several years. Publication of other methods for obtaining a large and more or less continuous supply of these animals has not been infrequent and many are familiar with use of *Elodea* (*Philotria,* Michx.-Britton), *Ceratophyllum* and other aquatic plants.

The ditch-moss is not readily found in many localities. My personal experience with several aquatic plants yielded indifferent results and failed to give sufficient numbers until, by chance one season, I tried the marsh plant, *Elodes campanulata* (*Triadenum virginicum* (L.) Raf., see Britton and Brown) and was rewarded with large numbers of amœbæ. Although absence from town in some seasons occasioned a too long interval between the times of collection and the use of the material, or made it impossible to provide the proper sequence of cultures, I have seldom been disappointed in finding the animals, though they may not have come just when wanted.

The usual custom was followed in making up the cultures. Crystallizing dishes or battery jars—the shallower dishes gave the better results—were crowded not too densely with the stems of the plants. The stems were usually cut two or three times. Tap water and water from the pond or marsh where the plants were collected were used, separately, but no difference in results was noted. The dishes were covered with plates of window glass, placed in a room of moderate temperature and there allowed to remain in diffuse light for a period of three weeks or more. When pains were taken to collect the plants at intervals and provide a sequence of cultures the results were most gratifying.

I have used the plant from four different localities, collecting from the water and from banks where the plants could only have been submerged at high water and mixing, with success in all cases. Since the locality seems not to be a controlling factor, and since the cultures of tap as well as pond water yield the animals, I assume that the *Elodes* is favorable for the original lodgment of amœbæ and their later multiplication.

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CROSSING-OVER IN THE SEX CHROMOSOME OF THE MALE FOWL

SEVERAL years ago an experiment was begun with the object of studying the inheritance of several sex-linked characters associated in the same individual, but the experiment had to be laid aside until last year. The second generation chicks are now at hand and prove beyond doubt that crossing-over takes place between the sex chromosomes of the male fowl.

In this preliminary report attention will be confined to the factors themselves, without regard to the somatic appearances of the individuals. Three dominant sex-linked characters, viz., B, I, and S were employed. B and I were introduced on one side; S, on the other. Hence the F_1 males were all BI, S,; B and I being in paternal (or maternal) sex chromosome, S in the maternal (or paternal). These males have been tested by mating them back to females of the composition b Is, b is.

If there were no crossing-over, offspring of this back cross showing the combination of somatic characters found in the F_1 male, would not occur. Actually, however, they do occur, thus demonstrating that crossing-over has occurred, a chromosome having the composition B I S, having been formed. Other cross-over classes have appeared, but the one cited is the one at the present age of the chicks, most easily recognized.

No crossing in the female is to be expected on theoretical grounds. None was observed in the original cross. Partly because of practical reasons and partly because no new combinations were available in F_1, it seemed wise to defer a test of this point until next season, when the new combination B I S should be available in the mature female.

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THE EQUAL PARALLAX CURVE FOR FRONTAL AND LATERAL VISION

IN the article by Mr. C. C. Trowbridge on " The importance of lateral vision in its relation to orientation "[1] is given an equal parallax curve showing the distances that a man

[1] SCIENCE, N. S., Vol. XLIV., No. 1135, pp. 470–474, September 29, 1916.

and a bird must move forward to give the same apparent displacement of objects against the horizon. It is the purpose of the following note to derive an analytic expression for this curve.

Consider first the case of lateral vision. Let A be the starting point of the bird, and let the two objects, A_1 and A_2 in the original axis of vision be at the distances a_1 and a_2, respectively, from A. Let y be the distance that the bird moves forward, and α the angle that is subtended at its eye by the distance A_1A_2. (See Fig. 1.) Then
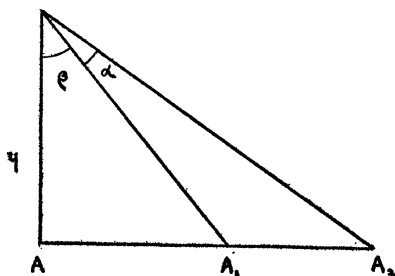

FIG. 1.

$$(1) \qquad \tan (\alpha + \beta) = \frac{a_2}{y}, \quad \tan \beta = \frac{a_1}{y},$$

where β is defined in the figure. Using the trigonometric formula for the tangent of the sum of two angles, and replacing $\tan \beta$ by its value from the second equation of (1), we get

$$(2) \qquad \frac{y \tan \alpha + a_1}{y - a_1 \tan \alpha} = \frac{a_2}{y}.$$

Solving this for y gives

$$(3) \quad 2y \tan \alpha = a_2 - a_1 \pm \sqrt{(a_2 - a_1)^2 - 4a_1a_2 \tan^2 \alpha}.$$

In taking up the case of frontal vision, it is necessary, as Mr. Trowbridge states, to have a deflection between the line connecting the observed objects and the direction of the man's motion. Designating the angle of deflection by δ, and the distance that the man moves from A by x (see Fig. 2), we have by the law of sines

$$(4) \qquad \frac{x}{a_1} = \frac{\sin (\gamma + \delta)}{\sin \gamma} = \cos \delta + \cot \gamma \sin \delta,$$

where again $AA_1 = a_1$, $AA_2 = a_2$, and α is the angle subtended at the eye of the observer by AA_1. The angle γ is defined in the figure. Also

$$(5) \qquad \frac{x}{a_2} = \frac{\sin (\alpha + \gamma + \delta)}{\sin (\alpha + \gamma)}.$$

By using the value of $\cot \gamma$ obtained from (4), we can easily eliminate γ and reduce (5) to

$$(6) \qquad \frac{x}{a_2} = \frac{x \sin (\alpha + \delta) - a_1 \sin \alpha}{x \sin \alpha - a_1 \sin (\alpha - \delta)}.$$

Solving for x gives

$$(7) \qquad 2x \tan \alpha = a \pm \sqrt{a^2 - 4a_1a_2 \tan^2 \alpha},$$

where

$$a = (a_2 + a_1) \cos \delta \tan \alpha + (a_2 - a_1) \sin \delta.$$

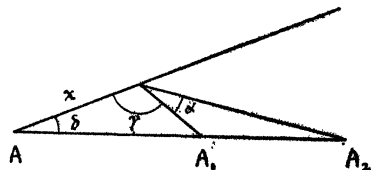Equations (3) and (7) then are parametric equations of the equal parallax curve.

FIG 2.

In plotting the curve of the practical problem we assign the values $x = 0$, $y = 0$ for $\alpha = 0$. To a value of α slightly greater than zero will correspond two values of x from (7) and two values of y from (3). It is easily seen that for the practical problem the smaller of these must be chosen in each case; that is, we must use the negative sign before the radicals in (3) and (7). For Mr. Trowbridge's curve the special values $a_1 = 1,000$, $a_2 = 2,000$ must be assigned, and in all instances δ must of course be known. PAUL R. RIDER

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A PREDECESSOR OF PRIESTLEY

To THE EDITOR OF SCIENCE: The notice of the Priestley Memorial in the issue of SCIENCE for August 17, 1917, reminds me of the best chemical joke I have ever heard. I can hardly forgive the "new chemistry" for having spoiled it. At our Brown University club dinners in Philadelphia we never have any wine. Many years ago when water was "HO" the late Rev. Dr. H. Lincoln Wayland, the best wit I ever have known, after a very happy eulogy of water, ended his after-dinner speech