even add to our food resources in a pinch



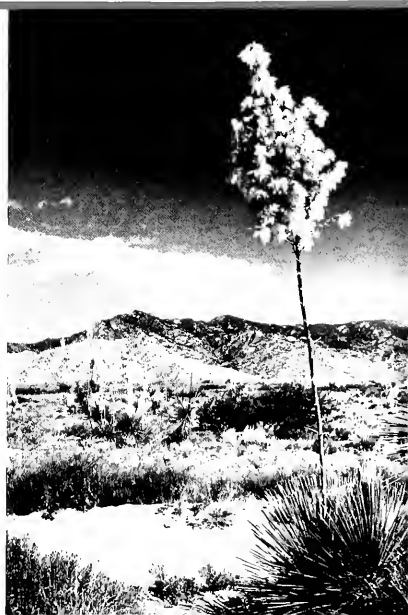
▲ A STRANGELY TWISTED JOSHUA branch forms the frame through which we see its fellow trees: a scene in Joshua Tree National Monument, in Southern California. The limbs are all clothed with the sharp, dagger-like leaves, which give way only on the lower part of the trunk to a checkered bark

Blossoms and “bayonets” form a striking contrast in these impressive relatives of the lily



◀ JOSHUA-TREE IN BLOOM. Each flower is like a tiny fist, closed tightly on itself. This beautiful head of bloom rises out of sharp dagger leaves at the end of the Joshua-tree branches

▶ THE PINALENO MOUNTAINS in Arizona make a background for this showy yucca blossom rising skyward from its nest of sharp leaves



# OUR DESERT *Yuccas*

By JOYCE ROCKWOOD MUENCH

Photographs by JOSEPH MUENCH

LONG ago, when huge ancestors of our present mammals roamed a glacial world, *Northrotherium* had his day. His known hunting ground included what is now Nevada, and we are told that he fed on yucca; in fact, his other name is the "yucca-feeding sloth." He and his ilk are gone, but still every year throughout the Southwest and in other scattered portions of North America and the West Indies, whole battalions of yuccas send up glorious panicles of bloom, presenting a miracle of contrast beside the heavy, sharp-pointed leaves.

From New England to the Gulf, *Yucca filamentosa*, or "Adam's-needle," is known in the garden as a bold, striking plant, and from Maryland southward it grows as a native. It and some 30 other species, mostly scattered in the Southwest, all belong, surprisingly enough, to the lily family. On the coastal hills of southern California is the "Candle of the Lord," as *Yucca whipplei* is commonly called. It rises from a rosette of narrow, sharp-pointed leaves and bears hun-

dreds of creamy-white blossoms.

In Arizona there are many species, from the bearded and gnarled Joshua-tree to the almost delicate *Yucca baccata* and *Yucca glauca*. The Joshua-tree, recognizable afar from its arms thrown out grotesquely to the sky, attains great age. It has been under observation for as long as 20 years without any measurable evidence of growth. Yet it rises from the lower forms and grows into a tree as large as 20 to 30 feet in its branch-spread. The buds are knobby-looking, and from a distance it is hard to decide whether fruit or buds protrude from the ends of the branches.

Spanish-dagger, Spanish-bayonet, or whatever else you care to call them, the yuccas are vigorous, hardy plants that have withstood the snow of winter and the arid climate of the desert in summer.

### *The yucca and the moth*

In 1872 Doctor Riley of Missouri discovered something about the yucca plant which is so interesting that men-

tion is seldom made of this genus without including it. The shape of the flowers precludes self-pollination, and few birds or insects are attracted to it. So practically every variety of yucca has a particular variety of the moth *Pronuba* to fertilize it. The moth, on the other hand, depends upon the yucca for self-perpetuation, for it places its eggs in the plant's ovary. This singular interdependence between members of the animal and the plant world has been studied thoroughly. The life cycle of the moth is so coordinated with that of the plant that the moth is ready when the flower is, and thus they have carried on from no one knows just what antiquity and presumably will into an unguessable future.

The yucca has yet another claim to interest. This lies in the variety of uses to which it has been put since man first turned to it to satisfy some of his needs.

*Yucca baccata* has a very edible fruit which is eaten fresh or preserved by the Indians. The fibers of several vari-

▼ NOT UNLIKE A BANANA in shape and flavor, the edible fruit of *Yucca baccata* has long been eaten and preserved by the Indians. The fruit has given way to the hard seed pods on these plants, growing on the high plateaus of northern Arizona

▼ A BLOOM of *Yucca whipplei*, growing with other flowers from a lateral stem. The dark, ball-like portion was a crème de menthe green touched with flecks of crystalline substance that made it appear wet. The purple on the edges of the petal is readily seen







▲ A WONDERFUL DISPLAY of yucca in bloom against a lacy-clouded sky. The broad leaves that end in so

determined a point always contrast vividly with the delicate quality of the blooms. Southern California



eties have long been used to tie things or as part of native rabbit traps. The roots of others yield a detergent, or cleansing agent, and we are told that some of the modern beauty shops are using them for their fine shampoos.

Its chief commercial use today is for splints. Because the wood is porous, pliable, and very light, it can be bent in conformity to the injury and will not then bend farther. There is also talk of producing some of the lower grades of cordage from it.

Aside from any useful qualities that it undoubtedly offers, let us salute the yucca—world traveler from ancient times—for the bold character it lends the desert landscape and for the sheer beauty of its panicles of cheer.

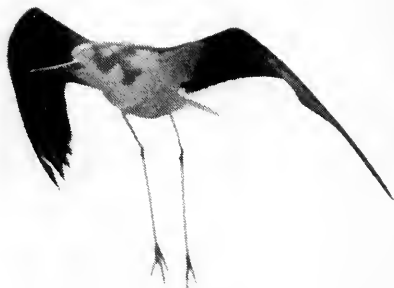


▲ **YUCCA BLOOMS.** This spectacular member of the lily family has been observed in the deserts of the southern parts of California, Arizona, and New Mexico ever since the white men arrived and began to talk about the country. Many names have been given to various species. Spanish-dagger or Spanish-bayonet is a common and most understandable name. The roots have been used for soap, the fibres for all sorts of purposes, and yucca splints are now in great demand for first-aid work

► **YUCCA BY MOONLIGHT,** with the waxy white blossoms standing out against a cloud-swept sky. It is only at night that the blossoms really open, and each individual flower stays open just one night. The yucca moth then comes on its silvery wings to fertilize the flower and lay its eggs in the pistil

# A TROUBLED FAMILY

## of STILTS



▲ THE STILTS gave away the secret of the nearness of their nest by hovering overhead and giving voice to piteous cries or floundering about in the prairie grasses as though their legs and wings were broken. These latter actions became especially violent when the nest was finally discovered

By KARL AND EDNA MASLOWSKI

FEW shore birds are more colorful than the black-necked stilt, which nests over a wide range in the United States from Oregon south to the border and along the Gulf to Florida. Fewer still are better named. The black neck and long slender legs are good reason for this bird's given and surname.

While producing a lecture film of Texas birdlife we recently encountered a great many nesting pairs of stilts along the edges of little fresh-water ponds off the Boca Chica highway near Brownsville and only a few miles from the Gulf of Mexico. Some of them seemed to have more than their share of trouble in their domestic life. We found stilt nests which had been destroyed by four-footed predators; others that had suffered from marauding grackles and man. The most unusual difficulties encountered by a pair of stilts that we observed at close range are chronicled in part in the following series of photographs. The pictures were made from a blind placed only ten feet from the nest.



◀ THREE EGGS comprised the clutch of this pair, though hen stilts sometimes deposit as many as four or five. The nest was merely a bare spot of earth rimmed about with a handful of dried twigs and grasses. Both male and female incubated the eggs. Mother stands over her clutch preparing to settle down for a period of incubation. We wondered if an elevator wouldn't have made things easier for her

► ONCE DOWN, the legs were usually held in this position. The long needle-thin black bill with the nostril near the base is ideally suited for probing about in the mud in search of insects, larvae, tiny fish, etc. Stilt eyes are blood red with black pupils



► IN THIS same area great herds of sheep and goats are raised for food, milk, and wool. One day about 500 of these animals milled all around the stilt nest. The parents' behavior as they tried to defend their home was the same as they had displayed when we discovered their eggs. They fluttered over the backs of the sheep and goats and groveled about on the ground as though in the throes of death. The nest was somehow spared—at least until the next chapter. While the herd was passing by, a mother goat dropped a kid in the brush near by and 20 minutes later the new-born kid wandered over to within three feet of the nest. Now the stilts changed from defense to offense. They no longer cringed and cried. The hen bird flew at the kid in rage



▼ STANDING over the eggs, the parent seemed to defy the kid to move nearer. At times, too, the female would scream loudly, spread her wings wide, and hop up and down as though to make herself look as big and fierce as possible. In short, she was now trying to intimidate her small opponent, whereas before she seemed content to try to lure bigger enemies away. Obviously, it was a nicety of judgment on her part in recognizing this difference in size and acting accordingly

▼ THE KID, of course, had no intention of harming the nest. Doubtless it was hungry and searching for its mother. Finally the little fellow collapsed, and all we could see was a white mound of fur behind the bush at the side of the nest. Mother settled to the eggs, and a temporary truce was called, though she still continued to scold and scream. A short while later a young Mexican herder came along following in the wake of his flock. He carried the kid away under his arm in company with two other babies which he had found abandoned





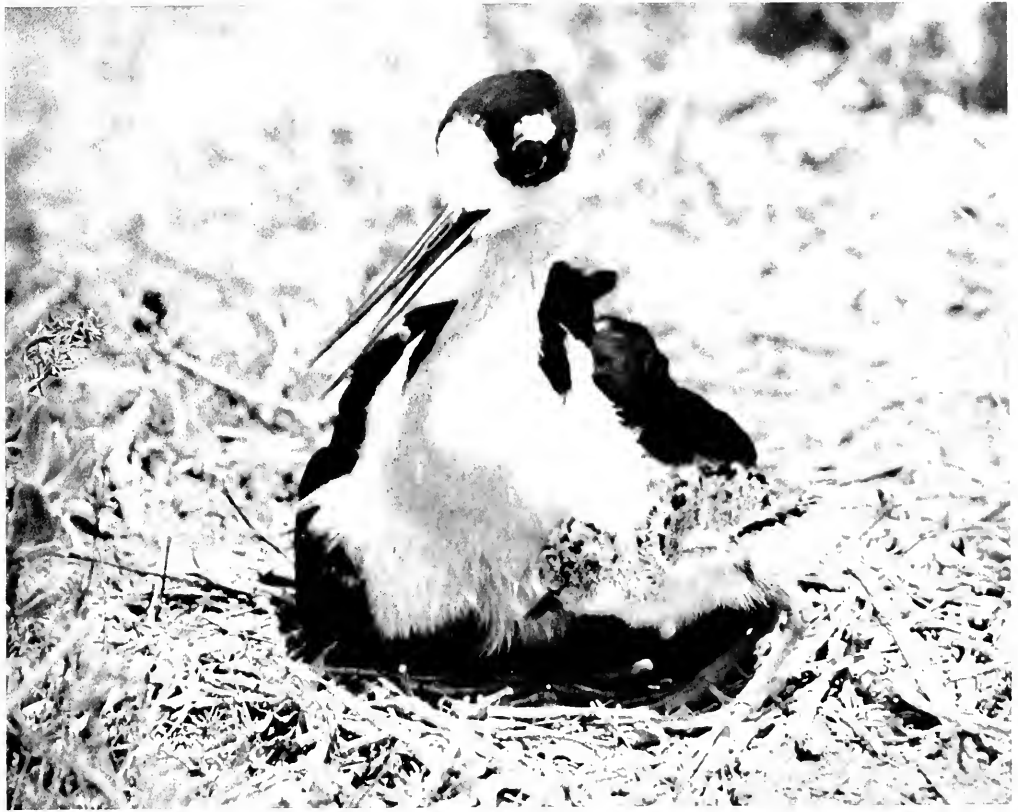
▲ A FEW MORNINGS later the stilts had more trouble on their hands—they were about to have a family. One chick was already free of its eggshell prison



▲ BY MIDMORNING there were twins, and Edna held them in the palm of her hand. Their spotted down seemed to resemble the pattern of the eggs from which they had just emerged. Consequently they could sink to the ground and be well-nigh invisible at a distance of five or six feet

➤ ONE OF THE BABIES soon wandered from the nest. Father prepared himself for the ordeal of sitting down on the wriggly chick and the third egg. See how he has fluffed his feathers wide apart so that his bare skin will keep both baby and egg warm



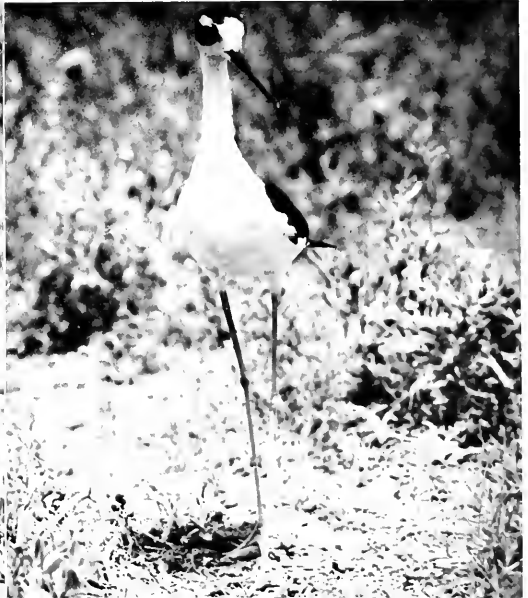


▲ THE SECOND CHICK returns for warmth and company

▼ A HEAD-ON VIEW reveals a splendid streamlined form. A chick is snuggled down along the parent's left wing



▼ THE THIRD EGG was added, but father continued to eye it optimistically for a while, evidently with the idea of triplets in mind, before he joined his family on the edge of the near-by pond





## Outpost in the Southwest Pacific

# BIRDS OF NEW GUINEA

### *The Whitney Hall Exhibit of the Month*

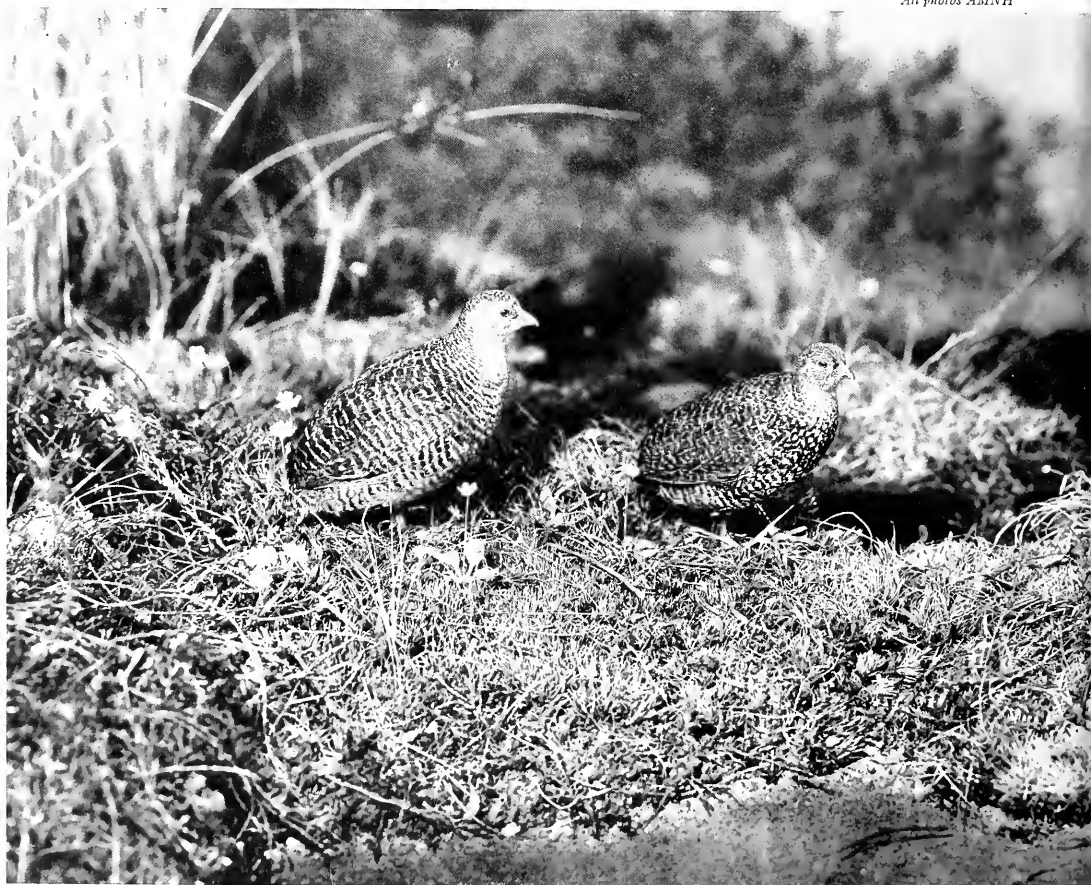
LITTLE known before the raids on Port Moresby, and almost untouched by civilization, New Guinea attracts attention today as a strategic position in the front-line defense of the Allied Nations. It is separated from Australia by a shallow sea only 100 miles wide at Torres Strait,—dry land until fairly recent geologic times. A drop of 50 feet in the water level would probably connect the two bodies of land.

One may not realize, even from the frequent dispatches, how large this island is. On a map of the

United States it would extend from New York City to Colorado. The trade winds bring a dry season to parts of the south and southeast coasts, where open country prevails, but the rest of the lowlands are dense with tropical vegetation. Mountains in the interior only a few degrees south of the equator are continually snow-clad.

This exhibit is a result of field studies made by the Richard Archbold Expedition of 1938-39 and is an exact replica of a section now in no man's land.

*All photos AMNH*





▲ THE SCENE portrays Lake Habbema, on which the expedition plane landed in the interior of Netherlands New Guinea. As we look southward across the lake at an elevation of 11,000 feet above sea level, Mt. Wilhelmina, the third highest peak on the island, can be seen in the distance. New Guinea is extremely rich in bird life, having 650 species

➤ A MACGREGOR'S BIRD OF PARADISE flies in to perch beside another of these gorgeous black and orange birds. The wattles of orange around their eyes look like ears and lend the birds a bizarre appearance. Perched high on an evergreen bough is a group of three Alpine Lories, brilliantly colored New Guinea parrots

◀ A DETAIL OF THE FOREGROUND of the exhibit shows us a pair of Snow Mountain quail on the flower-dotted turf at the edge of a dark forest of pine and tree-blueberry. The liverworts, mosses, buttercups, and gentians remind us of our own New England woods. In the tropics this northern flora is restricted to the highest mountains







▲ A GROUP of four Blue-faced Lories on top of an umbrella tree, one of the conspicuous plants of the region. On a lower branch is a single Great Noisy Honeyeater. Although New Guinea and Australia are related in their animal life, many species of birds in New Guinea are not found on the other side of Torres Strait

◀ ONE OF THE MOST attractive birds of the alpine woods is the gaudy Crested Starling. Gay flocks of these black, blue, green, and yellow birds bring the quiet woods to life

—Continued from page 141

"fish and chips" in London's East End can cover a multitude of fish. Yet it seems to have been left to the faraway Orkney Islanders to go for anything like mass consumption.

It has been a custom among Orkney Islanders for generations to accept dogfish as no more out of the ordinary than eggs and bacon. The methods of preparation is a trifle unusual. After cleaning and skinning the fish they break it up and spread the pieces out on the rocks to sun and dry. Even the squeal, so to speak, is put to practical use, the skin being employed as sandpaper. If you know dogfish you will understand how that can be. I wonder if people so resourceful might not, if put to it, go so far as to extract from a dogfish hide several thousand tin tacks.

Perhaps it is the sunning and airing that does it. Possibly some such lack accounted for the unfortunate failure of dogfish to crash into our own menus. At any rate the effort was not only made but on a big business basis. Gloucester canners did their conscientious best, including the building of special plants. The labels said "Grayfish," an indication in itself of the public pulse: many people would say emphatically "no" to dogfish when they were willing to take a chance on grayfish.

Some of those who ate the finished product said it was suggestive of roast pork with a fishy tang. This sounds even worse than you might be led to expect. They insisted that actually it was surprisingly tasty, but with the important proviso that you get a can right hot off the press. Everything seems to have hinged on that. If you permitted the cans to stand for a while on the shelves, the result is said to have been simply appalling. Natural ammonia in the flesh did its worst. Gloucester's dogfish canning industry faded out.

Prejudice dies hard. Several times out fishing I've promised myself to save a dogfish and cook it. My courage invariably failed. Too much like snake. The other day I interviewed several market fishermen that looked hardy enough to consume their own oilskins. I asked if they'd ever eaten dogfish. The looks they gave me were answers enough. Yet the scientists continue to insist we are neglecting a most nutritious food. Evidently they haven't found the right package. The war may see to that.

Not in our kitchens as yet but, surprisingly, in our laboratories the dogfish proves its genuine usefulness. The importance with which the commonly despised dog is regarded is indicated by anatomy textbooks in which entire sections are devoted to precise instructions on how to dissect a dogfish.

One zoologist explains it by saying the dogfish is easily obtained, easily kept, easy to dissect, and no good on earth for anything else. Others go further. They declare that a beginning zoologist can learn more anatomy from the carcass of a dogfish than from any other form of vertebrate, not excepting the human being. It is cartilaginous, not bony like most fish. It produces living young. In short, it is the perfect happy medium in vertebrate life. As such it has become standard and is universally used for dissection as an introductory type in the study of comparative anatomy.

That is why universities, colleges, high schools, and preparatory schools all the way from Maine to California are asking continually for dogfish and more dogfish. The Marine Biological Laboratory in Woods Hole on Cape Cod, among others, strives to meet the demand. Last spring while the dog runs were on I saw 6,000 in the course of a single day processed for dissection and pickled in formaldehyde. The Laboratory will ship anywhere from 10,000 to 18,000 every year.

Nor do you toss to the cat a dogfish head. There is also a steady demand for heads, for brain study, of course. The other day I saw a fairly typical order from the University of Chicago for 130. The store room was filled with barrels of pickled dogfish heads.

The dogs contribute to advanced research work as well, some as dead specimens, others as live patients. When subjected to a major operation, they will leave other fishes gasping with wonder as examples of operating table fortitude. Beyond a doubt, the dogfish is tough. Of special satisfaction to the operating scientist is its marked indifference to what ether can do. Most lower animals show aftereffects. The dogfish doesn't.

A fish has to be etherized or otherwise stupefied to keep it still. It comes to upon being returned to a tank of ordinary sea water—that is, if it happens to be a dogfish. Of other fishes you aren't so certain. One of the scientists in the Marine Biological Laboratory tells of six separate operations

upon a live dogfish during the course of a single afternoon. It was etherized and brought out of ether with each. The fish emerged from its final dreams as if nothing whatever had happened and immediately toured the tank in search of food and trouble. What a patient indeed.

### *Changeable camouflage*

It is perhaps fortunate that the dogfish is not an individual to strike sympathy within the human breast. Even the most ardent anti-vivisectionist would scarcely be disturbed. A famous operation involves cutting the optic nerve to blind the fish. The result helps to clear up a mystery perplexing not only to students of lower animal life but to every salt water fisherman as well. It seems also to have disposed of a common belief among fishermen that dogfish can't see very well.

Four young dogfish—the smooth variety—of a brood of seven were placed in a white-walled illuminated tank, the other three in a black-walled tank. Two hours later, the occupants of the white tank had bleached to a light color, while those of the black tank had gone extremely dark.

Next day the pale dogs were changed to the black tank and the dark dogs to the white tank. Within two hours each dog had reversed itself, taking on the tint of its surroundings. Here was about as convincing evidence as one could wish of color adjustment to environment. But what was the compelling force?

All of them were then blinded. Some were put in the white tank, the others in the black. The entire brood took on and retained an intermediate tint between light and dark. It was logically concluded that eyes were essential for the physical response to environment.

Thus the presumably useless dogfish is beyond doubt contributing appreciably to the fund of human knowledge, right from the elementary up. You can't help but feel it may also have a future as food. With the haddock crop running periodically thin, 27,000,000 dogfish brought annually into the ports of Boston and Gloucester might help a lot. Especially with food ration cards in the offing. Scientists continue to give them the green signal. The name is a difficult hurdle, but some of the textbooks now give "Grayfish" as a synonym for "Dogfish."

## RACCOON

*Continued from Page 119*

its ability to climb from its most remote ancestors.

Inject the word raccoon into any conversation and someone will immediately identify it as the name of the animal that always washes its food. This is one of those beliefs that at best is only true and at worst is a gross understatement of fact. Raccoons are passionate waders and worse than small boys when it comes to playing in shallow water. This love of water leads them to dunk every object of interest, apparently just to see what happens, and, if it chances to be food that holds attention for the moment, in it goes. Ivan and Abdulla seldom put food in water, but I have

seen them dunk various objects that I have suspended near their water pan. After eating, they wash their hands for minutes on end by first dipping them and then licking the upper sides of the widely spread fingers. In hot weather, water stimulates them, and the violent tussles that take place in their pan often result in a good ducking for both. Water streaming from a hose never fails to attract attention; they try to pounce on it as it splashes on the ground. No doubt the dunking habit is useful to an animal that digs so much of its food from river and stream bank or edge; who can say that a crayfish or frog caught in a muddy place would not be deliberately washed?

I am often asked whether Ivan, being male, will not grow dangerous;

'coons are well known to defeat dogs in battle. I cannot say even now, that, at the age of six months, my pets do not bite, because both of them have what might be called a "snap-reflex": if you take hold of one suddenly while it is eating or busily investigating something, the jaws will snap a finger that comes near them, especially from the belly side. If the finger is not jerked away the bite will not draw blood and is never followed by a second one. Abdulla rarely snaps, but Ivan is apt to do so. We have disciplined him by holding his snout firmly for several seconds after each offense. He hates to have his snout held, and often, immediately after snapping, sits on his haunches and grabs his own snout in both front paws, apparently trying to "beat us to the punch."

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# INFORMATION TEST

A few high spots in this issue on which you can try your knowledge.

Correct answers on page 160

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1. What bird has the name of something that makes a man taller?

2. What is the largest island in the Pacific?

3. Why are the rings of a tree of different thickness?

4. It never snows within five degrees of the equator.

True.....

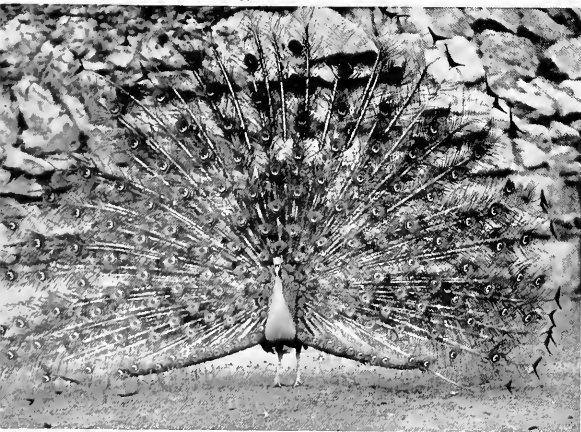
False.....

5. Gum arabic is animal, vegetable, or mineral?

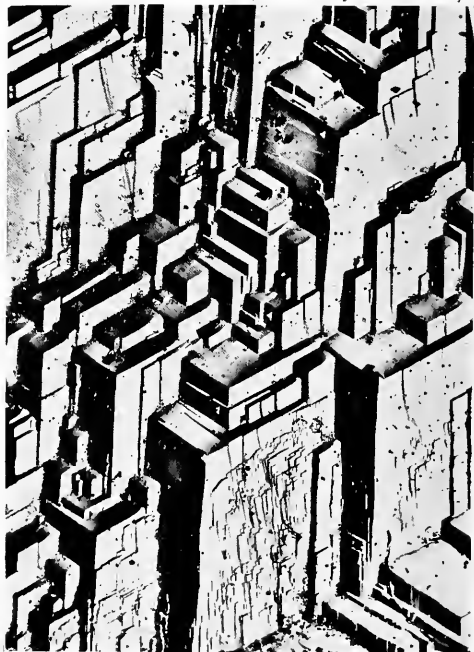
6. A Dogfish is:

- (a) a mud puppy
- (b) a "pocket-size" shark
- (c) a male catfish

*Photo by Ewing Galloway, N. Y.*



*Photo by Vincent J. Schaefer*



7. The peacock (*above*) lays:

- (a) A speckled blue egg
- (b) No egg at all
- (c) An egg with a pattern resembling that on the feathers

8. The photograph at right shows:

- (a) An architect's preview of the "bomb-proof" city of the future
- (b) The surface of a crystal useful in communication between war planes
- (c) Dry ice

# YOUR NEW BOOKS

LIBERIA • ECUADOR • ENTOMOLOGY • ALASKA  
JEANS: PHYSICS AND PHILOSOPHY • MUSHROOMS

## HERE IS ALASKA

----- by Evelyn Stefansson

Charles Scribner's Sons, \$2.50

AT a time when daily events in Alaska are creating a more general interest in that territory Mrs. Stefansson's book will be welcome. Designed for readers of high school age, it will also appeal to the average individual. It is not a text or reference book, but one that presents general information in an interesting manner.

It is based in part on original field work by Frederick Machetanz, who gave up his plans for using what he had gathered when he entered the Navy. Notes and photographs were turned over to Mrs. Stefansson, and from these and additional material she has prepared a beautifully illustrated description of present-day life in the Alaskan setting.

Obviously, Mrs. Stefansson shares her husband's philosophy or attitude toward northern lands. In other words, there is a certain amount of sales talk to show that even the northernmost part of Alaska is really a decent place to live in. Granting this is so, the fact still remains that large areas offer only a limited number of occupations for a relatively small population. As they possess no unique advantages to compensate for this they will always be marginal areas even if they may lie in the line of a future air route.

In view of the title there is perhaps too much emphasis on the Eskimos. This may create the impression that the majority of the population belong to that group. If this is a fault, it certainly does not detract from the interest of the text.

JUNIUS BIRD.

## WILDLIFE REFUGE

----- by Ira N. Gabrielson

The Macmillan Company, \$4.00

DR. GABRIELSON has made a substantial contribution to the literature of wildlife conservation in this volume devoted to the subject of wildlife refuges. He is well acquainted with the background for the present system of refuges and has taken an active part in the creation of many of them.

This work is essentially a textbook. The topic is a large one, and the book takes on the character of a catalogue, at times. Such passages have reference value but will not receive the attention, on a first reading, given the more descriptive pages presenting glimpses into the wildlife of a given area.

The first official wildlife refuge in America was created by law in 1870. The idea of setting aside areas of protection

for wildlife met with indifferent public response at first, and this happened during years when destructive practices were crowding so many species toward the brink of extermination. The author sketches the history of the refuge movement, describes the purposes, values, and limitations of refuges, and discusses management and basic concepts.

Refuges are classified as special purpose, big game, waterfowl, or general wildlife, and there is an extensive list of areas under these categories. Some of the longer accounts, as the chapter telling of "Alaska's Great Bird Cities," impress the reader with the great richness of wildlife there.

Refuges in the United States,—federal, state, institutional, and private,—refuges in Canada, refuges in Mexico, all attest to the great advances made since 1870. But the need for all of these, and additional ones as well, is a very real and vital one with significance for every man.

A person must read this book to get the proper realization of all that has been and should be done. This reviewer has not seen the topic of refuges handled in such authoritative and comprehensive fashion by any other author.

H. E. ANTHONY.

## LIGHTING UP LIBERIA

----- by Arthur I. Hayman  
and Harold Preece

Creative Age, \$2.50

LIBERIA, the first negro republic in the world, with its 43,000 square miles of tropical territory and huge Firestone Rubber Plantations, is a semi-protectorate of the United States of America. Established in 1822, it was straightway forgotten by the outside world until American troops landed in 1942 and President Roosevelt made his epoch-making visit at Monrovia, the capital, which brought the republic into headline news.

*Lighting Up Liberia* is an interesting and descriptive narrative of native customs and of political and social problems of the people. Arthur Hayman, who spent many years in Liberia, in collaboration with Harold Preece, tells a revealing story centered around five natives: Boat-swain, a giant negro chief, whose exemplary life became a legend; Small Sam, an undersized body servant; two native boys, Collins and Brown; and Chief Arku. The unfolding of the characters of these natives is a wonderful testimonial to the people of Liberia. The descriptions renewed memories of my own observations of the inhabitants in the remote parts of Kenya and Tanganyika. I can also

vouch for the integrity of the unspoiled natives back in the bush country.

The underlying theme throughout the 279 pages of this volume is a bold and determined appeal to make Liberia safe for Democracy. The coauthors have relentlessly turned the spotlight on the political leaders.

Hayman undoubtedly knows his Liberia, and no one can doubt his sincerity and sympathy for the native tribesmen of the hinterland.

*Lighting up Liberia* is of special interest because of its relation to the African front and will help the reader understand this little-known part of the world. It also has precise information that will prove invaluable to post-war mediators in settling African problems. It is written in simple, direct language, illustrated with photographs by Hayman, and is the first modern popular story of folklore in Liberia.

GEORGE G. GOODWIN.

## PHYSICS & PHILOSOPHY

----- by Sir James Jeans

The Macmillan Co., \$2.75

ALL who have read any of Sir James Jeans' books will agree that he is a rare combination of brilliant scientist and lucid writer. Perhaps no one can clarify abstruse subjects for the layman better than he. At the same time, he makes the story so interesting that the reader is enthralled.

This new book, *Physics and Philosophy*, has been written with the same lively sparkle that marks his former books. The first chapter is devoted to defining physics and philosophy in the light of the new quantum theory and the theory of relativity. Sir James then discusses the question, "How do we know?" In this he traces the history of philosophy from Descartes to Kant to Eddington. He compares the two voices of science and philosophy from Plato to the present. A chapter is devoted to the passing of the mechanical age (Newton to Einstein), another to the new Physics (Planck, Rutherford, and Bohr), and another entitled "From Appearance to Reality" (Bohr, Heisenberg, de Broglie, Schrödinger, and Dirac).

Sir James discusses such questions as: "Can we have any knowledge of the world outside us, other than that gained by the methods of science—observation and experiment?"

"Is the world ultimately spiritual and mental, or is it material, or both?"

"Are human beings endowed with free will, or are they mere cogs in a vast machine?"



