in pressing the telegraphic key which registers the appearance and disappearance of the meteor. The average of the results obtained for the duration of visibility is 0.6 second.

In order to secure the parallax of the meteors observations were made at Bloomington and at Bedford. The co-ordinates of these stations are, for Bloomington, longitude 86° 32′ 11″, latitude 39° 10′; for Bedford, longitude 86° 39′ 10″, latitude 38° 52′. The distance (rectilinear) between the two stations is 33.652 meters, equaling 20.13 miles.

An examination of our charts and recorded times showed that of all the meteors platted only one had been observed simultaneously at both stations.

Using the method of Klinkerfues, we found that the height of the meteor at the time of apparition was 143 miles, and its height at the time of its disappearance was 64 miles.

Mosquitoes and Malaria.

By Robert Hessler.

[Abstract.]

The recently developed theory that mosquitoes are the carriers of malaria from one man to another, which is based on the definitely ascertained cause of malaria, is a question of considerable importance to inhabitants of malarial districts, such as we have, for instance, along the Wabash River.

Speaking of Indiana, especially when compared with former times, it may be said that malaria has lost its terrors. To see what the disease really is requires a visit to such a region as the desolate Roman Campagna, or to the Isthmus of Panama. The ravages of the disease, known about Rome as Pontine fever and at Panama as Chagras fever, is something terrible to contemplate.

Popularly it is generally believed that the drainage of wet areas and of stagnant waters is the cause for the great diminution in the number of cases and of its severity among us.

For a cause, biologists and physicians always want something tangible —a something that can be seen, felt, weighed or measured; a something

that appeals to the senses. Many persons are satisfied with a very simple explanation, and frequently a name suffices. The term "malaria" etymologically means "bad air," and was applied to the disease in olden times when bad air or a "miasm" was supposed to cause it.

Now what is malaria? we may ask. What is its cause? How does it get into the body?

Diseases due to a specific cause, to a living organism, spread about over the face of the earth just as we see animals and plants spread. Many with originally restricted habitats have in the course of time attained a world-wide distribution. Some diseases, natives of warm climates, periodically leave their natural boundaries, as yellow fever or cholera, flourish for a short time and then disappear utterly. If a new disease appears in a country and the conditions for its existence are favorable, then the disease remains and is called endemic. The cold of our winters has a destructive effect on many diseases and a retarding influence on others. Some flourish only during the warm months of the year.

The date when a new disease first appeared in a country, or rather an old disease in a new country, is accurately known in many instances, and the gradual spread after its introduction has been carefully followed in some cases. Leprosy, for instance, now so common in the Sandwich Islands, was brought in by the Chinese in 1840.

Malarial fever had a restricted habitat in former times and has gradually spread and still does spread to places where it had never been seen before. Its appearance and spread in the Island of Mauritius in comparatively recent years was attended with a frightful loss of life. It was brought into the island in 1866 by some sick sailors, and an epidemic followed; in the year 1867, 32,000 out of a population of 310,000 died of malaria. In some of the lowly situated districts more than one-fifth of the population perished from fever alone.

The original home of malaria is unknown. Many of the islands of the sea are still free from it. All other conditions may be favorable, but unless the active cause is introduced the disease never appears in a country where it had never been known to occur.

It is now about twenty years since Laveran, a French military surgeon, then stationed in Algiers, discovered and first described the active cause of malaria. This discovery has been verified again and again and is now universally recognized as the cause. It is a minute form

of life belonging to the sporozoa and is most commonly known under the name of Plasmodium malariae. To detect this parasite in the blood is the crucial test for malarial fever in these days of laboratory methods of investigating and diagnosing diseases; once found, the application of the remedy for the disease is clearly indicated—this is quinine or one of the alkaloids of the cinchona group. Quinine is a protoplasmic poison to the malarial parasite.

The Plasmodium malariae lives in and at the expense of the red blood corpuscles of human beings afflicted with the disease. It appears first as a minute speck in the corpuscles, gradually enlarges, and about the time the cell is consumed it undergoes a segmentation, each segment being a new and independent being which at once seeks a new host, a fresh corpuscle. Segmentation keeps up the species in the body of the host.

Under suitable conditions a higher development of the parasite can be seen. It is a process of differentiation into gametes, or males and females, and the resulting offspring are concerned in the transmission of the species, and of the disease, be it noted, into a new host.

The role of the mosquito in carrying the disease from one person to another has been worked out during the past two years. The prevailing view of how this is done may be outlined in this wise: When the Anopheles mosquito bites a human being afflicted with malaria, the parasites in the blood are taken into the insect's stomach and here and in the intestines they undergo a certain cycle of existence, or evolution, lasting about a week or ten days, and sporozoids—corresponding to the eggs of higher animals or to the seeds of plants—are formed, and these get into the salivary gland, and when the mosquito bites again they are, along with the saliva, injected into the wound. Once in the human system these sporozoa seek and occupy the red blood corpuscles; gradually they increase in numbers by sporulation, and in the course of a few days, or after one or more weeks, evidence of malaria manifests itself. In this way malaria is transmitted to a new individual.

