VICIOUS CIRCLE OF MALARIA: MAN TO MOSQUITO TO MAN

BY RUPERT L. WENZEL
ASSISTANT CURATOR OF INSECTS

"In this march[1] from Natal, up from the coast and along the Jaguaribe valley nearly one hundred thousand people became infected with malaria, of whom about twenty thousand died. Like hordes of blood-thirsty Huns the mosquitoes advance, leaving always a trail of mourning and destruction in their wake."

Such was the commentary of a Brazilian health official, writing on the 1938 epidemic of malaria that paralyzed the northeast of Brazil, an area of only several hundred thousand inhabitants. Perhaps one can better comprehend the devastating effect of the epidemic if it is explained that malaria is primarily a disease of rural areas; hence the larger cities were not as greatly affected. The devastation of the rural areas, however, was almost complete, with entire villages wiped out. The epidemic was spread by an African malaria mosquito, *Anopheles gambiae*, that accidentally was introduced in the neighborhood of Natal, Brazil, about 1930.

Accounts such as the above help one understand why malaria is sometimes called the most important of all diseases of man. It is by far the most important of the parasitic diseases of man and of all the insect-borne diseases. Therefore, in developing plans for an insect hall in the Museum, it was decided that of the exhibits that are to deal with the relation of insects to human welfare, one should be devoted solely to mosquitoes and malaria. This exhibit was completed and installed in Albert W. Harris Hall (Reptiles, Amphibians, and Insects—Hall 18) last month.

The new exhibit essentially consists of two series of models. One series illustrates the life history of the most important malaria mosquito of North America (*Anopheles quadrimaculatus*). The other series shows, diagrammatically, the manner in which malaria parasites are transmitted by mosquito to man and from man to mosquito and the developmental changes that they undergo within each of these hosts. Also included in the exhibit are a map of the malarious areas of the world and a painting of a breeding place that is typical for many kinds of malaria mosquitoes. The models were executed by James E. Trott, formerly Artist-Preparator in the Department of Zoology. The map and paintings were prepared by Miss Margaret G. Bradbury, Illustrator in the Department of Zoology, who also installed the exhibit.

WHAT IS MALARIA?

There are many popular misconceptions about the nature of malaria and the manner in which it is transmitted. Until the latter part of the 19th century it was generally believed that malaria was contracted by breathing bad night air that arose from swamps. Hence the name malaria—*mal* (bad) plus *aria* (air). This belief, based on the observations of people over many centuries, was not illogical. Malaria mosquitoes fly at night and many of them breed in swamps. Thus, a person who lived in the vicinity of swamps in a malarious area and at night ventured out of doors or left his windows open was apt to be exposed to the bites of infected mosquitoes.

Toward the end of the 19th century, the studies of A. Laveran, Sir Patrick Manson, and Sir Ronald Ross, particularly, demonstrated that the disease is caused by infection with one-celled animal parasites called plasmodia (Genus *Plasmodium*) and that these parasites are transmitted through the bite of mosquitoes. Plasmodia belong to the same animal group (Phylum Protozoa) as does the well-known *Amoeba*. Four species are known to infect man. Thus malaria is a collective term applied to a group of related diseases that are caused by infection with any one of a group of closely related parasites. Such animals as birds, lizards, bats, rodents, buffaloes, shrews, and monkeys may be infected by distinctive species of plasmodia. All plasmodia are transmitted by female mosquitoes. Those that cause human malaria can be transmitted only through the bite of females of particular kinds called *Anopheles* mosquitoes.

FINISHING TOUCHES
Margaret G. Bradbury, Artist in the Department of Zoology, completes the installation of the malaria mosquito exhibit.

HISTORICAL AND SOCIAL ASPECTS

Malaria may always have affected man. Certainly the parasites of human malaria are in nature found in no other animal, and the most closely related species of plasmodia are found in other primates. Just when the disease was first mentioned in ancient writings is difficult to determine, but early Chinese writers, and later Hippocrates, refer to at least two different kinds. References to malaria in the Roman literature by such writers as Virgil and Cicero are not infrequent. The highly malarious Pontine marshes surrounding Rome have played an important role throughout the history of that city.