# Natural History

## ILLUSTRATIONS

are printed from photo-engraved plates made by STERLING ENGRAVING COMPANY, 304 E. 45th Street, New York, N. Y.

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Above illustration—Nile River Group—Detail showing Antelope Akeley African Hall—American Museum of Natural History



Under the last, he quotes Einstein's enlightening discussion of Schopenhauer's saying—"A man can surely do what he wills to do, but he cannot determine what he wills."

In the words of Sir James, "It can hardly be a matter for surprise that our race has not succeeded in solving any large part of its most difficult problems. . . . Perhaps life would be a duller affair if it had, for to many it is not knowledge but the quest for knowledge that gives the greater interest to thought—to travel hopefully is better than to arrive."

CLYDE FISHER.

## ECUADOR

----- by Albert B. Franklin

Doubleday, Doran & Co., Inc., \$3.50

THIS entertaining and instructive book should be well received not only in the United States, but also in the country it describes. This is a test which surprisingly few accounts of Latin American countries can be put to favorably. The explanation obviously is Mr. Franklin's fair and sympathetic viewpoint. His description of the structure of the country, the physically different regions, and the people in them is clear and graphic. (It should not be classed as a travel book in the usual sense. The narrative of his personal experience is successfully used to portray present-day life and conditions.) It is clear that he enjoyed the time spent in the country and went to the trouble to familiarize himself with its history and literature. Anyone going to Ecuador will do well to read this account, whether he plans to tour the country or stay for a longer period of time. The book is also recommended to those who are interested in our present relations with Latin America. The author's timely remarks on our activities in, and relations with, Ecuador will help towards a clearer understanding of the problems we face not only there, but in other countries. JUNIUS BIRD.

## GENERAL ENTOMOLOGY

----- by S. W. Frost

McGraw-Hill Book Co., \$4.00

WHILE this book is intended as a textbook for elementary college entomology, its approach is different from that of other entomological texts. Instead of the usual emphasis on anatomy and classification or on insects of economic importance, the greater part of this book is devoted to insect behavior, habits, and ecology. As a result, it should appeal to many persons interested in general natural history.

The first eight chapters contain material on such subjects as phylogenetic relationships and paleontological history, beneficial and injurious insects, metamorphosis, and morphology. The remaining fourteen chapters are not only those of greatest general interest, but also of greatest novelty in a book of this nature. In this portion of the book, aside from chapters on coloration, stridulation, and quiescence, insects are discussed according to habits and habitats. For example, aquatic and subterranean insects are considered

in separate chapters. Peculiar habits of different groups receive much attention. There are chapters on gall insects, leaf-miners, social insects, etc. A chapter entitled "Solitary Insects" concerns those forms, such as non-colonial bees and wasps, in which adults provide for the young, usually by storing food. In spite of the extensive discussions of the interesting and relatively uncommon means by which insects are able to survive, sufficient information is included on the more ordinary plant feeding and predaceous forms to give an adequately rounded picture of insect habits.

Examples are used to emphasize many points. Certain examples, however, are by no means the best that could have been selected to illustrate the principles involved. Parts of the book are marred by misstatements, some of which are of a serious nature. A most desirable addition to this book would have been a small amount of discussion and correlation of the numerous facts presented.

C. D. MICHENER.

## POLYNESIANS—EXPLORERS OF THE PACIFIC

----- by J. E. Weckler, Jr.

Smithsonian Institution

THE war has brought into the daily reading of millions of Americans a series of exotic places and unfamiliar names around which our most intense emotions are centered. Here our war is being fought and our near ones are stationed. To know what these places are like and who the people are that inhabit them is a natural desire, which the Smithsonian Institution has undertaken to satisfy by providing background studies, of which the present is the sixth in this estimable series.

Although Polynesia is not actually in the zone of fighting, it is a vital area contiguous to the more active scenes in Melanesia, and one that has already figured in several dramatic incidents. The eastern isles of the Pacific collectively known as Polynesia have enjoyed for the past decade (via the movies and popular books) a renewal of their romantic glamour. Despite this exploitation or perhaps because of it the real Polynesia has remained as little known as ever. In the present booklet Mr. Weckler presents a brief summary of some of the salient aspects of the Polynesians and their way of life. Since in the compass of 64 pages the vast lore and information about this region could hardly be adequately set forth, his account necessarily omits some phases that another might have included; but he has managed successfully, it seems to me, to convey much of the unique character of Polynesia. Some of the subjects dealt with include an account of current opinion on the peopling of Polynesia, the role of maritime affairs, the mythological background, the methods of colonization and settlement, the ancient way of life, and the effect of European contact.

It would be out of place to take issue on one or two minor items in a book written for general readers who are not concerned with the intricacies of scholarly hypotheses. I know of no other short

account that serves the purpose as well. It is well written, clear and interesting, and may be read in an hour.

H. L. S.

## ARROWS INTO THE SUN

----- by Jonreed Lauritzen

Alfred A. Knopf, \$2.50

THE Navajo walks in beauty. His religion is conceived in beauty. He belongs in that desert country in the same way as do the fragrant sage, the piñon, the cliffs, mesas, and cañons.

*Arrows Into the Sun*, the author's first novel, has its setting in the Navajo country. Mr. Lauritzen was born in Utah, but when he was seven years old his family moved to the Arizona strip, where he grew up, so he has known this country since childhood.

Sigor was not all Indian, yet he was born among the Navajo and spent his formative years there. Consequently, his thought patterns followed the Navajo trail, strongly. One day raiders came and killed Nijoni, his beautiful mother . . . and Dennis, his white father, took him to visit some Mormon friends. There Sigor immediately fell in love with Hallie, a young girl of Mormon parents. She came to represent to Sigor the best among the whites. His mother, Nijoni, and a captive Indian girl represented to him the best in the Indian. It was difficult for him to fit into the white man's pattern, and he could not fully approve of the Indian way. Therefore, there was a continuous inner struggle between his Indian and his white heritage. Mr. Lauritzen handles this conflict ably and with understanding. The chapters on Hallie, revealed in her diary, alternate with those on Sigor. Each is written in an entirely different style, each fits into and supplements the other.

## Your Magazine

The rationing of paper and other materials used in magazines and books is a circumstance to which publishers throughout the country are adjusting in the concerted effort to hasten victory and peace. Already there are fewer pages in NATURAL HISTORY Magazine; further reduction may be necessary. Readers are asked to be patient if conditions beyond our power interfere with the normal production of the Magazine. The materials and energies diverted are being applied to the task of saving, among other things, the American ideal of freedom and truth in public education.—ED.

As a portrayal of the Navajo and of the Mormons with whom they came in contact in the early 1860's, *Arrows Into the Sun*, is a fascinating story written with insight and sensitiveness. It is one that the reader will not want to lay aside until it is entirely finished.

TE. ATA.

## OUTLINES OF ENTOMOLOGY

----- by A. D. Imms

E. P. Dutton and Co., \$3.75

THE author states in the preface that this book was "written more especially for the student who embarks upon a university training in zoology or agriculture in preparation for a career. It will further serve as a preliminary manual for the would-be professional entomologist during his first year's course."

Rarely has an author better characterized the product of his pen; and Doctor Imms has demonstrated in this, as in former books, his unusual ability to present clearly and accurately technical details of the anatomy, physiology, behavior, and classification of insects. However, even the very limited group of students for whom this book was "more especially" written may wish that such a wealth of material had not been so telegraphically condensed into less than 200 pages. Personally, I much prefer the author's *General Textbook of Entomology* and his *Recent Advances in Entomology*.

FRANK E. LUTZ.

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## SANTA FE, NEW MEXICO

----- by Ernest Kneec

Hastings House, \$2.00

EXAMINING this book is like hearing a lecture on fascinating Santa Fe with the use of lantern slides. You put each slide into the stereopticon yourself and read the caption below the photograph,—and no one is there to jerk out the picture just as you settle down to enjoy it and dream about that charming part of our land. Mr. Kneec devotes most of his space to the Spanish influence, and, of course, Santa Fe is a Spanish city. He does, however, give us glimpses of a few near-by pueblos, an eagle dancer, a mother and child, and a few other Indians, as well as examples of some of the lovely old pieces of pottery from the Laboratory of Anthropology. He invites us into museums, shows us the old Palace of the Governors, old churches, and other public buildings. He has given us a number of examples of picturesque pueblo architecture, which is so much a part of the Southwest.

All this is told through striking black and white photographs, that in most cases have wonderful cloud effects. It is a satisfaction indeed to find here such superb photographs, taken by one who has a good eye for composition.

If you are going to Santa Fe,—and every one eventually goes to Santa Fe,—you could use this book as a picture guide to the "musts" on your list of places to visit. If you use the camera, this little book will give you some excellent ideas of how and what to photograph.

In our United States there are a few cities with a distinctive atmosphere, and to this small group belongs Santa Fe. It has the beauty of age, blended with but not spoiled by the modern. In this little book is portrayed much of the history, culture, architecture, and charm of Santa Fe.

TE ATA.

## COMMON EDIBLE MUSHROOMS

----- by Clyde M. Christensen

University of Minnesota Press, \$2.50

ALTHOUGH the author is Professor of Plant Pathology in the University of Minnesota, he has written a popular, nontechnical little book on mushrooms that will prove to be a welcome and dependable introduction to this fascinating subject. He realizes that there is no universal rule for distinguishing edible from poisonous kinds, but emphasizes the safe precaution, "*learn a few species well, and avoid all others.*"

The author begins his descriptions with what he appropriately calls "The Fool-proof Four," which include the Morels or Sponge-mushrooms, the Puffballs, the Sulphur Shelf-mushroom, and the Shaggymane. These will provide a safe start for any beginner. They are all delicious and they occur rather commonly throughout a large part of the United States.

About 50 kinds of edible mushrooms are clearly described and fully illustrated with 67 photographs, neatly all taken by

*Continued on page 160*



# LETTERS



SIRS:  
In response to your invitation to submit photographs of natural history, I am herewith enclosing two pictures. One is a photograph I took of a group of Rocky Mountain Sheep in Kootenay National Park in the Canadian Rocky Mountains,

the other a picture of a screen that was made from this photograph. The pictures were taken with an inexpensive camera, without telephoto lens.

HARVEY A. SARTORIUS  
Rockville Centre, N. Y.



SIRS:  
The beautiful glass models of microscopic life shown in the American Museum are my husband's favorite among all your wonderful exhibits. He is a surgeon, now a Lieutenant Colonel in the Medical Corps of the Army. I want to express to you my pleasure in forwarding to him the December number of NATURAL HISTORY. . . .

(MRS. WILLIAM H.) MARION B. FIELD  
Brooklyn, N. Y.

SIRS:  
I have been much impressed by your article, "Design for Swimming," in NATURAL HISTORY for October, 1942. I intend to refer to it in my lectures on Comparative Physiology of Vertebrates. . . .

DOUGLAS H. K. LEE,  
Professor of Physiology  
University of Queensland,  
Brisbane, Australia

SIRS:  
As a teacher of invertebrate Zoology I find NATURAL HISTORY to be the most valuable of all magazines, and my students look forward to each issue. I especially enjoyed in the December number "Universe Through a Microscope—The Protozoa" by Roy Waldo Miner, and the articles on snails by Doctor Gregory published in the last few years.

PRISCILLA F. POLLISTER  
Columbia University,  
New York, N. Y.

SIRS:  
. . . Since my son has been overseas we have been receiving the magazine and have enjoyed it very much. When we have finished with the copies, we send them to one of the schools, where they get a great deal of information out of them.

When they are through with the magazines, we get them back, as we are saving them for Paul to read when he returns from somewhere in the South Pacific. . . .

I thought the above information might be of interest to you, as we really get double out of our magazines.

(MRS.) H. H. NODINE  
Warren, Ohio

\*\*\*\*\*

## VICTORY BOOK CAMPAIGN

Books are recognized by our military leaders as part of our fighting equipment. Between January 5 and March 5 special effort is being made to secure them. The types specified as being in greatest demand are current best sellers, adventure

and western, detective and mystery fiction, technical books published since 1935, humorous books, and pocket-size books. Collections are being carried on in every town in the United States, with libraries acting as the receiving centers.

\*\*\*\*\*

### NOTICE—

Readers are encouraged to submit their own photographs of natural history subjects. Those selected for publication on this page will be paid for at \$1.00 each, with full credit to the photographer. Return postage must be included.

## LETTERS

Other unsolicited comments of the month:

*From a science teacher:* "Your magazine is of inestimable value and interest. . ."

*From a U S O Director:* ". . . We find a good deal of interest among the men and women in the service in this fine type of magazine."

*From an executive with one of America's foremost newspapers:* ". . . Congratulations on the most beautifully made magazine in the country."

*Also:* ". . . I find your magazine of great interest and very educational. Most of the subjects in it are those that I am interested in and make a hobby of."

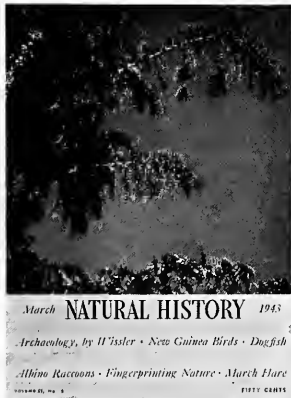
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". . . The quality of your articles and the photography place NATURAL HISTORY above all others in this field. . ."

". . . One copy is worth the subscription price. . ."

## COVER THIS MONTH



The golden blossoms of the Gum Arabic Tree of India (*Acacia arabica*) are seen in late winter or early spring over a range from central Asia and Arabia to Mediterranean Europe. The Kodachrome by Te Ata on the cover was taken in California in February.

This is one of the sources of gum arabic; two other trees produce what is known as true gum arabic, *Acacia senegal* and *Acacia catechu*.

Gum arabic is used in the manufacture of marshmallows, adhesives, and inks, and in pharmacy. The tree depicted also furnishes the substance for Arabian lacquer, and its bark is used in tanning in northern India. It belongs to the Pea Family (Leguminosae).

## BOOKS Continued from page 158

the author; and 18 species are shown in full color. All of the photographs are excellent with the exception of that of the Fly Agaric on page 31. On page 81, figures 49 and 50 appear to be interchanged. In the beautiful colored plates, it is perhaps hypocritical to state that the gills of the Common Field Mushroom are too blue,—not pink enough; and that the Chantarelle (*Cantharellus cibarius*) is too pale. The specific name of the Orange Chantarelle is consistently misspelled five times in the book. This reviewer likes the name "Coral Mushrooms" for the Clavarias better than "Club Fungi," for only an inconspicuous few are club-shaped. The author states that *Lactarius piperatus* is a perfectly edible mushroom. Although I have eaten 35 or 40 species of wild mushrooms, I have never tried this one on account of its peppery taste when raw. Perhaps this acrid taste disappears on cooking. The last section of the book is devoted to mushroom cookery. On the whole this is an excellent guide, and it is small enough to slip into one's side coat-pocket.

CLYDE FISHER.

## THE GREATEST EYE IN THE WORLD

----- by A. Frederick Collins

D. Appleton-Century Co., \$3.00

WITH this title and with the jacket and frontispiece depicting the dome of the new 200-inch telescope, one would expect a goodly portion of the book to be devoted to the Palomar Observatory, but only the last chapter is. We do have a book, however, entitled *The Glass Giant of Palomar*, by David O. Woodbury, which is almost entirely the story of the great 200-inch mirror.

The scope of the present book is indicated by the first sentence of the author's preface: "While many books have been written about telescopes and the celestial marvels that are revealed by them, there has not been one, in so far as I am aware, that deals with the inception and development of the great observatories, their equipment, past performances and present programs and personnel." The author should know that a great deal of this is to be found in *Stars and Telescopes*, by James Stokley, and *Men, Mirrors and Stars*, by G. Edward Pendray.

If the manuscript had been read by an astronomy teacher or amateur, a number of unfortunate little mistakes would have been avoided, such as captioning and listing the 40-inch reflector at the U. S. Naval Observatory as a refractor, and giving six inches instead of about two as the diameter of the mirror of Newton's larger telescope. The movement of a telescope in the horizontal plane is in azimuth, not in "altazimuth," Herschel's metal mirrors were never "resilvered," a spherometer does not measure the "thickness" of a lens or mirror but its curvature; in astronomy the equinoxes are points on the celestial sphere, not times of the calendar; the vernal equinox does not occur on March 16 but about March

21; the earth does not have two equatorial bulges; and Saturn does not have more satellites than any other planet.

A large section of the book is devoted to stories of the origin, development, and work of our great observatories, and these provide interesting and dependable reference material.

CLYDE FISHER.

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## Natural History Magazine

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## Answers to Questions on page 154

1. The stilt, well named because of its long legs.
2. New Guinea is the largest island in the Pacific.
3. Tree rings differ chiefly because of variations in climate. A dry season produces a thin ring, a wet season a thick one.
4. False. It snows on or near the equator in many parts of the world on high mountains.
5. Gum arabic is a vegetable product derived from certain acacias and useful in adhesives, confections, inks, and other compounds.
6. A dogfish is a "pocket-size shark." A mud puppy is an American salamander, and a male catfish is still a catfish.
7. The peacock lays no egg at all. It is the pea hen that does.
8. The photograph shows quartz, a crystal used extensively in radio communication.



*April*

# NATURAL HISTORY

1943

*Lost Worlds Reborn • Fishing Bats • Monkey Business*

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# PLANT LIFE

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Photograph courtesy of Edwin Way Teale

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## The Museum Meets the Public

---

WHEN science was very young, the gap between scientist and layman was very narrow. It could be bridged by a general education which was still capable of embracing all available knowledge. And the scientist was a scholar in all subjects.

As science advanced the gap widened. General knowledge fell to the bottom of the crevasse, and the layman became unable to reach across.

We have come to realize that this divorce between expert knowledge and public comprehension is one of the severest obstacles to the further progress of civilization. Our problem is how to fill the chasm so that scientist and layman may join again and move forward hand in hand towards a better future based upon a wiser use of what we know and shall learn together.

There is no general solution for the problem, applicable to all disciplines of thought. It must be separately solved for each major branch of learning. Our question is how to achieve a solution for the sciences of natural history through the medium of the public museums. What we must find or create is a common ground on which scientific knowledge meets public experience.

In their own history all sciences have sprung from such common ground. Newton watched an apple fall, and the seed of modern physics sprouted in his mind. Two entirely different, but both very feasible approaches to a renewed contact between science and layman are suggested by this incident.

We might arrange our introductory exhibits as a review of the history of knowledge from its simple beginnings in everyday experience. Science might step back into its own past to pick up the layman where he was left behind in the maze of increasing knowledge and retrace with him the path which has been followed, so that he might arrive, step by step, at an understanding of our knowledge of today. This type of historical approach has been very popular in education. But it has the drawback of poor economy of time and effort. Much of the knowledge which

was needed to negotiate the lower slopes on the climb to scientific understanding is useless at the peak, but has to be carried again when this method of teaching is followed.

A less fortunate variation of the historical approach was inspired by the theory of evolution, which states that not only human knowledge of nature, but also nature itself started from simple beginnings. We might therefore take, as our own starting point for an introduction to the sciences, the origin of the earth and evolution of life which followed. But we were looking for a common ground on which scientific knowledge and public experience of everyday life might meet. Nothing could possibly be farther from this experience, or from public concern, than the planetesimal birth of our globe or the primeval emergence of life on its surface. This approach is distinctly for the scientist himself, not for the layman. The starting point is simple only to the scientific mind but extremely remote and complex in terms of familiar, lay knowledge.

So let us return to Newton under the apple tree. Let us grant that his apple has fallen and been adequately accounted for. But let us follow his example. Let us look at the apples which fall today, the leaves that turn red in autumn, the roots that sprout in the spring, the bee that builds its hive, the chicken that will not lay eggs, the dust-cloud that rises behind the plough that cuts the prairie. Let us attempt to explain to our visitor these familiar everyday phenomena with which he is already so well acquainted. Let us try to do it by reducing the best of modern knowledge to the simplest possible terms, without cumbersome detours into the past of scientific childhood.

By so doing we would immediately break down the feeling that our subjects are futile and remote. We would create the satisfaction of a newborn understanding of things seen daily as a matter of course. We would establish a common interest and a common basis of elementary knowledge from which we can lead on into a deeper comprehension of more complex and distant things.

*A. E. Barr*

*Director, the American Museum  
of Natural History*

# LETTERS

SIRS:

Being an amateur archaeologist, I found your article, "How Science Deciphers Man's Past" (in the March issue, by Dr. Clark Wissler), very interesting and instructive. Even though I have long admired NATURAL HISTORY, my interest is now even greater. I can safely say that this is the best reference I have ever seen dealing with ancient aborigines. . . .

KURT F. LOESCH.

Hightstown, N. J.

\* \* \*

SIRS:

. . . For quite some time I had been looking for some sort of a nature magazine but seemed unable to find just what I wanted. Then one evening I happened to pick up the January issue of NATURAL HISTORY at the home of a friend, and I immediately concluded that this was the magazine for which I had been looking. I decided to enter my subscription immediately, beginning with the January issue, and it was with unrestrained enthusiasm that I awaited my first issue.

It was Mr. Teale's article on insects in winter, with the excellent photographs, that intrigued me. I attended Mr. Teale's lectures in Buffalo on *Near Horizons* a few weeks ago and find that in both his writing and his lectures he has a new, attractive, accurate, yet not technical, approach to the subject. Please publish more of his entomological articles soon.

. . . In closing, let me add that I find your magazine most interesting, from the beautiful natural-color covers right through to the last page. . . .

EVELYN WERICH.

Eggersville, N. Y.

\* \* \*

Other unsolicited comments of the month:

"I wish to tell you how much pleasure your NATURAL HISTORY Magazines have given me, not only for their popularity but for their scientific interest as well."

\* \* \*

" . . . your publication is one of the best on the market."

\* \* \*

" . . . You have an excellent magazine, and I hope its standard of excellence can be maintained during these difficult times."

\* \* \*

"NATURAL HISTORY has brought great pleasure to myself and family. Every issue maintains its value. . . ."

\* \* \*

" . . . I should like to congratulate you on this magazine, which is really excellent."



SIRS:

After reading the interesting story about "Ivan and Abdulla" in the March issue of NATURAL HISTORY Magazine, the thought came to me that you might be interested in an albino of a different kind. This is

a Florida striped skunk (*Mephitis elongata*), a true albino (not a black hair could I find), with pink eyes and pink toenails. The defense glands had been removed.

J. M. HOLLISTER

Schenectady, N. Y.

SIRS:

I can't help expressing my particular appreciation for Doctor Pope's "Ivan and Abdulla," as it carried me back to my boyhood pets. I had most of our local wildlife from 'coons to rattlesnakes, but one of the most interesting and amusing was a female 'coon raised on a bottle as were the two albinos. . . .

I never saw any mammal imbued with more curiosity than my pet 'coon. One day I brought a large 'possum home and laid it down to see what the 'coon would do. There lay the 'possum playing dead, with eyes closed, mouth open, and saliva dripping. The 'coon immediately started investigation by running first one arm down the 'possum's throat, then the other. But she next made the mistake of her life. She stuck her nose in. This was too much for the 'possum, which clamped down on

her. When I had pried the 'possum's jaws open, the 'coon went up the nearest tree like a scared cat, and it was several hours before I could coax her down.

The thing she enjoyed most was a boat ride and frog hunt. She would sit in the bow while I paddled the boat close to the river bank, and she never missed seeing and capturing a frog. She would swim back to the boat, climb in, and devour the frog; then she would take her place in the bow to watch for another.

One amusing thing she never failed to try to do was to wash a toad until it was fit to eat. She would scrub and scrub, then put it in her mouth and froth as if she had a mouthful of soap. Back would go the toad for another washing and another taste. She would look at the toad with a puzzled expression as if to say what kind of a frog was that. . . .

With best wishes for the continued success of NATURAL HISTORY, which no home should be without. . . .

D. P. LE FEVRE

State Roads Commission,  
Cumberland, Md.

**NOTICE**—Readers are encouraged to submit their own photographs of natural history subjects. Those selected for publication on this page will be paid for at \$1.00 each, with full credit to the photographer. Return postage must be included.

SIRS:

The enclosed photographs of Indian Pipes were taken and finished by a young nephew in Ottawa, Canada, who sent



▲ INDIAN PIPES have lost all their green coloring matter, or chlorophyll, which plants need in order to manufacture food from the soil. Lacking this, they have to live on dead organic material. Thus they are called saprophytes, in distinction to parasites, which derive their sustenance from living organic matter



Photos by Stanley Metcalfe

them to me, knowing my enthusiasm for wild flowers in general and the charming Indian Pipe in particular.

When Royal S. Kellogg, who is a member of the Museum, saw them, he suggested that your magazine might be able to use them.

Stanley Metcalfe is about 17 years old and has been an enthusiastic and clever amateur photographer for several years. He is especially interested in plant and insect life as subjects.

W. G. MACNAUGHTON.

New York, N. Y.



▲ THEIR white, waxlike appearance leads some persons to suppose that Indian Pipes are fungi, like puffballs and mushrooms. But they are flowering plants, and they produce seeds. Strangely enough, they belong to the Heath family, along with the blueberry and huckleberry. As the seeds ripen, Indian Pipes straighten up . . .

◀ . . . UNTIL at length they might better be called Indian Cigarette Holders. They make attractive table decorations and will survive indoors if taken with the roots. They must not be handled, however, because they turn black when even slightly bruised, as can be seen to a small extent in the photograph above. They also blacken on drying

The rationing of paper and other materials used in magazines and books is a circumstance to which publishers throughout the country are adjusting in the concerted effort to hasten victory and peace. Already there are fewer pages in NATURAL HISTORY Magazine; further reduction may be necessary. Readers are

asked to be patient if conditions beyond our power interfere with the normal production of the Magazine. The materials and energies diverted are being applied to the task of saving, among other things, the American ideal of freedom and truth in public education.—Ed.

LETTERS

Adventures of  
**LONGINES**  
THE WORLD'S MOST HONORED WATCH

The watch that slept  
two winters in the snow

In 1910 a New York banker got this Longines watch as a birthday gift. He was proud of it because it was one of the first Longines "moisture-proof" watches to be made. Then he lost it and two winters were to pass before he would see it again.

One day his son was mowing the lawn when something shiny on the ground caught his eye. It was the long lost watch, none the worse for its long sleep of two winters in the snow. His son wears it proudly today, a very perfect timepiece that has run for 31 of its 33 years of life.

The experiences of hundreds of thousands of Longines owners have made the reputation of Longines watches for keeping good time for a long, long time. It is a reputation that has been abuilding for 77 years.

Longines-Wittnauer Watch Co., Inc., New York, Montreal, Geneva; also makers of the Wittnauer Watch a companion product of unusual merit.

*Longines*

WINNER OF 10 WORLD'S FAIR GRAND PRIZES  
AND 28 GOLD MEDAL AWARDS

The beating heart of every Longines Watch is the Longines "Observatory Movement," world honored for greater accuracy and long life. \*Enc. U. S. Pat. Off.





*A new building of the Bell Telephone Laboratories*

## Reason for Confidence

**M**ORE than ninety per cent of American scientists are engaged in beating the Germans and Japanese.

More than ninety per cent of American scientific laboratory facilities are devoted to the same task.

American scientists are working at this job six or seven days a week, long hours, with few interruptions.

They are getting somewhere, too.

Every now and then the Germans and the Japanese have an unpleasant surprise.

They find that American science has caught up with them and passed them.

It is reassuring to us and discouraging to our enemies, for American scientific

facilities are the greatest in the world. And they are functioning.

Little by little, some of the things that have been developed become public, but most of them you won't hear about until after the war.

But now, without the details, you can have faith that American research — industrial and academic combined — is rapidly giving our fighting forces an advantage.

Along with other American industry the Bell Telephone System has its own Bell Laboratories — the largest in the world — working overtime for victory.

**BELL TELEPHONE SYSTEM**



*Your continued help in making only vital calls to war-busy centers is a real contribution to the drive for victory*

# NATURAL HISTORY

*The Magazine of the American Museum of Natural History*

FREDERICK TRUBEE DAVISON, President

ALBERT E. PARR, Director

VOLUME LI—No. 4

★ ★ ★ ★ ★ ★

APRIL, 1943

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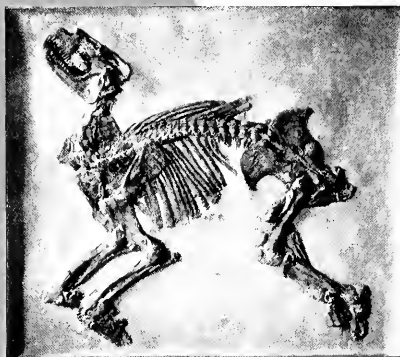
# FROM ROCK TO

By JOHN C. GERMANN

Staff Artist, American Museum of Natural History

## How the scientific artist brings a prehistoric animal to life

► A DRAMATIC example of the challenge and inspiration in reconstructing lost worlds: remains of the prehistoric animal named *Scarrittia*, which enabled science to fill in a gap in the story of ancient times



AMNH Photo

### Six steps leading to the artist

1. Fossils are found in most parts of the world, but the chief problem is getting at them. The master fossil-exposer is erosion, which scours away the surface of the earth, especially in badlands and deserts. The scientist has been quick to learn this. You are apt to see him in gullies like those shown below, searching in the bright silence for fossils—the fragments that form the tattered pages of the earth's history

2. The end of a bone protruding may be his only clue, but removal of the surface occasionally reveals a complete skeleton. The material encasing it may be soft sand or rock much harder than the specimen itself. Special brushes, awls, and chisels are used in uncovering it

3. When the specimen is cut free, it

is splinted and bandaged with cloth dipped in flour paste or plaster. Then it is crated and shipped

4. In the laboratory a preparator removes the bandages and carefully chips away the encasing rock

5. The scientist now studies the fossil. He compares it with many others and draws upon the published findings of other scientists working on similar problems. He and the artist frequently confer, for it becomes evident that a restoration will be possible

6. Before putting brush to canvas, the artist must diagram the anatomical features that make this animal different from others living and dead. Only when he has made detailed sketches of all its unusual features does he feel free to proceed with the over-all restoration

FOUND in an extinct ash-filled crater in Patagonia, this heavy-limbed beast had lain in its tomb for some 30 million years. Its sturdy, massive head and shoulders suggest the slow, calm manner in which it grazed over its prehistoric landscape. The beast's fore legs are longer than its hind legs, giving it a sloping back, which ends in a stubby anticlimax of a tail.

The country where our animal lived was in general a gentle, rolling land, covered with good pasturage. The slow-moving animals must have been content as they traveled along in loose-knit herds, apparently having little to worry about.

However, as spring passed into deep summer, the intense sunlight that warmed them dried up the shallow pools of water dotting the plains. Day by day, thirst forced the grazers to wander farther and farther afield.

We shall probably never know exactly when and how they first discov-

### 1. EROSION

John S. Nichols



### 2. DISCOVERY

AMNH photos



### 3. BANDAGING





A.M.N.H. Photo

▲ **TRAIL'S END:** the past re-enacted. Drawing on the resources and detailed studies of specialists, the artist reconstructed in full the scene of an ancient tragedy, as described below

ered the lake in the volcanic crater. Perhaps some strong, young animal, attracted by the fresh, cool currents of air blowing down from it over the hot, dry plains, led the little band up through the break in the rim of the crater.

The herd, plodding over the dusty slopes, probably broke into an awkward run at sight of the lake. The older and wiser animals scanned the bowl of the crater perhaps for signs of danger but, seeing none, proceeded to the water, drank deeply, and fell into the restful mood of that silent place.

The herd lingered on through the

closing hours of the hot afternoon, refreshing themselves on the water, and were tempted to rest in the coolness of the lengthening afternoon shadows. Then a strange thing came to pass.

With the setting of the sun, the breeze of that long-ago day probably dropped to a flat calm, even as it so often does today, and thin vapors rose from cracks in the floor of the sleeping volcano. The fissures had doubtless been hidden until now by the strong sun glare. And though the vapors had been issuing all along, the breeze had carried them harmlessly away. As the air grew calm, the deadly

fumes started to fill the bowl of the crater from rim to rim. The animals that lingered were doomed. Those lying down succumbed first, entering upon their age-long sleep as the deepening vault of blue slowly changed to the velvet black of night.

The salient features of the landscape above are based on actual geologic evidence. The weathered rim of the volcano is still traceable today. The ancient lake is gone, but its bed, consisting of sediments deposited by the long-gone water were traced and mapped at the time the animal was discovered by the well-known paleontologist, Dr. George Gaylord Simpson. The volcanic gas vents, or fumaroles, which killed the animals are a common feature in similar craters today and can be studied in many parts of the world.

#### 4. PREPARATION

#### 5. STUDY

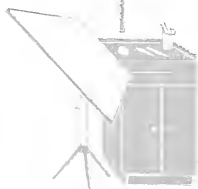
#### 6. THE ARTIST



## Preliminary Sketches

THESE informal drawings illustrate the interesting sort of problems that arise and must be solved before the actual drawing is undertaken. The question was how to represent this animal succumbing to the poisonous fumes known to have killed it in the volcanic crater described on the preceding page.

Some modern animals drop their forequarters to the ground first, others their hindquarters. But since *Scarrittia's* family tree vanished from the earth many millions of years ago, it was impossible to draw from existing forms. It was a safe assumption, however, that if the gas hung low to the ground, those animals that were drinking would have fallen first. So the poor creature was sketched in every conceivable posture that the known facts of his anatomy would permit, before the most realistic and likely pose was chosen.



## The Reconstruction of a Prehistoric Rodent

TOMORROW the animal will sit for its portrait. That is a big day for the scientific artist, and if you look in upon him you may sense that it is. Much has gone before, and he is eager to begin work on the final task.

Were he about to paint the portrait of a person, he might be thinking how great was the responsibility of putting a likeness on canvas for posterity. As it is, he feels a great responsibility, but time is reversed. He is about to bring an animal to life that has been dead for 40 million years—an animal that no person living or dead has ever seen, an animal that will be viewed "in the flesh" for the first time on his canvas.

