the owl's account of his mistake, though I doubt not he is as badly frightened as the more injured party.

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THE writer was conducting some experimental work in orchards in west central Illinois and staying at a farmhouse several miles from town. One evening early in June the owner of the orchard, the farmer occupying the place and the writer were sitting in front of the farmhouse under a large tree just at dusk of evening. The weather was hot and none of the party were wearing hats. Suddenly a screech-owl flew from one of the trees to the head of the farmer and attacked him with claws and beak, inflicting several rather severe lacerations on the top of his head and his forehead. The farmer, not approving of this demonstration on the part of the owl, promptly retired to the house, secured his shotgun and to use his own expression "blew a hole through the middle of the owl."

This owl was the male of a common screech-owl *Otus asio asio*. Another owl, presumed to be the mate of the one killed, was noticed the same evening and on a number of other occasions in the trees in the yard but never showed any inclination to molest any one before or after the death of her mate.

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SYNCHRONOUS FLASHING OF FIREFLIES

DR. BROKENSHIRE, a medical missionary in Mindanao, in an article "Through Philippine Jungles" in the September *Missionary Herald*, concludes with the paragraph copied below which will appeal to those who are interested in the synchronous flashing of fireflies.

> It got dark. Then all one could see was now and then a flash of light from the shore where the Moros were living. The combination of darkness and the continual thumping of the paddles made me sleepy and I dozed off several times. I aroused once to see a strange sight. Off there in the darkness was a tree just filled with lightning bugs. The strange thing was that they all flashed at the same time. One second everything would be dark, the next second the whole tree would be aglow with a beautiful light!

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

"VITALITY" STAINS

As a preliminary report to work which is being continued on the physiological effects of vital stains, the following summary of observations is offered.

Methylene blue, neutral red, Bismark brown and Janus green were used in concentrations of 1/12,500 and 1/5,000 in sea-water with *Aurelia aurita* and *Gonionemus murbachii.* The largest and most active individuals were selected from a total of 75 Aurelia and 850 specimens of Gonionemus which were examined. Only the first two stains were used with Aurelia, which were stained for a period of two hours. The specimens of Gonionemus were stained for only forty-five minutes. In each case the animals were washed in several changes of sea-water before being placed in a running salt-water aquarium where observations were made.

The stains in each case had the effect of a stimulant, causing increased activity for a period considerably longer than was observed for the controls after being placed in the observation aquarium. In one case there was intermittent activity for over an hour, while the controls ceased activity within two minutes. With Aurelia the controls died before any of the stained individuals, twenty-one days after starting the observations. The stained individuals were normally active ten days later.

With a series of thirty-six individuals of Gonionemus, it was found that the individuals stained with Janus green died in about ten days while all the others lived at least three weeks. Relative activity was determined by response (pulsation of the bell) to pinching by forceps of a tentacle near the sucking disk. This stimulus was regarded as relatively uniform. At the conclusion of the observations the individuals in the order of decreasing activity (vitality) were as follows: neutral red, methylene blue, Bismark brown and the controls. The Janus green individuals had died.

References in literature to vital stains lead us to think that they are all toxic, but that some are less so than others. This is quite possible, but these few observations direct us toward further observations, for in each case the stained individuals either outlived the controls or were more active than the controls at the conclusion of the observation period. Certain ameboid cells of Aurelia were seen to contain concentrated masses of limited size of the stain, and it is suggested that vital stains may in some way increase the activity of these particular cells. These ameboid cells may have as their main function the protection of the individual against invasion by foreign substances.

These commonly known "vital" stains seem (except for Janus green) in the case of Aurelia and of Gonionemus to increase somewhat the vitality and length of life of the individuals stained. Further observations both on these jellyfishes and other forms will be reported at a later date.

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AN ICHTHYOMETER

THIS apparatus was designed to make possible quantitative studies on the activity of fishes. It had been in use for some weeks in the laboratory of animal behavior of the zoology department of the Ohio State University when Magnan's description of a device for registering the speed of swimming in fishes was published.[1] Breder has described a dynamometer for recording the pull of fishes, which, however, he states was not very successful in operation.[2] While Breder's apparatus was made to register pull and that of Magnan to measure speed of swimming, this device records neither of these, but is constructed to show the total swimming movements of fishes over considerable periods of time and their position from time to time in the aquarium.