The life history, or the development of the parasite, can be followed:

First. In the blood of a malaria fever patient by taking a drop of the blood at variable intervals and examining it under a high power of magnification. This will show the sporulating generation.

Second. In blood kept for some time under suitable conditions—warmth and loss of fluid by evaporation—under the microscope.

Third. In the organs, notably the spleen, of persons dying from malaria.

Fourth. In the bodies of mosquitoes after feeding on the blood of a malarial fever patient, the insects being kept at a summer heat.

With the cause definitely recognized, malarial fever may be defined in this wise:

"A specific infectious disease depending upon the presence in the blood of one or more of several species of closely allied parasites (Haemosporidia), which develop within, and at the expense of, the red blood corpuscle of the infected individual, resulting, according to the species and number of the parasites present, in more or less periodic febrile paroxysms or in continued fever."

We may now ask: How does this active cause get into the body? Or, in other words: How do we catch malaria?

When the mosquito theory was first announced it was thought that any and all mosquitoes could transmit the disease. It has since been found that there is only one genus which is now universally suspected.

There are about 250 species of mosquitoes described, and of this number about 30 have been found in the United States. The genus to which the malaria carrying mosquito belongs is that of Anopheles; it may be recognized by its spotted wings and the peculiar position of the body when at rest—the body axis projecting away from the place of support, as a wall. Our common mosquito belongs to the genus Culex and is considered harmless; it has no spots on the wings and the body axis at rest is parallel to the wall. Anopheles is an inhabitant of the country. Culex lives in the city as well as in the country.

Mosquitoes normally live on the juices of plants; the sucking of blood is an acquired habit. The females alone suck blood, the mouth-parts of the males are not adapted for it. They seem to survive our winters; they are often to be seen during warm days in the midwinter months. In the spring the few survivors are ready to repopulate all the country around—and at the same time spread malaria. With us malaria is essentially a disease of warm weather.

There are two chief methods by which the subject can be studied:

First. To search for Anopheles in its usual habitat and then for the malarial fever. Or,

Second. To find the malarial fever and then look for Anopheles.

The blood of man upon which the mosquito has been feeding can readily be studied in thin sections of the insect properly stained. In some of the slides which I will pass around, the distended stomach, filled with blood, can be easily distinguished; under a high magnification any Plasmodium malariae in the corpuscles can be seen.

From the preceding remarks it will be seen that three chief factors are involved in this question:

1. The fever-stricken human being, or, the disease in the body, or, in other words, the reaction brought about by the presence of the active cause.

2. The cause itself, the Plasmodium malariae.

3. The transmitting agent, carrying the active cause from one infected human being to others. This is the Anopheles mosquito.

Now what is to be said on the application of all these discovered facts? Most of us, unless we see a well defined application for newly discovered facts, are not inclined to attach any great importance to such discoveries, and, on the other hand, the more directly we are concerned the greater the value to us. In the field of medicine the value of a discovery is estimated in the light of the relief it gives mankind from disease and affliction.

How best to apply this new knowledge in reducing the ravages of malaria and in banishing it from the face of the earth is a question on which opinions differ. By some it is held that the best method of procedure is to destroy all the mosquitoes, and thus prevent the transmission from one individual to others. It is claimed by advocates of this class that the malarial parasite may not live exclusively in man, but might be inoculated from lower animals. On the other extreme are men who aim to exterminate malaria by exterminating the malaria germ itself, by properly diagnosing all malaria cases and administering sufficient quinine; by isolating all such patients and protecting them from mosquito bites. They blame the mosquito less than the infected blood upon which the insect feeds. It would be impossible, they argue, to get rid of all the mosquitoes in any community, much less of those in the whole world. Their reliance is quinine and screens.

Besides these extreme views there is what may be called a compromise, that is: To reduce the number of breeding places of the mosquito to a minimum, by drainage and drying up all wet places and pools of

stagnant water; by isolating the sick and protecting them from the bites and by the administration of quinine. With the breeding places reduced and the sick isolated there will be a constantly diminishing number of malarial fever cases.

A number of experiments have already been made along these lines. Former efforts, as those of the Italian government in planting Eucalyptus trees, have been futile because founded on imperfect data. Of the Eucalyptus it should, however, be said that it does have a slight influence, the leaves containing a volatile oil offensive to the mosquito, and on this account they do play a slight part in lessening the ravages of the disease among those living in a grove of the trees.*

Quite different are the results of experiments made this year. From the Eucalytus theory of a generation ago to the mosquito theory of to-day is a step far in advance, and results based thereon are equally significant.