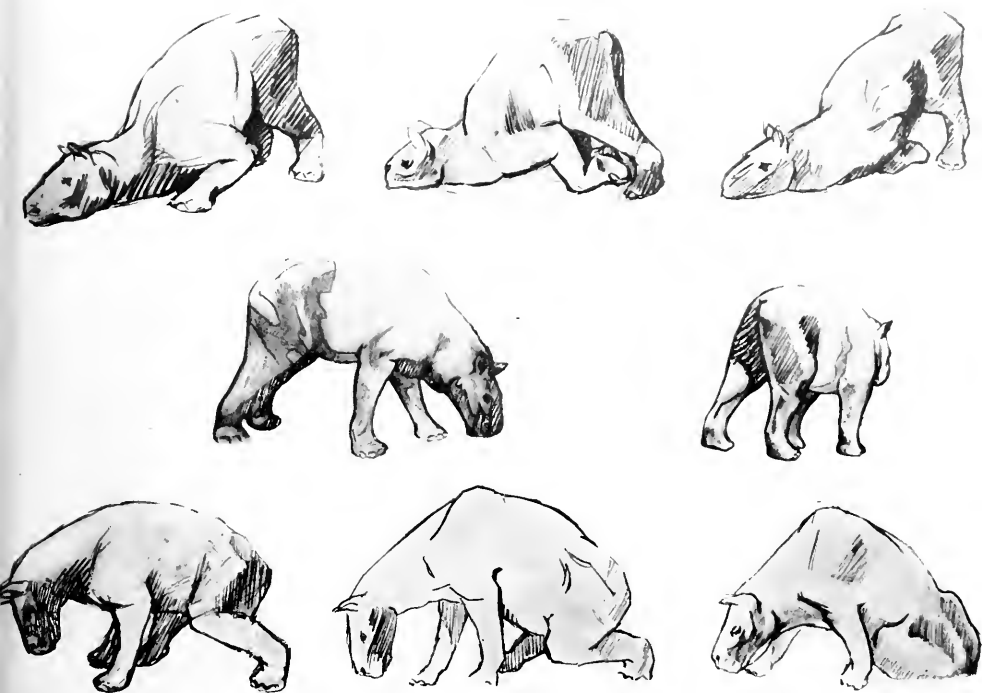
When Leonardo da Vinci examined a sea shell imbedded in the rock of

a mountain top, he rightly concluded that the rock of that mountain had once formed the floor of the sea. His trained observations and logical deductions told him that the creature which once occupied this shell must have lived in the sea. The ocean had not visited the mountain within the memory of man; there was only one conclusion to draw. This shell was very, very old—so old that it had turned to stone and was a fossil.

So it was that an artist was among the first men to be intrigued by the study of paleontology. He was a forerunner of the students to come, and his work indicated the basic requirements for this most fascinating science—trained observation and the ability to link together fragments of a remote past.

You will see that our scientific artist knows exactly what he is doing. After the long hours of backbreaking work by the fossil diggers, there followed seemingly endless weeks when specialists sorted and studied the material in the laboratory. All the science that went before into the restoration of animals related to this one is reapplied with new insight.

We see him revolving a skull in his hands, holding it in one position and then another to change the lighting. Now and again he comes back to a particular spot on the bone, which has occupied his attention for many days. In a tray near by lies a small fragment of bone. He examines the surface of the skull through a low-power binocular microscope. The lines he has been drawing on it form a



pattern. He fits the small bone onto the large, and we see him relax. He is certain of its position. He knows how the jaw should hang, where the muscles were attached, how it moved in life.

The light has grown dim by now, and the skull will have to wait until morning for the exciting work of drawing the portrait. Unlike the impatient tribe to which the artist belongs, the skull has had much practice in waiting. Some 40 million slow years of measured sunsets have gone by since it started its career as a fossil.

There had been a quick, swirling flood and a landslide, then darkness—and the everyday worries of our animal of long ago were at an end. When the floodwaters subsided, he was definitely started on the way to

becoming a fossil. Deeply buried, he was well protected from the attacks of wind, sun, and flesh-eating beasts. The underground forces disposed of the flesh and neatly applied the proper minerals to replace the bone.

The land where a stream had flowed became a lake bottom. The lake, in turn, dried up, and the plant world grew over the deeply buried fossil. Mountain ranges came into being and cut off the moist winds that nourished the plants. The plants died, and the landscape became a desert.

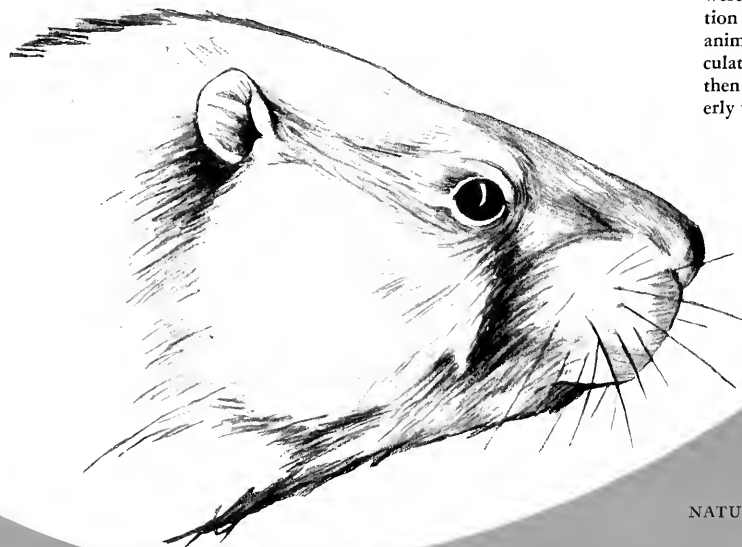
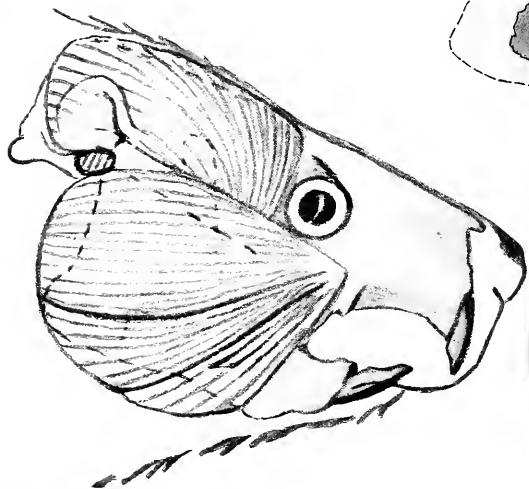
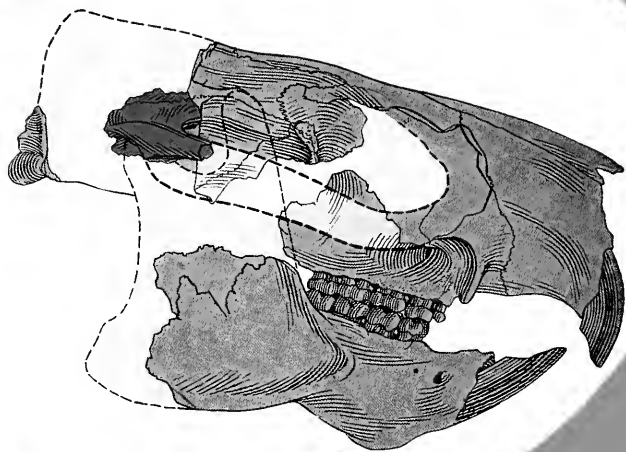
The infrequent rains were no longer gentle but came once more as brief, violent downpours. With no plant roots to protect the earth's surface, erosion, the master carver, took the stage. Thus began the long but final phase of our fossil's return to sun-

light. One day a corner of it emerged from a bank into the air of the outside world.

That is where an explorer found it. If he had not, the air would in time have destroyed it beyond recovery.

To realize how exacting is the thought and work that goes into the restoration of a prehistoric animal, you would have to follow the specimen from the place where it was discovered into the laboratory and thence to the artist's studio. This is a long trail. Every step is performed by people who are as much intrigued by this vocation as is the man who is to do the portrait. A quick summary of these earlier steps in its journey to the artist's studio is given at the bottom of the preceding spread. Here we pick up the story and carry it on.

## Bone to Muscle to Fur

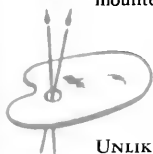
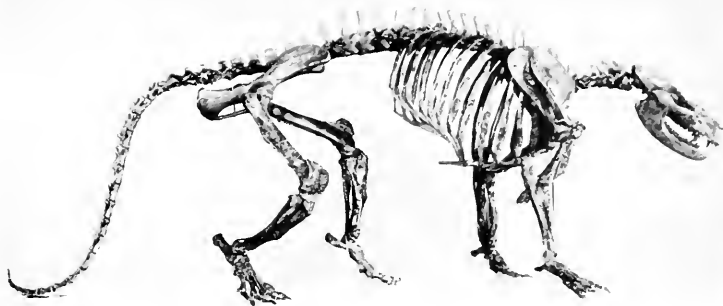


THE SMALL BONE marked in color on the skull above was the key to the facial lines of *Manitsba tanka*, a prehistoric rodent. Days of close work were needed in order to fix its position so that the artist could place the animal's jaw and draw in the musculature on the center sketch. Only then could he clothe the face properly with fur as in life (*below*)

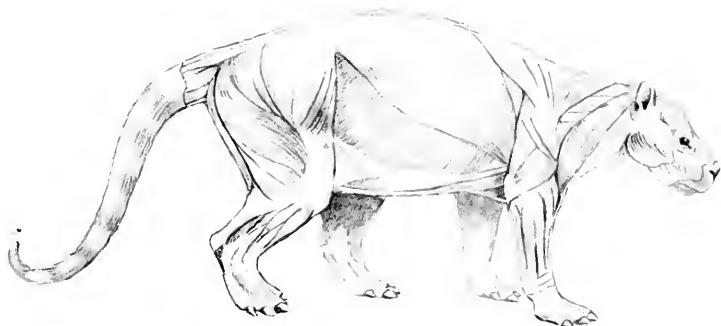


## Three Stages

THE SAME TRANSITION from skeleton to musculature to fur is shown below as applied to *Ectoconus*, whose rebirth on canvas is traced step by step on the following pages. *Ectoconus* is one of the oldest mammals to be seen mounted in any museum



UNLIKE AN ARTIST portraying a modern animal, the one working on a prehistoric creature must start with the bare skeleton. With great inventive and mechanical skill the laboratory artisan has put this mass of brittle fossil remains together in a correct and lifelike striding posture (*top picture*)



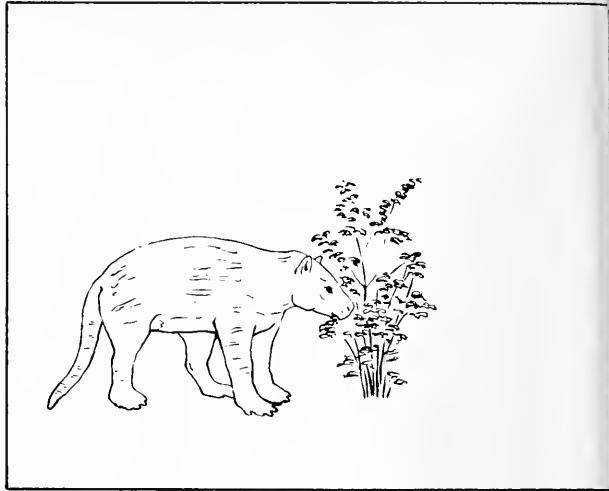
► THE POSITION of the muscles, often all but obliterated by time, must be determined, often with the assistance of the comparative anatomist

► WITH THE OUTER LAYER of muscles in place, there remains the problem of giving the animal its rightful covering. In the case of some animals actual fragments or impressions of the hide have been preserved. But if these are lacking as is usual, the climate in which it lived and a host of biological considerations are taken into account. The artist is now ready to place the animal in its proper background and render the entire scene in full color





An analysis of the steps that are taken in a complete restoration must surely dispel the old fable of the mad scientist retreating to a secluded tower with a small fragment of fossil bone, emerging some time later to startle the world with a model of a strange creature complete in all details. As you have seen on the preceding page, almost the entire skeleton of the animal was at hand. The remaining steps in the process are all performed with as much care as were the earlier ones.

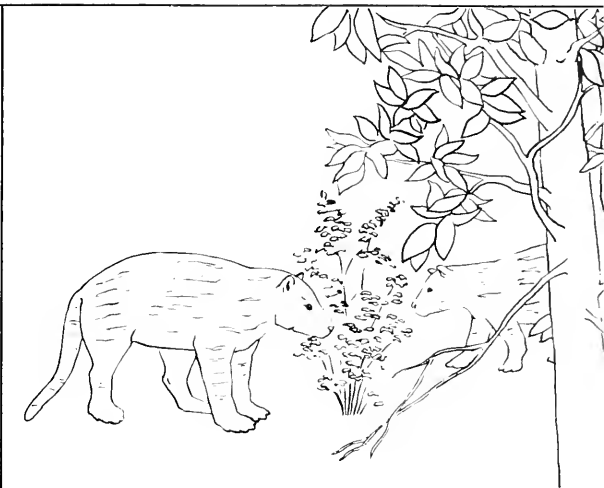
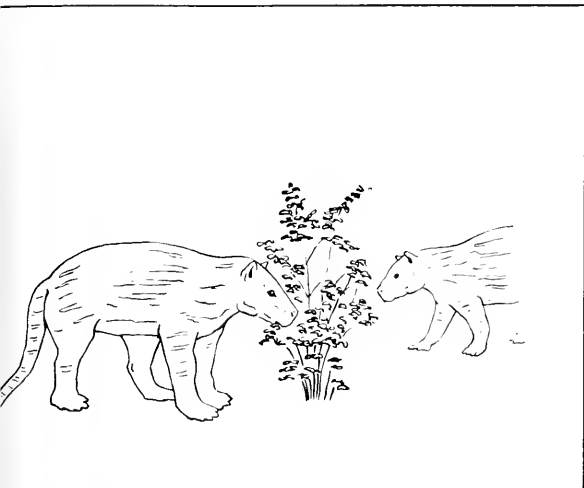


▲ THE FIRST STEP is to choose a pose that will portray the characteristic physical features of the animal to best advantage. The animal must also be placed on the canvas in such a manner as to form an interesting and pleasing composition



▲ IN ORDER TO SHOW the relative size of the animals and at the same time give authentic variety to the environment, a soft-shelled turtle was placed in the foreground. This familiar turtle is found in the same geologic formation as *Ectoconus*

▲ CERTAIN PALMS were also known to have existed during the time *Ectoconus* was on earth. These and other tropical growth were placed where they would lead the eye out into the more open country beyond the forest. The question of whether such a palm would grow near such a moist locality as is depicted for *Ectoconus* was satisfactorily answered, and the finishing touches were put on the picture



▲ NEXT, in order to lead the attention from the central feature of the picture into the surrounding country, it was decided to include a partner for *Ectoconus*. This second animal, walking into the picture, would serve to show *Ectoconus* in motion, and his entry would suggest a larger extent of marginal forest than could otherwise be indicated

▲ THE EVIDENCE revealed that *Ectoconus* lived among trees of a sort whose descendants flourish today—the chestnut oak. In including this vegetation in the scene, a position was chosen where the tree would be clearly discernible and where a rather strong balancing area happened to be needed

▼ THE COMPLETED PAINTING shows a prehistoric scene which human eyes never beheld, yet it is scientifically accurate in all essential details. Such a painting

takes longer than one of, say, a pair of cows in a field, but the artist who penetrates the dark corridors of time takes a special satisfaction in his accomplishment



▼ THE DINOSAURS are representative of a vast host of cold-blooded creatures that overran the earth long before the appearance of the remote ancestors of our present-day animals. The three illustrations reproduced here show how the artist, before painting an animal, makes a complete model of it, using the mounted skeleton as a basis

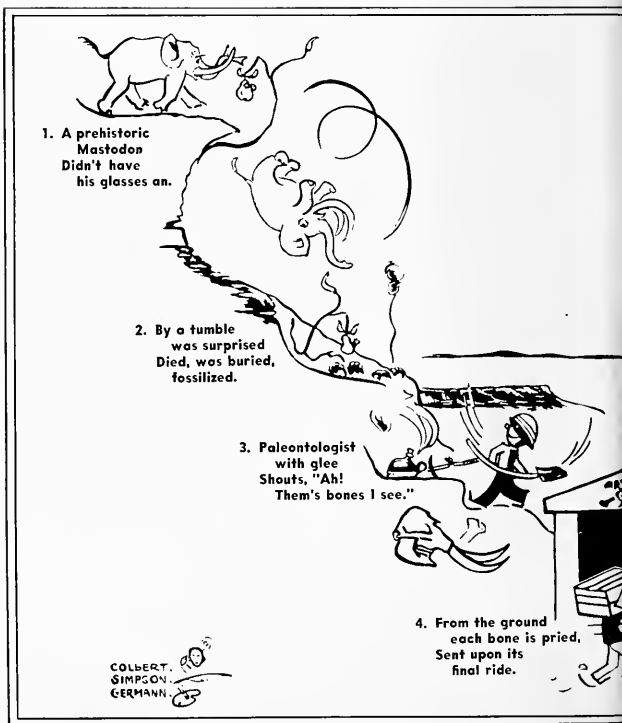
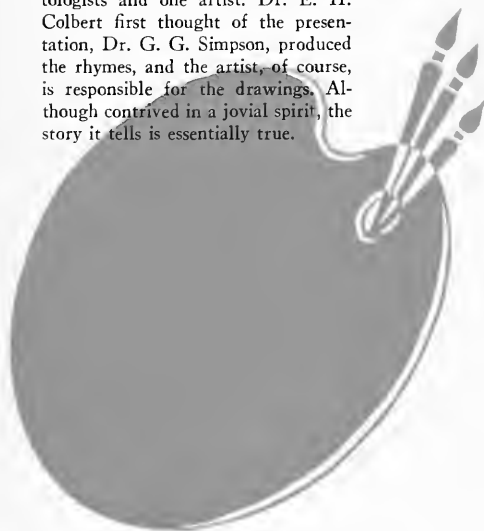


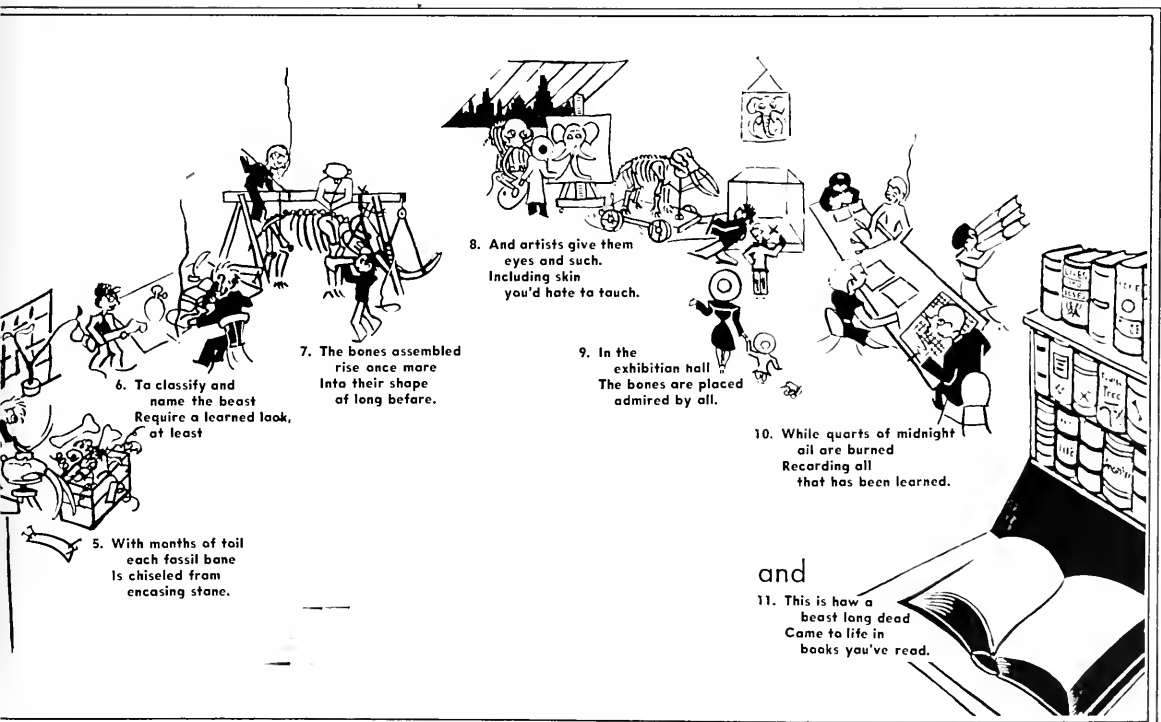
A.M.N.H. Photos

▲ WITH THE SKILL of an anatomist and the balanced judgment of a truly great artist, Charles R. Knight created these models primarily to enable him to get the proper distribution of light and shadow in his final painting

► THE FAMOUS KNIGHT RESTORATION of this dinosaur, *Trachodon*, from the Age of Reptiles, demonstrates the soundness of the artist's judgment and more than justifies the care used in his approach to the subject. Without the models it might not have been possible to achieve the intense realism of this masterpiece

For a quick review of the science of rescuing prehistoric animals from oblivion, the following pictorial condensation in a lighter vein is offered. It is the work of three men—two paleontologists and one artist. Dr. E. H. Colbert first thought of the presentation, Dr. G. G. Simpson, produced the rhymes, and the artist, of course, is responsible for the drawings. Although contrived in a jovial spirit, the story it tells is essentially true.



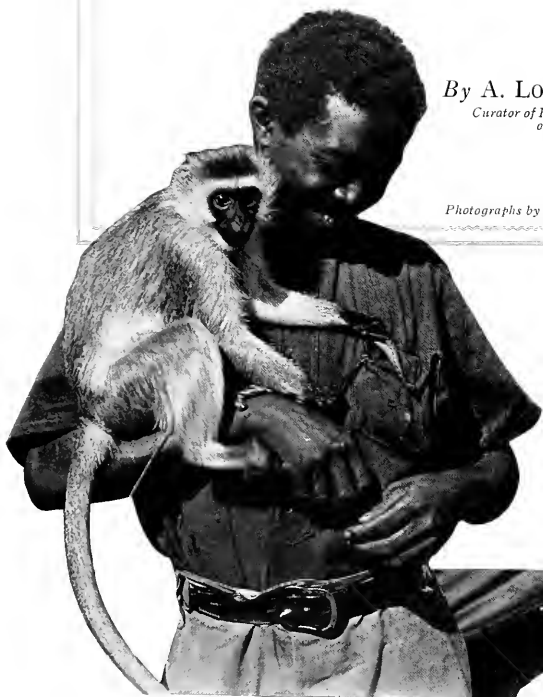


# Monkey business

By A. LOVERIDGE

Curator of Reptiles and Amphibians  
at Harvard's Museum of  
Comparative Zoology

Photographs by Carl Akley



▲ CURIOUS, intelligent, and impetuous, the green monkey or guenon attracts the attention of all who see him. These primates have lightweight bodies and long legs and arms

➤ "VANITY, VANITY"—is it in the monkey too? He dearly loves a mirror, but is puzzled and intrigued by what he sees

Most captive animals are glad to return to the wild, but even war may fail to dislodge the guenon monkey from the scenes where it learned to live with man

WHEN you hear of war sweeping through a land, your concern is usually for its effects on the human family. Few ever pause to consider what becomes of family pets and zoo denizens. Pet-keeping in the tropics is much more commonplace than in temperate climes, where circumstances tend to restrict it to such prosaic creatures as the cat or dog, canary or parrot. Should you land at an East African port, for example, there is a reasonable chance of your being accosted by a native who has a *tumbili* for sale. *Tumbili* is the Swahili equivalent for Johnston's Guenon.\* This is the commonest of African monkeys, *Cercopithecus aethiops johnstoni*. The little fellow has a buffy-olive colored coat, a grayish-white waistcoat, white eyebrows, and an alert black face.

When the tide of war rolled over German East Africa (now known as Tanganyika Territory) in 1916, the retiring Germans liberated many of their captive animals. In such circumstances most creatures gladly revert to



a feral life, but not the monkeys! It is probable that their own kith and kin refuse them admission to their roving bands. Be that as it may, the fact remains that the liberated monkey becomes a mere hanger-on of mankind—a simian parasite for the nearest humans, whose company he craves yet hesitates to share.

My first acquaintance with such a foot-free monkey was at Morogoro, when temporarily billeted in a cotton warehouse opposite the station. A score of East African Mounted Rifles who had been there for some time, left shortly afterwards, so for a while I had the place to myself—as I thought—, inheriting a comfortable bed and other furnishings abandoned by my comrades. I very soon learned, however, that loneliness was not to be my lot! One afternoon a little black-faced guenon dropped five feet from a loft above and landed with a thud upon my cupboard.

It happened that I was resting beneath my mosquito curtain, convalescing from malaria, and was unnoticed by the monkey, who, with a grunt of satisfaction, leaped to the table. Here he picked up a piece of bread, held it to his nose, and wrinkled that organ considerably. Apparently the food passed the censor with ease for it disappeared like magic. Next the raider sniffed at a recently used soup plate, licked it, and rejected it as being no good; then, taking a third of a loaf, he bounded back into the loft with the remainder of my bread ration for that day!

For three weeks this animal was the plague of my life. When all was quiet he would come and sit on a buttress beam, ten feet away—silently watching. If I feinted at throwing something at him, he promptly disappeared through a foot-high hole, only to return a minute later to grimace at me. He took to pelting me with grains of maize, and I would reply with anything handy; I never hit him, but I smashed one window and lost my boot behind a ton of cotton bales for 24 hours! I think that he really enjoyed having things thrown at him, but the moment my back was turned, down he would drop to steal something which his sharp eyes had selected. The whole neighborhood was up in arms against him, at least those on his visiting list. Some tried to make me responsible because the little beast decided to share the same roof, select-

► HE'LL CAJOLE YOU one moment and steal from you the next. But don't try to poison him, for he's quick to detect its presence. If you're a realist, you'll cater to his largely vegetarian tastes, expecting to have your household blitzed and yourself pelted with any article he may choose to throw at you



► THE GUENONS are affectionate and greatly attached to their young, risking their own lives in an attempt to protect them. Once acquainted with a person they enjoy human companionship



ing the deserted cotton ginnery upstairs for his headquarters.

At first I attempted to drive him away—a very futile proceeding. Rats would partake of cyanide placed on bread, but the monkey would only sniff at it, eat the bread, and leave the poison. Once he carried an especially attractive morsel mixed with treacle up to the loft and threw it down at me with apparent disgust. He knew all about condensed milk, would steal a tin and, ascending to the roof, hammer the can on the galvanized iron in a vain attempt to get at the contents.

After I moved upstairs, he became so bold that he would come through the window and snatch bread off my plate as I was sitting reading at the table. This audacity caused his downfall, for I encouraged him to enter through the window by generously proffering bread and treacle day after day until his suspicions were somewhat allayed. The fact that I could ill-afford to spare the food gives some indication of my desperation. Even-

tually I set a noose in the window, with one end of the cord attached to my foot beneath the table. At the critical moment I jerked the cord and my enemy was snared. Instantly he sprang out, but on feeling the noose tighten around his neck, he promptly seized the cord above his head, clambered up it, then sat in the window frame gibbering at me in the manner which has earned the guenons their name. I led him quietly across the room and tied him to a piece of machinery until he should become accustomed to captivity once more. The following morning I gave him away.

Shortly afterwards I was put in charge of a camp on the lower slopes of the Uluguru Mountains, adjacent to the Fifteenth Stationary Hospital, and so came to make the acquaintance of another ownerless monkey. Jenny, the simian Houdini of Morogoro, was known to all monkey proprietors in the district. Many times she had been in bonds, but always escaped. Yet she made no attempt to join the roving

\* Pronounced to rhyme with anon, with a hard g and a nasal ending.



# Birds of the *FIJI ISLANDS*

The Whitney Hall Exhibit of the Month

**S**LIGHTLY smaller in total land area than Lake Ontario, the Fiji Archipelago, pronounced "Viti" in the native language, is one of the largest and most beautiful in the Pacific. Most of the more than 200 islets comprising the group are of volcanic origin and are fringed by coral reefs which are broken by openings opposite the mouths of streams.

The five mountainous and heavily-wooded islands (Kandavu, Viti Levu, Ovalau, Vanua Levu, and Taveuni) are richer in bird fauna than any of the other islands in Polynesia. Fifty-four species of native Fiji land birds are now known. Only birds known to be able to undertake long colonizing flights are found there, such as parrots, pigeons, kingfishers, and starlings. Fiji's possession of four genera and sixteen species found nowhere else indicates the considerable age of these islands. Most of these birds are restricted to the mountains, while the common birds of town and village are of widespread or recently introduced kinds.

Fiji lies outside the limits of perpetual southeast trade winds, and the mountains of the larger islands, attaining an altitude of up to 5000 feet, are sufficiently high to produce somewhat different types of climate on the windward and leeward slopes. The vegetation is luxuriant—far richer in species than that of more easterly Pacific islands—and is chiefly of the Indo-Malayan forest type. The relatively large native population is of mixed Melanesian and Polynesian stock. The group became a British colony in 1874.

The exhibit was obtained through the co-operation of John Sheridan Fahnestock and the late Adam Bruce Fahnestock on their Pacific Expedition of 1940.

◀ **FIJIAN LORIES**, brilliant red and green birds, perched on a vine near a "dakua," a pine closely related to the famous kauri of New Zealand

▶ **THE EXHIBIT** represents a site on Viti Levu, the largest island. From the slope of Mt. Korombamba, at an altitude of 1408 feet above sea level, we look southwestward across the water towards the island of Mbengga. The date is July, in the heart of the trade-wind period. Perched high in the branches near the center is a golden or bright orange dove. It is not a native of Viti Levu but occurs only as a straggler from the neighboring islands of Vanua Levu and Taveuni

*AMNH photos*



▲ ON A ROCK overlooking a steep incline rests a Silky Dove. The exhibit portrays fifteen different species of birds, most of which are small or medium in size. The numerous plants characteristic of the region include various ferns and a pink orchid. The Fiji archipelago embraces more than 200 islets

# The Creation of an Indian Jar

By TE ATA

POTTERY-MAKING among the American Indians has always been a woman's craft, although certain ceremonial vessels must have been made by the men. The potter's wheel was unknown on the American continent until brought here by the white man from the Old World, and it is still unknown to the native tribes. Indian pottery is made by the so-called "coil method."

In the olden days pottery was made to some extent by most of the tribes of the United States, except those in the Great Plains area. Among the Indians who followed the buffalo and were almost continuously on the move, breakable vessels were not practical. It was among the agricultural tribes that pottery attained its greatest development. Although beautiful pots were formerly made by the New York State Indians and by those in southeastern United States, the craft is still carried on among the Pueblo Indians of the Southwest where it has reached its highest art.

Pueblo Indians live in villages (*pueblo* is the Spanish word for *village*) in northeastern Arizona, where the Hopis dwell on flat-topped mesas, and in the Rio Grande Valley of western New Mexico.

Some of the New Mexico pueblos are also located on tops of mesas, such as "The Sky City" of Acoma. The largest pueblo is Zuni, one of the famed Seven Cities of Cibola, located near Gallup. There are about 16,000 Pueblo Indians, living in about a score of pueblos. The buildings of the pueblos are made of sun-dried brick, or adobe, the walls usually being plastered with mud. These dwellings, which are quite permanent in this "land of little rain," may be from one to five stories high (the first "apartment houses" in America), and in some cases as many as several hundred Indians may live in one building. They subsist chiefly on corn, beans, and squashes, which they raise near by.

While pottery is still made at the various pueblos, the most famous pottery maker in the Southwest is probably Marie Martinez of the small pueblo of San Ildefonso, located about 20 miles north of Santa Fe. The vessels that Marie makes are decorated by her husband, Julian,—the black pots being decorated by a method invented by Marie. The designs used are in many cases the same as or adapted from those of the old Basket Makers, who preceded the present pueblo-dwellers. Every piece that Marie and Julian make is a beautiful museum piece.



Photo by Harold Kelogg

▲ THE HISTORIC PUEBLO of San Ildefonso is situated near Santa Fe, New Mexico. One of the foremost native arts of the Southwest reaches a high level of perfection

in the pottery produced by the Indians of this village. When first seen by early Spanish explorers in 1598, San Ildefonso village was within a mile of its present site



A.M.N.H. Photo

▲ ONCE SEEN, the celebrated black ware of San Ildefonso will readily be recognized wherever it is found. It has a distinctive sheen like that of black lacquer, with designs rendered in a soft, frosted surface. Many pieces of this beautiful ware have found their way into museums and homes throughout the country

▼ MARIA AND JULIAN MARTINEZ (*see cover*) are among the most distinguished artists of the village. They find the best clay far from the village, as shown below. It is never removed from its bed without first sprinkling the place with blue corn meal with a prayer. The clay is

then placed in a bag and carried home. There it is ground and winnowed to remove gravel and other impurities and is mixed with a fine tempering material. This is a friable gray sandstone, which also has to be pulverized (*below*). Maria knows just the right proportions





▲ WATER is added to make a paste. Maria mixes the ingredients with as much care and skill as an expert pastry cook making a pie. Meanwhile at her side a young girl of the tribe absorbs the lore of pottery-making in typical Indian fashion, doubtless dreaming of



the day when she can carry on the art that has made her people famous. Note the turquoise and silver bracelets and necklace Maria wears, characteristic of the native-made jewelry prized by the Southwest Indians. The paste must be kneaded to just the right consistency

*All photos by Clyde Fisher*



▲ NO GLAZE is used on this pottery. The beauty and sheen of the vessel depend upon the slip—a thin clay paste—which Maria is applying above with a brush. This is red, although the finished ware will be jet black



▲ IMMEDIATELY after the slip is applied, the surface is polished with a very smooth pebble of quartz, which has been in use a long time. A shiny red finish results, and the vessel is now ready to be decorated



▲ ALL INDIAN POTTERY is made by the coil method. The potter's wheel was unknown in America before the coming of white men and has not been adopted. To the wonderment of spectators, Maria always pinches off just enough clay to make a coil that will reach once around



the jar without overlapping. A gourd spoon is used to give the final shape. The base of the pot is molded beforehand like a mud pie. About eight minutes are needed to mold a vessel. Next it is placed in the sun and allowed to dry until it is thoroughly hardened



▲ THE PAINT for black pottery is a mixture of white earth and a vegetable gum made from the Guaco, or Rocky Mountain Bee Plant, which Maria is gathering here. It is related to the old-fashioned spider flower



▲ JULIAN, whose specialty is painting the designs, makes his brushes of yucca leaves. Here he is fraying the end to make it absorbent. He usually uses two sizes, one for finer lines, the other to fill in solid areas





*Photo by Te Ata*

▲ WITH PAINT about as thin as water, the designs are painted on the polished surface of the vessel—in this case a beautiful shallow platter. Julian draws freehand and always makes the circular pattern come out even



*Photo by Harold Kellogg*

▲ WHEN 40 OR 50 vessels are decorated they are set on a crude grill platform for the firing. This is the last time they will be seen red with white designs, for this treatment changes their appearance



*Photos by Clyde Fisher*

▲ THE FIRE is kindled and allowed to burn vigorously for 20 minutes before any move is made to smudge it and force the smoke into the pottery



▲ THEN it is completely covered with fine fuel and tended for another 20 minutes. Thus the carbon of the smoke is driven into the pots to give them the black color desired





▲ THE VESSELS are placed upside down and are protected at this stage by sheets of metal to keep the fuel from touching them. Another sprinkling of corn meal accompanies Maria's prayer for a successful firing



*Photos by Clyde Fisher*

▲ THE FUEL is piled all over and thrust beneath the grate. Dried cow dung is used, with small quantities of cedar bark inserted in order to give the fire a good start. It is most important that there be abundant smoke



▲ HOT WORK. Maria now takes out the sheets of metal, while Julian throws on ashes. The whole kiln is now completely covered and no smoke arises



*Photo by Harold Kellogg*

▲ AFTER COOLING awhile, the pots are removed, the ashes dusted off. All shine with a beautiful ebony luster—perfect examples of the ware that has made San Ildefonso famous

# Wildlife of Tanganyika

Attractive scenes of Africa  
from Akeley African Hall

*All photos AMNH*

As every visitor realizes who has seen them in the American Museum of Natural History, the 28 habitat groups in Akeley African Hall constitute a composite image of Africa. In them one sees the varied and spectacular wildlife of an entire continent, true to nature in every scientific detail and portrayed with a degree of artistry unexcelled anywhere in the world.

