He refers also to the rhythmic flashing of the Indian fireflies.

F. P. Connor[3] refers to the "rhythmic flash of swarms of fireflies on a dark night, so beautifully seen in the Terai districts of this region [India]."

On July 22, 1933, I made a trip to the top of Hawksbill Mountain in the Blue Ridge of Virginia, pitching a tent on the plateau or Summit Pene plain just below the knob. As darkness came on, I began scouting over the pastures with a powerful spotlight. At 8:10 the first fireflies were seen in flight, spotting the darkness with an occasional flash of brilliant light. The flashes were never rapidly delivered, a considerable interval of rest always following each flash so that it was difficult to follow the insect in the darkness by its light. Even the flash itself was a leisurely delivery of light. Probably not more than eight or ten of these flying males were seen.

Points of light also came and went in the low herbage around, and these were traced to wingless females. The flying males and the wingless females were identified by Mr. H. S. Barber, of the U. S. National Museum, as *Photinus scintillans* Say.

I soon found that the flash of my light stimulated the flash of these wingless females. Their flashing response came very soon after the beam of my light went forth. I became much interested in the responses of these quiescent females. It was a matter of a nice synchronism on the part of a number of females every time I flashed my light. It was rather impressive to throw the spotlight over the low shrubbery one to two hundred feet away and to behold the reaction of half a dozen or more females flashing an almost immediate response with their tiny lights. This play with these insects continued for some time. At 8:30 the males had ceased to fly, but the females continued to respond to my flashlight in the herbage until 9:00 P.M., when their responses ceased.

In this instance the quiescent, wingless females were synchronizing their flashes in response to my light, and presumably they would behave in the same way to the perceived flash of a flying, flashing male. My stronger beam of light, affecting a far greater area, stimulated many or all the females to flash their signal, resulting in a nice synchronism within a scattered population every time I flashed my light. In this instance synchronism was experimentally induced in a population of females, but with a population of males flying and flashing around indiscriminately, there could have been no synchronism induced. At no time did the few males observed tend to flash in unison, and none were observed to descend to the females.

[3] *Jour. of the Bombay Nat. Hist. Soc.*, 36: 4, 1018, 1933.

While the observations I have reported appear to be relating to the mating impulse, I feel convinced that the remarkable synchronous flashing of many tropical fireflies does not necessarily fall in this category. A recent contribution by Hugh M. Smith[4] on the synchronous flashing of certain fireflies in Siam makes this plain.

The spectacular rhythmic flashing of groups of males as observed by Smith parallels perfectly the behavior of certain crickets and katydids, the snowy tree crickets, outstanding among these, which chirp in unison, not as a mating adaptation, but purely from some organic law of rhythmic appreciation which governs their chirping.

My original note in SCIENCE[5] appears to have led to the erroneous conclusion that the synchronism which I observed proceeded in waves from one or more sources. I did not observe a moving of the impulse in waves. My wording may have been a little ambiguous on this point. My use of the word "wave" as I have expressed it, "of alternate waves of illumination and darkness in the distance," had reference to that content of the word "wave" as a period of marked activity, as a *wave* of enthusiasm, not as an impulse moving along.

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STUTTERING

IN a series of twenty-four cases of stuttering studied this summer in the laboratory of biolinguistics, at the University of Michigan, a marked improvement, even to a complete cessation of stuttering, was noted when the stutterer spoke while walking on all fours. When the stutterer assumed this position the arythmicity and lack of coordination decreased.

As yet, no explanation of this phenomenon has been discovered. It is conceivably due to the reinforcement of reflexes. More specifically, stuttering as a spastic phenomenon may be caused by a temporary stimulus applied to an upper motor neuron. This might be due to a temporary dilatation of the capillaries of the precentral cortex. By the assumption of the quadrupedal position an alteration of blood pressure possibly ensues, which releases the blood that dilates the capillaries. Hence, the spasticity ceases and the patient carries on a more nearly normal conversation.

If this view proves correct, then present theories and methods for correcting stuttering should be revised and greater effort should be made to place them upon a physiological basis.

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[4] SCIENCE, 82: 151–152, August 16, 1935.
[5] SCIENCE, 44: 710, November 17, 1916.