In modern times malaria has affected the welfare of man perhaps more than any other disease. It takes an annual toll of millions of lives and is responsible for the economic decay and lack of development of large areas of the earth's surface. During World War I, the British, French, and German armies were virtually paralyzed by malaria on the Macedonian front. Following the war, mass population movements resulted in widespread epidemics in Europe. Russia suffered the worst malaria epidemic known in modern times. Other severe epidemics have taken place in recent years in Brazil and in Egypt. During World War II, malaria was one of the greatest hazards to military operations in the Pacific and the China-Burma-India theaters of operations. Some observers seriously believed that victory would belong to the side whose armies most successfully combated it.

DISTRIBUTION OF MALARIA

Human malaria is primarily a disease of the warm parts of the world, but one species of parasite (*P. vivax*) has successfully invaded large areas in the temperate zones. On the whole, however, climate limits the distribution of the disease. Figure 2 shows the areas of the world in which malaria is endemic or native. In North America malaria at one time extended as far north as Canada; it now occurs chiefly in the southern states. The time may not be far off when the disease will be relatively un-

[1] Of the mosquito, *Anopheles gambiae*.

common in the United States, providing public-health safeguards are maintained.

THE MALARIA CYCLE

Malaria parasites must undergo a separate cycle of development in both man and the female anopheles mosquito. The mosquito can become infected only by biting an infected person within whom the parasites have undergone certain developmental changes. A person, in turn, can become naturally[2] infected only through the bite of a female anopheles in which the parasites have undergone changes. This cycle of development and transmission is called the malaria cycle. It is shown in its simplest diagrammatic form in figure 1.

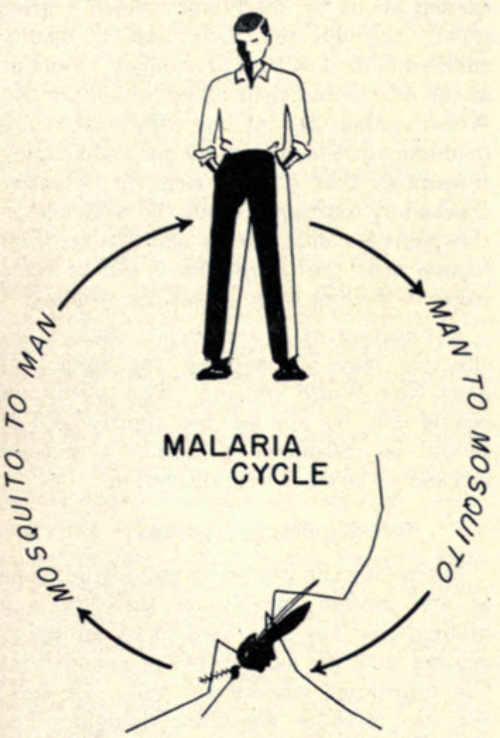

Figure 1

[2] The disease can be directly transferred from man to man by blood transfusion.

Inasmuch as the anopheles mosquitoes are the link that can be most effectively attacked in order to break the malaria cycle, it is desirable to note briefly their life cycle, characteristics, and some of their habits. Most mosquitoes belong to two large groups that are called Anophelinae and Culicinae. The latter group includes the greater number of described species, among them such familiar kinds as the common house mosquito and the yellow-fever mosquito. The life cycle of all mosquitoes consists of four stages: (1) egg, (2) larva, (3) pupa, and (4) adult. The first three stages are aquatic. The four stages of anophelines and culicines are compared in figure 3.