Visitors are immediately aware that not only the animals but many of the foreground accessories such as trees, grass, sand, and rock were brought from the very spot in Africa they portray. Ranging from desert to jungle and from mountain to plain, these exhibits offer a broad lesson in geography as well as in the natural history of the vast land that was called the Dark Continent before the originator of this Hall, the late Carl Akeley, popularized the phrase Brightest Africa.

◀ "CAMEL" OF EAST AFRICA, the gerenuk. The camel can go for days without water, but the gerenuk is said not to drink even in the well-watered Tanganyika country. Its long neck and limbs are well suited to the life of this aberrant member of the antelope family. The gerenuk is a wanderer found from Somaliland to Kilimanjaro



► THIS GERENUK might have been selected by Grimm for one of his fairy tales. Its scientific name, *Lithocarpus walleri*, may seem long, but so is the animal when it reaches for its diet of twigs and leaves on the uppermost branches of the rich Tanganyika bush. The horns of the buck (opposite) are heavy and have a peculiar forward curvature at the tips. The coat is red-fawn, with a broad band down the back. The gerenuks are found in small herds



▼ NATURE DID NOT GIVE the female impala horns to protect herself. But the male has large lyrate ones. In the group are shown four stages in the development of the male horns. This animal, unlike the gerenuk, requires a great deal of water. Impalas associate in herds in the parklike acacia forests of Serengeti Plains. They are noted for their grace and their habit of taking extraordinary bounds when alarmed. It is interesting that both the impala and the gerenuk are related to the gazelle, though they do not look alike



# Uncle Sam's Prize Fur

▲ EVACUATED because of the war: the village of St. Paul, chief settlement in the fur seal islands



◀ A BULL SEAL roars his anger at the intruding cameraman

# Factory Closes Down

By BEN EAST

*All photographs by the author*

▲ A HAREM of more than 100 cows belonging to the large bull at the left: a characteristic scene along the beaches of the Pribilofs. During the breeding season the bulls neither eat nor drink for three months

Two million fur seals gathering each spring on the lonely Pribilofs in Bering Sea form one of the world's great natural history exhibits. This year they will find their human neighbors gone

THE biggest and most profitable fur farm in the world, Uncle Sam's huge, natural seal ranch on the Pribilof Islands of Alaska, is shut down, probably for the duration.

The bleak and foggy Pribilofs, whose great herd of fur seals has yielded in recent years a cash crop valued at \$2,000,000 to \$3,000,000 annually, are unpeopled now for the first time since their discovery by the Russians in 1786. The seals had the rocky beaches to themselves last summer, unmolested by the Aleut killing crews that have taken the harvest for more than 150 years.

The United States Navy evacuated the native population of the Pribilofs to a place of greater safety in southeastern Alaska last June, and sealing operations came to an end. It is not likely they will be resumed while the war lasts. The Pribilofs are outposts,

highly vulnerable to surprise raids. This is the first time since 1916 that the Government has failed to take its harvest of seal skins on the historic Bering Sea Islands of mist and blood.

There is, of course, a slim chance that Japanese landing forces which established themselves early last summer in the western islands of the Aleutian chain, some seven hundred miles from the Pribilofs, may have invaded the fur seal islands and killed as many seals as they could in a flying visit. If that has occurred, however, the American Navy, keeping watch at its Dutch Harbor base less than 250 miles to the southeast, has made no announcement of the raids.

There are two reasons why Tokyo might be tempted to try a raid on the Pribilofs. The first is an ancient grudge, held by Japan for 37 years. In 1906, when the United States was

waging a losing fight to protect the dwindling seal herd and before pelagic sealing was banned by a four-power treaty signed by this country, Great Britain, Russia, and Japan, Japanese poachers gave American agents on the Pribilofs considerable trouble.

Aleut sealers on St. Paul Island finally fired on a party of Nipponese poachers that came ashore in heavy fog, killing five or six. The incident created a sharp exchange between the two governments, and from that date to the present war the Aleuts of St. Paul and St. George dreaded Japanese vengeance.

The second reason for a raid on the islands is the fur itself. Japan has kept a covetous eye on the growing herd in recent years. In the fall of 1940 she served notice she would terminate, a year later, the treaty forbidding pelagic or open-sea sealing.



◀ **ST. GEORGE**, a smaller village than St. Paul, is also deserted now. The seal herds begin along the beach a mile to the right of this picture and extend along the shores of the fur seal islands for many miles. The boat in the foreground is a native baidarka, made of canvas stretched over a wooden frame. Originally sea lion skins were used. Early Russian influence is seen in the church at left



◀ **LIVING BEYOND THE TREE LINE**, the few white families on St. Paul nevertheless grew vegetables in a community garden in the summer of 1941





▲ CHILDREN on St. Paul Island brought together by a lollipop party: a cross section of the population now removed

to a place of greater safety in southeastern Alaska. Some plainly show their heritage of mixed Russian and Aleut blood



➤ COWS, PUPS, AND BULLS crowd the breeding grounds in a thick, bawling horde

▼ LUNCH TIME. Within two days after the expectant mother arrives at the fur seal islands, in late June or July, she gives birth to her single offspring. As the pup grows, she returns from the sea at intervals to suckle it as shown below



If certain Chinese and American strategists are correct in believing that Tokyo contemplates a surprise attack on Russia, then Japan may well have a double reason for wanting to take the Pribilofs and hold them long enough to slaughter 200,000 to 500,000 seals. Remembering the bitter lesson learned by her German ally on the Russian front in the winter of 1941, she may want fur clothing for a Siberian army badly enough to risk a big-scale raid on the seal islands. There is no storehouse of fur in the world to compare with them, as Tokyo well knows.

The Pribilof seal herd is one of the great wildlife spectacles of the world.

When Gerassim Pribilof discovered the islands in 1786, an estimated four to five million seals lolled and bawled and fought and bred and suckled on the rugged, boulder-strewn beaches of St. George and St. Paul.

Reckless over-killing without re-

gard to sex or age so reduced the herd in the first 20 years that the Russians found it necessary to suspend killing for two years in 1806. In 1822 provision was made for the protection of enough young seals to serve as breeding stock. By 1834 the herd had yielded 1,800,000 pelts, and another crisis arose. All sealing operations were halted once more. From that time on the Russians killed no cows.

When we acquired Alaska in 1867, it was estimated the seals numbered hardly fewer than two million. A troubled period followed. Pelagic or open-sea sealing took such a terrific toll that the herd was down to 125,000 animals in 1911, when years of protest and controversy on the part of the American Government finally brought the four-party treaty banning pelagic sealing. In return, we ceded to Great Britain, Japan, and Russia 15% each of the annual take of pelts.

Russia later dropped out of the agreement when we did not recognize the Soviet Government after 1918. She has never undertaken any sealing operations at sea, however. The 15 per cent clause of the treaty was observed with Japan and Canada up to the outbreak of the present war.

Careful management of the seal herd and the killing of none but young bachelor bulls has achieved one of the most spectacular results in the history of wildlife restoration. The 1941 census of the herd showed 2,250,000 animals. The 1939 take was 60,000 skins, that of 1940, 65,000. In the summer of 1941 we harvested 95,000 pelts.

The American fur seal herd has no other land home than the Pribilofs, and no seal sets a flipper ashore from the time the animals leave the islands in the autumn until they return in spring.

The mature bulls make a short migration and are first to return. In



← THE BIG-EYED YOUNG are covered with short black hair and are known for their appealing ways

a mild winter they may spend the entire year around the islands. In severe winters they drift south to the Aleutian Islands or the Gulf of Alaska.

In late April or early May the beach masters begin to arrive and come ashore. Each selects his harem ground for the season, and for 90 days he does not leave it to drink or feed.

By early June the cows arrive from winter haunts as far south as California, almost all pregnant from the previous summer's breeding. As they come ashore the bulls coax, drive, or carry them into their harem areas; and as the migrating cows arrive by the increasing thousands, the noise and fighting and confusion mount to a frenzied climax.

The harems are crowded close together, so that the cows of one harem literally touch those of the next. The bull makes every effort to keep his harem from straying, and his methods of domestic discipline are by no means gentle. Since he weighs 350 to 450 pounds and the cows only 70 to 75, he is in a position to enforce his will.

Within six to forty-eight hours after she arrives, the cow gives birth to a single black pup, and within an-

other five or six days she is in heat and ready to be bred again.

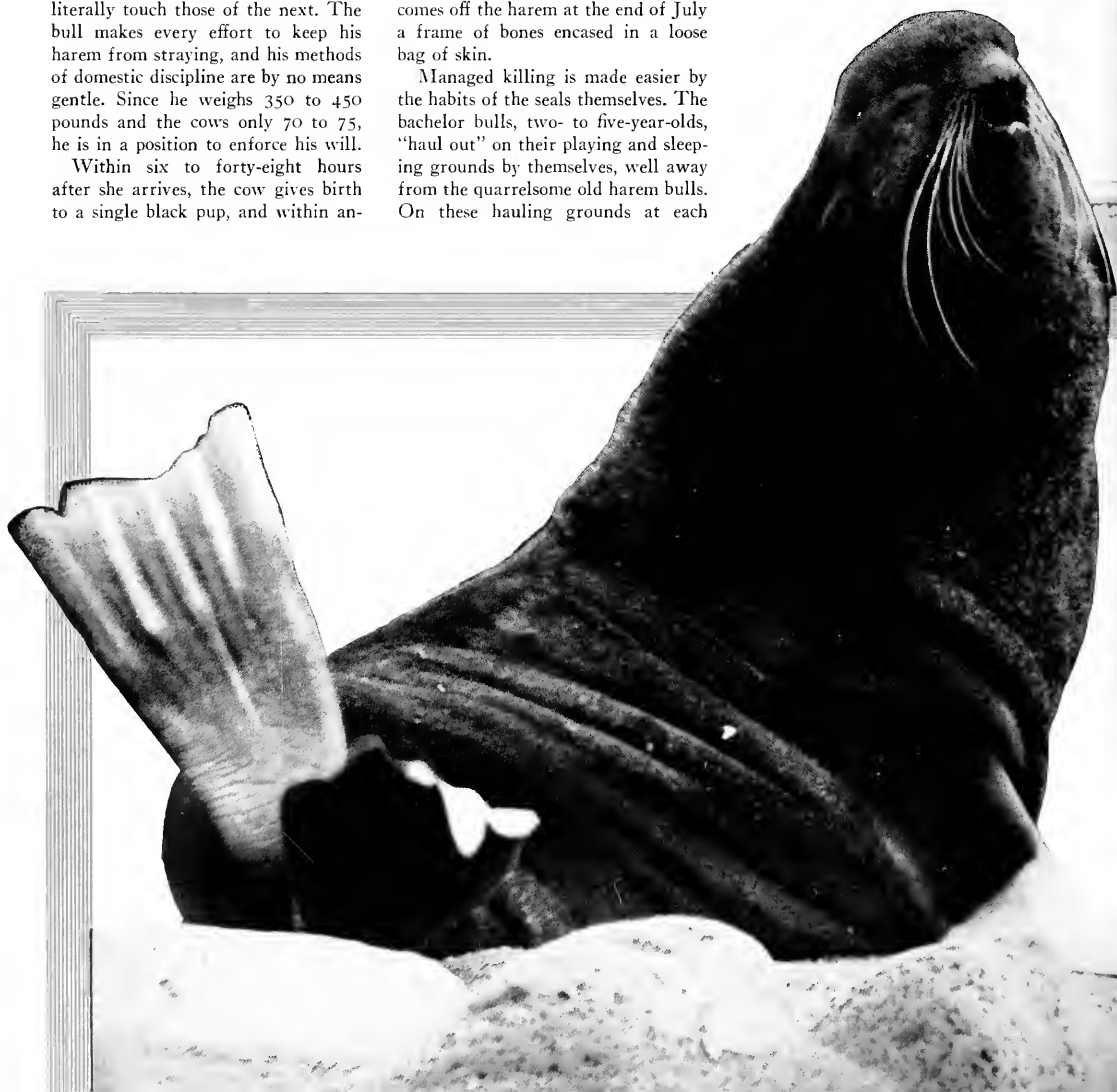
After mating, the cow is no longer of interest to the bull and is permitted to return to the sea to feed. She comes back ashore every so often to single out her pup from the thousands in the teeming rookery and suckle it.

Harems range from one cow to well over 100, depending chiefly on the location and herding instinct of the animals. For three months the harem master remains almost continuously on the alert, guarding his home area, collecting cows, riding herd on them, fighting his neighbors, fending off the raids of younger "idle" bulls not quite old enough to collect a harem in the hard way. He accomplishes this without eating or drinking, and without sleeping much, and comes off the harem at the end of July a frame of bones encased in a loose bag of skin.

Managed killing is made easier by the habits of the seals themselves. The bachelor bulls, two- to five-year-olds, "haul out" on their playing and sleeping grounds by themselves, well away from the quarrelsome old harem bulls. On these hauling grounds at each

rookery the Aleut sealing crews round up the youngsters and drive them inland to level ground where thick grass will protect the pelts from volcanic cinder. The driving is done in late evening or early morning, to avoid the "heat" of the cool foggy days. Three-year-old bachelors are chosen for the fur. Others in the drive are rejected and allowed to return to the sea. The work is as efficient as that of any modern slaughterhouse and as humane and swift as it can possibly be made.

Later the pelts are collected in trucks and taken to the salt houses in the villages, to be scraped, salted, and shipped to a St. Louis, Missouri, fur dressing firm. The carcasses are collected and put through a rendering





◀ **MOTHER AND CHILD** on a Pribilof beach: a study in curves and countenances

plant which extracts the valuable oil and reduces the rest of the seal to dry bone meal. Nothing is wasted save the flippers, which are too "rubbery" with cartilage and tendons for the by-products plant to handle.

The fate of Uncle Sam's fur seals remains indefinite. Whether they increase in numbers or are decimated is one of many questions hanging in the balance of war in the North Pacific. A few years ago the Pribilofs were so remote that few people knew anything about them. Today they are so close to the turmoil that anyone who reads the papers knows about them. We can only hope that when the turmoil is ended, this great natural resource will remain intact.



**SEAL COURTSHIP.** A cow (*right*) barks her blandishments, while her lord and master (*left*) appears more interested in the photographer. The male is always much the larger animal. From fall to spring not a seal sets flipper on the rocky Pribilofs, and the cows roam as far south as California. Yet the Alaskan fur seal knows no land home other than these tiny dots in fogbound Bering Sea

*Continued from page 177*

bands which often came within sight of her haunts. Jenny was a familiar object at the hospital, where she could be seen sliding down tent ropes, racing through the wards, or perched upon the foot of a patient's bed, refusing to be cajoled within arm's length by tidbits. She preferred to snatch a biscuit or some other coveted object from the bedside table of a dozing man; then she would retire with her loot to the ridge pole of a marquee. This freebooter was also addicted to paying calls on the captive monkeys, whom she alternately fondled and robbed.

I had, at this time, acquired three monkeys of another species (*Cercopithecus mitis albigularis*), and to one of these Jenny became a regular visitor, making friendly advances, then snatching away Kima's food. Frequently insult was added to injustice by the thief serenely eating the stolen morsel within a yard or two of her victim, who, tugging and straining at her chain, would disturb the peace with her piercing denunciations.

On my approach Jenny always took to the trees, but after a time I induced her to sit on the high reed fence surrounding my quarters by holding out at arm's length a pawpaw fruit at which she would furtively nibble. If I attempted to bend my arm so as to shorten the distance between us, instantly Jenny would be a dozen feet away. One day I instructed a native to go to the farther side of the fence and, after I had engaged Jenny's attention with the offer of fruit, seize her by the tail.

"Oh, but she will bite me," he exclaimed.

"Never mind," said I, "you shall have 50 cents (= 12 cents U. S.) if she does."

The plan worked; and when Salimu caught hold of her tail she made no attempt to bite, only threatening to do so and indulging in a "frightfulness" demonstration. Raising her bushy, white eyebrows, she opened her mouth till her lips formed a great round "O," and punctuated this display with menacing chattering. The effect is startling, especially when accompanied by a short rush, but the facial expression is so like a caricature of human astonishment that it is apt to make onlookers laugh—which has the effect of annoying the monkey more than ever!

On the third day of her captivity

Jenny gnawed through the telephone wire that connected her belt to a ring which slid up and down the pole on which was her sleeping box. I recaptured her the same afternoon and substituted a light chain for the wire. After several futile attempts to gnaw through the chain Jenny settled down and became quite affectionate. One day my servant, Salimu, killed a rat as it ran from my tent. He was about to carry the corpse away when Jenny, who had watched the hunt with great interest, evinced so much eagerness to have it that I stopped the boy and

tossed it to her to see what she would do with it. First, seizing the tail in her mouth, she defied anyone to take it from her; then, she subjected the rodent to a critical examination. She opened the mouth and looked inside; next, she examined its fur minutely and appeared to pounce upon some fleas which she may have found there. After this she climbed the pole to her box and sat on top of it with the rat between her knees, nursing it in a manner that was truly comical. For two days she clung to this rat, guarding it closely and defeating every attempt to deprive her of it, despite the fact that it was badly decomposed. Much of the fur had slipped, and bluebottles buzzed about her face as she carried the corpse about! This strange behavior was doubtless a manifestation of some misdirected maternal instinct, for Dr. Ray Carpenter has filmed a pictorial record of a rhesus monkey which carried about the body of her dead baby until nothing but skin and bones remained.

Alas! as so often happens with pets, Jenny's end was tragic. Two months after the episode with the rat there were signs that some food had disagreed with her—she had partaken too freely of jam on the preceding day. In the morning she was lying on her side toying with bits of gravel. I released her immediately, and she took a little milk and sugar; she then went to a washbasin in which she plunged her hands while drinking deeply. I lifted her onto the bed and she bit me. When I endeavored to make her comfortable, she arose and went to the other monkey, throwing herself down beside Kima in a very exhausted manner. The Blue Monkey showed her sympathy by trying to clean Jenny's fur.

The next morning she wandered about the adjacent scrub. Hoping that she might find something by way of medicine for herself, I gave orders that she was not to be molested. At four o'clock she came walking back, and when Salimu laid her on the bed in my quarters she looked most humanly forlorn. Almost immediately, however, she sprang up with considerable agility, climbed a wire rope, hurried across the top of my python's cage, and ascended the pole to her own box. I remarked to Salimu that perhaps she was not as ill as we had supposed. How grossly I had misjudged her was revealed next morning when we found her lifeless body a short distance away.

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# BAT FISHERMEN



By JOHN ERIC HILL

Drawing by

G. FREDERICK MASON

**I**N the spring a man's fancy is wont to turn to thoughts of fishing. Memories of the pleasures of that sport occupy his moments of leisure, sometimes to the detriment of his work. Boys will get bent pins, string, and a stick, almost any stick, or if they are more fortunately situated they will get more suitable tackle, dig for worms or catch grasshoppers, and haunt the shores of ponds and streams. Even the lake in Central Park, New York, will be fished with patience, though to little profit. But the industriousness of fishermen is not greater than their pride in their catches, and each one, young or old, feels strongly the loss of the fish that get away.

Although there are about 1000 different bats, only three are known to be fishers, two of them American. One is the bat shown in the cartoon, the mastiff bat of the American tropics, called scientifically, *Noctilio leporinus*,

It is quite as ugly-looking as the picture, and one of its most noticeable distinctions is its large hind feet with heavy claws. The other species is a bat found on the islands and shores of the Gulf of California, called *Pisonyx vivesi*. So little known is this bat that it has no common name. Long before there was any proof that it caught fish for a living, its large feet and claws, so like those of the mastiff bat, led scientists to suspect that it did. Later the examination of stomach contents and the analysis of the droppings showed that this supposition was correct; in fact, no other remains of food were found but fish.

The mastiff bat lives in caves,

crevices of rocks, or hollow trees, and it does not restrict itself to fish-eating. Many sorts of insects are captured in the air by the bat's big feet and the membrane between the legs and tail. Its sharp-pointed cheek teeth cut up the hard bodies of even beetles into minute pieces, but the food can usually be identified. When these bats live on the sea coast or in other situations where small fish abound, they fly out over the water in the evening, glide down to its surface, and scoop up their prey. If pelicans are also fishing, it is even easier for the bats, for some fish are injured by the birds and others are frightened to the surface.

If a mastiff bat gets knocked into the water or caught by a wave, it swims well and can take off from the water again, unless some larger fish should turn tables and strike the bat.

The fishing bats of the Gulf of California live with petrels in crevices and rock-slides, apparently in harmony with the birds, and they are not known to live away from the sea shore. No one has yet watched them fishing, for they stay in their retreats until after dark and come home before the dawn.

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---

# YOUR NEW BOOKS

SOUTH AMERICA • JOHN BARTRAM'S DIARY • INDIANS  
GARMENT OF GOD • OLD BAY PATHS • PACIFIC BIRDS

## REDISCOVERING SOUTH AMERICA

----- by Harry A. Franck  
J. B. Lippincott Co., \$3.00

AFTER a lapse of more than a quarter of a century, Major Franck revisits the scenes of his earlier adventures. Where on former trips he traveled afoot, he this time covers in a few hours by plane distances which would have taken weeks. Those of us who have enjoyed others of his books will find this no mere repetition. As we might expect, his descriptions of places and people hold the reader's interest, are timely, and have the added advantage of his earlier experiences. Some people may disagree where he expresses his own likes and dislikes. For instance, those of us who are partial to Chile and the Chileans will regret some of his remarks of a more personal nature, although on the whole he does give a clear general picture of that country.

It is interesting to note the changes which have occurred: remote areas now easily accessible; forests changed to farm land; the development of "nationalism" in the various countries; the lessening of local differences in costume and customs, and many others. Not only is his account entertaining; it is of value to all those concerned with the development of South America.

JUNIUS BIRD.

## THE OLD BAY PATHS

--- by George Francis Marlowe  
With Photographs by Samuel Chamberlain  
Hastings House, \$2.00

THE network of highways between Boston and Hartford were in large part originally Indian trails. On the coming of the white man, many of these were widened to become bridle paths, woods roads, and public roads, and more recently some have developed into the broad concrete highways of today. This is a fascinating little book about "their villages and byways and their stories." The 52 photographs by Samuel Chamberlain illustrating the text are superb and add much to the interest and attractiveness of the volume.

The running story of the origin and routes of these old Indian trails, carried through the pioneer history of New England, is unobtrusively documented by references at the end of the book, and this gives the reader the feeling that it is dependable history. At the same time,

the author has made it very human by including personalities and anecdotes, such as taking as a souvenir the bell from the engine-house, which had been John Brown's headquarters at Harper's Ferry, to Marlborough, Mass., where it now hangs in Grand Army Hall; the romantic story of Sampson Wilder and his preparation of the haven of refuge for Napoleon at Bolton; the account of Jack Straw, the Croatan Indian who had been taken to England by Sir Walter Raleigh and presented to Queen Elizabeth; and the amusing experiences of the celebrated Sarah Knight, a school teacher of Charlestown, who at one time had Benjamin Franklin as a pupil.

The traveler who is interested in the early history of New England will find this an excellent guidebook in unraveling these old paths, especially if he is willing to negotiate some of the way on foot.

CLYDE FISHER.

## NOW THAT WE HAVE TO WALK

---- by Raymond Tiffitt Fuller  
E. P. Dutton & Company, \$2.50

MR. FULLER, taking advantage of the present shortage of gasoline, has provided us with a number of reasons to walk. All of his reasons are excellent ones. They have to do with intimate glimpses of bird, animal, and plant life in the field. Particular emphasis is given to seasonal excursions, and we are informed that the immediate neighborhood, adjacent to our homes, will provide endless opportunities to become acquainted with woodland neighbors.

Mr. Fuller presents a six-point program. The first step suggests that we determine to take up walking, bicycling, and a nature hobby. Second, "buy one or two or three handbooks pertaining to your selected hobby; make the local museum and/or library an additional authoritative reference book on the subject. Third, force yourself to get out-of-doors as often as possible . . . choose at least one ample rambling-range, explore it, learn it . . . always wear your oldest, most worn-out clothes and shoes . . . and like them!"

There are several other points, too, but we are particularly glad that "worn-out" shoes are emphasized. Mr. Fuller no doubt was a prophet who foresaw the coming of shoe rationing.

This is enthusiastic, philosophic writing about everyday wildlife happenings, skipping about from accounts of the author's experiences with bats, opossums, and rep-

tiles to the planting of trees, with a consideration of "America's Gamest Bird," the ruffed grouse, and a chapter entitled "Humility Before Bees." Thrown in for good measure is some advice concerning interior house painting and the rescue of bricked-up fireplaces in old houses. The book is stimulating, interesting, and exceedingly readable.

W. H. CARR.

## KEY TO THE NESTS OF PACIFIC COAST BIRDS

Oregon State Monographs, Studies in Zoology, Number 4

----- by Elmo Stevenson  
Oregon State College, 50 cents

BIRDS' nests offer an attractive field for study, and there is much to be learned from them even after the birds are through with them. Their wholesale collection, even after the breeding season, is open to some objection, however, for there is no way of assuring that the nests are taken after the birds have left. Game laws are justified, therefore, in prohibiting their collection or possession except under special permits.

Nevertheless, nests may be studied in the field, and for the species of birds found on the Pacific Coast the present booklet will be found very useful. It classifies the nests according to their materials, shape, size, and position, and gives the number and color of the eggs as contributory data. Photographs of the nests and eggs of 75 species are shown on the plates, as preserved specimens or in their natural positions, and form a useful adjunct to the text.

JOHN T. ZIMMER.

## THE INDIAN SPEAKS

----- by Marius Barbeau and Grace Melvin

The Caxton Printers, Caldwell, Idaho, and The Macmillan Company of Canada, Toronto, \$3.00

ANY book that conveys with fidelity the thoughts and feelings of one race to another has its place in literature. *The Indian Speaks* is such a book, and the title is an apt one. The myths, songs, and stories of the American Indian hold great fascination for young people and adults as well. Ethnological students have spent years of study in this field, the results of their research having been pub-



lished usually in formidable reports or filed away and not yet available to the general reader.

Doctor Barbeau is anthropologist and folklorist of the National Museum of Canada, and the coauthor is the Head of the Department of Design in the Vancouver School of Art. The authors, who have collaborated in the preparation of the texts and the 40 excellent drawings, have kept themselves in the background and have allowed the Indian to speak for himself. There are contributions by the Rocky Mountain Indians, the Blackfoot, the Iroquoian, and the Algonkian. A few stories are from the Mackenzie River Athapascans. Some are from unpublished texts in the National Museum of Canada.

In the myths we are told "how the world was created, how the Earth-Mother holds up our island—America, how the Great Raven conjured the first people out of a clam shell into the world, how Asentma sang the song of life and brought forth the wild animals."

Instead of abridging the speech of Chief Logan, the Mingo, which won acclaim as Demosthenian from Thomas Jefferson, we wish it had been given in entirety. It is so short, and is generally considered the supreme speech of its kind in Indian history.

A delightful story, especially for those who believe the Indian has no sense of humor, is that of "The Last Pagan," who left his three wives and chose a new one in order to come into the Christian church as a monogamist. As his former wives were all equally fine and valuable, he would not hurt their feelings by an unfair choice.

In this volume we have a well selected collection, carefully documented as to source, that in brief space and readable form gives us a wealth of American Indian folklore.

TE ATA.

## CARNIVOROUS PLANTS

----- by Francis Ernest Lloyd

Chronica Botanica Company, Waltham, Mass.; G. E. Stechert and Company, New York City, \$6.00

THE field of carnivorous plants has always been one of the most fascinating to the student of plant life, as well as to the nature-lover. Much has been written by famous scientists of the past and present on this subject, but the material is so widely scattered that a great deal of time must be spent to bring together all of the published information. Doctor Lloyd does all this in review form, making it readily available in a single book for the benefit of the interested reader, and to it adds the results of his own lifetime of study upon this interesting phase of nature. Here, to quote the author, we have for the first time "an historical review and summary of our present knowledge about the carnivorous or insectivorous plants."

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Above illustration—Nile River Group—Detail showing Antelope  
Akeley African Hall—American Museum of Natural History



### BOOKS

*Continued from page 199*

reader is the part on the structure and mechanism of the different types of insect-traps and the manner of digestion of their prey so far as it is known.

The format of the book is European rather than American in style, but this has much in its favor in view of the subject matter. A great convenience for reference and study is the repeated chapter numbers and headings at the top of every other page somewhat in dictionary style. The only flaw one can find is the antiquated style of placing the plates together at the back of the book rather than within their respective text portions. The half-tones are not of a quality comparable to the rest of the book and do little justice to what must have been excellent photographs.

The book may be highly recommended to the interested student or reader who can afford to indulge in such an unreasonably high-priced book.

E. J. ALEXANDER.

### THE GARMENT OF GOD

----- by John C. Merriam

Charles Scribner's Sons, \$2.00

THE author of this little volume is one of our leading scientists. For many years he taught paleontology and historical geology in the University of California. Since 1920 he has been President of the Carnegie Institution of Washington and Regent of the Smithsonian Institution, having retired from the former position after nearly 20 years of service. Perhaps his dominant interest has always been the influence of nature upon the lives of men, which is the theme of this book, and the concomitant interest in the preservation of our natural wonders.

This book has been written from the standpoint of the poet and philosopher, with his feet always on the solid ground of nature. The third chapter, entitled "Types of Inspirational Influence in Impressive Natural Features," is made up of six essayettes, which remind one strongly of the writings of our literary naturalists, Thoreau, Burroughs, and Muir. The titles of these little essays range widely: "The Beeches of Adams Mill Road," "The Lake Region of England as Seen by Wordsworth," "The Grand Canyon of the Colorado," "Crater Lake," "The Redwoods of California," "The Coming of Spring."

The combination of the scientist and poet is evident in the statement, "While human ideas and ideals must be developed imaginatively they must rest upon facts." Doctor Merriam believes with Keats that "A thing of beauty is a joy forever," and states that "with the development of such a mental state one who has seen the Grand Canyon or Crater Lake or the prominences on the sun will have ever after a new illumination on every subject touched, whether in the vastnesses of great spectacular phenomena or in the smaller things of everyday life." He believes "that a clearer vision of nature will enhance the joy of living."

CLYDE FISHER.

### DIARY OF A JOURNEY THROUGH THE CAROLINAS, GEORGIA, AND FLORIDA, JULY 1, 1765-APRIL 10, 1766

----- by John Bartram  
(Annotated by Francis Harper)

Transactions, American Philosophical  
Society, vol. 33, part 1, \$2.00

JOHN BARTRAM (1699-1777) might be described by some such anachronistic term as "illiterate scholar." A Philadelphia Quaker filled with curiosity regarding the Colonial borderlands, he set down his experiences with a prosy lack of color and imagination that contrasts strongly with the notable literary and esthetic qualities later revealed by his son, William. His knowledge of syntax and spelling were amazingly rudimentary, even for his time. Inconsistency is a first characteristic of his use of language, as exemplified in a minor way by his genius in offering seven different and equally outlandish spellings of "mosquito" in one short journal!

And yet, withal, John Bartram was the first botanist of America, the friend of savants in every Colonial center of culture, the correspondent and peer of men of science in Britain and elsewhere in Europe, including the great Linnaeus, whose unbounded admiration of Bartram is a matter of record. Through his activity in discovery and acclimatization, and the founding of a garden that still survives, his influence has been profound, far beyond the promise of his matter-of-fact narratives.

Accounts of Bartram's several travels have been published in whole or in part, but the Diary of most of the journey of 1765-1766, which took him and "Billy" from the vicinity of Cape Fear, N. C., southward almost to the source of the St. John's River in Florida, has lain in manuscript until the present day. In undertaking its publication, the American Philosophical Society (of which Bartram was a founding member) has been fortunate in commanding the services of so creative an editor as Dr. Francis Harper. With almost chauvinistic zeal, he has actually covered the greater part of the route of the Bartrams, identifying their sites and landmarks even, on occasion, to particular trees of 175 years earlier. The resulting introduction, comments, and annotated index, together with the series of 37 figures, form an illuminating critique and concordance, making the Diary an outstanding contribution to the history, ethnography, geography, zoology, and botany of the pre-Revolutionary southeastern United States.

R. C. M.

### U R G E N T

The Museum Library is in need of back issues of NATURAL HISTORY, particularly the first four issues for 1942. Copies sent to the Librarian, Natural History, New York, will be greatly appreciated.



