

DISCUSSION

SYNCHRONOUS FLASHING OF FIREFLIES

ANOTHER contribution to the elucidation of this remarkable phenomenon appears in a recent issue of SCIENCE,¹ that being the twentieth article on the subject in the same journal in the last twenty years.

This most recent explanation of the phenomenon is to the effect that a flashing female firefly in the grass attracts a small group of flying males which adjust their flashing period to that of the male which first responds to the flash signal of the female; another female, stimulated by the first flashing group, in turn attracts another coterie of males, which flash in unison with one another and in synchronism with the original group; and so the wave passes from female to female "until a large number of fireflies scattered over an extensive area are flashing in unison." The conclusion of this writer is that "the whole process thus depends on the fact that all the females reply to each of the flashes of the male at the same definite interval."

This explanation, which ascribes the phenomenon to a mating adaptation, may satisfactorily account for the behavior of the particular American species of firefly under observation, but it fails utterly to cover the synchronism in the flashing of fireflies in southeastern Asia, more particularly in Siam, where the phenomenon is exhibited on a vast scale and was witnessed by me very frequently during each of the years 1923-1934. How entirely different are the facts in the two cases may be seen from the following outline of the behavior of fireflies in Siam.

As has been pointed out by Morrison,² this phenomenon in Siam at least is unrelated to mating. The males which exhibit synchronous flashing are not in flight but are stationary on the leaves of a single species of tree (*Sonneratia acida*). This tree grows on the edge of streams which may be in flood for protracted periods, so that a tree may stand in several feet of water. When darkness approaches, the males from the adjoining jungle fly to the nearby *Sonneratia* trees, but during this flight show no synchronism in flashing.

Synchronous flashing occurs hour after hour, night after night for weeks or even months, without regard to air currents, air temperature, moisture or any of the other meteorologic conditions which have been stated to influence firefly flashings; there may be a dead calm, a gentle breeze may be blowing or even a steady wind may prevail. The night may be clear, the sky may be overcast or a light rain may fall without noteworthy effect on the rhythm or intensity of the flashing, but during bright moonlight the phenomenon is practically absent.

No females are observable at any time during the synchronous flashing, and it is obvious that the gathering of the males on a particular kind of tree on the water's edge is unrelated to mating. So far as known, the flightless females remain in the adjacent jungle from which the males have definitely flown for the purpose of engaging in this nightly display.

I consider the synchronous flashing of fireflies in Siam the outstanding zoological phenomenon in a country that abounds in zoological features of great interest. The display may be seen to best advantage along the broad stretch of the Menam Chao Phya which extends between Bangkok and the sea, and it is there that I have taken a number of parties of Americans and Europeans to witness it. Imagine a tree thirty-five to forty feet high thickly covered with small ovate leaves, apparently with a firefly on every leaf and all the fireflies flashing in perfect unison at the rate of about three times in two seconds, the tree being in complete darkness between the flashes. Imagine a dozen such trees standing close together along the river's edge with synchronously flashing fireflies on every leaf. Imagine a tenth of a mile of river front with an unbroken line of *Sonneratia* trees with fireflies on every leaf flashing in synchronism, the insects on the trees at the ends of the line acting in perfect unison with those between. Then, if one's imagination is sufficiently vivid, he may form some conception of this amazing spectacle. By going out into the river far enough from shore to lose sight of the individual flashes, a person may obtain from a single tree, a group of trees or a long line of trees a weird pulsating mass effect.

Some persons who have never seen the phenomenon and are skeptical in regard to its actuality stress the statement of observers that there may be a few fireflies which flash asynchronously. I have noticed this behavior on several occasions and have collected specimens of the apparently aberrant individuals, which proved to be of different species, easily distinguishable by the different intensity, color and rhythm of their light as well as by anatomical characters.

I am unable to offer any explanation of this phenomenon, and my principal object is to point out the facts as applied to Siam. I may express the opinion that some of the published explanations are more remarkable than the phenomenon itself. Thus, one writer³ holds that "for such a thing to occur among insects is certainly contrary to all natural laws," and he attributes the phenomenon to the sudden twitching of his own eyelids—"the insects had nothing whatever to do with it." Among other explanations that do not explain, at least so far as Siam is concerned, I would

¹ J. H. Buck, SCIENCE, 81: 339-340, 1935.

² T. F. Morrison, SCIENCE, 69: 400-401, 1929.