BREEDING PLACES

One commonly thinks of mosquitoes as breeding in almost any kind of water accumulation. However, most individual species have specific breeding requirements. The young of some species can tolerate a rather broad range of environmental conditions, for example, a wide range of acidity in the water; others are adapted to a very narrow range of conditions. Thus the early stages of some mosquitoes are confined to salt-water marshes; of others, to ponds or impounded water that has a certain amount of aquatic vegetation, a particular intensity of sunlight, and other characteristics.

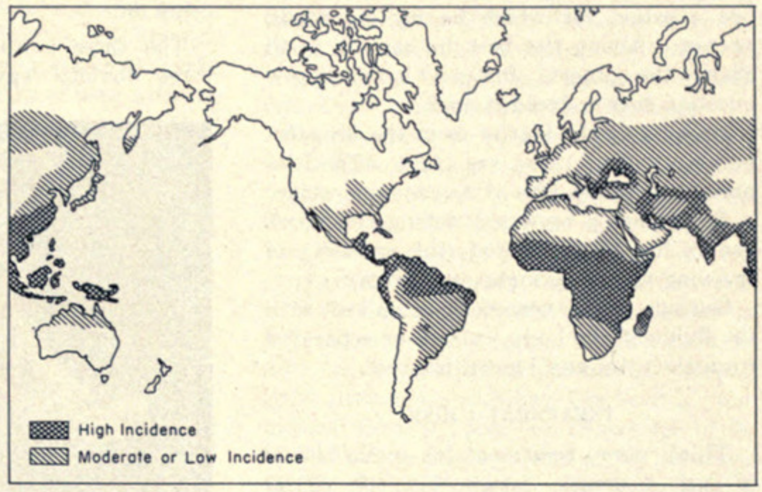

Fig. 2. Map showing distribution of human malaria throughout the world.

Anopheles barberi of North America breeds only in water-holding treeholes. *Anopheles bellator*, an important malaria mosquito of South America, breeds only in the water that gathers at the base of the leaf axils of epiphytic bromeliads, plants of the pineapple family that grow on the limbs of trees. In general, most anopheles breed in standing or very slowly flowing surface water, such as swamps, ponds, sluggish streams, and rice paddies. A few breed in rather rapidly running water.

BITING HABITS

The biting habits of anophelines also vary considerably. The females of some

(*Continued on page 8, column 1*)

