

the angle $G I J$ is somewhat less than 45° . The center of gravity of the system then lies vertically below the cord. Choose axes fixed in the body as follows: For the axis 1 take a horizontal line through the center of gravity and perpendicular to the plane $G I J$, for axis 2 take the axis of the rod, and for axis 3 take a line

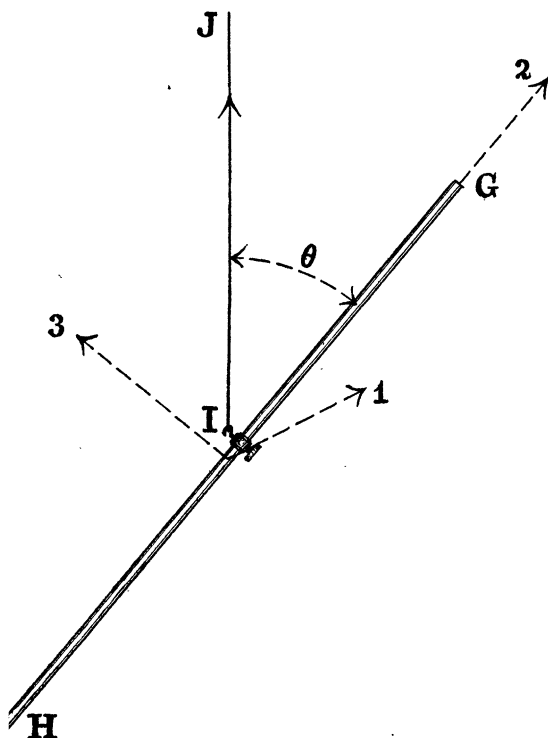


FIG. 1.

through the center of gravity and perpendicular to the plane of 1 and 2. 3 will then lie in the plane $G I J$. These axes are represented in the figure, where the axis 1 is supposed to project directly towards us, and the coordinate system is consequently right handed. Take right-handed rotation as positive. Then Euler's first equation may be written

$$A \frac{d\omega_1}{dt} - (B - C) \omega_2 \omega_3 = L, \quad (1)$$

where A , B , and C stand, respectively, for the moments of inertia about the axes 1, 2, 3; ω_1 , ω_2 , ω_3 for the angular velocities about those same axes; and L for any external torque

which may be acting about axis 1. In the present case we have very nearly $B = 0$ and $C = A$, so that equation (1) becomes

$$\frac{d\omega_1}{dt} + \omega_2 \omega_3 = \frac{L}{A}. \quad (2)$$

Now give to the system a right-handed rotation about $I J$. We then have $\omega_2 > 0$ and $\omega_3 > 0$. If the center of gravity were to stay immediately below the cord we should have $L = 0$ and therefore $d\omega_1/dt < 0$. But this would increase the angle θ and so throw the center of gravity out from underneath $I J$. The weight of the system and the tension in $I J$ would then supply a positive torque L . It is possible to have this torque of such magnitude as to make $d\omega_1/dt = 0$, in which case the torque is entirely non-momental. The reason for the necessity of this non-momental torque is easily seen by considering an element of the rod near G or H . When the rod is rotating there must act upon this element a centripetal force directed toward the axis $I J$. This force is supplied by means of the torque L .

A rotation of sufficient magnitude to make θ very evidently greater than it is when the system is at rest is easily imparted by hand.

ARTHUR TABER JONES

SMITH COLLEGE

A UNIQUE HORNET'S NEST

IN the magazine, *The Guide to Nature*, Vol. 10, No. 1, June, 1917, Earl A. Newhall, of Shelburne, Mass., under the title "The nest of an unknown hornet," mentions a hornet's nest of peculiar form which he found hanging under the eaves of an old shop. An excellent photograph of this strange nest accompanies the article. Newhall wrote to Dr. L. O. Howard, of the Bureau of Entomology, sending a photograph of the nest. Dr. Howard states:

I never saw a hornet's nest like the one in the photograph and I have referred your letter to Mr. S. A. Rohwer, of this bureau, who has studied these creatures for many years and he replies as follows: "I have never seen a nest like this before and do not know if it is an abnormal one or not. If possible, I should like to have some of the ma-

kers so that it would be possible to determine the species and thus know if it is abnormal habit.

The nest in question consisted of a globular portion which was abruptly contracted below into a long, slender, vertical neck of practically uniform diameter. This slender neck served as the only means of entrance into the structure.

The writer wishes to state that he once found one of these unique nests at Oxford, Mass., many years ago. This nest was kept as a curiosity in the writer's collections for many years and did not fail to excite the wonder and admiration of those who saw it. In size and shape this nest was similar to the one found by Newhall at Shelburne, Mass. Newhall states that he found his specimen under the eaves of a building. As well as the writer can remember, the nest which he found at Oxford, Mass., was suspended from a small branch of a tree not far from the ground. The maker of the nest was never seen. Although the writer has always kept a sharp eye open since for other specimens of this kind, none has ever been seen. It would be of considerable interest to know whether the two unique nests in question really represent abnormal deviations of habit for some well-known species, or the normal habit of nest-construction for a very rare and little known, or even unknown, species.

H. A. ALLARD

WASHINGTON, D. C.

SYNCHRONISM IN THE FLASHING OF FIREFLIES

THE articles on the flashing of fireflies which have appeared from time to time in SCIENCE have aroused my desire to experiment upon the subject. The presence of two individuals of the firefly, *Photuris pennsylvanica* DeG., in my tent at the University of Michigan Biological Station at Douglas Lake, Mich., on the evening of July 17, 1917, gave me my first opportunity. With the tent dark, I watched the two fireflies for about ten minutes. For a while they flashed alternately, but it soon became apparent that one was flashing a trifle more frequently than the other. Consequently, once in every two and one half to three minutes flashing was simultaneous. Then for

about twenty minutes I experimented with a three-celled vest pocket flashlight with the following results. I could easily get in rhythm with the firefly, but I could not make the firefly change its rhythm and keep with me. Sometimes the fireflies would stop while I was flashing the light and again they would continue to flash after I stopped flashing. At no time could I control their flashings. The flashlight and the two fireflies flashed simultaneously when I synchronized with one of the fireflies until its time interval brought it into coincidence with the other.

On the evenings of July 19 and 25, 1917, I had opportunity to carry the experimentation further—on each occasion with a single firefly. The same kind of results were obtained from these experiments. However, I discovered that when I brought the flashlight within 25 centimeters of the firefly it ceased flashing and did not recommence until after I had ceased flashing or until I had moved the flashlight back a meter or more.

On many evenings at the College of Agriculture of the University of the Philippines, at Los Baños, I have watched splendid fireflies, of which there are large numbers in the immediate vicinity. I frequently noticed that small trees and shrubs would be more aglow at certain times than at others, but I never happened to observe a time when a small tree or shrub was all alight one instant and dark the next. In my experience there were always some fireflies flashing in the "dark" periods. The times of greatest light occurred when the greatest number of varying flashes coincided.

From these observations and experiments it seems to me that complete synchronism in the flashing of a group of fireflies is simply a very rare accident, occurring when the flashes of the individuals chance to come at the same time.

FRANK C. GATES

CARTHAGE COLLEGE,
CARTHAGE, ILL.

UREDINIA OF *CRONARTIUM RIBICOLA* ON RIBES STEMS

DURING the past season uredinia of *Cronartium ribicola* Fischer have been discovered for