Several speakers following Professor Bessey, commended the sentiments of his paper, and deprecated the undue attention given to systematic botany in many cases, where the chief end of the study seems to be to enable the student to find out the technical name of the plant.

A paper by Prof. T. J. Burrill of Illinois, upon 'An experiment in silk-culture,' came next upon the programme. The experiment was but very partially successful as regards the production of silk, the larger part of the worms dying of a contagious disease at about the time when they should have formed cocoons. The investigation of this disease formed the main subject of the paper. The disease was identified by the author, and by Professor Forbes, with the *flacherie* of Pasteur, and was plainly not the disease which he describes under the name *pébrine*. It also appears to be identical with a disease which has lately proved very fatal to the larvae of the cabbage butterfly.

The writer was not aware that any one had previously positively determined the existence of true *flacherie*, or of *pébrine* in America; but, if the conclusions of his paper were correct, the former, at least, has, in all probability, long existed here unrecognized.

In remarking upon the above papers, Prof. C. V. Riley claimed that both these diseases of the silkworm had been recognized by entomologists in this country, though they had not been able to give the disease that careful microscopical and bacteriological study which Professors Burrill and Forbes had done. He also stated his belief that the germs of *flacherie* are omnipresent, and that the disease may be induced at any time by unsanitary conditions.

A paper followed by Major Henry E. Alvord of New York, upon 'Telemetric aid to meteorological records,' describing briefly an apparatus made by the Telethermometer company of New-York city, by which a continuous record of temperature can be obtained at any reasonable distance from the place of observation, and with very little trouble. The results of about six months' comparison of one of these instruments, with thirteen daily readings of a standard mercurial thermometer, showed a tolerably close agreement between the two. The telethermometer was slightly tardy in its changes, and usually failed markedly to reach the minimum daily temperature, and frequently fell a little short of the maximum. The author considered it — though by no means perfect — to be the best aid yet found for recording atmospheric temperatures in connection with agricultural studies.

The next paper was by Prof. H. P. Armsby of Wisconsin, upon 'The creaming of milk by the Cooley system.' It was chiefly statistical, giving the results of some two hundred and fifty experiments in creaming the milk of single cans by this system; and showing that in eleven hours 90–99 per cent of the fat of the milk was recovered in the cream, as against 75–80 per cent in some recently reported German experiments in which the temperature of the water surrounding the cans of milk was much higher. The experiments furnished also some hints as to further investigations upon the influence of small variations of temperature upon the process, but no definite conclusions.

A paper by Prof. G. C. Caldwell of New York, upon 'The lactobutyrometer,' consisted chiefly of a review of the tests of this instrument on record; but contained also some experiments as to the cause of the failure of the process in certain cases to extract even approximately all the fat from milk, particularly that from highly-fed cows. The author concludes that his experiments are at least not inconsistent with the belief that either an albuminous envelope, or some sort of an accumulation of albuminoid matter about the fat globules, gives rise to the difficulty.

A brief report by Prof. W. J. Beal, upon the progress of experiments on the vitality of buried seeds, and a short account by Prof. C. V. Riley of a new remedy for locusts, which has been successfully used in California, and the reading by title of a paper by Prof. E. W. Hilgard "On some redeeming traits of 'alkali' soils," closed the reading of papers.

At the business meeting, the following officers were elected for the ensuing year: President, Henry E. Alvord; secretary and treasurer, B. D. Halsted; executive committee, Henry E. Alvord, B. D. Halsted, and E. M. Shelton.

THE DEVELOPMENT OF THE EYE.

In a recent paper before the Philadelphia academy, Dr. Benjamin Sharp has endeavored to trace the development of the highly complex vertebrate eye from the simplest deposit of pigment in an epithelial cell. The simplest organ of vision is found in the Lamellibranchiata; but these are not the primitive organs of the group, the ancestral eyes being present in a few forms for a short time during the free larval stage. The most primitive adult eyes are found in the common oyster, in which the free edge of the mantle is lined with a numbei of epithelial cells (fig. 1) having a nucleus (n), a deposit of pig ment (p), a transparent cuticul (c), with an undoubted power o vision. The next step of ad vance is illustrated in the com mon Venus, in which the eye are confined to the most exposed part of the body, the so-called siphon. So far there has been no protection to the visual organs other than that afforded by the shell; but in Venus the fact that there are pigment cells at the base as well as on the extremities of the tentacles indicates a change soon o take place. This change is well shown in the razor-shell Solen (fig. 2), where all the eyes are arranged about the base of the tentacles, and, furthermore, are sunk into deep grooves. The organ is also much more perfect.

FIG. 1. — Visual cells of Ostrea virginica. c, cuticle; p, pigment; n, nucleus.

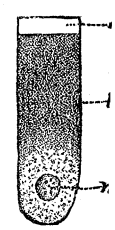

FIG. 2. — Oı visual cell Solen vagin c, cuticle; pigment; nucleus.