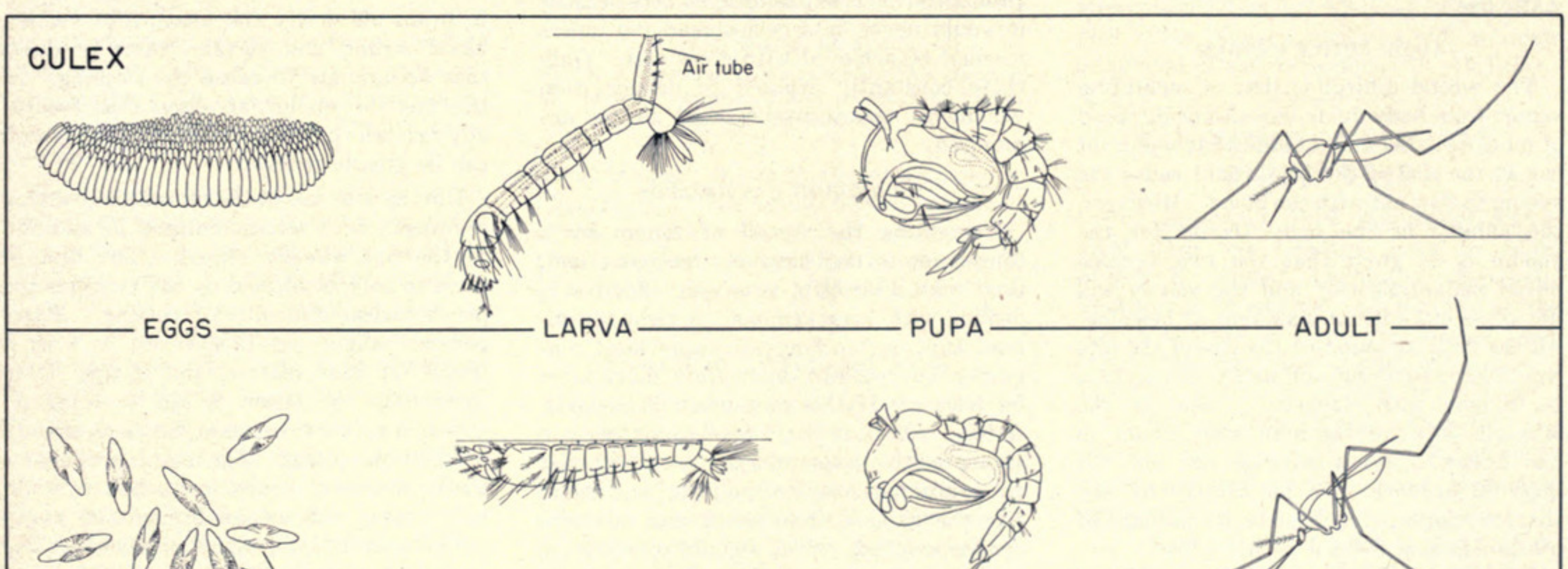

Fig. 3. Life stages of anopheline and culicine mosquitoes. Anopheles eggs have air floats and are never laid in rafts; the larvae lack an air tube and lie parallel to the water surface; the adults rest with the body at a marked angle instead of parallel to the biting surface. Drawings on this page by Margaret G. Bradbury.

THE SNAKE-BITE PROBLEM

By CLIFFORD H. POPE
CURATOR OF AMPHIBIANS AND REPTILES

"WHAT should I do if a poisonous snake bites me?"

This is the question that the reptile man dreads more than any other because it is one question for which he has no ready answer. About the best he can do is to change the subject. Just why is this simple question such a dreaded one?

Looking at the matter from the broadest point of view, there are three difficulties presented by the bite of a venomous snake:

First, there is no way of telling how much venom has been injected (the necessity of knowing will be brought out herein).

Second, snake venom, once mixed with the fluids of the body, cannot be separated from them by any known process.

TREATMENT A RISK

Third, every treatment for snake bite is of such a drastic nature that the victim must run considerable risk in subjecting himself to any one of them; his troubles are only initiated by the poison itself.

Any treatment might almost be described as adding insult to injury or, better still, adding injury to injury. Now it becomes clear why it is so desirable to know how much venom has been injected: if the amount is small, the effects of it may well be preferable to those of the treatment.

The first difficulty, that of being unable to determine the quantity of venom injected, has not been fully appreciated in the past because of the unjustified assumption that a snake discharges its full load whenever it bites. This is now known to be untrue. A large snake may bite and withold nearly all of its supply of poison, the process of biting being far from a completely automatic one.

AVOID FUTILE MAYHEM

The second difficulty, that of separating venom from body fluids, can also be disposed of quickly. One might think that a prompt cut at the site of the bite would cause the venom to flow out with the blood. However, the affinity of the body tissues for the venom is so great that the two become mixed instantaneously and the venom will not come out with any amount of bleeding. All the flesh surrounding the site of the bite would have to be cut out, and such mayhem is fraught with dangers. There is the story in point of the man who, bitten on one finger, seized a hatchet and cut the digit off at once. To his dismay he saw that, moving with such haste, he had hacked off two fingers instead of just one.

The third difficulty, the drastic nature of the treatments so far devised, cannot be dealt with so briefly.

Three scientific methods of treating snake poisoning have been developed, but no man can accurately say just what is the relative value of the three methods. Each method has advantages and disadvantages, and each one calls for much further investigation. Two schools of thought have grown up, and adherents of one school are often intolerant of the methods of the other. This state of affairs makes impartial investigation hard to carry on.