*May*

# NATURAL HISTORY

1943

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# The Aim of Museum Teaching

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IN the pride of his tremendous technological achievements during the early part of the twentieth century man tended to develop an overconfidence in his mastery of nature and to deceive himself into a feeling of independence of his environment. With our greater mechanical progress it was only natural that this conceit should be stronger and more enduring in this country than elsewhere. Not until the dust bowl threw its black clouds over half of our country did the first significant doubts begin to take root in the mind of our nation.

In other countries the superficial character of man's apparent victory over nature had already long been recognized. In this realization whole sciences and social philosophies had grown up. As the ultimate attempt to evaluate the forces of environment in combination with other factors in man's history, the science of geopolitics was founded in England, only to be miserably perverted and put to evil use by the present enemies of our country.

Today the dangers of our own conceited ignorance, and of the false or evil knowledge of others, have been forcefully brought home to us, and the task of bringing our thoughts on man's relationship to his environment back to fundamentals becomes the urgent duty of all institutions of education and research able to bring their methods and their knowledge to bear upon the subject. Obviously the natural history museums of the country are such institutions, with a particularly important role to play in elementary education for the future and in the general education of the public which has left its school days behind and rules the fate of our country today.

To fulfill this duty, the museums must be willing to attempt, even now, a rapid development of new exhibits with emphasis upon the interpretation rather than upon the mere presentation of nature. To be sure, all museums already contain many exhibits which are not limited to a static display of living or dead objects but also attempt to explain their relationship. But very few museums, if any, have carried this development far enough to be able to offer an at all satisfactory basis for the understanding of nature as a whole which man must have if he is to

establish a happy and enduring relationship between himself and the totality of his environment.

It would appear that the natural history museums themselves fell victim to the conceit of admiring nature more for its charms than for any power it might hold over man. A species which had lost all relation to man's affairs by becoming extinct was for that very reason treated with a reverence in museum display never accorded man's living enemies or friends. Even the subjects explained in the interpretive exhibits have almost invariably been chosen for their fascination rather than for their importance.

Without abandoning our achievements of the past, let us get back to a more realistic appreciation of our mission for the future. Let us remind ourselves and our visitors that in spite of what we are pleased to call man's creative genius, man never can become a producer in the fundamental sense but must always remain only a consumer of what nature provides. With all his ingenuity he is incapable of creating one ounce of substance or one mosquito-power of energy. The best he can do is only to rearrange in new combinations the forces and materials he finds in his environment. Regardless of the advances he may make in the technology of rearrangement he will therefore never be able to free himself of his dependence upon the living and dead nature by which he is surrounded.

It plainly follows that one of the main duties of any institution dedicated to the study of natural history must always be the task of informing the public of the materials present and the forces operating in the natural environment of man, conceived in terms of their harsh realities and not only in terms of their fascination or their beauty. We must attempt to make what is important fascinating and not merely accept the importance of fascination. Without minimizing the great emotional value of teaching the esthetic enjoyments and intellectual relaxations offered by nature, we must recognize that if we let that be the end of our effort we are scarcely giving half of the service of which we are capable. And only the individuals and institutions which give all the service within their powers are entitled to a good conscience and the continued support of the nation today.

*A. G. Barr*

*Director, the American Museum  
of Natural History*



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# LETTERS

Shortage of space resulting from paper rationing necessitates the shortening of the letters department, but every effort is made to preserve a balanced representation of opinion.

SIRS:

I wish everyone might read Dr. Parr's editorial [The Time and the Place for Teaching] in the March number. What he says about cultural education is so deeply true that it would be nothing short of a world calamity if that truth should be forgotten in the stress of war. We recall a long dark time in history when culture was driven into hiding; and whether we consider its refuge to have been in the Church, or in the cloister, or in the Saracenic seats, its light was kept

burning for us. We must hold fast to our museum institutions and the spirit of them if we would not again stumble in a cultural eclipse.

TOM HUGHES.

Banning, Calif.

SIRS:

Readers will be distressed to learn of the recent death of the San Ildefonso Indian artist, Julian Martinez, whose portrait appeared in color on the cover of last month's NATURAL HISTORY.

It will be recalled that, in conjunction with this cover, an illustrated article was published on the pottery-making of Julian and his wife Marie, probably the most famous pottery-makers in the Southwest.

New York, N. Y.

CLYDE FISHER.



BIG BILL, a park pelican of New York, photographed by Jay T. Fox

SIRS:

... My monthly evening off is the evening I find NATURAL HISTORY in the mail. No chores are done that evening until NATURAL HISTORY is read from cover to cover. . . .

I am an engineer engaged in war work and have not had a vacation in three years. . . . NATURAL HISTORY brings such interesting articles and beautiful pictures right to my home that it constitutes a little vacation for me.

ROBERT WOSAK.

SIRS:

In renewing my subscription for the current year to the very interesting as well as well-prepared publication NATURAL HISTORY, I take pleasure in sending my best wishes for the increasing progress of the Institution which edits it, a model in its field, and of the Magazine in particular, also a model amongst the others of the same type. Its informative value is great, and it pleases me to point out the great educative, scientific, and aesthetic merit of the admirable photographs and sketches and suggestions found in all its articles, which stimulate the

study of the marvelous world surrounding us. Across its pages the earth, the sky, the air, and the water manifest the marvelous harmony which exists between all the forms and beings of creation.

I should like to stress particularly, so that this aspect may never be overlooked, the masterly studies dealing with the great biological and geological problems from the standpoint of evolution. . . . I recall amongst them "The Road to Man," "A Fossil Comes to Life," "Design for Swimming," and "Ice Age Winter Resort," without in mentioning them belittling the rest.

In spite of the pessimistic opinions and of the horrors we are witnessing, there wells in the depths of the human soul an instinct to beauty, which knows itself to be indestructible and which surges through the barbarism unleashed by unbalanced and diabolical men, and strives to shine in a new and better world. The hope that it will be so is the only thing which justifies our life, for to the contrary it would not be worth living by ourselves or by our children.

(DR.) ALBERTO E. J. FESQUET.

Buenos Aires, Argentina.

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Above illustration—Nile River Group—Detail showing Antelope  
Akeley African Hall—American Museum of Natural History



Sirs:

. . . I read your magazine from cover to cover, and find it hard to wait for the next issue to arrive. The long period between the June and September issues is unbearable. I wish you would find it possible to publish your magazine every month, but that's probably out of the question.

This will make my third year as a subscriber to NATURAL HISTORY, and my only regret is that I didn't know about it sooner. . . . I subscribed sight unseen. My expectations were more than fulfilled with the first issue.

Keep up the fine work.

WITMER S. HUNT,

Forest Park, Ill.

Paper rationing and other exigencies unfortunately make twelve issues a year impossible.—E.D.

\* \* \*

SIRS:

. . . Regarding the wonderful covers, is it not the special mission of the Magazine to bridge the impassable distance between the Zoo and the Museum for the many people who long to see their treasures but never can? In that field it has

no rival. But is it not stepping outside its special field, for instance, to give us the October "Double Arches?" A striking, handsome cover, but a disappointment to one who eagerly watches for each new magazine and wonders what new bird or animal will be presented. . . .

I love the magazine and will never be without it, as long as I can read. . . .

NELLIE B. PENDERGAST.

Duluth, Minn.

\* \* \*

SIRS:

. . . I was particularly interested in the article on Salton Sea, which appeared in the January number.

I believe I was the first white boy to be a resident of Palm Springs, California, and I well remember seeing the harvesting of salt, from what is now the bottom of Salton Sea, at (old) Salton Station on the Southern Pacific Railroad. . . .

J. S. BORDWELL.

Riverside, Calif.

\* \* \*

SIRS:

. . . We continue to read each new issue of NATURAL HISTORY with unending delight. . . .

CARL T. RAMSEY.

Dorset, Vt.

**NOTICE**—Readers are encouraged to submit their own photographs of natural history subjects. Those selected for publication on this page will be paid for at \$1.00 each, with full credit to the photographer. Return postage must be included.

## Three little words!

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BARRED OWL: An unusual bird portrait by Myrton S. Reed

### THE COVER THIS MONTH



May **NATURAL HISTORY** 1943  
*Mesquite · Cuban's Nightbird · William K. Gregory*  
*Our Only Monk · Insect Gardeners · Smallest Baskets*  
WAGNER & CO. N. Y. CITY CENTER

The two Great Horned Owls decorating the cover of this issue were photographed in Kodachrome by Edward A. Hill, with a Leica camera equipped with a Summar

50 mm. lens. The immature birds are shown in their natural habitat as they appeared at about 7:30 in the morning in early April.

The Great Horned Owl has a wide distribution from New Brunswick to Florida and west to a narrow belt beyond the Mississippi River. And if all the sixteen or more subspecies are considered, the range extends from the limit of trees in Arctic North America to the Straits of Magellan. It is our most powerful and formidable looking owl, a courageous and faithful parent. It does most of its hunting at night or in the dusk, although it can see quite well in the daytime. Even cats sometimes fall victim to its talons. Being exceedingly wary, the Great Horned Owl is not frequently seen during daytime, yet it may come very close to a person under the protection of darkness. Its call, ranging from a deep hooting to a blood-curdling shriek, is most apt to be heard during January and February and again in the autumn.

The Great Horned Owl nests most frequently in the deep woodlands, and the young remain in nest for at least a month. The adults are great rat catchers.—Ed.

*Adventures of*  
**LONGINES**  
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*Pacific Mission - one watch kept on running*

On October 21, 1942, eight men in a Flying Fortress made a forced landing on the Pacific. Three rafts were inflated as the plane settled. Six minutes later, the plane disappeared and the men were alone in the broad Pacific. Thus began an ordeal of drifting; burned with sun and salt water, starved and parched with frightful thirst; that ended with a miraculous rescue 21 long days later. It is the now epic adventure of the Rickenbacker Pacific Mission. One by one all of the watches in the party, except one, stopped running. No watches are built for the punishment these watches suffered. But we are proud that the one that kept on running was a Longines.

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## **WAR CALLS COME FIRST**

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# NATURAL HISTORY

*The Magazine of the American Museum of Natural History*

FREDERICK TRUBEE DAVISON, President

ALBERT E. PARR, Director

VOLUME LI—No. 5

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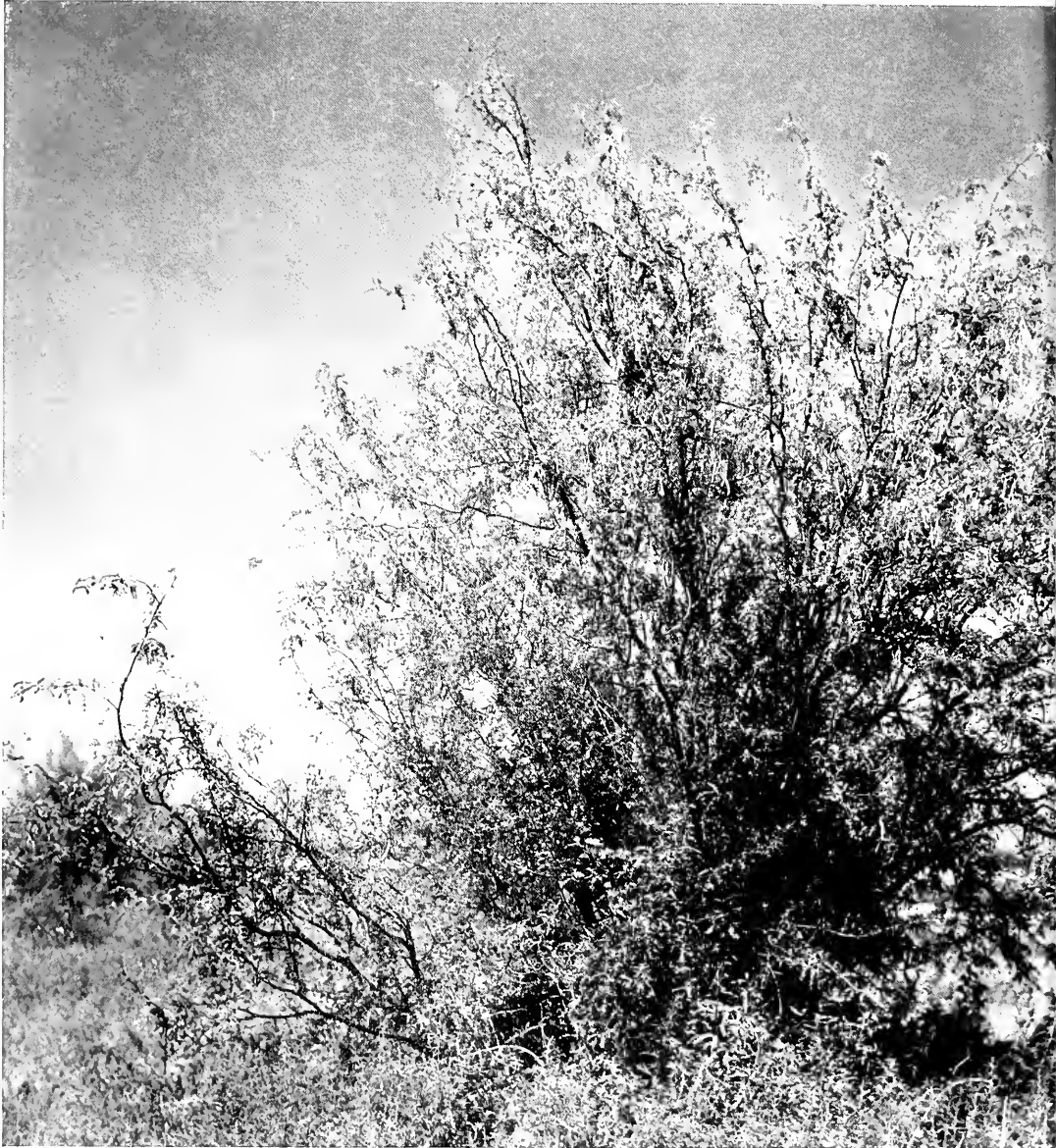
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# *The Conquering*



▲MESQUITE makes the cowboy arm himself in leather; its thorns will puncture an automobile tire.

But at this time of year, it brings to great areas in the Southwest the beauty of a vast peach orchard

# Mesquite

By J. FRANK DOBIE

*All photos by the author unless otherwise indicated*



Max Kogley photo

Its story is the story of our West. Range people curse it yet are lonesome without it. Today the question is: why is mesquite ruining so much cattle country and how can it be controlled?

EVERYONE who has read stories of the West has heard of mesquite, but except for those who live among it, few have a clear idea of the peculiarities of this interesting plant.

Its association with the land and the peoples of the Southwest is dateless. Its name comes to us from the Aztec. Yet living men have seen it march upon a conquest of its own good earth with an aggressiveness scarcely matched by any foreign invader. Many successful invaders in the realm of nature have come from abroad, like the English sparrow, the Italian fruit fly, and the Japanese beetle. Not the mesquite. Like ragweed, it is our own.

While, a long generation ago, the mighty forests of America were being felled by man, forever shuffling for space, the mesquite began spreading with accelerated power. Cultivation of the plains and the prairies went forward, but the mesquite went on planting its long roots in lands skipped by the plow. Today its thorned branches cover tens of millions of acres. Being an enemy of grass, it is sterilizing an empire of land into nonproductivity.

The explanation of its march is an interesting lesson in conservation. The mesquite makes no advances on fields plowed annually. But in Texas only about one-fifth of the land is cultivated, most of the remainder being grazed. Land that is only moderately grazed evidently offers limited opportunity for mesquite, but it takes hold at once in land that sheep or cattle have denuded of the protecting turf.

According to a recent survey by the Agricultural and Mechanical College of Texas, 35,000,000 acres of land in this state are "infested" by mesquite

to greater or lesser extent. Grass will grow underneath a single mesquite, but when brush makes a dense thicket, the grasses are shaded and rooted out.

In 1846 Lt. U. S. Grant saw the 150 miles of country between Corpus Christi and the Rio Grande as rolling prairie, with "vision obstructed only by the earth's curvature." Today a great part of this land is thicket. It is range land in which the "openings" are growing smaller annually. In 1850 Colonel R. B. Marcy, exploring the Red River country, described the trees as standing "at wide intervals upon ground covered with a dense carpet of verdure." Today the Waggoner ranch of half a million acres and other ranches large and small in the Red River country are in many places so covered with mesquite that the only verdure to be seen is on top of the brush.

About 50 years ago botanists of the United States Department of Agriculture joined landholders in predicting that within a short time the rapid encroachment of the mesquite would seriously reduce the carrying capacity of the range lands. But the spread at that time was nothing to what it has been since. As a barelegged boy 40 years ago I used to ride horseback in southern Texas across what was known as "The Hay Pasture." Somebody had at some time mowed prairie hay in it. It was several thousand acres in extent and was mostly prairie. Today only a "brush hand," armored with leather, can penetrate many of the thickets in the "Hay Pasture."

The general belief is that mesquite has spread because the range is no longer burned off as it was during Indian times. An argument against this explanation is that grass fires will not



◀ **THOUGH THE MESQUITE** is a form of brush, here is one in Live Oak County, Texas, whose trunk has attained a thickness of 30 inches



▲ **MORE THAN 50 YEARS OLD:** a mesquite tree with a circumference of ten feet, nine inches at the fork. The largest mesquites in America are on the drainages of the lower Rio Grande and the lower Nueces

▶ **AS CROOKED** as a dog's hind leg. From this example you would not suspect that the first cannon used in the war for Mexican liberty was made from a hollowed-out mesquite log



▼ **IN MOISTER LOCATIONS** the leaves of the mesquite tend to be broader, and the traveler will welcome their shade. It grows as far west as Death Valley, but to find shade

beneath it in the arid regions is like "trying to dip water with a sieve." The mesquites shown below are on Miller Creek, 40 miles west of Austin, Texas

kill mesquite roots and that live roots will put up fresh sprouts. One way to make mesquite *spread* is to chop off a tree: a dozen "switches" will spring up from the stump. A far more potent agent in checking the spread was, I am convinced, the grass itself. When white men overgrazed the country, they left the soil exposed to mesquite beans. Few seeds can find lodgment in a heavy turf of grass, especially the curly mesquite grass native to the country, which makes a carpet as unbroken as the finest swards of Bermuda and other lawn grasses.

The mesquite bean grows in a long pod not unlike that of some varieties of snap beans. A pod that drops on bare ground or on grass is bored into by a small beetle that eats the seeds. In dry weather, however, beans will last a long time for the benefit of hungry stock, and nearly all beans that produce new mesquite plants have been swallowed by animals. In other words, mesquite spreads not by root projection or self-sowing but through the stomachs of animals. Seeds dropped by a cow or horse on top of thick turf will, upon germinating, have difficulty in putting roots down to the soil. On the other hand, droppings on bare ground hold moisture at that spot and give the seedlings root.

More than a hundred years ago, oxen driven from far down in Mexico to salt deposits east of El Paso were fed mesquite beans by their drivers,





who carried sacks of them for the purpose. You can still see long, irregular lines of mesquites that were planted in this manner. In New Mexico, too, more than one old roadway is lined with mesquites. And I have been told that in Oklahoma, between Ponca City and Elgin, mesquites show where Texas cattle were moved from trains to grazing grounds.

The noted and observant frontiersman Charles Goodnight told me that when he was scouting on the Plains during the Civil War, he was always happy when he saw mesquite. The bush told him that water could be found within five miles. According to him, mustangs had carried the mesquite seed, and mustangs were not accustomed to range more than five miles from a watering place.

On elevated, arid ranges of Arizona, New Mexico, and western Texas, the mesquite is a sprawling bush, with more of itself underground than above. Amid windblown sands it accumulates and holds the soil in irregular mounds and is a positive blessing both as a provider of food and conservator of soil. Often only thorned switches appear on the surface, while underneath a far-spread system of roots is usable for fuel. "A hell of a country," the frontier saying went, "where a man has to dig for wood and climb for water" (go up canyons to headsprings).

As the elevation drops and rainfall

increases, the mesquite changes to a tree with a trunk large enough for fence posts. The largest in circumference I have ever measured was ten feet, nine inches around, five feet above the ground. The largest mesquites in America are on the drainages of the lower Rio Grande and the lower Nueces.

Westward it is edging into alkali flats where greasewood once had no competitor. Along the Texas coast it is stepping across salt grass prairies that once forbade it. Its eastern vanguards have passed beyond some of the sentinel pines of the great woods flowing out of Louisiana and Arkansas into Texas and Oklahoma, thus indicating its adaptability to acid soil. The mesquite, however, is not a forest tree. It is correctly classed as brush.

Although it can persist in shallow soil, its first choice is rich land. The early-day "mesquite flats" were the pick of the land. The belief was that the roots of well-established trees went down to water, and the place to dig a well was beside a mesquite tree. The roots do not necessarily go to water, although they reach toward subirrigated strata. A stratum of water too near the surface will prevent hardy growth. Along washes I have seen roots exposed more than 40 feet long, and they are known to slope down fully 60 feet below the surface. They not only prefer rich soil, they enrich it, for being leguminous, their roots nitrify it.

"To find shade under a mesquite tree is like dipping water with a sieve," wrote an early-day traveler. The leaves are small, but on a hot day of burning sun both man and beast may be grateful for its shelter. Small leaves prevent evaporation. To illustrate its adaptability, in Death Valley and on the deserts of Sonora the mesquite has leaves that are much more slender and shorter than in moister regions.

It is from the juicy bean pod, rich in protein, that animals get nourishment. Few of the hard beans are chewed. The digestive process only softens them slightly for germination.

During drought, cattle browse on the leaves and pick up and pull off the ripe beans. "Bitter mesquites and poor folks' children are plentiful," is an old border saying. The average man, even while seeing his grass choked out by the mesquite, does not want to get entirely rid of the choker. Mesquite grows in areas that are not potential grassland and is often a welcome tenant of the landscape. It sometimes even serves as important browse for animals. But black brush—the true chaparral of the Southwest—guajillo, and certain other bushes are more important lifesavers in time of drought. And their range is limited compared with that of the mesquite.

Grass affords a balanced diet that the mesquite does not. Horses do bet-

▼ "MESQUITE BONES" in Death Valley. In the drier parts of the Southwest, the mesquite is a sprawling bush,

*Photographs by Edward Weston*

with more of its fiber underground than above. Its roots are known to slope down fully 60 feet below the surface





▲ THE APACHES and other Indians made bows of mesquite; ranch people use it to build corrals



▲ EVERY STROKE of the ax opens a fresh bottle of perfume, for mesquite wood has an aroma all its own. The scent of mesquite burning will make any dweller of the Southwest homesick. Even a brief visitor from Canada shipped a carload of mesquite back with him to add a Texas flavor to his morning coffee



▲ THE FIRST PAVING BLOCKS in historic San Antonio were of mesquite, and cabinetmakers find its grain unsurpassed by walnut, rosewood, or mahogany. The color varies from marbled yellow to a smoldering blood-red

ter on it than cattle. Drought-stricken animals forced to a mesquite diet will eventually succumb from wads of fiber clogging the digestive tract. Yet beans will aid grass in fattening them. It is claimed, however, that the beans will cause a cow's milk to dry up, starving the calf while the mother is thriving. Possibly the milk merely becomes too bitter and the cow goes dry as a result of not being sucked.

In some widely varying regions mistletoe grows luxuriantly on mesquite trees. Wild turkeys clawing the mistletoe out of the tops and pecking the berries make an exciting spectacle. Mistletoe itself is good cattle feed, and sometimes during barren winters ranchmen chop it out, while cattle follow, grabbing it from the ground.

The first white man to cross the continent north of lower Mexico was Cabeza de Vaca. Shipwrecked on the Texas coast in 1528, he wandered naked among naked savages for years before finally making his epic journey to the Pacific. The natives among whom Cabeza de Vaca went native often lived no better than badgers. Their feasting season, as he tells, was when the prickly pear apples and the mesquite beans ripened. Then the Indians would dig a hole in hard earth, or perhaps find a pothole in rock, put in quantities of bean pods, mash them with a wooden club, pour in water, mix in dirt to "sweeten" the juice and neutralize the mesquite bitterness, and finally swill the extract. The Indians, he says, got very big bellies from the earth and water they swallowed. Bean pulp, in addition to being rich in protein, has a grape sugar content of from 25 to 30 per cent.

Indians also made a meal—*mesquitmeal*—by pounding the pods, as observed by a drover, James G. Bell, on the Gila River in Arizona in the middle of the last century. The bean is too hard, but cakes made from the pod flour had a honey-sweet taste, our narrator tells us, and would be palatable but for the dirty manner in which they were made.

During the Civil War when coffee became unprocurable in the South, "muskeet coffee" took its place among other substitutes made from okra seeds, parched wheat, corn, acorns, and sweet potatoes. White men have not given the mesquite a high rating as a food plant, but in time of need it has been a godsend. When some Mexican traders in the days of the Texas Republic had been through dire

straits, their reaction was, "With pear apples alone one can live, but with pear apples and mesquite beans one will get fat."

Remedies provided by the mesquite are many. Most are of Indian origin. A frontiersman had such a severe case of flux that his life seemed in jeopardy. Tea made of mesquite root cured him. Tea of the bark is said to be excellent for the same malady, also for nervousness, colic, and flesh wounds. The fluid extracted from the leaves, called *alcoal*, is used in Chihuahua as an eye lotion. The sap is just as good for the same purpose and is a *remedio* for impure blood.

To make clothes white, Mexican washerwomen sometimes put a small pack of the leaves in the wash pot and let them boil with the clothes. The same women will assure you that the white inside of the bark will cure dyspepsia.

Various attempts, without appreciable success, have been made to commercialize the translucent, amber-colored gum exuded in large quantities by old mesquite trees. Its properties resemble those of gum arabic. A preparation from it has been advertised by an American drug company as an emollient for inflamed mucous membranes. Mexicans chew it for toothache. Dissolved in hot water, the gum can be used as a gargle; and the Apache Indians long ago put it to good use as a coating to make baskets watertight.

They and other tribesmen made bows of mesquite; and when the patriot Morelos fought for Mexican liberty in 1810 he constructed the first Mexican cannon out of a mesquite log. He split the log, hollowed it out smoothly, fitted the halves back together, and bound them around with green rawhide. The cannon worked.

A few cabinetmakers are educating the public to appreciate the beauty of finished mesquite wood. The grain is not surpassed by that of walnut, rosewood, or mahogany. The color varies from marbled yellow to a smouldering blood-red, and it takes a superb polish. Only the outer parts of large trunks, however, can be expected to yield first-class slabs. Under the force of winds, the heart of the standing timber "shakes," or cracks, badly. But the wood has the virtue of not shrinking irregularly and leaving cracks. Mesquite furniture is as beautiful in texture as any redwood, but it is likely to remain high-priced because of the characteristic heart "shakes" and the

scarcity of long straight trunks. Whether mesquite will solve the problem for pipe manufacturers in a wartime dearth of briar root remains to be seen. It is being tried.

A man who enjoys cutting with an axe will get a joy out of chopping mesquite that no other wood can give. It splits well with the grain, and its brittleness makes it break easily. Its hard texture offers just the right resistance to the axe and makes animated chips. Then there are always the color and the aroma of the wood itself, every stroke opening a fresh bottle of perfume.

The axe-hewn woodwork of various old ranches, churches, and other buildings of the Southwest shows how well mesquite endures. The first paving in San Antonio was of mesquite blocks. They did not remain level in wet weather, but present-day experiments in tiling of mesquite may give the country some of the most beautiful floors in the world.

Long before there were any cities in the Southwest, mesquite pickets were used for corrals and cabin walls. The first barbed-wire fences of the range country used mesquite posts, some of which have not rotted away yet. If the mesquite is mature when cut and allowed to season well, I doubt that it is less durable in the ground than cedar, though ranchmen import the latter when there are thousands of mesquite posts growing on their land.

There is an old saying, "The mesquite knows." That is, it knows when winter is over and, unlike the prematurely budding peach, not yet naturalized, will rarely be caught leafing out before the last frost has passed. "When the mesquite begins to bud, it's time to put out tomato plants," is an old-time garden direction. Again, "Plant cotton when the mesquite leafs."

Like most plants of the Southwest, the mesquite is thorny. Not many thorns are harder—as many an automobile driver has found at the expense of tubes punctured by driving over mesquite bushes or fallen branches. Mesquite thorns have served frontier people as pins. They have also stove-up many a good cow horse! They will not decay in the flesh as will prickly pear thorns. Jabbed deep into muscle or joint, they emanate a kind of poison that makes the wounded person feel momentarily faint. It is these thorns that make the cowboy of the Southwest ride with leather toe-fend-

ers, protect his legs and thighs with leather leggins, wear a jacket of heavy duck, ride in gauntleted gloves, and regard his felt hat as a kind of military helmet.

Often and often I get homesick for the smell of burning mesquite wood. Many a time riding in the brush country, I have smelled out a hidden Mexican hut, especially at night, by the aroma of mesquite smoke floating out of its chimney. A friend of mine who often camps in the mesquite country always holds his hands in the smoke during the breakfast period so that he can carry and enjoy the odor of burning mesquite for hours afterwards.

What a flavor it gives to meat! If one is broiling a steak over an open fire and the mesquite burns down to coals, it will be well to add enough fresh fuel to make smoke. Mesquite wood in a fireplace in winter, in addition to supplying the warmth and light and cheerfulness of all open fires, provides a bouquet not easily forgotten. The Comanches favored mesquite, because, while making a hot fire, it gives off slight smoke to inform an enemy. Some mineral in the wood corrodes the iron in stoves and boilers.

Liveoak coals will last longer than those of mesquite, but cannot outglow them. When old Bigfoot Wallace wanted to describe the burning eyes of "the Indian hater," he said they "glowed like mesquite coals."

No day can be counted entirely lost which begins with the smell of a mesquite fire at dawn and the taste of coffee boiled over it. When Roy Miller came down from Toronto with his wife to visit her sister, he could not get used to the difference between the coffee cooked on the ranch over an open fire of mesquite and that in town. He got the habit of boiling his coffee over mesquite even in town, and when he went back to Toronto, he decided he simply had to have a supply of mesquite wood. A whole carload was shipped to him. The freight was appalling, but the coffee regained its flavor, and the neighbors all enjoyed the aroma of the burning wood. Speaking of flavors, although honey from alfalfa has, justly, a high reputation, to me it is not nearly so delicious as honey from the mesquite, perhaps mixed with nectar from guajillo and other brush.

Such is the mesquite, which dwellers on the land knew and used and lived with centuries before Columbus vanguarded the hordes of invaders



*Josef Muench photo*

▲ THE LONG BEAN POD of the mesquite is not unlike that of some varieties of snap beans. Those shown here are dry ones. These pods are eaten by horses and cows, as well as by people. And since the mesquite grows where few other woody plants can survive for lack of moisture, it is sometimes a lifesaver

►It is the juicy pod, rich in protein, that gives nourishment. Cattle swallow most of the hard beans without chewing them. When coffee was scarce during the Civil War, the mesquite took its place among other substitutes

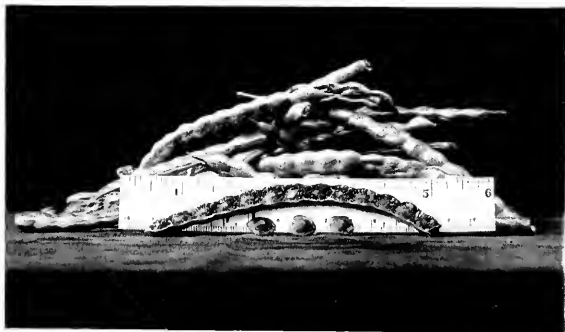
who were to overrun, utilize, and gash the very guts out of the earth in their frenzy of exploitation. The human natives resisted long, always retreating, and then were broken and silent. The nonhuman natives, always silent, resisted not and merely clung to the earth, moved only by the will of Nature. And surely over an empire of land, the mesquite has been chief of all these nonhuman occupants. Following the will of Nature it has not retreated but now advances as conqueror over the titled domain of the conquerors.

Is there nothing can stop it? The grubbing hoe and axe can, but they are an expensive and slow method. Experiments have been made in applying kerosene to mesquites and waiting for them to die. But there are not enough sprayers and daubers to treat the millions of trees, and the mesquite will steal up behind its destroyers.

A "tree-dozer" does the job faster. This is a tractor of the caterpillar type armed with a battering ram that easily shoves over even the larger mesquites, breaking them off and tearing them out by the roots. A gigantic blade may also be attached to the front of the tractor to cut roots underground, so that the growth may be eradicated more completely. These powerful tools are lowered and raised by hydraulic levers in the hands of the driver.

He heads into a jungle with deafening noise, tearing a swath as easily as a ship plows through water. Sometimes he catches sight of a rattlesnake wriggling away from the monster, but more often, perhaps, the monster runs over the snake. If it is bird-nesting time, the nests and their contents go down in ruins. A fawn hidden by its mother and told to remain unmoving may now and then jump up just in

*New York Botanical Garden photo*



time to escape. The tree-dozer cannot travel as straight as a plow. At tough, thick places it has to pause for special jabs and showings-back of the debris. It works with cleared wreckage on one side of it and earth-choking thicket on the other.

The history of the tree-dozing machines cannot be segregated from the history of other "caterpillars" that are now cultivating, constructing, and demolishing the world. As applied to brush, however, the machine has been largely developed on the great King Ranch of Texas, scene of much experimentation and development in range industry.

When Captain Richard King established the Santa Gertrudis Ranch, the nearest brush visible was a line of trees ten miles away. That was in 1853. By 1895 no prairie existed in that direction. The brush had grown up to the house and pens.

The year 1895 marked the climax of a terrible drought that drove poor Mexicans inland from up and down the border, looking for food. R. J. Kleberg (son-in-law of the late Captain King) and Mrs. King combined the job of feeding the starving men and improving the land. Grubbing is the hardest kind of manual labor, and many of the Mexicans had to be fed for days before they had strength enough for it. Before the drought broke, the King Ranch had around 2000 refugees grubbing out mesquite. This brought results, but when they went back home, land-clearing virtually stopped.