³ Philip Laurent, SCIENCE, 45: 44, 1917.

place those that ascribe the phenomenon to puffs of wind, illusion and accident. The most naive of all would seem to be "that complete synchronism in the flashing of a group of fireflies is a very rare accident, occurring when the flashes of individuals chance to come at the same time."⁴

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A CASE FOR PRIORITY IN BOTANICAL NOMENCLATURE

THAT the principle of priority once regarded as the basic rule for determining "validity" or correct "usage" in botanical nomenclature has somehow fallen in disrepute is but natural because of the many individual cases where hewing to the line has resulted in extreme confusion. To-day few deny the practical advantage gained by recognition of *nomina conservanda* in preserving names familiarized through use. It must be recognized, however, that acceptance of a particular *nomen conservandum* without taking account of older recognized homonyms may cause greater confusion than that which it is aimed to correct.

A case in point is a recent proposal by J. E. Dandy¹ that the name *Eriospora* (Hochst. 1851), as used for a genus of 4 or 5 species of Cyperaceae, be accepted by the coming International Botanical Congress as a *nomen conservandum* in place of a synonym, *Catagyna* (Beauv. 1819). This proposal does not take account of the fact that the name *Eriospora* was previously published for a fungus by Berkeley and Broome.² The fungus genus *Eriospora*, with only four known species, has a well-defined place in the technical literature. If Mr. Dandy's proposal be accepted at this congress this particular genus of fungi becomes nameless, contributing an added difficulty to the already overcrowded and confused mycological nomenclature—unless, of course, fungi be ruled out of botany, as is proposed by some.

In this era of specialization the taxonomist of seed plants, of ferns, of fungi or of what not, is likely to be familiar only with those genera included in his specialty. It is inevitable, therefore, that a specialist will fail occasionally to realize that his preferred generic name may be preferred also by the student of another group for an entirely different organism. If only the natural interests, preferences and prejudices of the phanerogamists or of the cryptogamists are to be considered each group would favor validating its particular pet name; but neither party desires to invalidate a well-established usage. Accepting either name, however, necessarily invalidates the other. Since both names may have an equally meritorious

usage by different groups of distinguished taxonomists and there is no adequate means for obtaining a fair judgment as to which usage is the more desirable the two points of view are patently irreconcilable without recourse to priority. In view of these considerations it would seem that wherever homonyms have both attained a well-established usage we must hew to the line of priority in nomenclature if we would avoid useless and endless confusion.

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THIS laboratory has recently reported a study of performance following the noon meal at tests primarily of mental functions.¹ This work indicated that early afternoon sluggishness among mental workers is probably a form of drowsiness, related to the shift of blood to the splanchnic region following a meal. The sluggishness was most when a heavy meal was eaten at noon, and was least when a dairy lunch of a common cereal, such as corn flakes, was eaten.

Further data, of considerable importance to acoustical workers, are now available. The lower auditory threshold for a tone of 256 cycles on the Western Electric 2A audiometer was determined for seven healthy young men within half an hour after they had finished their noon meal. All these subjects showed a dulling of their sense of hearing after they had eaten their noon meal.

This dulling was greatest on the days when they had eaten a heavy noon meal, the average minimum intensity which was audible being 7.0 decibels on the heavy meal days. On the days when the cereal lunch was eaten, the same men averaged 4.5 decibels as their threshold intensity. This is a difference of 35.7 per cent. greater acuity on the cereal meal days.

Oculists tell me they notice a similar dulling of visual acuity when eye examinations are made after a heavy meal. It is possible, also, that the senses of touch may be dulled after a heavy meal, since it is known that blood is then drawn from the skin to assist in the processes of digestion. The change in acuity of hearing, however, may likely be due as much to the relatively anemic condition of the brain following a heavy meal as it is to an alteration in the circulation to the inner ear itself.

This interesting and unexpected phenomenon associated with hemastatics not only throws light on some of the diurnal variations in human performance,² but

¹ D. A. Laird, H. Drexel, D. DeLand, K. Reimer, "Early Afternoon Sluggishness." Proceedings of the National Office Management Association, June 4, 1935.

² G. L. Freeman, "Diurnal Variations in Performance and Energy Expenditure." Northwestern University Press, Chicago, 1935.

⁴ Frank C. Gates, SCIENCE, 46: 314, 1917.

¹ Kew Bull. Misc. Inform., No. 2, p. 83, 1935.

² Ann. and Mag. Nat. Hist., Ser. 2, 5: p. 455, 1850.