The three methods are correlated with three obvious ways of dealing with any poison: preventing its spread, extracting it mechanically, and neutralizing it. Extracting the venom by incision and forced draining and limiting its spread by a tourniquet are methods that may be almost as old as man. Neutralizing the venom is a recent scientific development based on medical knowledge that the ancients did not have. Immunization is not considered here because it would never have widespread use unless it could be achieved with great ease. Only those constantly exposed to danger from venomous snakes would need to be immunized.

'DON'T STEP ON ME'

Reproduction of a rattlesnake's head exhibited in Albert W. Harris Hall (Hall 18). Poison is ejected by the long, hollow, curved, sharply pointed fangs. A series of growing fangs is always ready to replace those broken in use or shed.

TOURNIQUET HAS HAZARDS

Preventing the spread of venom by a tourniquet is the simplest treatment and, used with discretion, it is very effective in dealing with some venoms. A tight tourniquet kept on too long will cause local congestion and prompt death from shock after its release. If this dire result is escaped, serious infections may develop to cause a slower death. Experiments have shown that the tourniquet need not be tight, and therefore the dangers from shock and infection can be avoided. Even so, the confinement of the venom in a limb for too great a period may cause loss of the limb. Again the importance of knowing how much venom has been injected comes to the fore, for it is certainly better to suffer the general effects of a sublethal dose of venom than it is to lose a limb by keeping the venom locked up in it with a tourniquet.

Venoms of the New World poisonous snakes, with the exception of the coral snakes, are in general held in check by the tourniquet. The damage they do is mostly to the blood and blood vessels; the poison is carried about by the lymph, which courses slowly through the body and is readily checked in its flow by a tourniquet. Venoms of the cobras and their allies, which are Old World snakes, and of our coral snakes are predominantly neurotoxic or nerve-damaging substances that do not seem to be easily checked by tourniquets, but the evidence on this point is contradictory and it is far from certain that the tourniquet is not of some value in dealing with neurotoxic venoms.

Application of a tourniquet, then, is an effective way of checking the spread of most New World venoms. The tourniquet should not be applied too tightly and it should be considered primarily a first-aid method to be used with discretion.

THE INCISION METHOD

Extracting the venom by making incisions at and around the site of the bite is a method that has been used to advantage in dealing with the same types of venom that the tourniquet checks so well. In fact, the two methods are often thought of as parts of a single one. As already explained, cutting is not simply a matter of letting the venom flow out immediately, and it is doubtful that incisions made over the actual fang punctures are of any more value than those made in the surrounding area. A great number of cuts must be made, preferably after some swelling has taken place. Before this there is little to cut and great danger of severing blood vessels, tendons, and nerves. The object of cutting is merely to drain off slowly the mixture of venom, blood serum, and certain waste products that accumulate to cause the swelling. In this way the amount of venom that eventually reaches the blood stream via the lymph can be greatly reduced.

But, as with use of the tourniquet, cutting is fraught with serious dangers in addition to the one already stated. The first of these to be encountered by the victim is the psychological difficulty of cutting. Many persons cannot cut themselves, or even a friend for that matter, and if they force themselves the strain is apt to bring on shock, or rather to increase the shock already brought on by fear. The use of local anaesthesia would of course help, but it could not prevent the nausea brought on many individuals by the sight of blood. The second danger from cutting is the great chance of introducing infection. Some sort of mild suction must be applied over each cut for many hours, since the proper kind of drainage is a slow one. Anyone would realize that this incision treatment should be put in the hands of a competent physician as soon as possible.

DANGER IN ANTIVENINS

The third method, neutralizing the venom after it has spread more or less widely through the victim, was thought, when first developed within the century, to be the final solution to the whole problem. Experience of a few decades has slowly brought out the fact that grave dangers are associated with this method just as with the others. This serum, known as "antivenin," is made from the blood of immunized horses, and large quantities of it are required to neutralize appreciable amounts of venom. Many human beings react violently to antivenin, either by dying instantly or by suffering severely from serum sickness some days later. Just what the dangers from antivenin are can scarcely be estimated as long as the one school underestimates them while the opposing school exaggerates them.