▲ ITS FLOWER and leaf clothe the springtime Texas landscape in a symphony of color, as every mesquite appears, in the words of the poet, "Feathered and tasseled like a queen"



◀ NATIVES gathering mesquite beans in Mexico. The Indians have defended the mesquite as the solution for almost every difficulty from toothache to the blues. Its leaves are used as a substitute for bluing, and it is sometimes used in making an alcoholic beverage. The Apache Indians used the gum to make their baskets watertight

The King Ranch is larger than the state of Delaware, but the brush spread from only about one-quarter of the land to approximately three-quarters of it in 50 years. Cleared land will grow enough grass to support from three to six times the number of cattle that brushed-over land will. Furthermore, they are better cattle. So about 1927 the King people decided that it was better to "buy land from themselves" — clear it — than to increase their acreage. Land is worth what it will produce. So far, tree-dozing machines have been used almost exclusively by well-to-do ranchers, and comparatively few of them. The King Ranch and other large ranches using the machines have bought them. A few operators do contract for work, but this is mostly on lands designed for cultivation. The surface of the brush country has so far only been scratched.

"I'll make a prediction," says Bob (Robert J., Jr.) Kleberg, manager of the King Ranch. "After this war is over thousands of war tanks will be converted into machines for clearing land, both at home and abroad. It will be possible for a man who does not own more than a section of pasture land to get it cleared at a reasonable price, with the assurance of future increase in returns. What we do in Texas will be small in comparison with the clearing of land for use elsewhere, particularly in the tropics."

The machine age is bound to curb the mesquite that has so overspread itself, but there will be no disposition to annihilate it. It will remain forever characteristic of the Southwest. Hard things have been said about it, but to many of us born and reared in the Brush Country the mesquite is as graceful and lovely as any tree in the world. When in spring the trees and bushes put out their delicately green, transparent leaves, and the mild sun shines upon them, they are more beautiful than any peach orchard, to which they are often compared. Then the mesquite is itself a poem.

Primroses burn their yellow fires  
Where grass and roadway meet;  
Feathered and tasseled like a queen  
Is every old mesquite.

I could ask for no better monument over my grave than a good mesquite tree, its roots down deep like those of people who belong to the soil, its hardy branches, leaves, and fruit holding memories of the soil since the time when thorned men began to walk on it and remember.

**1** WHERE ONCE the grassy landscape spread unbroken to the horizon, mesquite has in recent decades moved in to take possession of the land. Grazing cattle sow the seeds and in turn are starved out by the encroaching thickets which kill the cover of grass necessary for sustenance. Vast areas have been rendered useless for grazing by this invasion. Grubbing with ax and hoc can eliminate the brush, but this is a slow and strenuous method. The so-called "tree-dozer" is the most recent remedy. After disheartening attempts with the use of manpower, this machine has been employed with good effect, especially on the King Ranch, which is larger than the state of Delaware

**2** THE "TREE-DOZER" is a caterpillar tractor with a battering ram that levels the largest mesquites and tears them out by the roots. A gigantic blade may also be attached to the front to cut the roots underground. These powerful tools are lowered and raised by hydraulic levers in the hands of the driver

**3** WITH ITS SNOOT against a tree the tractor charges ahead with open throttle. The reclamation of land in this way is not intended to exterminate the mesquite entirely. This symbol of the Southwest will always be a welcome member in a balanced scheme of vegetation. In some regions it has spread from approximately one-fourth of the acreage to three-fourths of it within 50 years

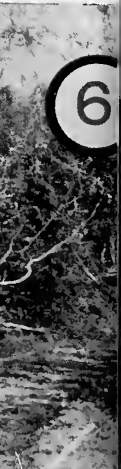
**4** A DEAFENING ROAR accompanies the mechanical monster as it heads into the "jungle"

**5** THE "TREE-DOZER" advances with cleared ground on one side and well-nigh impenetrable thickets on the other, piling up debris ahead of it

**6** THE "TREE-DOZER'S" TRAIL of wrath is not always straight, but the job gets done

**7** A NEW ANIMAL OF THE RANCH COUNTRY wears a brand: the machine whose ranch operators claim can play a large part in shaping the future world for agriculture and cattle raising, particularly in the heretofore impenetrable tropics. Predictions have been made that army tanks may be converted to open up jungle regions for post-war food production

*La Plant Choate photos*









## The Story of the Vanishing Serrano Indians

ANOTHER group of First Americans is soon to be leaving the American scene. A dozen graying men and women are all that are left of the illustrious tribe of the Serrano.

It is barely 50 years since Cío, the first civilized Serrano leader, went to his rest, yet another 50 years must see all the purebloods gone from the hunting grounds. For this sturdy tribe that once numbered some 1500 is passing as surely as the great gray bears and the herds of antelope have passed from Southern California's valleys. We who live in the high country of the Mountaineers are watching while they vanish before our eyes. And the last full blood to vanish will be a direct descendant of that same sterling Cío.

This high country lies some 30 Spanish leagues (almost 80 miles) back from the old Camino Real of the mission padres. The founding padres never journeyed up into it, no travelers' tales of it ever reached their ears, yet they saw it often. Two great sister peaks herald its location far and wide. Each December one of them becomes a white scimitar that flashes against the sky, the other a frosted citadel with gleaming turrets.

The hinterland cattle enterprises of Misión San Gabriel eventually brought the padres a little closer. The two mountains stood higher in the pale east. Indian neophytes began straggling in to the mission from the back country, followed by more through the years, so that the soul-seeking Franciscans thought to go out and settle among them. They set up a mission rancho at Guachama, "Place of plenty to eat," near a river bottom at the western foot of the range, and another rancho farther back and higher up, almost between the white peaks. They said their first mass here on Saint Gorgonius' day, in the early spring, and named the beautiful lofty region San Gorgonio.

They spied antelope coursing through the bunch grass; and on tree trunks, beyond a tall man's reach, they made out scratches in the bark where bears had recorded their claw marks.

It was of slight concern to the friars that they had invaded a population center of the grizzlies. They were mindful only that they had reached the virgin heart of the Indian country. They already knew the valley natives; these stalky brown strangers

from the canyons of the scimitar they called Mountain People—Serranos, in their Spanish.

But the stalky brown men called themselves Máringayam. They have this pretty fiction, that in the dim past their ancestors took final leave of the desert home, and trailed up into the narrowing pass between the peaks until they reached a watered canyon mouth just on the western lip of the desert. Making camp at dawn, they were glimpsed by some natives who lived farther up the canyon. "Ho!" cried these; "you come with the morning—you are máringayam." And that was the name they chose to be known by.

They talked little, in low voices. To the expressive padres the tranquillity of these hinterlanders must have seemed naïve, the padres never suspecting, we may believe, that behind such quiet dignity lay the weight of an ancient lineage, and folklore that ran back through centuries. To the eager friars these were merely mountain-bound savages to be snatched from their pagan wilderness; in the brown men's own eyes they were the chosen people of creator Pakrokkitat and heirs to the choicest corners of mountain and desert; while in the view of more than one modern scholar they and all their Shoshonean cousins are kinsmen of the immortal Aztecs. Some measure of the Serranos' tranquil dignity could have been inspired by the majestic architecture of their chosen home. Behind them soared the tallest hill in the land, while before them, across their narrow valley, towered the highest precipice.

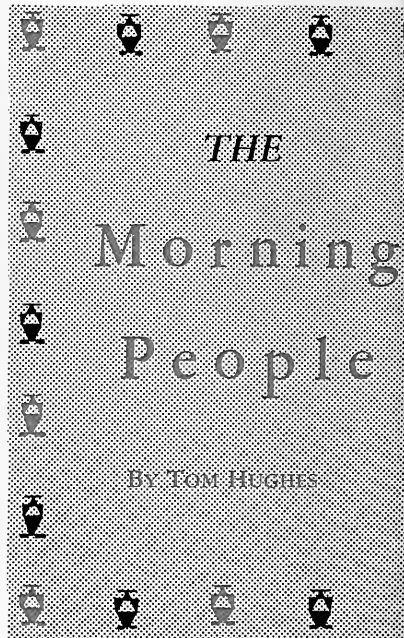
Throughout their temporal affairs the Serranos showed a high degree of practicality. In this land of little rain they built sweat houses for cleanliness and health. They buried their dead almost within the hour. They made their bows of ash and their arrows of light arrowweed to bring down the fleeing antelope. Professional deer hunters wore antlers upon their heads as they crept through the chaparral toward their quarry; but in the rutting season, when bucks were wont to challenge competition, more than one hunter was glad to discard his provocative headgear on the instant.

It is among the native's spiritual matters that we find ourselves groping for light. Totemism and the moiety

structure puts the Serrano cult fairly beyond the grasp of an unimaginative white man's understanding. It is not likely that the padres bothered to apprehend any of it. We may say that the Serrano moieties, that of Coyote totem, some of Wild Cat totem, complemented one another through all their sharp totemic rivalry, and served to weld the tribe. Totem rites survived for years after the Christianizing of the people, and persist faintly to this day in their seasonal fiestas.

We have another engaging situation. The remnant Serranos, although classed as a Mission tribe, are Protestants. That Serrano cosmogony inclined the latter-day natives more toward Protestantism than toward Catholicism is less likely than that they were carried in this direction by the example of their outstanding chief, Cío Morongo, and his son, Captain John. Both had received early Catholic baptism, each in middle life embraced a Protestant faith, Captain John becoming a Moravian.

This Morongo family is quite the most prominent in Serrano history. The family name seems to have sprung from a former tribal home on the Mojave Desert. Of late white men have reversed the borrowing, and today we know a Morongo band, a



Morongo reservation, a Morongo valley, and three Morongo creeks.

Chieftaincies previous to Cío's are not of dependable record, except that they were held by Morongos at the time of the desert exodus; but we know that the mantle descended from Cío to his eldest son, Francisco. Captain John, second son, although he was the Serranos' greatest post-mission leader and champion, was engrossed with his larger labors in the Indian Bureau and cared not for the titular office. So the headship passed for a time from Francisco to his son Rafael. At this juncture we detect what may have been a weakening of their ceremonial fabric. They double-broke all precedent by settling the stewardship upon a woman and a non-Serrano. This was Captain John's widow, who, as Rosa Chavez, had come, according to reliable family testimony, from the Wónupahyam band, possibly of the neighboring Cahuilla tribe. She held the office until her death, whereupon her only surviving daughter, Sarah, accepted custody of the ceremonial beads. Sarah is chieftess today, although her position would seem to be more precisely that of chieftess regent, since her brother John, only son of Captain John, can claim the headship by right of customary succession. He has not done so and declares that he will have none of it. Although his

heart is not set on preserving the ancient ceremonials, his advice is sought and harkened to in tribal councils.

It is not through dearth of leadership, however, or a straying from the faith of their fathers, or from any apparent faltering in the blood stream that the Serranos are passing. We see an immediate and overshadowing cause in their rigid marriage custom, which restricts them to unions between members of different clans of the tribe. This stern exogamy, having led them down the narrowing path of tribal pureness, now speeds their exit.

Marriage prohibition follows totemic lines. (An occasional overstepping of the lines has drawn upon the offenders deep, unrelenting disapproval from both sides.) The one other surviving clan besides the Morongo is the Muyhátnayam, of Wild Cat totem. The Morongo clan is of Coyote totem. The Muyhátnayams and the Morongos intermarried, but no marriageable Muyhátnayams are left; and there is the end to giving and taking in marriage within the tribe. Coyote may not wed Coyote.

Of the 30-odd remaining clansmen it seems that barely twelve can be listed as purebloods. All bear the Morongo patronymic. The Muyhátnayams apparently contributed only women to the later alliances, and children are born into the father's moiety and totem.

The purebloods are Tom, nephew of Captain John; his wife Nellie, a Muyhátnayam; their son Henry and daughters Magdalena and Joaquina; Tom's cousins Salomón, Pío, a sister of Pío's, Macario and his three children by a deceased Serrano wife. The demise of the last of these twelve will mark the extinction of the pure stock, and the youngest is 50.

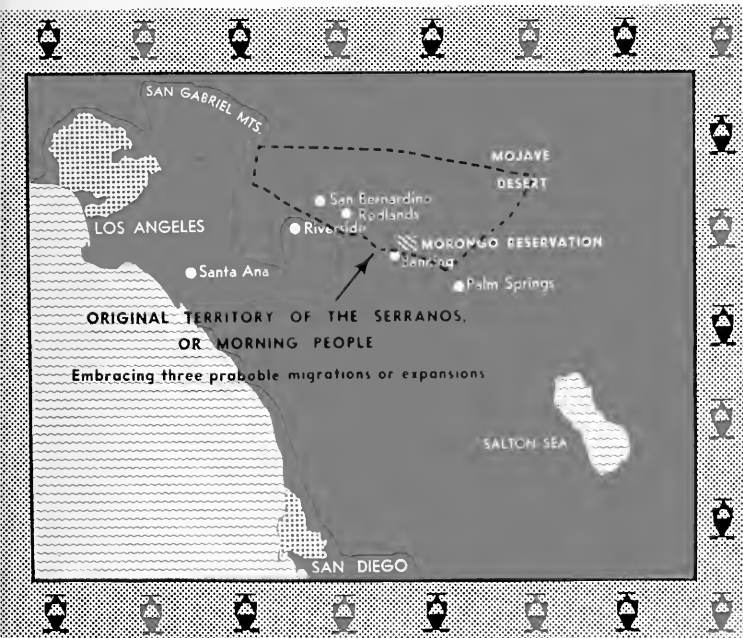
The full bloods are living at scattered points in Southern California: four out on the Mojave desert, five at Highland, one at Needles, and two on Indian land near Banning.

Almost every Serrano speaks English without accent or color. Few of the youngsters, indeed, know anything of Serrano speech. The oldsters themselves confess to a backsliding in use of their native tongue; it is not surprising, since Spanish has long been the local idiom between Indians and Mexicans, and so many items of today's world lie outside the old Serrano vocabulary. There is no native name for such Spanish novelties as horse, cow, mule, sheep, hen, wagon, to say nothing of the host of modern American gadgets. But we may be sure that they had a name for Old Grizzly, the great lumbering fellow who struck terror to the hearts of the mountain folk and in the hunger months had them carrying torches after nightfall. We wonder that they did not emblemize *him* into a totem.

The grizzlies are gone, and the antelope. The grasslands have been taken over by barley fields and orchards and towns. Train whistles echo across the pass, and metal wings thread the blue east-and-west lane between the peaks.

From his home against the foothills of the scimitar Tom Morongo looks calmly out upon it all. It is not hard to get him to talk of those other days. "Yes, we got along all right here in our mountains. We always found plenty of time for living. Folks thought a lot of one another. Of course, there were hard times, too, when floods came, or drouths, or fires swept the chamiso hills. I guess we couldn't stand all that now. We're getting soft, and we'd rather ride, like everybody else." So Tom lives each modern day in genial compromise between modernity and the tradition of his dignified, soft-spoken fathers.

One of his children or nephews or nieces will make the historic gesture of turning the last Serrano page. A Morongo led his people up into the mountains with the morning, a Morongo will be watching the sunset.





All photos by AMNH

▲ ONLY ONE-TENTH INCH IN DIAMETER: probably the smallest basket in the world, yet it has a design

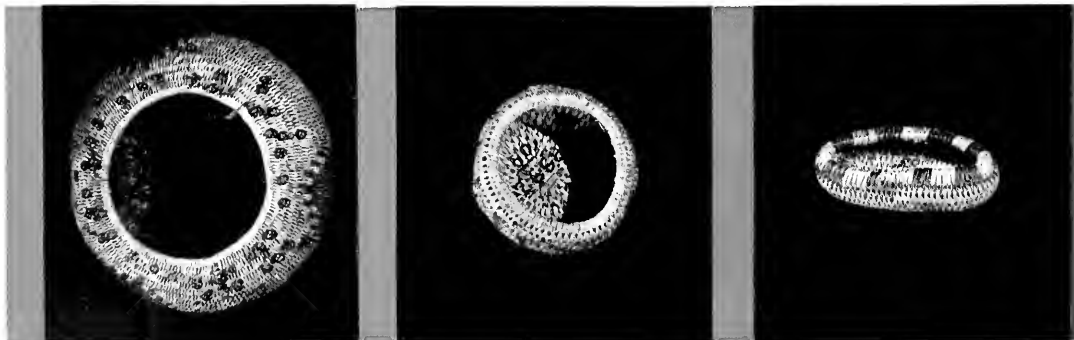
# One of the World's SMALLEST Baskets AND

ONE of the extraordinary exhibits in the American Museum is a display which the visitor might even pass without noticing. This is a basket that is smaller than the head of a match. Beside it is one with a circumference of over nine feet. Both were made by the same Indians.

The Pomo Indians show not only a greater variety in the form of their baskets than any other people in California but also probably a greater number of weaves. More than 200 designs in the weaving have been described. The Pomo weaver almost invariably leaves a break in the horizontal design of the basket, "so as not to become blind" or

"because their tribal hero, the Coyote, told their ancestors to."

For centuries among these Indians baskets took the place of almost every sort of utensil for the gathering, storing, grinding, and serving of vegetable foods, and for ceremonial purposes. There were baskets for storing acorns, for winnowing acorn meal, even for catching fish. The forms range from flat, platelike baskets to almost perfect spheres and cones of varying proportions, as well as boat-shaped types like some of those shown here. But the tiny jewel of a basket above will probably be considered by many the most astonishing.





THESE SMALL BASKETS are made by coiling and sewing the strands and then drawing them tight. The largest basket at left is less than one-half inch in diameter

THE POMOS employ feathers and shell beads for the ornamentation of their baskets. Those below and at far left are reproduced in actual size

*AMNH photos*

The Pomo Indians of northwestern California are perhaps the most versatile and skillful basket-makers in the world and they go to extremes

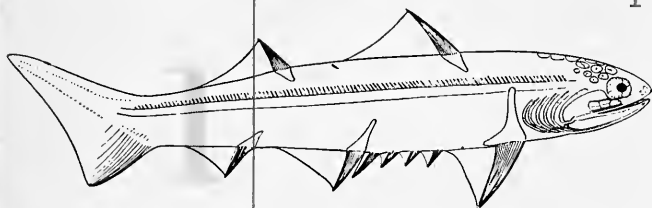
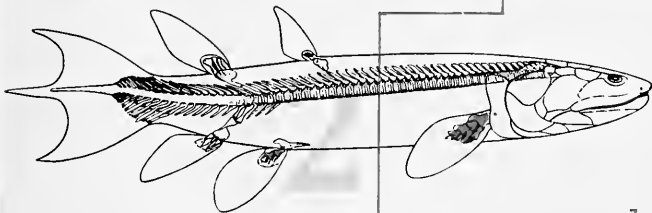
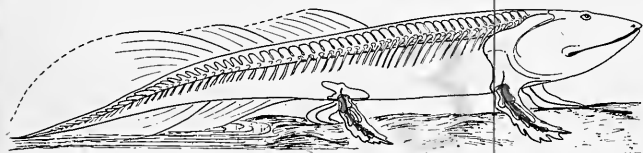
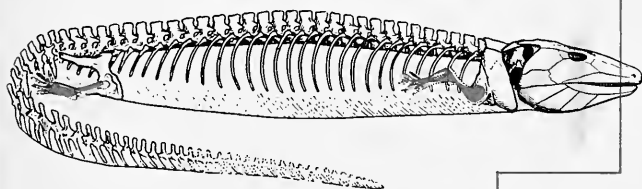
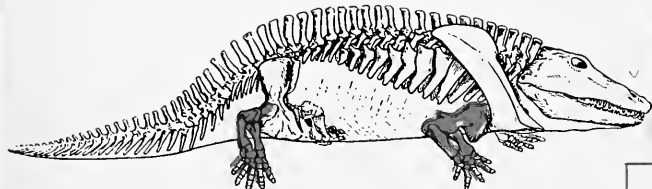
▼ TWO PERSONS could sit in this giant Pomo basket. The pleasing appearance of the baskets made by this California tribe is largely in the evenness of the surface and the regularity of the stitches

BIG ONES, TOO



# Environment and

Five early stages from fin to foot



5 ◀ IN THE ROCKS of about 200 million years ago we find this pioneer in overland travel, *Eryops*. He is cumbersome from a modern point of view, but even with his sprawling limbs he was definitely on the way toward faster locomotion on land.

4 ◀ LATER the amphibian *Eogyrinus* appeared with a slender tail like a salamander and probably small but effective feet. Progress over the mud was no doubt aided by sidewise sweeps of the body as in the preceding stage.

3 ◀ EVOLUTION TOWARD A LIFE ON LAND was also accompanied by a merging of the fins in the tail region as shown at left. The resulting broad surface aided the creature in moving through the water. But it was to become more of a handicap than an advantage on land, as in this inferred intermediate stage.

2 ◀ IN THIS IMPORTANT FISH (*Eusthenopteron*) of 300 million years ago, we see for the first time the extension of muscles into fins that have narrowed at the base to become paddle-like. The colored area indicates the extending muscular tissue. This fin could be moved more than that of many of the fishes we know today; it was beginning to bend and twist at the "wrist."

1 ◀ ONE OF THE MOMENTOUS ACHIEVEMENTS was the change from swimming to crawling. Some 350 million years ago the earliest fishes (left) had rigid fins that served only as keels and rudders. Muscles extending into the fins from the body had not yet given them more than a slight warping movement.

▼ THE AUSTRALIAN CRAWL was the first method by which animals traveled on land. Motion pictures of the nearest living representative of this

early stage of locomotion on land reveal this action particularly in the hind legs, as shown below. Since the legs are short, a swinging of the

body from right to left increased the length of the stride—a carry-over from the swimming motion of fishes

After Schaeffer



# Locomotion in Mammals

By WILLIAM K. GREGORY,

Chairman and Curator,  
Departments of Fishes and Comparative  
Anatomy, The American Museum  
of Natural History

A trip through the ages shows how the animals we know today evolved their many varied methods of travel on land, in the sea, and in the air

THE moving picture which we are about to see has no real beginning, and though many of its actors have dropped out along the ages, the picture itself may still be going on many millions of years from now. For neither Environment nor Locomotion show the least sign of coming to an end.

We may conveniently start with a very diffuse gaseous environment as it was in the parent nebula from which our earth was to be born. During several billions of years the atoms were combining and building up into stars. Eventually a certain star, or possibly a whirling pair of stars that came too close together, flared up and burst, giving rise to our sun and planets. At last we see the young and growing earth and its satellite the moon, both pelted unceasingly with meteorites of all sizes but held to their course by the pull of the sun and by their attraction for each other. Gradually the earth became strong enough to build up its outer envelopes of rock, water, and air, and to hold them from flying off at a tangent. Thus the struggle was unending between the forces that push things away from the center and the forces that pull them toward the center, between the heat caught from the sun and the deadly cold of space.

Such is the relatively simple machine that has kept the earth revolving and its outer layers churning in the age-old cycles of erosion, deposition, and uplift of the lands.

We may expect that in the future much more will be learned as to the ways in which the energy of the sun's rays, acting on preorganic compounds, built them up and mixed them to form the first living matter. Already

there has been encouraging progress in the effort to discover how this vitalizing energy is used in building up out of simple chemical substances the green coloring matter of plants, and how this substance in turn absorbs and stores up the sun's energy and provides the fuel for the locomotion and other activities of animals.

So many forces enter into the mixture called protoplasm that even without the further mixing effects of bisexual reproduction the living substance has always been highly variable in details; but it has usually been conservative in its underlying patterns. Given a revolving earth with long cycles of changing environment and a variable but slowly yielding life stuff, and you have a sort of large-scale kaleidoscope, with never ending opportunities for the emergence of new life patterns. Thus as the scenes slowly shift, natural selection is constantly setting new prizes of survival, either for those who successfully defy change and become living fossils, or, more frequently, for those who change with the times and keep up with the environment and with their competitors.

The unstable life substance possessed, among other powers, sensitivity and contractility. And so we come nearer to our subject, since the "basic patent" for locomotion is the sensitive, contractile muscle cell.

If Grandfather Fish\* could have known all this he might have thought of himself approvingly as the heir of all the ages and the predestined climax of creation. But his elation over his own fumbling experiments toward

a streamlined body might have been dampened considerably if he could have foreseen some of the later improvements in the fins which he had merely inherited from his forebears. It would doubtless have startled the old pirate if he could have had a vision of the countless transformations of his descendants in their unceasing efforts to outswim and devour him, and to outcrawl, outrun, outfly, and generally outmanoeuvre each other.

Among the many things that a fish must have and use successfully, we may assign a high priority to the chevron-like muscle segments arranged in a diminishing series on either side of the body. Even a good tail fin is merely accessory to these rippling muscle segments. Their value lies in their power to send waves of contraction along the body, swaying the head slightly and thrusting first to the right, then to the left as in skating, but pushing forward as a result.

In the earliest fishes the fins were fairly stiff ridges on the body, serving as keels and rudders (*illustration at left below*). Slips from the main chevron-like muscles, inserted on either side along the base of the fin, were able to warp the fin a little to one side or another. Later these fin muscles became more powerful; in some families they extended out on to the sides of the fins, and eventually they helped to transform fins into paddles. In the ancient lobe-finned, air-breathing fishes there were seven such paddles: namely, two dorsals, one anal, two pelvics, and two pectorals. Besides this, the chevron muscles beneath the rear end of the vertebral column had increased in size and could evidently impart a rippling movement to the spreading three-pointed tail.

There is indirect evidence that the progress of the lobe-fin fishes toward a life on land was marked by the lessening of the differences between the

\*Gregory, William K. "Family Tree of the Vertebrates: Grandfather Fish and His Descendants." NATURAL HISTORY, XLVIII, October, 1941.



# Environment AND Locomotion IN Mammals

AGAIN and again cosmic forces, operating for millions of years, have uplifted mountain chains and worn them down. While plant life has been evolving through the ages, the animals, varying widely, have invaded each new environment and evolved new methods of locomotion.

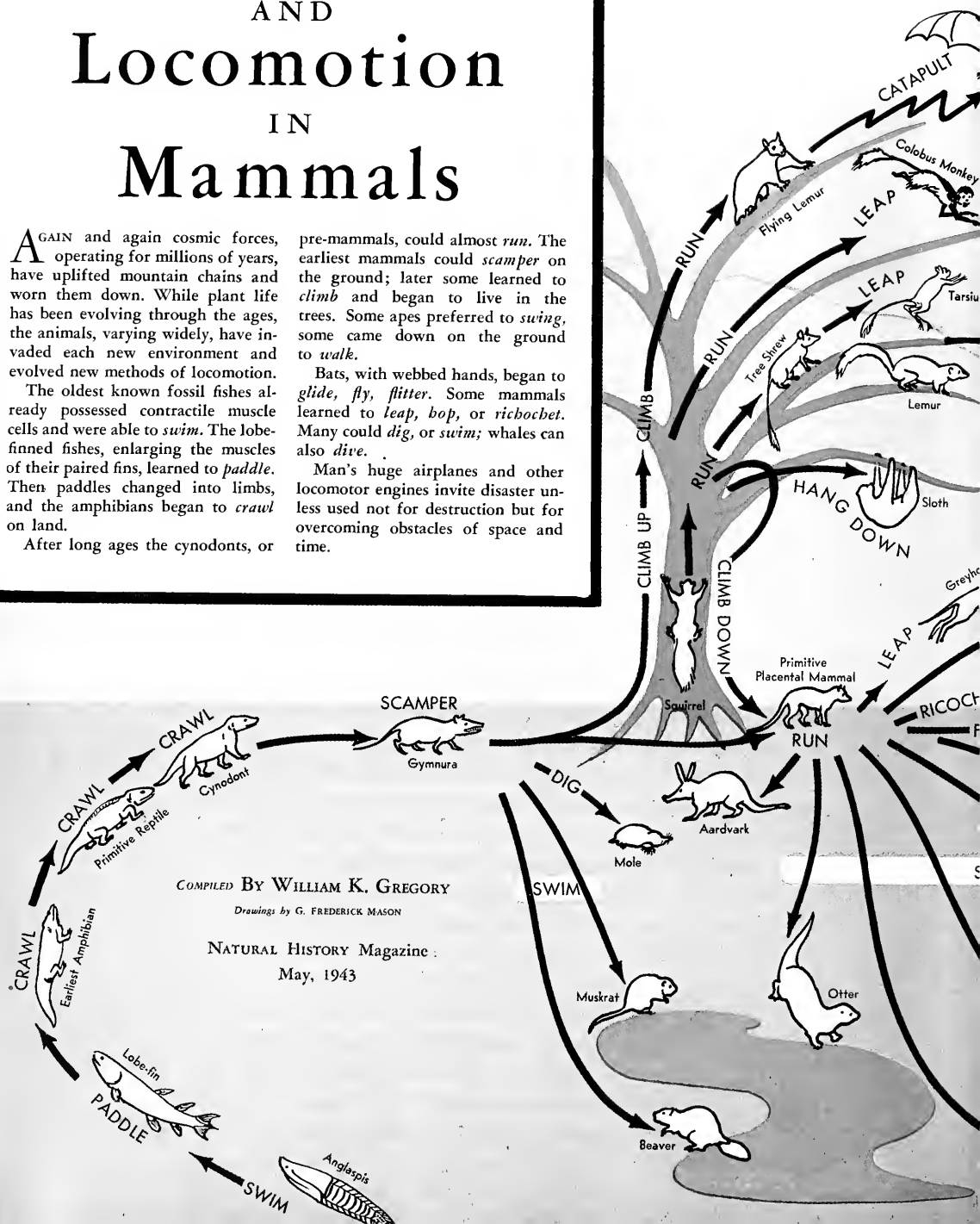
The oldest known fossil fishes already possessed contractile muscle cells and were able to *swim*. The lobe-finned fishes, enlarging the muscles of their paired fins, learned to *paddle*. Then paddles changed into limbs, and the amphibians began to *crawl* on land.

After long ages the cynodonts, or

pre-mammals, could almost *run*. The earliest mammals could *scamper* on the ground; later some learned to *climb* and began to live in the trees. Some apes preferred to *swing*, some came down on the ground to *walk*.

Bats, with webbed hands, began to *glide*, *fly*, *flitter*. Some mammals learned to *leap*, *bop*, or *ricochet*. Many could *dig*, or *swim*; whales can also *dive*.

Man's huge airplanes and other locomotor engines invite disaster unless used not for destruction but for overcoming obstacles of space and time.



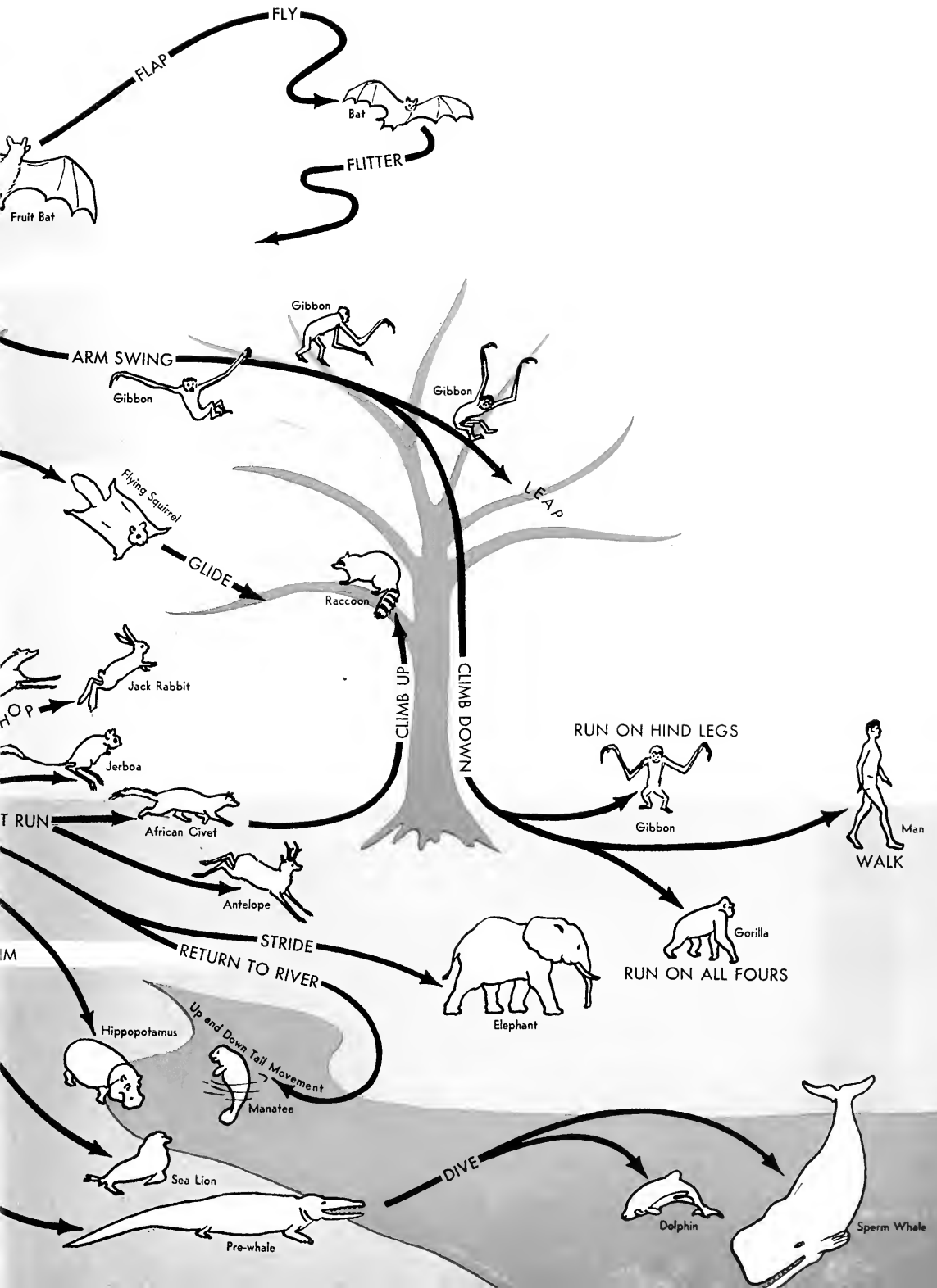
COMPILED BY WILLIAM K. GREGORY

Drawings by G. FREDERICK MASON

NATURAL HISTORY Magazine

May, 1943





dorsal, anal, and caudal paddles, by the multiplication and thinning of their fin rays, and still later by the reduction of these fins to a long thin web. Meanwhile some of the muscles on the side of the body sent out branches, which crept under the skin along both the upper and lower surfaces of the large paddles. Other muscle branches near the rear margins of the fins subdivided into buds which became the fingers and toes. Even in their completed state, arms and hands, legs and feet, are simply outgrowths of the body wall, supported by bones derived from parts of the skeletons of the paired paddles.