The Italian railways—with their lonely stations in the plains and valleys—were the first to take advantage of the new theory in adopting prophylactic measures against mosquito infection of malaria by protecting their buildings and those occupied by their workmen by mosquito netting. The tests have been regarded as conclusive. Of 104 railway employes protected from mosquito infection not one contracted the disease. On the other hand, out of 359 persons not thus protected but otherwise living under similar conditions, only seven or eight escaped the fever.

A more elaborate test was made at Paestum, in a fearfully infected region to the southeast of Naples. The houses had wire screens over every opening—doors, windows, chimneys, etc., and persons going in and out after dusk were obliged to wear veils and closely woven, thick gloves. One hundred three persons were thus protected and of this number only three showed symptoms of malarial infection. The difficulty of inducing ignorant persons to fully comply with directions for protecting themselves accounts for the exceptions. No quinine was used by the party. Out of the population of 307 souls living in that region and not protected, all but five contracted malaria—these five being sons of the soil who seem to have been immune to a considerable extent. Where the protected party took no quinine, the exposed persons, on the other hand, during the same period, took six pounds.

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*The specimens of Eucalyptus here shown are, one from Battipaglia, north of Paestum, in a terribly devastated region of Italy; the other from the Roman Campagna above the Callistus catacombs.

It is now proposed to isolate all fever patients in the malarial districts and to protect the dwellings by screens—a tremendous undertaking with an area of 20,000 square miles and with a population, much of it very ignorant, of 2,500,000.

CHANGES IN INDIANA.

In regard to the changed condition in Indiana—the former prevalence of malaria, especially in the Wabash bottoms, even only two or three decades ago, and its comparative rarity at the present time: It seems to me that the explanation is to be sought chiefly in the fact that proper medication, the taking of sufficient quinine, is resorted to promptly nowadays, resulting in the rapid disappearance of the disease, or disease symptoms, in the afflicted individual, and thus keeping the number of foci from which the disease could be disseminated at a minimum, and at the same time shortening the period of existence of such foci, or, in other words: The fewer individuals there are in any neighborhood the less the liability for the healthy to contract the disease.

In former times quinine was a very costly remedy, used as a last resort and usually in insufficient doses; to-day quinine is very cheap and by many used for any suspicious malarial symptoms.

Then, too, mosquitoes were, no doubt, more abundant in former times than at present, owing to the greater number of wet places where the animals could breed; stagnant water being one of the essentials in the life history of the insect. Drainage is restricting such breeding places more and more, thus indirectly reducing the number of mosquitoes. Now that the proper relationship of malaria to swamps and pools is known, it becomes a comparatively easy matter to still further diminish the progeny of the "skeeters" still among us. The simplest method, except drying up wet places, is to spread a film of oil over all bodies of stagnant water—the larvae as they come to the surface to breathe get the oil in the respiratory system and quickly perish. The necessity of isolating and properly protecting all malarial fever cases is self-evident.

SUMMARY AND CONCLUSIONS.

Malaria is a disease which once had a restricted distribution, but which in the course of time has been distributed over the face of the earth; it is most common in warm climes; it is due to a specific cause,

the Plasmodium malariae, a minute organism living in and destroying the red blood corpuscles. The parasites are transmitted from one person to another by the mosquito. A certain cycle of the life history of the malarial parasite takes place within the body of the mosquito and the spores are injected from the salivary glands into and under the skin in biting.

Certain species of mosquitoes are the carriers to and fro of the infecting organisms. They may in a general way be recognized by their spotted wings and by their peculiar position when at rest.

The prevalence of malaria can be diminished by guarding against mosquito bites; by isolating malarial fever patients, giving them sufficient quinine and protecting them from being bitten; by reducing the number of breeding places of the mosquitoes by drainage.

Individual prophylaxis is best attained by avoiding the bite of the mosquito.

A Shell Gorget Found Near Spiceland, Indiana.

By Joseph Moore.

All I propose to do in this brief paper is to give a history of the object represented by the accompanying photograph, leaving it for others to tell the meaning of the engraved design and also its relation to other specimens of prehistoric art. About half a mile north of Spiceland, Henry County, while some men were loading gravel and sand, they came to some graves from which were taken two or three badly decayed human skeletons, the skull of a groundhog and the gorget which is the subject of this report. One of the human skulls is well preserved and the other sufficiently so to indicate its character. They represent rather a fine type of head.

The photograph herewith presented is very nearly one-half the size of the original, which is in length five and three-fourths inches. The greatest breadth toward the wider end is three and one-eighth inches, and that of the narrower end is two and one-half inches.