After a century of investigation, modern science remains unable to cope with snake poisoning. There is little doubt that if the snakes of this country, let us say, annually killed thousands instead of scores, the problem would be solved in a very short time. It is hard to interest research physicians in a problem that does not exist in big cities where the institutions of medical research are concentrated. A real cure for snake bite might not save many lives but it would give tremendous mental relief to millions of persons living in the country and countless thousands of others who seek recreation in the wilds.

AN EXHIBIT REJUVENATED

By EMIL SELLA
CURATOR OF EXHIBITS, BOTANY

The recent installation of a large epiphytic aroid (*Anthurium acaule*), native of tropical America, is really a partial restoration. Completed in 1910, this particular reproduction remained on exhibition until a short time ago.

The species shown grows either as an airplant on branches of trees or on rocks. Its creeping stem produces large masses of aerial roots and its leaves often attain a length of four feet and a width of one foot or more. The flower spike is erect but becomes pendent when the fruit develops. All in all, its total assemblage is indeed striking.

In the course of rearranging the exhibits in Martin A. and Carrie Ryerson Hall (Plant Life—Hall 29) to take greater advantage of the recently introduced case lighting, we occasionally come across an individual specimen that requires something more than the usual cleaning and refreshing treatment. The anthurium was one of these; a close inspection of it revealed hidden damage to the leaves. This and the considerable darkening of the various pigments made it necessary to replace the foliage as well as some of the other parts in order to justify its remaining alongside the other reproductions. There were undoubtedly other causes for this condition than the natural aging processes, such as an accidental blow at the time it was being moved from the old Museum building in Jackson Park or possible exposure to some oxidizing agents that may have been present in the exhibition case.

Fortunately the necessary living material for these replacements could be obtained through the co-operation of the Garfield Park and Lincoln Park conservatories. Yet an unpredictable amount of time is always needed for the discriminating task of replacing part of the old with the new and matching the remainder so that one may not easily distinguish between them. This reconstruction, shown in the accompanying illustration, is the result of the combined efforts of Frank Boryca and Samuel H. Grove, Jr., Assistants in Plant Reproduction, and Artist-Preparator Milton Copulos.

ANTHURIUM ACAULE
Model of a tropical American aroid. This creeping or climbing perennial grows on trees or rocks. Exhibited in Hall 29.

Australian 'Mountain Devil'

The Museum has received a specimen of an Australian reptile, the Moloch lizard (*Moloch horridus*). The creature, resembling American spiny desert lizards, is known in Australia as "mountain devil." Specimens are difficult to find. The one received at the Museum is a gift from A. R. Main, of the Zoology Department at the University of Western Australia in Nedlands.

The Moloch lizard, about 6 inches long, lives on a diet of ants. It looks somewhat like the horned toad.

BIRDS FROM NEPAL

The Museum recently had word that Dr. Robert L. Fleming is safely back from his successful bird-collecting trip to Nepal. Bird study and bird collecting have always been a hobby with Dr. Fleming, who is a teacher in the mission school Woodstock at Mussoorie in the United Provinces of India. He has visited the Museum staff when on vacation in Chicago, and he has long been one of our most valued correspondents.

Last summer he broached the possibility of a bird-collecting trip in the little-known country of Nepal to Boardman Conover, Trustee of the Museum and Research Associate in Birds. Mr. Conover was enthusiastic, for his own notable private collection of game birds would be enriched by collections from this region, which is remarkable for its wealth of pheasants. Nepal, lying just south of Tibet, has been a "forbidden country" and our knowledge of its birds dates back over a century to the times of Sir Brian Hodgson, who was British resident there. The opportunity to learn more of its avifauna was too good to miss, and the costs of a three-month trip on behalf of the Museum were assumed by Mr. Conover. (Mr. Conover died last month—*see page 2.*)

From Dr. Fleming's preliminary report we learn that a collection of some 700 bird skins was made during the three months spent in Nepal (November, 1949, through January, 1950). His glowing letters tell of climbing to 15,000 feet among the towering Himalayas, of travels by elephant in the tropical valleys and bird shooting from elephant-back, of his cordial reception by the administration, and of the friendliness of the people. We gain the impression of an outstanding success. The Museum collection will be notably augmented by the birds obtained by Dr. Fleming. Further report of the Nepal Expedition will be made on arrival of the collections. —A.L.R.