All these parts were profoundly modified by variation and selection.

The earliest land-living amphibians, as shown both by their fossilized footprints and fossil skeletons, had short limbs, much crooked at the elbows and knees, but with the spreading hands and feet pointing forward. The nearest living representatives of this early stage of locomotion on land are the newts and other salamanders. Thanks to the enterprise of Dr. Bobb Schaeffer, we now have excellent motion pictures which show that the newts in crawling raise their hind feet in the air and slap them down in a manner reminding us of the "Australian crawl" stroke in swimming (see drawings on pages 222 and 223). But these tailed amphibians still retain the essential feature of fish locomotion, since the body is thrown into lateral waves. There is indeed good evidence that at first this wriggling movement of the body played an important part in swinging the right and left fore and hind feet into their forwardly directed position and in lengthening the unduly short stride.

When crawling on land began there were new inducements for longer-limbed breeds which could crawl faster in either pursuit or flight. By the unremitting enforcement of these requirements and through natural selection operating on heritable variations in all directions, many lines of specialists were evolved.

In several lines the wriggling method was emphasized. The number of vertebrae was greatly increased as the body lengthened, and the limbs became reduced or were eliminated entirely so that snakelike forms were developed. This happened several times, beginning far back in the days of the Pennsylvanian coal forests. True snakes were evolved from lizards at a much later period.

In other lines the limbs became longer and the trackway narrower, especially in the ancestors of the dinosaurs. Some of these early fast-running reptiles also gave rise to the birds.

Still other crawling forms, belonging to the reptilian stock, left the highlands to return to the swamps and streams, for example, the crocodiles and alligators. Later some of them pushed out into the sea (plesiosaurs, ichthyosaurs, etc.) and turned their limbs into a new kind of paddles.

Meanwhile the environment was providing innumerable new puzzles and opportunities. First, the primitive water plants known as algae sent up hordes to invade the fresh waters. Later the ferns and intermediate types of the Coal Ages gave rise to and were largely replaced by the cycads—forms intermediate in appearance between tree ferns and palms. Still later came the conifers and the higher flowering plants and grasses. The diversity of plant life served as the primary food source for the equally diversified animal world. Especially on the land the plants also afforded many different types of homes for the animals; but they were also useful in providing all sorts of footholds and places of retreat and safety, as well as hazards and obstacles for the locomotor systems of the animals to overcome.

### *Cold-blooded to warm-blooded*

The prelude to the grand drama of the Age of Mammals began under the harsh conditions of an early glacial period which came on some 200 million years ago in the Permian Period. Such times are always unfavorable to cold-blooded reptiles, including lizards, since they possess only very inferior methods of slowing up the loss of heat from their own bodies. But certain small lizard-like creatures of the middle Permian Period in South Africa were then beginning a long series of improvements in their equipment for running, and as they were good runners, they could generate heat by exercise, though they were inferior to their own descendants, the mammals, in their ways of conserving heat.

From comparison of modern lizards and mammals we may deduce how the blood system probably developed. In the line that led to the mammals the circulation was modernized, especially in the heart itself, by the development of a complete

partition separating the pure arterial blood from the depleted venous blood. Later the insulating power of the skin was improved by the development of a hairy covering. Moreover, the enlarging brain gained better control over the more and more powerful and complex general equipment.

Several fossil creatures from successive stages of the Karroo series of rocks in South Africa give evidence that small lizard-like animals gave rise to the cynodonts and other related forms which were nearing the lower mammalian level. By the end of the next period (the Triassic) the mammals themselves were already represented by several little-known forms.

It was not possible, however, for the rising class of mammals to spread easily into completely welcoming environments, as they had to withstand the competition and resistance of their reptilian predecessors. Many of the smaller reptiles had had millions of years to learn the best ways to conceal themselves and to sneak through the underbrush. Some of these managed to hang on and even succeeded in giving rise to the diversified lizards and snakes of the Age of Mammals. On the other hand, they contributed at least a useful item to the food resources of many early mammals and of quite a few modern ones. The giant reptiles, including the dinosaurs, while possessing various fairly advanced types of locomotor apparatus, proved highly deficient in brain power. They were unable to adapt themselves successfully to the period of mountain- and high plains-building which partly preceded the main adaptive branching of the mammals in the Paleocene and Eocene epochs.

The story of the branching evolution of the locomotor systems of mammals has been pieced together by close study of the feet, limbs, and backbones of hundreds of fossil mammals in comparison with the corresponding parts of still existing forms. Meanwhile, studies of the relations between bones and muscles in recent mammals have provided another important key for reading the story recorded in fossil skeletons. Although the fossil record is broken at many points, enough is already at hand to supply the broad outline that is summed up in the chart on pages 224 and 225.

The crawling pace of the earliest reptiles gave place to the mode of

locomotion which, for want of a better name, I have called scampering. By this I mean running about in a furtive way close to the ground and ready to spring this way or that. This sort of movement is seen today among small mammals such as rats and other rodents, shrews and other insectivores. The hands and feet of these creatures are rather small and unspecialized, often with five somewhat spreading digits tipped with claws. The late Dr. William D. Matthew showed that this general pattern of the hands and feet was found among the earlier Eocene mammals, not only among the insectivores, rodents, and carnivores but even among the predecessors of the hoofed mammals. He concluded that these spreading hands and feet were sufficiently near to those of the American opossum to indicate that at an earlier period the ancestors of these groups had learned to climb trees; also that in general the earlier mammals had lived mostly in the trees to keep out of the way of the fierce land reptiles. But even before the last of the dinosaurs had perished, some of the descendants of the tree-living mammals are seen to have gradually spent more time on the ground, losing the spreading form of hands and feet and taking up new lines of specialization for other modes of life.

Among those early mammals which remained in the trees, the fossil primates of roughly 50 million years ago (Eocene times) had already developed rather specialized forms of grasping hands and feet. In fact, all known lemurs, tarsoids, monkeys, and apes bear clear traces of living now or in former times largely in trees. This evidence is in the bones of their hands and feet. It is so even with the baboons, which now spend most of their time on the ground. The same is true of the feet of man, in which the great toe and the four outer toes have been brought together and bound into an effective foot for walking on the ground. The human hand, arm, and shoulder girdle show the same fundamental plan, differing only in various secondary modifications which have made the human hand a better implement for human needs.

One branch of the mammals that remained for a very long time in the trees was the bat tribe. Here the hands are enormously enlarged, and the skin between the fingers forms the web of the wings. The cogeo,

wrongly called the "flying lemur," supplies a sort of structural link tending to connect the bats with less specialized mammals. It leaps from the trees and sails through the air by means of a fold of skin stretched between its fore and hind limbs. Since the web of skin extends between its rather long fingers, this animal has progressed a little further toward true flight than either the "flying squirrels" or the "flying phalangers." In the bats the hands have become so greatly enlarged as to be an impediment in running. But comparative evidence indicates that the remote ancestral bats ran and leaped among the trees, using their large hands and feet to catch the branches as they landed. The successive stages suggested in the chart are climbing, running and leaping, catapulting upward, using the enlarged hands first for flapping flight (as in the fruit bats), and finally for fluttering, an erratic combination of diving and turning used in the pursuit of flying insects.

Some of the early tree-dwelling mammals, avoiding the extreme specialization of the bats, gave rise to the monkeys, which run freely on the tops of the branches and leap well from branch to branch. The gibbons have learned to raise the arms above the head and catch the underside of the branches at the end of very long leaps. This method of progression, called brachiation, has been carried to an extreme by them, but less developed stages of it were probably used by the ancestors of the oranges, chimpanzees, and gorillas. Of these, the oranges have tended to give up the leaping and content themselves with long arm swinging, while the chimpanzees and still more the gorillas spend much of their time on the ground. The human skeleton bears a great many features which are found also in the skeletons of the apes and which give weighty evidence of a former arboreal mode of life.

#### *In the deep*

At the opposite extreme from the fluttering bats are the gigantic whales, which can withstand enormous water pressures in deep diving. To sum up their story in a few lines, their remote mammalian ancestors were very probably primitive short-legged carnivores of semiaquatic, somewhat otter-like habits. After reaching the seacoast they became more and more specialized for pursuing schools of fish, finally following them out to

sea. Their increasingly long tails, waving up and down, developed flanges of tough skin to form the flukes. Meanwhile their fore feet were reduced to flippers, and their hind feet eventually disappeared entirely, leaving only the vestigial limb bones and pelvis beneath the greatly thickened skin. The sea cows (manatees and dugongs), although recalling the whales in appearance, have been derived independently from some quite different source and, in spite of external appearances, are probably related remotely to the elephant and the conies (dassies).

To go back to the earlier mammals, the spreading five-toed hands and feet became much shorter in the striding forms, of which the elephant is a good example. These heavy beasts merely swung their massive legs forward and pulled them backward, swaying from side to side and rolling their weight from one side to the other. At the opposite extreme are the delicately built, leaping antelopes, whose feet have become lengthened and narrowed so that the limbs form compound levers or throwing-sticks. This sort of progression, originating on the hard open plains, involves the gradual reduction in number of the digits on each extremity. In the horses only the middle or third digit remains visible externally, but slender splint bones represent the second and fourth. Meanwhile many detailed improvements have been worked out, such as the double-jointed ankle pulley in the even-toed hoofed mammals, and the shock-absorbing hoofs, ligaments and tendons of the horse.

Many of the central stocks of the later mammals have been swift runners, such as the dogs (culminating in the greyhounds) and the cats, including the swift cheetahs. Some of the groups have branched widely. For example, primitive civet-like forms gave rise to the secondarily arboreal raccoons, coatis, and kinkajous; while from the prevalently ground-dwelling cats came several tree-loving forms, including the clouded leopard.

The bears are gigantic specialized dogs with feet adapted for walking on the sole with the heel touching the ground. The giant pandas are bearlike relatives of the little pandas and raccoons.

Digging animals (for example, the moles, the armadillos, and the aardvarks) have come from widely different families. While each type

*Continued on page 244*

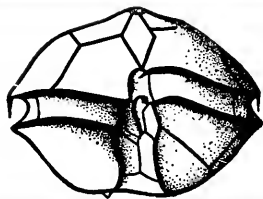
# Shellfish

## Poison

Some summer tips for safety in the shore dinner

*At right: The shell of *Gonyaulax catenella* magnified 840 times*

*Above: A Pismo clam*



By L. H. FOWLER

**S**TAPLE provisions among the early settlers along the Pacific Coast were often scarce and difficult to obtain. But the pioneers had a way of shrugging off their troubles by keeping in mind the old axiom—"When the tide is out, the table is set." It still holds true. Clams and mussels are among the most delectable of the bivalves, as many gourmets will agree. Yet, there are often periods during the summer months when these succulent shellfish harbor a poison deadly as the venom of a cobra.

This toxicity in clams and mussels may occur at any point along the outside waters of the Pacific Coast from Juneau, Alaska, to the Gulf of California. In the North Atlantic the regions affected are mainly along the coast of Belgium and in the Bay of Fundy, Nova Scotia.

The original source of the poison is found in a microscopic organism of the sea, the dinoflagellate *Gonyaulax catenella*.<sup>\*</sup> It is free-swimming, and like all plankton organisms it is most abundant in summer. It may multiply to as large a number as 40 million per quart. At such times the ocean may, for miles, present a deep rust color, the so-called "red tide," and a beautiful luminescent spectacle at night.

<sup>\*</sup> Dinoflagellates are on the borderland between plants and animals.

The poison content may vary considerably; even a small number of the organisms—not enough to be visible as red water—may be sufficient to make shellfish dangerous as food.

The poison contained in these dinoflagellates is one of the strongest known. It is an alkaloid, like strychnine and aconitine. About one millionth of a gram by injection is enough to kill a mouse.

Luckily, the "little dinos" are usually most abundant some distance off shore. However, natural currents and weather conditions sometimes combine to bring countless hordes of the organisms close in along the beaches. The plankton serve as a food for many animals of the seashore, including the bivalves. After the clams and mussels ingest the plankton, the poison is stored in their digestive glands. Once there, it is a menace to all warm-blooded creatures who are in the habit of feeding on shellfish.

The poison is not harmful to the shellfish itself. In man, its seriousness is proportional to the number of the organisms and their alkaloid content. If a large number are present in the water, the toxicity of shellfish may rise to dangerous levels in a few days. When the organism disappears, the stored poison is slowly excreted by the shellfish, and in the course of several

weeks they again become safe for food. The muscular tissue (white meat) of the shellfish contains little poison; practically all of it is concentrated in the digestive viscera, the dark central portion. It would be well to remember that fact when preparing shellfish for the table during the summer months when the "little dinos" are prevalent. To date, there has been no known case of shellfish poisoning where the "dark meat" has been discarded.

Ocean mussels (*Mytilus californianus*) are the worst offenders. The Washington and Pismo clams have also been responsible for several fatalities. Other varieties of clams and the Pacific oyster have not caused any deaths so far as is known, but the poison has been found in most of them. Only shellfish whose habitat is far from the open ocean, such as soft-shelled clams, native oysters, and scallops, are entirely free of the poison. Abalones and crabs do not feed on plankton, so there is no danger of becoming poisoned from these sea foods.

Shellfish poisoning has been known and recognized in Europe for more than a hundred years. On the Pacific Coast the first outbreak recorded occurred in the exploring party led by Captain George Vancouver. It happened in 1793, on the island which now bears his name. Since 1927, the records for the Pacific Coast show 346 cases of shellfish poisoning. All the cases occurred between May the 15th and the 15th of October.

Last May the recurrence of *Gonyaulax catenella* was suspected in the State of Washington. Reports were received of many cats and chickens dying after being fed with the viscera of freshly dug clams. Experiments were inaugurated immediately to determine if the deaths were caused by this organism. The effects were found to be typical in both the cats and chickens. The cats developed paralysis in the hind quarters, which worked forward to the front part of the body. Finally, paralysis of the heart muscles caused death. Chickens at first developed an unsteadiness in the legs and eventually were unable to stand. In most cases the chickens were dead within two hours. Of those affected, about 30% of the cats and 80% of the chickens died. There were authentic reports from poultry men of large numbers of chickens dying.

Tests made by Doctor Sommer\*, who was sent to this district from California, showed that although there were large amounts of poison in the clams' digestive organs there was no poison in the muscular tissue. This accounts for the lack of illness in human beings; people always carefully clean razor clams before cooking. It is common for people to feed the clam viscera to chickens or cats. At many times of the year this is permissible, but during the late spring and summer it is a dangerous practice, as can now be seen.

There were several human fatalities in other Washington districts around this time. One death occurred from eating hard-shelled clams from Clallam Bay on May 3, 1932. On May 5th, two of five persons who had eaten mussels from the mouth of the Elwah River died, the other three were very ill. About this time, two Indians also died on Vancouver

Island from eating mussels gathered on the western side of the island. In these cases small clams and mussels were eaten whole without cleaning, which explains the fatal results. The poison was located in the digestive organs of the shellfish, and the people consumed not only the flesh, but also the organs filled with poison. The above localities are all exposed or partially exposed to the open sea. Of special interest to sportsmen is the fact that many shore birds and diving ducks are also killed by the *Gonyaulax* poison.

Considering the large amount of shellfish consumed, even in summer, the extent of paralytic shellfish poisoning is no doubt exceedingly small. However, the dangerous nature of the poison makes it a serious public health problem.

The symptoms of shellfish poisoning in man are entirely of nervous origin and may set in immediately after the meal. A prickly feeling in the lips, tongue, and finger tips are the first signs of intoxication. An ataxic gait, muscular in-co-ordination, and finally ascending paralysis, mark the progress of the poisoning. Death results from respiratory failure in from 2 to 12 hours after eating the toxic shellfish. Vomiting may occur in severe cases. Small amounts of the poison ingested by the shellfish during periods of low toxicity apparently have no effect on the human body.

No specific treatment or antidote for shellfish poisoning is known. Experience has shown that the provocation of active vomiting by apomorphine is more effective in removing pieces of shellfish from the stomach than lavage. In severe cases artificial respiration should be resorted to.

The plain fact that the viscera of any bivalves during summer time may be a potential source of poison should be readily understood. Therefore a safe rule is: *Do not eat the viscera (dark meat) or drink the juice from mussels, clams, or similar shellfish from the open Pacific Coast, between the 1st of May and the 1st of November.*

For the past twelve years the state of California has taken measures to prevent the occurrence of shellfish poisoning. During the poison season of 1939 it was proved beyond doubt that warning signs posted along the beaches and across the highways at the county lines helped to reduce the number of cases of poisoning.

The health officer or local physician has an excellent opportunity to dispel the many erroneous notions in the minds of people concerning shellfish poisoning. Temporary exposure to the sun does not harm living mussels or clams, nor does it make them poisonous. Copper in the rocks, oil on the beaches, or pollution of the water are in no way connected with shellfish poisoning. Mussels and clams nearest the low water line are, if anything more poisonous than those taken higher on the beach or ledge. The former have a longer feeding period.

Toxic shellfish cannot be distinguished except by laboratory tests. Discoloration of a piece of garlic or a silver spoon in the cooking utensil is no indication of poisonous shellfish. The addition of baking soda in cooking shellfish has been advocated and helps to reduce the toxicity, but it is by no means a sure safeguard against poisoning. During the doubtful season to be safe, *eat the white meat only and wash it thoroughly before cooking.*

\* The writer is indebted to Dr. H. Sommer and Dr. K. F. Meyer of the University of California, and Dr. D. L. McKeenan of the Washington State Department of Fisheries for much of the data in this article.



# The Only American Stork

By RICHARD H. POUGH  
*National Audubon Society*

SINCE dawn we had been tramping through a typical south Florida landscape—flat pine woods, open glades, and small elongated strands of cypress. As the sun rose higher and higher, heat waves began to blur the distance and the volume of bird song decreased noticeably. The birding had been good, although we hadn't seen the wood ibis that Tom, our cracker guide, had promised us.

Thirst and fatigue reminded us that we had been on our feet a good many hours, and the going underfoot had been far from good. Wasn't it about time to turn back? We hoped our guide knew where he was. This strange country was so different from our northern woodlands that our eyes failed to record those subtle differences that ordinarily make it possible to retrace one's steps. "How about turning back pretty soon," we tactfully suggested. "We can't expect to see everything our first day. Maybe we will have better luck with the wood ibis on the coast."

To our surprise Tom pointed off to the south and said: "Them's flintheads there now." At first all we could see was a small puffy cumulus cloud similar to the many others that were beginning to form in the previously cloudless sky. Suddenly we realized that beneath the cloud was a swirling mass of birds. Binoculars revealed about a hundred broad-winged black

and white birds spiraling ever closer to the flat cloud base. A new bird for our life list.

Tom explained that one could always count on seeing flintheads on a quiet day as soon as the horizon began to shimmer. Once in flight, they spiral up and up like vultures with hardly a flap of a wing. Suddenly when almost out of sight, they dive back to earth with a roar which Tom likened to that of a bull alligator. As often as not the whole flock will at once repeat the entire performance. We had always known that vultures habitually use these cloudcapped rising columns of hot surface air—known to weather men as thermals—but in their case it

*Three Lions photo*





*Allan Cruickshank photo*

◀ **THREE EGGS** is a normal wood ibis clutch. They are chalky-white in color. The nest is about eighteen inches wide and five deep. It is composed of coarse sticks but is sometimes lined with moss, green leaves, or other soft material

▶ **AN AUDUBON WARDEN PATROL** is maintained throughout the year among the Thousand Islands of the southwest Florida coast. The survival of these interesting rookeries would best be assured by the establishment of an Everglades National Park or a Federal Wildlife Refuge

*Three Lions photo*

LIKE most expert soarers, the wood ibis possesses a broad wing and a very small tail. The contrast between the jet black flight feathers and the white body plumage produces a strikingly beautiful pattern. The wood ibis is a big bird, the span of its outstretched wings measuring five to five and one-half feet





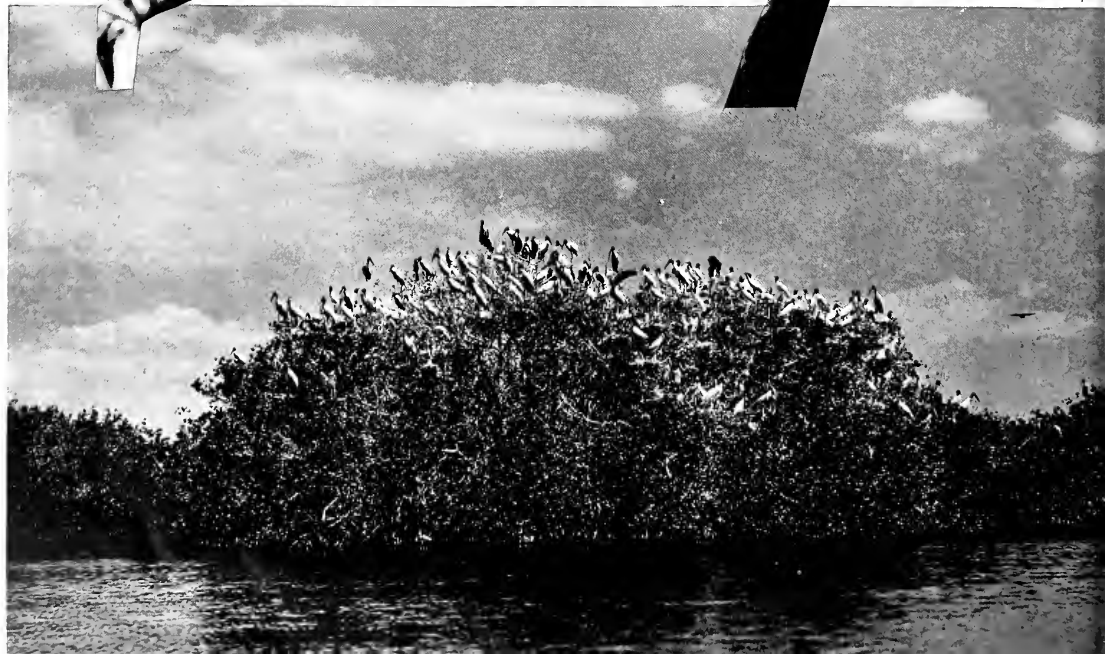


► COLORED CELLULOID and numbered aluminum leg bands make this youngster a marked bird. Through the banding of large numbers of young much has been learned concerning the movements of these birds and the age at which they breed

▼ IN SOUTH FLORIDA the wood ibis begin to gather into rookeries in early winter, and in some years most of the eggs have hatched by the end of January. Although nesting over salt water, the adults fly inland to the Everglades to feed. Unwise water diversion has caused such serious drought in many recent years that the ibis' feeding grounds have been destroyed and nesting made impossible



Allan Cruickshank photo





is clearly as a means to an end. Because of a vulture's feeding habits, it must of necessity spend a great deal of time aloft in search of food. But why should wood ibis spend hours slowly climbing to five or six thousand feet only to descend at once and repeat the performance? No explanation seems possible except that they enjoy it. Like a small boy with a sled on a snow-covered hill, or an otter at its slide on a mud bank, they are willing to spend hours climbing in order to enjoy a few brief moments of headlong descent.


These interesting birds variously known as ironheads, flintheads, or gannets, because of their bare, featherless heads, reveal their inherent playfulness in many other ways. Wood ibis are, for instance, one of the few birds that will fly upside down. Not as part

of a loop, like a marsh hawk in nuptial flight, but as a deliberate wing-over during ordinary flight. In some cases they have been observed to continue sailing upside down for several hundred yards before righting themselves. Tightrope dancing is another favorite trick of the wood ibis. Instead of picking a substantial perch like any sensible bird, an ibis will teeter endlessly on the top of a vertical snag or on a slim, swaying branch that is barely capable of sustaining its weight.


Even the gathering of material for their not too substantial nest takes on the aspects of a game. They disdain to pick up twigs from the ground but insist on plucking them from a tree while in full flight. If, as a child, you ever tried grabbing rings from a merry-go-round, you can appreciate

that this is not the easiest thing in the world to do. Nor is the wood ibis by any means always successful at the game. An observer sometimes wonders that they don't kill themselves. Nevertheless generation after generation of wood ibis continue to gather their nesting material the hard way.

Wood ibis have developed what appears to be a very efficient manner of feeding. Possibly it is because they have solved the problem of getting a living so successfully that they have time and energy to engage in play. Feeding, like soaring, nesting, and roosting, is with them a community activity. Their favorite feeding grounds are shallow ponds in open grasslands or marshes. A whole flock descend together on such a pool, and each bird at once goes to work stirring



THE MALE WOOD IBIS is a much larger and heavier bird than its mate. Both are active in the care of the solemn-faced young



▼ ALONG THE SOUTHWEST Florida coast the wood ibis nests in the low tangled red and black mangrove thickets lining the waterways. Many years of complete freedom from molestation under the watchful eye of Audubon wardens has dispelled much of their traditional wariness. Red mangrove is one of the few trees that takes root and grows in shallow salt water. A person can penetrate it only with the greatest difficulty

*Allan Cruickshank photos*



up the mud with its feet. The performance has very much the appearance of a dance. Its apparent purpose is to rile the water and force small fish, tadpoles, and other aquatic animals to the top. Whenever one of these comes to the surface, the nearest bird kills it with a snap of its bill. This snap produces a loud clacking sound, and a whole flock of feeding ibis makes a noise that carries for quite a distance. After a while the dance subsides and the flock then, but not until then, starts to feed. Frequently more food is floating dead on the surface than the flock can eat. However, it is not wasted as turtles and other scavengers quickly clean it up.

No one seems to know just how these birds came to be called ibis. Actually they are storks—the only North American representative of this ancient and honorable family of birds. The wood ibis is a common, wide-ranging species found from our southern states south all the way to Argentina. Thanks to a natural wariness and a highly unpalatable flesh, they have been able to survive remarkably

well. Lacking any very beautiful plumes, they were not persecuted by the plume hunters as were the egrets, with which they frequently share their rookeries.

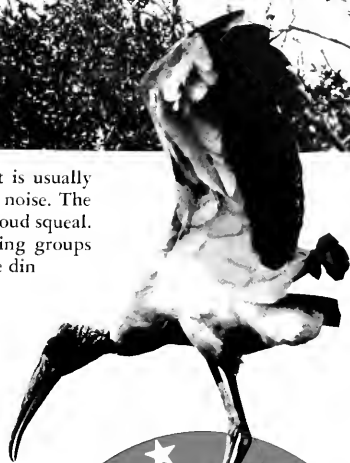
A visit to one of these wood ibis nesting colonies is an exciting event. By preference they choose a dense strand of cypress composed of mature trees one hundred or more feet high located in a region of open glades or pine lands. Here they build their loosely constructed and for such a large bird rather small nests, in the topmost branches. Often each tree will contain ten to twenty nests, many of which will be 80 feet or more above the shallow water of the swamp. One such rookery occupying an area about two miles long and a half mile wide in the Big Cypress of Florida is estimated to contain an average of 40,000 breeding birds. Snakebirds, as well as American egrets, commonly share these rookeries with the ibis.

Before their virtual extirpation from Florida the lovely roseate spoonbill nested in some of the more southern rookeries of the wood ibis. There is apparently a definite affinity between these two species, the ranges of which almost completely overlap, as even in feeding they frequently associate with each other.



▲ A BREEDING COLONY or rookery as it is usually called is a scene of constant activity and noise. The adults make a hoarse croak, the young a loud squeal. The roar made by the wings of returning groups of foraging birds continually adds to the din

► GOURDHEAD is another of the many names by which the wood ibis is known. Like most of its other names, this one comes from the peculiar roughened appearance of the dark naked skin of its head and neck. The bird at right is indulging in a typical teetering performance on the top of an insecure dead branch



◀ IT WILL TAKE these four rather droll-looking young wood ibis four years to mature. Until then their heads will be more or less feathered. During this period they avoid the adults and form flocks with others of their own age



▼ THE SCENE of the world's greatest explosion: Sunda Strait, connecting the Indian Ocean (on the left) with the Java Sea. This map shows the outlines of Krakatoa before the volcanic eruption



▼ CAULDRON IN THE SEA. A column of steam and cinders is hurled to a height of 1000 feet, as old Krakatoa's youthful offspring, "Anak Krakatoa," grows and threatens the neighborhood. A view of the eruption of 1930



*Erving Galloway photo*

CAPTAIN WEBSTER, master of the mail steamer "Hawarden Castle" anchored off Port Elizabeth, South Africa, was a methodical man, and with the brevity characteristic of master mariners he recorded the bare facts of a puzzling incident:

At eight-thirty P.M. on August 27th (1883) wind moderate, southeast, with ship riding head to wind. Suddenly ship swung head to northeast, bringing wind and sea abeam. Though cable had parted but on going forward found heavy strain on cable caused by anchor still bearing southeast from ship. Dropped second anchor. . . . At eight hours, fifty minutes P.M. ship turned head to wind. Remained in this position eight minutes then swung again with head to northeast. From this time until midnight occasionally headed wind and sea but . . . remained most of time heading northeast with moderate wind and sea abeam.

Six hours earlier, 4000 miles to the northeast, an Agent of Eastern Province, Ceylon, sat facing the window of his office overlooking Argam Bay. Commercial duties, never arduous, were less pressing than usual, and with a drowsy eye he saw a group of natives on the offshore bar. Precisely at 3 P.M. he lifted a heavy eyelid, and what he saw galvanized him instantly into complete and astounded consciousness.

Half a mile offshore a small boat rose high on an ocean swell—a single broad bulge in an otherwise smooth

Exactly 60 years ago the mightiest spectacle of all recorded history gave notice of itself on every one of the 197 million square miles of the earth's surface

sea. The swell was moving shoreward with the speed and silence of an arrow. In the shallows on the seaward slope of the bar the mass of water rose swiftly as might the entire ocean by some incredible catastrophe. It engulfed the terrified group on the bar and filled the harbor with confusion. Even as the Agent observed the amazing scene, the flood reached its highest, poised a moment, and swung seaward laden with flotsam snatched from far above the mark of high tide.

Captain Webster at Port Elizabeth and the Agent on Ceylon had witnessed a remarkable phenomenon. Neither, however, was omniscient and neither recognized the sea wave for what it actually was—a messenger of chaos, death, and destruction. It was impressive within itself but infinitesimal in comparison with the catastrophic burst that had eviscerated the volcano of Krakatoa at ten o'clock that morning in the Sunda Strait between Java and Sumatra. The wave had spread from an outburst of energy cosmic in its dimensions, one which in one way or another gave notice of

itself on every one of the 197 million square miles of the earth's surface.

It was not the first eruption of Krakatoa nor was it to be the last in our time, though nothing since has equaled it in violence. In Sunda Strait the closely grouped islands of Verlaten, Lang, and Krakatoa are but small bumps in and around the crater of an immense volcano 25 miles in circumference. The existence of such a cone, diagrammatically shown in the accompanying illustrations, is in itself adequate proof that this was not the first outburst. Native legends of the region refer to an eruption lost in antiquity, and recorded history gives meager account of a mild outburst in 1681.

After two centuries of silence these most recent paroxysms of Krakatoa began as they ended—in violence. Exactly 60 years ago on the 20th of this month residents of Batavia, on the opposite side of Java, "heard booming sounds like the discharge of artillery," and windows rattled periodically all day. Not until two days later did a passing ship bring word of the onset of activity at Krakatoa. It

# The greatest

▼ **GATHERING FORCE:** another airplane photograph of the hole in the ocean at the site of the most violent cataclysm in the history of man. In the background is seen one of the islands left after Krakatoa's major explosions in 1883

▼ **UNPREDICTABLE.** Whenever Krakatoa appears restless, the catastrophe of 1883 is recalled, when a cubic mile of rock was hurled 17 miles into the air and 36,000 persons lost their lives



*Press Association, Inc.*



*Ewing Galloway photo*

# *Explosion of all time*

reported explosions on the island and a tower of dust reaching 36,000 feet into the air. This was indeed news.

Within the same week an excursion from Batavia visited the volcano and ascended the blackened slope of hot cinders. At the top of the highest peak they saw a crater 3000 feet in diameter, from the center of which there issued with a terrific roar a great column of steam, carrying volcanic dust 10,000 feet into the air. Following this report few cared to come to close grips with the seething volcano, and thereafter information came only by passing ships. Late in June a second column appeared more nearly in the center of the ancient cone. There followed a month of increasing violence and a third gigantic jet broke forth, throwing skyward immense clouds of dust and pumice, which settled in vast rafts on the surrounding sea. Shortly thereafter eleven smaller jets appeared, and Krakatoa settled down to the deadly business of self-destruction.

Passing ships reported constant detonations on the island, but none of this was news to the residents of Batavia. Heavy clouds obscured most of Krakatoa, and continual lightning flashed in the darkness hanging over

By **HOBART E. STOCKING**

*Department of Geology, West Virginia University*



*Edwin Lewis  
(AP photo)*

► **LYING BETWEEN JAVA AND SUMATRA,** Krakatoa is on the fringe of the territory now occupied by the Japanese. A view from a near-by island





★ THE ANCIENT VOLCANO AS IT APPEARED BEFORE THE ERUPTION OF 1883. The portions projecting above the ocean are Verlaten Island (on the left), Lang Island (background), and Krakatoa (center).

★ THE SAME REGION AFTER THE ERUPTION. Most of Krakatoa has disappeared. Verlaten and Lang Islands have been enlarged by the addition of volcanic debris.

the volcano. For miles around, the air was heavy with sulphurous odors, and meticulous ship captains complained that merely passing through the area gave adequate time for gases to corrode and blacken every inch of exposed brasswork.

On Sunday afternoon, August 26th, there was no ship closer than ten miles from Krakatoa, but judging from the account of Captain Watson of the British ship "Charles Bal," this distance was the equivalent of a front row seat. The air was choked with dust, and there was a continual rain of volcanic debris, such that all hands fell-to to keep the decks cleared. The ship "Loudon," at anchor in the Bay of Lampong 50 miles from the volcano, reported that "lightning struck the mainmast conductor five or six times" and that there was a constant rain of phosphorescent mud. Natives in the crew were terrified by this display, and stokers deserted the engine room to assist the deck hands as they rushed madly about extinguishing the glow with their hands, pleading that if any spark of this cold fire found its way below decks it would, somehow, scuttle the ship.

