

with visual lines appropriately crossed, is discussed but incorrectly explained by Sir David Brewster in his book on the stereoscope, many of his experiments having been performed more than forty years ago.

Dr. Keller seems to be affected slightly with divergent strabismus; which, however, has not resulted, as it so often does, in the loss of power to secure binocular vision. He will find the phenomena of vision by optic divergence discussed in a series of articles entitled 'Notes on physiological optics,' published in the *American journal of science* for November and December, 1881, March, April, May, October, and November, 1882.

W. LECONTE STEVENS.

170 Joralemon Street, Brooklyn,
May 15.

Diathermancy of ebonite.

Absence from home has prevented me seeing sooner *Science* for April 30.

In referring to my paper read before the April meeting of the National academy of sciences, you state, "Prof. Alfred M. Mayer, in describing recent work, stated that he had succeeded, by the use of a lens of ebonite, in inflaming various substances by the concentration of dark rays, for which ebonite is translucent." The statement is not what I stated before the academy. The title of my paper, as published by the academy, is, "On the diathermancy of ebonite and obsidian, and on the production of calorescence by means of screens of ebonite and obsidian."

The focus of dark rays was obtained by 'screens' of ebonite and of obsidian placed across the cone of rays reflected from a large mirror, or those refracted by a lens of glass of twenty inches diameter. I have obtained foci of dark rays with a combination of thin lenses of ebonite, but the heat of such foci is not sufficient to inflame substances.

ALFRED M. MAYER.

Hoboken, N.J., May 13.

Pharyngeal respiratory movements of adult amphibia under water.

The letter of Profs. S. H. and S. P. Gage, in your issue of April 30, induces me to recall and publish an observation made by me in 1877.

During a stay of some months in New York in the summer of that year, I several times visited a museum and aquarium, situated, if I remember aright, on 6th Avenue. I saw there a very fine specimen of *Cryptobranchus Alleghaniensis* about twenty inches long. I watched from time to time for several hours, but never saw it rise to the surface for air. As it lay at the bottom of its clear glass tank, I saw very distinctly continuous rhythmical respiratory movements. These, however, were not confined to the pharyngeal region, but seemed to me to extend the whole length of the body-cavity. It was a kind of squirming or wriggling movement running down the body. I looked carefully for currents issuing from gill-slits, but could see none.

At that time I concluded that the movements served the purpose of churning up the air in the lungs so as to utilize as much of the oxygen as possible. This seemed the more necessary in amphibians on account of the simplicity of their lung-sac. I had fully intended to draw scientific attention to

the subject, but on returning home I could not at once lay my hand on a good account of the gill apparatus of the adult *Cryptobranchus*, and meanwhile other things engaged and diverted my attention.

It might be well for those who are studying this subject to at least bear in mind the suggestion that rhythmic movements may possibly serve to utilize more perfectly the oxygen contained in the lungs of animals capable of remaining long under water. In my boyhood I have often waited, rifle in hand, three hours for an alligator to rise; and that, too, in mid-summer, when their vitality is highest.

JOSEPH LECONTE.

Berkeley, Cal., May 10.

Absorption of mercurial vapor by soils.

In the issue of *Science* for April 23, it is stated (p. 370) that the mercurial-vapor remedy has, in the hands of myself and assistant, failed to produce its promised results as a phylloxera insecticide.

This sweeping statement is not justified by the facts given by me in the issue of this journal for Dec. 4, 1885, and by its further elaboration as given in the 'Report on viticultural work,' since published. It has been demonstrated by our experiments that the reported total failures were due to improper materials used in the preparation of the mercurial mixtures, whereby the formation of mercurial vapor in the soil was practically prevented, and that when reasonably pure mercury is employed, and proper means used for its distribution in the soil, all insects within the mercurialized area died in the course of from thirty to forty-eight hours at the ordinary temperature, and much more rapidly at a higher one. It therefore appears perfectly practicable to protect vines planted in uninfested ground from attack coming from without, by surrounding the stocks with a sufficiently thick (eight to ten inch) layer of mercurialized soil, which, without obstructing or repelling the entering insects, will insure their being fatally poisoned before they can pass through it. This would leave the choice between grafting on resistant stocks on the one hand, and the mercurial protection on the other, in the planting of new vineyards, the cost being (in California) about the same in either case; it would also serve for protection against threatened invasion, in the case of vineyards already planted, since, apart from the case of open soil-cracks giving access to the vine-roots, the stocks are the only known route by which the phylloxera reaches the root. Such are the presumptions created by our small-scale experiments: how far the process will prove available in large-scale practice, remains to be determined by experience, but there is no especial reason to question its feasibility.

As regards, however, the treatment of ground and vines already infested, our experiments tend to show that the diffusion of the mercurial vapor is too slow, at the ordinary soil-temperatures, to promise success; especially in the case of clay soils, which absorb and render inert a large amount of mercurial vapor before an effective excess can be obtained.

It has been abundantly shown that the mercurialized soil exerts no unfavorable action upon the growth of the vine; and there is every reason to expect that an application once made will remain effective during the life of the vine.

E. W. HILGARD.

Berkeley, Cal., April 8.