ECONOMIC GEOLOGY FIELD TRIP

The Museum's 1950 Mississippi Valley Field Trip left Chicago early in May. Robert K. Wyant, Curator of Economic Geology, is in charge. Collections of the ores from three lead and zinc mining areas of the Mississippi River Valley will be made. The areas and their features are as follows:

I. *Wisconsin-Iowa-Illinois District:* Lead and zinc mining activity has been partially rejuvenated in this area by recent geological investigations.

II. *Southeastern Missouri Lead Belt:* Located in the Flat River area, this belt contains one of the most important lead deposits in the world.

III. *Southeastern Illinois:* A new zinc-producing area is adjacent to the important Illinois fluorite deposits.

FIFTY YEARS AGO AT THE MUSEUM

Compiled by MARGARET J. BAUER

One of the many skills of Carl E. Akeley in the fine art of taxidermy was his exceptional talent for mounting horned and short-haired animals by means of his sculptural method. His artist's observation of the anatomy of these beasts is clearly shown in the life-like mounts of the Swayne's harte-

SWAYNE'S HARTEBEEST
On exhibition in Carl E. Akeley Memorial Hall.

beest, now on exhibition in the hall commemorated to him. (After fifty years of progress in taxidermy, visitors and preparators still comment on the skill with which Akeley caught the facial expression of these somewhat grotesque antelopes.)

MALARIA MOSQUITO—

(*Continued from page 5*)

species ordinarily will feed on the blood of a wide variety of animals but may have definite preferences. Those that prefer the blood of animals other than man are called *zoophilic;* species that prefer the blood of man are called *anthropophilic.* Naturally, there are all degrees of anthropophily and zoophily. *Anopheles gambiae,* an African species that probably is the most dangerous carrier of malaria in the world, is a species that almost always feeds on the blood of man in preference to that of other animals. Male mosquitoes, of course, feed on plant juices and never take a blood meal.

It is not likely that adult anopheles live longer than a couple of weeks, on the average. In the temperate zones, some species are known to live over the winter as adults; this is true for only a relatively few individuals of the species involved. The duration of the early stages varies, depending upon factors such as temperature, food supply, and species characteristics. On the whole, species that breed in special niches such as treeholes undergo a longer period of development than do those that live in swamps and ponds.

A couple of hundred species of anopheles are known to science. Although experiments show that probably all or nearly all of them are capable of harboring and transmitting the parasites of human malaria, nevertheless only about two dozen species seem to be of any real importance in this respect. The place of man on an anopheles "food preference list" may be very important in determining whether or not that mosquito will be a dangerous malaria carrier. On the other hand, a species that rates man very low may be so abundant in the vicinity of humans that it still may be an important carrier. Flight range and breeding habits may also be important.

A very interesting factor, which is little understood, is the degree of compatibility between mosquito and parasite. Some anopheles are refractory to infection by the plasmodia so that only a small percentage of individuals may become infected at all, and an even smaller percentage may become sufficiently heavily infected to insure transmission to humans. In some cases a particular anopheles may vary in its refractoriness to different species of malaria parasites or to different strains of the same species. Obviously the above are only a few of the many factors that determine the effectiveness of an anopheles as a malaria mosquito.

STAFF NOTES

Dr. B. E. Dahlgren, Curator Emeritus of Botany, and **Dr. Hugh C. Cutler,** Curator of Economic Botany, have returned to the Museum from the Cuba Botanical Expedition .... **Dr. José Cuatrecasas,** Curator of Colombian Botany, has been appointed Corresponding Member of the Ecuadorian Institute of Natural Sciences (E. Instituto Ecuatoriano de Ciencias Naturales).