Shortly after midnight there came a lull in the volcanic tempest. Krakatoa was not a large island nor did it stand much above the level of the Indian Ocean. Such violent and continued explosions must certainly have opened fissures below sea level, and into some of these deep cracks water

must have poured. The vast Indian Ocean, but little disturbed, was dousing the small glow on its fringe, but the battle was not won. Superheated steam was being developed under terrific pressures.

The Ocean did not quench the incredible heat of steam and molten rock; it merely fastened down the safety valve of Krakatoa, while subterranean fires of Vulcan's forge raged in full fury. The result of this deadlock was exactly what might happen to a man-made boiler under similar circumstances: there followed a period of relative quiet as internal pressure mounted to astronomical heights. It was the same sort of build-up that occurs in a geyser, but far greater. The external manifestations of internal forces had been appalling up to now; with but brief frustration they were to reach proportions never before or since witnessed by man.

There was a mighty explosion at 5:30 and another at 6:44 A.M., but these were merely preliminary throat-clearings, which brought the inhabitants of Batavia upright in their beds. Beneath the impenetrable shroud of dust a mighty thunderbolt of Jove was in the making, and at Krakatoa a few more hours of relative peace came as a prelude to evisceration of the volcano.

At 10:02 A.M. Krakatoa exploded in a gigantic, catastrophic burst. A cubic mile of rock, pulverized in the explosion, shot seventeen miles into

the air. The roar was plainly audible on the island of Rodriguez, 3100 miles to the east. A gust of compressed air shot through space to blow out lamps, blow in windows, even blow down walls in Batavia nearly 100 miles away, and the same gust encircled the earth to oscillate barometers in New York City.

The roar of chaos, clearly audible for more than 3000 miles, gave instantaneous birth to a mighty wall of water which, like concentric ripples from a pebble tossed into a quiet pond, spread out from Krakatoa as a center. These were ripples of cosmic proportions: 50 to 100 feet high. At 350 miles an hour they roared onto adjacent coasts and with incredible speed spread death and destruction over hundreds of miles of shore line. As fee for Vulcan's spectacular fantasy, the wave claimed 36,000 lives.

The wave ripped through Sunda Strait and rippled the entire Pacific. Westward, with diminishing amplitude, it raced across the Indian Ocean and with a last lethal fillip astonished the Agent on Ceylon. Six hours later this and succeeding ripples puzzled Captain Webster at Port Elizabeth by swinging his anchored ship broadside to moderate wind and light sea. It raced past Good Hope, swung northward into the Atlantic, and gently lifted tidal gauges on the shores of Britain. It spanned the South Atlantic and met its other half from across the Pacific some-



where in the vicinity of Cape Horn.

The curtain fell slowly on the mightiest spectacle of all recorded time with a blaze of glory. Bizarre sunsets were seen at Calcutta, Alexandria, Rome, Paris, Washington, San Francisco, and Hong Kong, as the vast cloud of volcanic dust made eight recognizable circuits of the earth. Born of a violence never before witnessed by man, it settled gently on every continent of the earth.

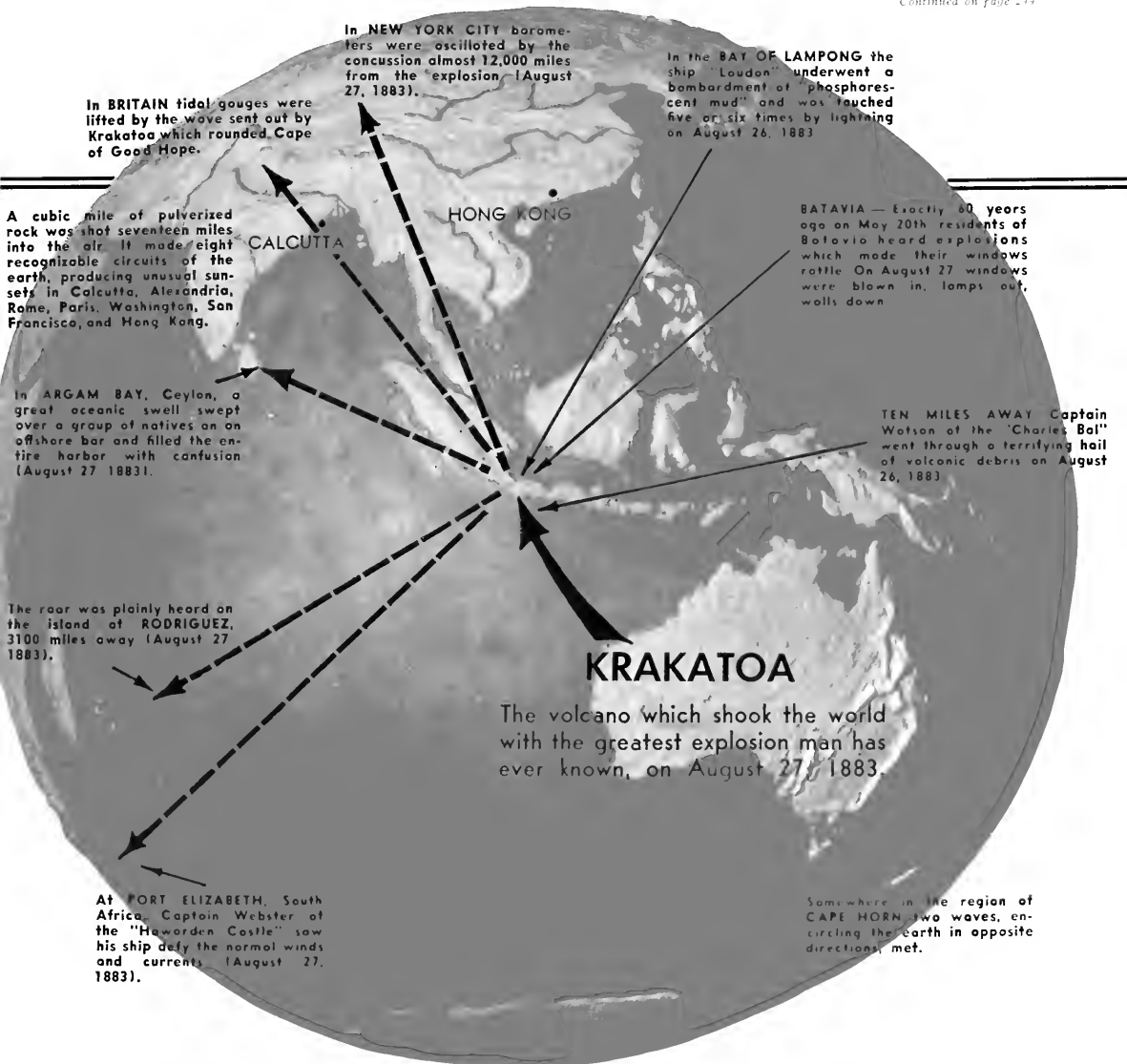
There are nearly 600 of Krakatoa's kinsmen scattered over the earth. The majority are concentrated in a narrow belt bordering the Pacific

Ocean from Cape Horn northward along the coasts of South, Central, and North America. Mount Lassen in California is the solitary representative of the clan in the United States. The belt continues westward through the chain of the Aleutians, bends south to include Fujiyama, and continues on to the region of Krakatoa. There is a westward extension of the belt into the Mediterranean, including Vesuvius and Stromboli in Italian territory. Embattled Malta is a mass of volcanic debris, and strategic Pantelleria, midway between Sicily and North Africa, is a volcanic fragment.

Outside the narrow belt there are a few mighty cones rising in mid ocean, and of these Mauna Loa of the Hawaiians, 29,000 feet above the floor of the sea, is one of the better known.

Some volcanoes remain in constant and mild eruption for decades, and so accustomed are the near-by inhabitants to such vagaries that no one is much disturbed. Mauna Loa is of this benevolent class. Others may be quiescent for centuries and support on their slopes cultivated fields, the owners of which are completely unaware of the potentialities of the mass on which they live until it erupts in sudden vio-

*Continued on page 214*



In **BRITAIN** tidal gauges were lifted by the wave sent out by Krakatoa which rounded Cape of Good Hope.

In **NEW YORK CITY** barometers were oscillated by the concussion almost 12,000 miles from the "explosion" (August 27, 1883).

In the **BAY OF LAMPONG** the ship "Loudon" underwent a bombardment of phosphorescent mud" and was touched five or six times by lightning on August 26, 1883

A cubic mile of pulverized rock was shot seventeen miles into the air. It made eight recognizable circuits of the earth, producing unusual sunsets in Calcutta, Alexandria, Rome, Paris, Washington, San Francisco, and Hong Kong.

CALCUTTA

HONG KONG

**BATAVIA** — Exactly 60 years ago on May 20th residents of Batavia heard explosions which made their windows rattle. On August 27 windows were blown in, lamps out, walls down.

**TEN MILES AWAY** Captain Watson of the "Charles Bat" went through a terrifying hail of volcanic debris on August 26, 1883

In **ARGAM BAY**, Ceylon, a great oceanic swell swept over a group of natives on an offshore bar and filled the entire harbor with confusion (August 27 1883).

# KRAKATOA

The volcano which shook the world with the greatest explosion man has ever known, on August 27, 1883.

The roar was plainly heard on the island of **RODRIGUEZ**, 3100 miles away (August 27 1883).

Somewhere in the region of **CAPE HORN** two waves, encircling the earth in opposite directions, met.

At **FORT ELIZABETH**, South Africa, Captain Webster of the "Hawarden Castle" saw his ship defy the normal winds and currents. (August 27, 1883).

# INSECT GARDENERS



By JOHN ERIC HILL

Drawing by

G. FREDERICK MASON

**T**HIS month many readers will put in, or cultivate, a victory garden. Growing food gives the gardener a feeling of accomplishment, perhaps because agriculture was one of the later achievements of mankind. Although food plants were grown in the Middle East and Egypt much earlier, the first European gardens were planted only about 5,000 years ago, and in many parts of the world people still depend on hunting or the keeping of herds, or on the natural produce of the forest and field. Now there is an urgent need to increase food production in order to sustain workers in our great industrial expansion, and to feed the armed forces and the starving people of Europe when victory is won. Gardens will be of great importance in this task.

The gardener often thinks the insects act as if all his efforts were for their benefit. But some ants have gardens of their own, which they tend with as much care as ever man did. These are the fungus-growing ants, a tropical American group that has several representatives in the southern

United States. The most highly specialized of these gardening insects, the leaf-cutting or parasol ants, have an elaborate system of underground chambers, each several square feet in extent and often eight feet or more below the surface. On the floor of these garden rooms are beds of chewed-up leaves, looking like flattened sponges and covered with the white fungus growths on which the ants feed.

The workers, imperfect females as in the ant world generally, are of several kinds. Those that tend the gar-

dens are small. The workers that go out to cut the leaves, carry them home, and chew them to the pulpy mass used in the garden are almost three times as large as the gardeners. The soldiers that defend the colony from enemies are still larger and are provided with powerful jaws. Workers weed and take care of the gardens and also feed and look after the larval ants—grublike, helpless babies of the colony.

When the young queen leaves her parental nest for her marriage flight, she carries a small pocketful of the fungus (the pocket is below her mouth and the pellet is the remains of her last meal in the home nest). After mating, the queen alights on the ground and begins to dig. She soon excavates a small nest chamber and in this she plants the small fungus mass. She then begins to lay eggs for the new colony and takes care of the young garden. Until the first workers have matured, the fungus is grown on excrementa, and the larval ants feed on the eggs laid by the queen. Once the workers have reached the adult form they take over the care of the young and go out to gather leaves for the fungus garden. The queen works no more, but becomes an egg-laying machine.

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## ON YOUR RADIO

Programs of the American Museum and Hayden Planetarium, Spring, 1943.

WEDNESDAYS over WNYC

from 3:30 to 3:45 P. M.

*Science for the Seven Million*

•

SATURDAYS over WNYC

from 10:45 to 11:00 A. M.

*The Stars Will Tell*

A new quiz program, broadcast directly from the Hayden Planetarium, in which boys and girls attending the morning show may participate.

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# YOUR NEW BOOKS

CHILE • COPPER • INSECTS • INDIANS • NICHOLAS COPERNICUS

## CHILE

----- by Erna Fergusson

Alfred A. Knopf, \$3.50

CHILE with its intriguing geography and diversity of climate, its history, and mixed population offers an inspiring challenge to any writer. Miss Fergusson has very successfully met this with unusual fairness, common sense, and discernment. The result is an excellent and entertaining analysis of the country, its people, and their problems, which refutes the common idea that only long residence in a country qualifies one to write about it. If all writers on Latin America were to take the same care to familiarize themselves as thoroughly with the history and literature of the countries they visit as she has we would all benefit and there would be less complaint from the people written about.

No country is so perfect that a skillful writer who lacks understanding or is content with half truths cannot find something which may appear ridiculous or offensive—he may even give such impressions unintentionally. To accurately portray a people showing both their virtues and their faults without rancor or bias is a rare accomplishment. The reader is left with the feeling that not only are the Chileans and their country worth knowing, but that the author herself must be a thoroughly worth-while person.

JUNIUS BIRD.

## FORWARD WITH SCIENCE

----- by Rogers D. Rusk

The Plimpton Press, \$3.75

AS stated in the preface, Doctor Rusk attempts in this volume to show not only what recent developments in physical science are of most importance today, but how the wave of science is related to the present engulfing social tide, and he has succeeded magnificently in this broad and sweeping survey. He has given us a story of the development of science that is as fascinating as a novel.

The author is a college professor of physics, but he has the rare facility of popularizing the physical sciences in a way that reminds one of Sir James Jeans and Professor George Gamow, and in the biological sciences of Professor Thomas H. Huxley. A few of his chapter headings are: "The Wave of Science," "Newly Discovered Particles," "The Amazing Electron Microscope," "Keeping Up with X-rays," "Man-made Radioactivity," and "Harnessing Atomic Energy." He discusses cosmic rays, origin of the solar system, age of the earth, Bethe's carbon-cycle theory for the conservation of the sun's

energy, quantum theory, and relativity. In reference to the general theory of relativity, Doctor Rusk says, "The mathematics is complicated but, contrary to persistent rumor, the ideas *can* be put into words of not too many syllables." He then proceeds to give us one of the clearest, nontechnical discussions that this reviewer has read, of "the greatest one-man revolution since the time of Galileo."

The closing chapters, written from the point of view of society in relation to scientific development, are most illuminating. The author makes this provocative statement, "The phenomenon of war has proved that we live in a pagan world where brute force can only too easily gain ascendancy, and it has not yet been demonstrated that man can finally control the situation in which he finds himself. If he can control it, it can only be through the development of a social conscience, which must more and more supplant the ritual of religion, and through the integration of the scientific aspect of life with that social conscience."

CLYDE FISHER

## NICHOLAS COPERNICUS

----- by Stephen P. Mizwa

The Kosciuszko Foundation, 75¢ brochure bound; \$1.50 cloth bound

HERE is a beautiful booklet, prepared with great care by Doctor Mizwa for the 400th anniversary of the publication of the famous book, *De Revolutionibus Orbium Coelestium*, which set forth the Copernican system of astronomy. It is also a memorial to the great Polish astronomer, who died in the same year in which his epoch-making book was published. Memorial meetings will be held in hundreds of colleges and universities throughout the country. These demonstrations will be climaxed by a meeting of tribute in Carnegie Hall, New York City, on May 24, the date of the death of Copernicus. Dr. Harlow Shapley, Director of the Harvard College Observatory and President of the National Academy of Arts and Sciences, is chairman of the national committee, and will preside at the meeting in Carnegie Hall.

The booklet is much more than a souvenir of this commemoration. It has permanent value as a dependable biography of one of the greatest astronomers of all time. The author has taken triple pains to have it both scientifically and historically accurate. While the monograph was in manuscript form he had the careful criticism of Dr. Henry Noble McCracken, President of Vassar College and of the Kosciuszko Foundation, of Dr. Oscar Halecki, the outstanding contemporary Polish historian, Professor of History at the University of Warsaw and

now Director of the Polish Institute of Arts and Sciences in New York, and of Dr. Edward Rosen of the College of the City of New York, leading Copernican scholar.

The exquisite frontispiece design in color was contributed by a refugee Polish artist, Arthur Szyk, "perhaps the greatest living miniaturist working in the technique of illuminated medieval manuscripts." The abundant illustrations add much to the human interest of the book, which is a thing of beauty and literally *multum in parvo*.

CLYDE FISHER.

## INDIAN EXPERIENCES

----- by De Cost Smith

Caxton Printers, \$4.00

DE COST SMITH (1864-1939) was a good artist and a scholarly man. His boyhood was spent on the borders of the Iroquois Onondaga Reservation in western New York, so his interest in Indians was second nature. When still a youth he began to visit the Missouri River country to make notes and sketches, giving special attention to the history of exploration in that area. In middle life he descended the Missouri by canoe from Fort Benton to St. Louis, with a copy of the Original Journals of Lewis and Clark, checking and identifying the narrative of those famous explorers, making photographs and sketches as he went along.

After his death in 1939 the manuscript for this book was found among his papers. So far as we know, it is his only book. The reader will find it no ordinary volume, scholarly in spots but again thrilling in interest and narrative. There is a section upon the technique of Indian art, comprehensive and convincing, demonstrating the influence of white man's drawing upon the work of the Indian. The other outstanding contributions are character studies of Rain-in-the-Face and Sitting Bull. These are masterpieces in analysis and historical interpretation, based upon close acquaintance with these two important Indians and supported by documentary materials. Others have taken turns in interpreting Sitting Bull but none we have read are so convincing and consistent as the 30-page discussion in this book. We see Sitting Bull not as a lucky moron as some writers seek to prove him, nor as the great military genius others would have us believe, but as a clever, wise prophet who by superior salesmanship and self-advertisement among white people achieved lasting fame. The study of Rain-in-the-Face is equally thorough and painstaking. Though his historic position is inferior to that of Sitting Bull, this chapter increases the reader's confidence in the author's insight.

C. W.

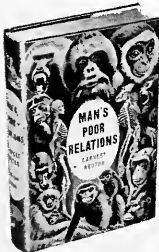
## "EARNEST

# Hooton

once more hits the stride of 'Up From the Ape'; in the present volume he strides with the seven-league boots of factual knowledge and warm understanding. In words of one syllable: *It is a swell book.*"

—PROFESSOR W. M. KROGMAN,

*Secretary, Section on Anthropology, American Association for the Advancement of Science*



HERE, in word and picture, are the physical oddities, the grimaces and antics, the idiosyncracies of personality and sex life that distinguish monkeys, chimpanzees, gorillas, orangutans and all the rest of ape-and-monkey society, told in the author's beguiling manner.

## MAN'S POOR RELATIONS

by Ernest Hooton

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## HIKING, CAMPING AND MOUNTAINEERING

----- by Roland C. Geist

Harper and Brothers, \$3.00

HERE is an outdoor, "how to do it" book that brings fond recollections of Dan Beard, Horace Kephart, and Ernest Thompson Seton, the masters in this field. It is all very enlightening, and up-to-date but it loses the original motivating woodland philosophy and feeling in the process of presenting, in concise fashion, the how, when, and where of open air-living along forest trails. In a chapter on, "Hiking and Walking in General," the author describes everything from the "goose step" and competitive, athletic walking to walking backward and "tiptoe walking." It is related that, "Strong, tough feet are the result of walking barefoot; therefore, walk barefoot whenever possible"—a good idea, no doubt.

Excellent advice is given on outdoor clothing and equipment, how to plan a hike, behavior on the trail, general aspects of camping, camp equipment, and how to set up, maintain, and break a camp. Sound information on fires, cooking, and food is also made available in eminently worthwhile fashion. Some 72 pages are devoted to the exact science of mountaineering. The author says that, "Both hiking and camping are an integral part of the new youth movement here and abroad." This reviewer fails to understand what the "new youth movement" refers to. There is no explanation provided. Youth always moves, and walking and camping have been part of the American heritage for many years, greatly encouraged by State and National Parks and by numerous youth organizations, such as the Boy and Girl Scouts and innumerable educational institutions and groups. Happily the national urge to spend added free hours in the out-of-doors is increasing year by year, with or without the aid of "movements."

WILLIAM CARR.

## BOOM COPPER

----- by Angus Murdoch

The Macmillan Co., \$3.00

THE glamor of the Comstock, the Mother Lode, and the Mesabi Range has been so often written about, pictured, or broadcast that almost everyone is familiar with some aspects of their history. The thin finger of Michigan's Keweenaw Peninsula projecting up into Lake Superior has had few chroniclers, and although geologists the world over are familiar with its unique copper deposits, they have not attracted the popular interest for this generation that other camps and other minerals have.

Perhaps because it is so isolated, few travelers visit the region, and the mines had passed their spectacular period long before the era of the tourist and the trailer. In their day, from before the Civil War up to the end of World War I, the peninsula was as important as any mining region of the West, and millions of dollars were distributed in dividends. All of the legends of sudden wealth and equally sudden poverty, which are so fa-

miliar in connection with the West, can be duplicated in northern Michigan. The winter hardships of the country can rival anything the western deserts can produce, while the hazards of the Lake Superior storms add an element of individuality to the mining of these deposits.

Mr. Murdoch has made their history an interesting and lively account, which will surely increase the tourist's interest in the remote Michigan country when people again are free to travel. It is to be hoped that summer visitors may one day help to bring back some of its former prosperity, now that the mines are so deep that they no longer can be worked at a profit. Both the traditions and the scenery make a visit worth-while, and all who are interested in copper mines and in the unique specimens that one finds in all collections will surely enjoy this book.

The author has done considerable research and seems to have written a reliable book as well as an interesting one. However, copper in its native state (that is, uncombined with non-metallic elements, not "pure" as Mr. Murdoch defines it) is not nearly as rare as the author thinks, nor is it necessary to envisage long trade routes to explain the copper in Mexico, as a visit to any large mineral collection would have shown him. But what does it matter if the geology of *Boom Copper* is a little weak; it is a good history of the Keweenaw Peninsula and its denizens. The bibliographies of the United States Geological Survey should be consulted for references to the geology of the area rather than the spotty bibliography at the close of the book.

F. H. POUCH.

## INSECT INVADERS

----- by Anthony Standen

Houghton Mifflin Co., \$3.50

IT is impossible to tell very much about insects in a single volume, but the author has managed to cover the field of economic entomology very well. Two unfortunate features about the book are the title and the "blurbs" on the jacket. The book deals with much more than "Insect Invaders," and one might gather from reading the "advertising" that the author was on the verge of madness. Despite this I have found the book very interesting. The material is presented in a thoroughly readable manner and the facts are accurate in almost all instances. It is not true, however, that citrus scales "can only be dealt with by a gas attack."

In view of the field covered by the book it is at once apparent that the author has stressed the damages caused by insects while relegating to an unnecessarily brief space their great value. In reading about good insects we find that a fly scatters its eggs over the grass and that they will not hatch unless eaten by a caterpillar. This is true, except that there are more kinds of these flies in North America than there are serious imported pests. This same type of understatement occurs many times. In stating that flies live in barnyard manure it is implied that all flies do, whereas the author is referring only to the housefly, which also breeds in garbage.

Even with its shortcomings the book is

valuable, and anyone wishing to obtain a general knowledge of insect problems and the methods employed in solving them (but not insect control) may do so here. But we are *not* losing the "insect war" and we shall not lose it so long as other insects are around to do the major part of control work. C. H. CURRAN.

## FIELDBOOK OF NATIVE ILLINOIS SHRUBS

----- by Leo R. Tehon  
Illinois Natural History Survey,  
Manual 3, \$1.25

THIS is the third in a series of field-books issued by the Illinois Natural History Survey (the first was on wild flowers and the second on land snails) intended primarily for amateur naturalists and nature-lovers. The author, Doctor Tehon, who has for more than 20 years held the title of Botanist of the Survey, has produced an excellent guide to the shrubs of this mid-western state.

The descriptive section includes 270 species and 27 varieties, with a paragraph on the distribution of each. The line-drawings by Miss Kathryn M. Sommerman are especially clear and helpful, and the keys by the author are unusually complete and usable. For example, five characters are given to distinguish the two species of alder.

The little volume is printed on very good paper in well chosen, legible type,—a fine piece of bookmaking. It is a carefully prepared handbook that will surely prove most useful to the ever-increasing number of nature-lovers.

CLYDE FISHER.

## GEORGE WASHINGTON CARVER, AN AMERICAN BIOGRAPHY

----- by Rackham Holt  
Doubleday, Doran & Co., \$3.50

"CARVER'S GEORGE," as he was known as a boy, was born a slave in a log cabin in western Missouri. He grew up an orphan, and was early taught by his foster mother to wash; it was almost entirely by his laundry work that he earned his livelihood during his youth and college days.

At 25 he was admitted to Simpson College, Iowa, and from here he went to Iowa State College at Ames, where he had two great teachers who appreciated his marked ability and became his loyal friends. These teachers were James G. Wilson, who became Secretary of Agriculture under McKinley, Theodore Roosevelt, and Taft; and Henry C. Wallace, who held the same post under Harding and Coolidge. The latter's son, Henry Agard Wallace, now Vice-President of the United States, as a boy, tramped the fields and woods about Ames with Carver, to whom he gives credit for introducing him to the mysteries of fertilization in plants and for teaching him to identify the grasses.

From Ames, Carver went to the Tuskegee Institute in Alabama to take charge

of agriculture, for which work he had been strongly recommended by his old teachers, Wilson and Wallace. This move was in response to an invitation from the Principal, Booker T. Washington. The building for the Agricultural Department of the Institute was partly financed by Morris K. Jesup, former President of the American Museum, who also paid for the Jesup Wagon, a farmers' college on wheels, used by Carver as Agricultural Collaborator of the U. S. Department of Agriculture. Among his many achievements at Tuskegee is his epoch-making research upon the sweet potato and the peanut.

Many honors have come to him. In 1916 he was made a fellow of the Royal Society of England. In 1923 he was awarded the Spingarn Medal for distinguished service in agricultural chemistry. In 1939 he received the Roosevelt Medal for distinguished service in the field of science. In 1941 the University of Rochester honored itself by conferring on him an honorary doctorate degree. Mrs. Holt has written a fine story of a truly great American.

CLYDE FISHER.

## DARKNESS AND THE DEEP

----- by Vardis Fisher  
The Vanguard Press, \$2.50

IN this book the author attempts to reconstruct the steps by which the anthropoid rose through the fringe of limitations separating him from man. There is an introductory sketch of 47 pages outlining the formation of the world and the appearance of life, ending with what may pass for men. The reader may find this introduction dull and trying to the eyes because it is printed in slanting type, but he will miss little if he skips it. The remainder of the book is a narrative of how man may have groped his way from an anthropoid existence into a human one. For methodological reasons the whole transition is projected into the life of a single individual and his family associates. One recognizes the influence of Freud's philosophy in the characterization of the hero, a "culture leader," as a victim of early frustration and a neurotic type. The other leading characters are a dominant male, a female, the practical and brilliant leader of her kind, and two or three stupid morons. The other obvious influence is from the data on chimpanzee behavior, presented in the report emanating from the Yerkes Laboratory in Florida. By skillfully welding these together in a Freudian framework, the author produces a gripping narrative, an imaginary reconstruction of the beginnings of language, knowledge, invention, and social co-operative life.

The ending to the narrative is rather abrupt and may leave the reader with the feeling that he has been let down or that the curtain falls unexpectedly in the midst of a fascinating experiment. Seemingly the purpose of the long introduction is to condition the reader to the bloody brutality of the evolutionary process and so ease him into toleration for the brutal, murderous, vociferous, erotic behavior of the dawn man.

C. W.

## AMERICAN GARDEN FLOWERS

----- by Gladys Lynwall Pratt  
Illustrated by Rudolf Freund  
Random House, \$1.00

A TRULY remarkable collection of information in regard to a well-selected list of our best known garden shrubs, vines, and herbaceous plants. The original home of each plant is given, the origin of its common and scientific names, and quite often hints for its culture.

In flowing English, Gladys Lynwall Pratt describes each species. We lose the sensation of reading and feel as if she were speaking to us, her fellow garden enthusiasts.

Exceedingly valuable is the section that so clearly explains the plant's cycle of life, pollination, flower parts, and seed distribution. These subjects, which the laboratory scientist usually makes seem formidable to the layman, are here explained so graphically that the flower-lover's fear of technical terms is entirely dispelled. Particularly fine are the black and white illustrations on the margins of the pages devoted to these discussions. No one looking at the illustrations of bulb, corm, tuber, and rhizome could ever again confuse the terms. Rudolf Freund is to be congratulated on his technique.

A quotation from the description of the Lily, a flower so greatly loved through the ages, will serve to show how simply and charmingly the text has been handled:

"When you look at stately lilies in a garden or greenhouse and smell the magnificent flowers which fill the air with sweet perfume, it is difficult to remember that these flowers are closely related to the lowly cooking onion. The fragrant odor of lilies was once thought to be injurious to health, and people were warned that in time of Plague they must be avoided. However, lilies were considered beneficial in some circumstances, for they were supposed to cure 'hyles' (boils), 'dull ears,' and 'faint heart!'"

The different plants discussed are all illustrated in full color by the talented artist, Rudolf Freund. The shrubs shown on the front end-sheets and the vines on the back ones are particularly lovely in color. They are combined in an exceedingly artistic manner.

MARGARET MCKENNY.

## ATOMS, STARS AND NEBULAE

----- by Leo Goldberg and Lawrence H. Aller

The Blakiston Company, \$2.50

THE Harvard Books on Astronomy provide a most readable and at the same time instructive, up-to-date, and authoritative survey of the whole field of astronomy. The complete series comprises nine volumes, five of which have been published. The books are edited by Harlow Shapley and Bart J. Bok of the Harvard College Observatory. The first four, which were recently reviewed in

NATURAL HISTORY, are as follows: *Earth, Moon and Planets* by Fred L. Whipple, *Between the Planets* by Fletcher G. Watson, *The Milky Way* by Bart J. Bok and Priscilla F. Bok, and *The Story of Variable Stars* by Leon Campbell and Luigi Jacchia.

The present volume, *Atoms, Stars and Nebulae*, which has just appeared, is the fifth in the series. The first chapter is an excellent introduction to stars and nebulae. Then follow fascinating discussions of stellar "rainbows" or spectra, atoms, and molecules (stellar building blocks), the climate in a stellar atmosphere, dwarfs, giants, and supergiants, analyzing the stars, pulsating stars, exploding stars, planetary nebulae, "between the stars," what makes a star shine, and related subjects.

There are altogether 150 illustrations, the majority of which have never before appeared in print. They include excellent photographs of nebulae, star-clusters, various types of spectra, and portraits of a number of astronomers who have made significant contributions to astrophysics. Also there are many helpful diagrams scattered throughout the book.

This volume is up to the high standard set by the four preceding ones, and students and teachers of astronomy will be on the lookout for the remaining ones which have been projected.

CLYDE FISHER.

## THE VICTORY GARDENS OF 1942 AND 1943

----- by T. H. Everett

The New York Botanical Garden, 1943

A WORTHY report and prospectus of the demonstration plot maintained at the New York Botanical Garden. Comprehensive suggestions are given for home growers: planning and preparing the garden, seasonal schedule, do's and don'ts, etc.

## KRAKATOA —Continued from page 239

lence. Krakatoa was one of these peacefully malevolent cones, although it offered no inducement to habitation in a region abounding with more suitable localities for man.

The rocks of continents contain evidence of countless prehistoric volcanoes. In contrast to the violence of some that we know today, they are not only peaceful but in many instances exceedingly profitable to mankind. The material which volcanoes extrude, either placidly or violently, is exceedingly complex. It is not only melted rock: it contains vast amounts of liquids and gases, and in the complex solution there may be notable amounts of gold and silver. A volcano becomes extinct when its throat has congealed to a pipe of solid rock. At this time hot waters rising from great depths carry in solution compounds derived from the original magma, or

## ENVIRONMENT AND LOCOMOTION IN MAMMALS

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solves its own problems in its own way, many have shown similar responses to similar tasks.

Thus the mammals have added their new versions of the old theme of adaptive branching of the locomotor apparatus. Being hot-blooded vertebrates, most mammals can develop and spend great stores of energy in moving quickly and in traveling over long distances. Following their predecessors of other classes of vertebrates, the mammals seem to have explored and exploited all possible types of environment, from the burning sands of the desert to the icy waters of the polar seas, and from the rarified air of high mountains to the enormous pressures met by deep-diving whales.

After man had evolved from the lower mammals he first compelled them to loan him their fleet limbs; then he began to produce still more powerful locomotor machines, which have culminated in the stratosphere planes and flying ships, in the tanks and submarines of the present period. The civilization that produced these super-engines of locomotion and destruction might eventually be exterminated through the abuse of their power; but it seems more probable that a sufficient majority of the human race will learn to use them for the benefit of mankind as a whole and as legitimate aids in overcoming the still serious handicaps of the world's far-flung environments.

molten rock. As the waters find their way along cracks and crevices in the solidified throat of a volcano they deposit, with other materials, a part of their load of precious metals.

The rich gold-silver lodes of Cripple Creek, Colorado, are all within the throat of an ancient volcano. Here the very ultimate stage of volcanic activity becomes a mining hazard. A mixture of nitrogen and carbon dioxide seeps into drifts and tunnels from minute pores and fractures in the volcanic debris. These lethal gasses have frequently brought a halt to mining operations by literally filling drifts, tunnels, and shafts up to the level of the ground.

In rare instances the magma solidifying in the throat of a waning volcano may contain an abundance of the elements which, when combined under great heat and pressure, form precious stones. The "pipe" of Kim-

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The Museum Library is in need of back issues of NATURAL HISTORY, particularly the first four issues for 1942. Copies sent to the Librarian, Natural History, New York, will be greatly appreciated.

berly, South Africa, which has produced an incredible wealth in diamonds, is simply the congealed conduit of a long extinct volcano, one so ancient that the slow process of erosion has completely leveled the cone.

There are whole encyclopedias of the lore of volcanoes, and yet their activity remains one of the incompletely solved mysteries of the inorganic world. That they contain melted rock is obvious, but the source of the heat is unknown. That the erupted material comes from within the earth is certain, but from what depth? And more to the point—what circumstances initiate a volcanic eruption? Once begun, what brings it to a close? Science continues to investigate these mysteries and may some day deduce a clear picture of what goes on inside the earth as indicated by the occasional but spectacular manifestations we see at the surface.



