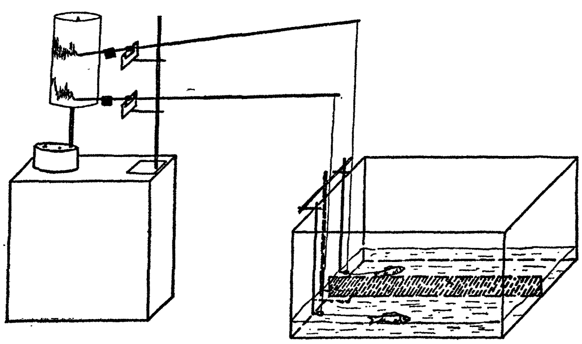

FIG. 1

The slow kymograph of the Harvard apparatus company, revolving once in approximately fourteen hours, is used. An aquarium which may vary in size with the size of the experimental fish is filled not more than four inches deep with water. An aquarium through which water is running may be used for species which do not thrive in still-water aquaria. The recording device consists of a long lever to the short arm of which the tracing point is attached. To the end of the long arm a fine thread is tied. This thread passes through an eye fixed rigidly about a half inch above the surface of the water at one end of the aquarium and directly below the point of attachment of the thread to the lever arm. This thread is attached to the tail of the experimental fish just anterior to the caudal fin. A sharp needle may be used and the thread passed through the skin and a little of the muscle in the dorsal part of the tail region. Such a wound is very slight, soon heals and apparently causes the fish little irritation. A sliding weight is fixed to the short arm of the lever and so adjusted that the short arm is slightly heavier than the long arm. When the fish swims away from the rigid eye the long arm of the lever is pulled down and the movement recorded by an upstroke of the recording point. As the fish swims back toward the eye the long arm of the lever swings up, taking up the slack in the thread, and the movement is recorded by a downstroke of the recording point. Thus every swimming movement is recorded and by the proper measurements the total distance covered by the fish in a given time can be computed. By placing an opaque partition down the center of the aquarium it can be divided into two long, narrow compartments and records of two individuals can be taken simultaneously. Such a long, narrow compartment results in movement almost entirely in a direction directly away from or directly toward the rigid eye. To secure activity records with the least possible disturbance to the fish the lever should be constructed of very light material, and should be balanced so that the fish pulls only a gram or two of weight. The long arm of the lever should be of such a length that when the fish swims from one end of the aquarium to the other the end of the arm describes an arc subtending an angle of between 30 and 45 degrees. The length of the short arm can be so adjusted as to give a record of convenient height. The lever can be constructed of soda straws. One end of a straw is split along one side for an inch and a half, the end rolled in and telescoped into the unsplit end of another straw. In this way four or five straws may be telescoped together, making a lever extremely light and at the same time sufficiently rigid for this work. The fulcrum consists of a needle passed through a small cork, and the lever is fixed rigidly to this. The ends of the needle fit into small metal sockets. The lower limit in the size of the fish is about two inches in length. A certain minimum weight is necessary to overcome surface tension and cohesion at the point where the thread is being drawn from the water in taking up slack. In fish of small size this weight becomes a disturbing influence in normal activity records.

As can readily be seen, the apparatus is applicable to problems where it is desirable to know the movements and changing positions of fish in a still-water or running-water aquarium. Such problems as the reactions of fish to light, temperature, oxygen supply and food supply can be studied quantitatively. The apparatus, by the addition of certain accessories, lends itself to the study of conditioned reflexes. It is being used at present in this laboratory in a study of

[1] A. Magnan, "Les Caractéristiques Géométriques et Physiques des Poissons. Avec Contribution a L'Etude de leur Equilibre Statique et Dynamique," *Annales des Sciences Naturelles, Zoologie*, T. XII, Fas. 1, Avril, 1929.

[2] C. M. Breder, Jr., "The Locomotion of Fishes," *Zoologica*, Vol. IV, No. 5, September, 1926.