In the Gastropoda, from which the lamellibrancl have probably degenerated, the visual organs ta] their morphological position at the oral end of the body; and, with only one or two exceptions, there is but a single pair of eyes. In Patella, the row of eyes last seen in Solen has become a simple sphere of pigmented cells; and in Haliotis we have also an open sphere, but, instead of the refractive cuticula in front of each cell, there is one combined mass forming a lens, which is purely a secretion, not cellular as in vertebrates. Fissurella goes practically as far as any gastropod, having a closed eye containing a lens, and a transparent epidermal covering acting as a cornea. Both Fissurella and Haliotis have a distinct nerve specialized for sight, which connects the eye with the superior cephalic ganglion.

In an early stage of the vertebrate embryo, the anterior medullary groove divides into three segments, — the fore, mid, and hind brain. The fore-brain sends outwards and laterally a swelling, which increases in size, and passes on to the epidermis; and here an invagination takes place to meet this outward brain-growth. This invagination finally closes, and soon becomes cut off, forming a hollow vesicle, the cavity of which is finally obliterated, and, becoming transparent, forms the lens of the adult eye. In the mean time the growth from the brain has arched over and above this vesicle; and then, folding over laterally, it encloses the lens (fig. 3), which fills up the anterior opening of the cavity of this 'secondary optic vesicle.' After the closure is completed by the union of *a* and *b*, there is a double-walled vesicle, the interior wall giving rise to the many layered retina, while the external wall forms the pigment layer of the choroidea.

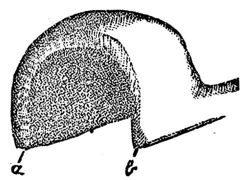

FIG. 3. — Diagram to illustrate the method by which the secondary optic vesicle encloses the lens which should fill up the open end. Eye of vertebrate.

The evolution of this eye seems simple; for, as soon as it became of importance to its possessor, a corresponding stimulation took place in the brain, where sight is without doubt seated. An increase of development began all along the tract, from the lens to the brain; and, as this increased, that part of the brain nearest the eye enlarged, and proceeded by steps outward in a manner similar to the process now taking place in the development of the eyes of Vertebrata. We then have a stage in which a part of the brain closes over the superior part of the eye, being separated by a layer of fibres which is the much shortened and flattened primitive optic nerve. The pedicle connecting this advanced part of the brain, which may be looked upon as a ganglion, will now be called the 'secondary optic nerve,' — the optic nerve of the eyes of the adult Vertebrata. Dr. Sharp thus holds, 1°, that the lens of the vertebrate eye is homologous with a primitive invaginated eye, such as we find to-day in the gasteropods; 2°, that the layer of optic fibres of the retina is homologous with the primitive optic nerve.

In vertebrates as well as invertebrates we frequently find blind animals, the near relatives of which have well-developed organs of sight. In these cases the accessory organs are first to disappear, the lens first; and in the lowest forms of degeneration, Branchiostoma notably, nothing remains but a slight deposit of pigment on the anterior end of the neural canal. This deposit in Branchiostoma, and a similar deposit in some larval Ascidia, have led Lankester to regard the primitive type of Vertebrata as a transparent animal with eyes sessile in the brain; but Dr. Sharp's investigations have led him to the opinion that forms so degenerate as these should not be taken as a standard on which to base our conclusions in regard to the origin of the vertebrates.

CIVILIZATION AND EYESIGHT.

THE discussion following Lord Rayleigh's article upon 'Civilization and eyesight' (*Nature*, No. 798, p. 340) has resulted in a clear exposition of this interesting subject. Rayleigh is of the opinion that the supposed superiority of the savage eye is merely a question of attention, and practice in the interpretation of minute indications; and that it is comparable with the acuteness of the blind in drawing conclusions from slender acoustical premises. It is doubtful whether the blind can hear sounds wholly inaudible to others; and, likewise, it seems impossible for the savage eye, with practically the same aperture as the civilized eye, to resolve objects, beyond a certain point, calculable by the laws of optics from the wave-length of light.

J. Rand Capron (*Nature*, No. 799, p. 359) suggests that, in considering the question of aperture, the fact that this, though probably following a general rule applicable alike to savages and civilized beings, varies in individual cases, should be taken into account. He mentions an assistant who had a singularly 'sharp' eye, and could pick out with ease companions to double stars, small satellites, etc., which others saw with difficulty. The pupils of his eyes were always larger than those of most other persons; and he had the peculiar power of being able to read fine print with ease when the gas was turned half on, and it was his habitual custom to read in this way. He suggests that there must be something more than a mere 'question of attention and interpretation of minute details,' when a savage can resolve two distant dots into distinctly appreciable personages, as regards sex and garments.

R. Brudenell Carter urges (*Nature*, No. 800, p. 386) that there is no necessity for a larger aperture to explain acuteness of vision. The savage might have greater sensitiveness to variations of light, greater sensitiveness to color, and acuteness of vision over a larger retinal area. All these advantages might be conferred by better formation or higher development of the retina; and such higher development might at once be promoted by exercise, and handed down by descent. He believes that the conditions of town-life are unfavorable to the evolution, and favorable to the degradation, of the eye; and, further, that a mod-