GIFTS TO THE MUSEUM

Following is a list of the principal gifts received during the last month:

Department of Botany:

From: Dr. Paul C. Silva, Berkeley, Calif. —14 specimens of algae, California and Lower California; Dr. Hugh C. Cutler, Chicago—73 cryptogams; Donald Richards, Chicago—50 specimens of fungi and 284 cryptogams.

Department of Zoology:

From: Harry Hoogstraal, Chicago—255 bird skins, Africa; Chicago Zoological Society, Brookfield, Ill.—2 mammals and 21 birds; Dr. Harald Sioli, Belem, Brazil—131 specimens of land and fresh-water shells, Brazil; Nancy Traylor, Winnetka, Ill.—a bird skin, Illinois; A. R. Main, Nedlands, Australia—a lizard, Australia; Laura Brodie, Chicago—a cottontail rabbit skeleton, South Carolina; Dr. Jeanne S. Schwengel, Greenwich, Conn.—47 specimens of limpet shells; Ronald Goldman, Chicago—16 bats (*Myotis*) Missouri.

LECTURE TOURS IN JUNE DAILY EXCEPT SUNDAYS

Tours of exhibits, under the guidance of staff lecturers, are conducted every afternoon at 2 o'clock, except Sundays and certain holidays. On Mondays, Tuesdays, Thursdays, and Saturdays, general tours are given covering all departments. Special subjects are offered on Wednesdays and Fridays; a schedule of these follows:

Fri., June 2—Best Foot Forward—Footgear around the World. Illustrated introduction in meeting room (*Harriet Smith*).

Wed., June 7—What to Wear—Unusual Materials Used in Clothing (*Marie Svoboda*).

Fri., June 9—What's in a Name—Misnomers in Natural History. Illustrated introduction in meeting room (*June Buchwald*).

Wed., June 14—Origins of Modern Dress (*June Buchwald*).

Fri., June 16—On the Rocks. Illustrated introduction in meeting room (*Anne Stromquist*).

Wed., June 21—Fragrant Plants—Perfumes, Spices, Incense (*Miriam Wood*).

Fri., June 23—Animals of Fable and Legend. Illustrated introduction in meeting room (*Lorain Farmer*).

Wed., June 28—Wisdom of the Wild—Special Habits of Animals (*Jane Sharpe*).

Fri., June 30—Summer Hobbies—Exploring the Out-of-Doors. Illustrated introduction in meeting room (*Miriam Wood*).

Persons wishing to participate should apply at North Entrance. Tours are free.

NEW MEMBERS

The following persons became Museum Members between April 17 and May 15:

Associate Members

Mrs. Walter H. Jacobs, Glen A. Lloyd

Annual Members

William U. Bardwell, Myron M. Bennett, Eugene P. Berg, Mrs. Paul H. Bonfield, Mrs. Edward Earle Brice, David Dunning Brown, Miss Mary H. Burris, Alfred J. Cilella, Harry W. Clemenson, Roger W. Doderlein, Ralph O. Earlandson, Richard C. Frasier, L. Rene Gaiennie, Miss Blanche Gardner, Robert L. Grinnell, Thomas H. Hargreaves, W. C. Havelaar, Master Jonathan T. Howe, Sidney R. Johnson, Sievert Klefstad, John F. Mercer, C. H. Michael, Oscar W. Olsen, Miss Agnes M. Pearson, Alf F. Reid, P. F. Ryan, Harry H. Schraeder, Edward A. Slindee, Professor Julian J. Steen, Mrs. Florence S. Thompson, Edwin H. Wendt, Walter W. Wenholz, Hubert J. Wolfe.

Detroit Newsboys Visit Museum

Two hundred *Detroit Times* carrier boys visited the Museum recently.

PRINTED BY CHICAGO NATURAL HISTORY MUSEUM PRESS