seen, is also appreciably darkened by its presence. When the star is black and the card behind it white, the illusion is still present, though a brightening of the black takes the place of the darkening just mentioned.

The rationale of the illusion is easy. The outer ring is really transparent, and the edge of the card is really seen through it. The transparency of the ring strongly suggests the transparency of the centre, a suggestion that we accept the more easily because the rapid rotation changes the appearance of the central portion somewhat from its familiar resting appearance. The apparent darkening of the portion of the central part overlying the black card is to be similarly explained. It is especially interesting, however, as being clearly a psychological illusion, an "illusion of judgment," while the color illusions formerly so called are being shown to be physiological, and largely, if not entirely, due to the mutual influence of adjacent portions of the retina.

A physiological explanation of this illusion seems hardly possible; and its psychical character is further attested by the ease with which it is corrected when the card remains stationary, and the unequal degree in which it seems to affect different observers.

A SUGGESTION AS TO TOPOGRAPHIC MAPS.

BY ARTHUR P. DAVIS, LOS ANGELES, CALIFORNIA.

WHILE the scientific and technical bodies of California and other States are agitating the question of topographic maps, educating the public on the question, and endeavoring to secure State appropriations and Government coöperation for such surveys, it may not be amiss to suggest other sources that might be made to furnish valuable contributions toward the same end. I refer to the very extensive and costly surveys made by engineers, promoters, and companies to determine the necessary information for the construction of railroads, irrigation systems, etc.

I have known cases where a large number of preliminary or trial lines have been run, the aggregate cost of which amounted to many times that of a good topographic map of the region under investigation, which would have shown all that the afore said surveys can show, and a great deal beside; for it is always an open question, whether the line finally determined upon is in reality the best in all respects, or whether some other, of the many untried possible routes might not be somewhat better or cheaper. All these possible routes would be shown by a good contour topographic map, and in addition thereto it would serve as a valuable piece of data for any future additions or alterations in the work.

Another argument in favor of the contour map that ought to weigh strongly in its favor with the persons above referred to, is the philanthropic one, that such a map is a valuable and permanent contribution to science. A large percentage of the scientific discoveries that have contributed so prodigiously to the intellectual and material advancement of the human race, have been made by persons working without the incentive of financial gain, and it is safe to say that few of them would have been made, if that had been the only incentive followed.

I do not believe that engineers and capitalists in charge would prove less public spirited than others if their attention were properly directed to this matter; and if geologists and others actively interested would persistently present these facts to the proper persons, great good might result. The main point to be carried is the substitution of the plane table for the transit in making preliminary surveys.

Without a systematic method of accurate field-sketching, which is the essential principle of the plane table, topographic mapping on any extended scale is impossible. Properly handled, with triangulations to check locations, and level bench-marks to check elevations, and with stadia to assist in sketching, plane table work may be entirely accurate within any scale adopted, and serve not only for preliminary information upon which to locate routes for canals, railroads, etc., but is a permanent record of comprehensive information to guide all future engineering operations in the country included, so that ordinarily at least two or three times as much might be advantageously spent on the construction of contour maps as would be required for running preliminary lines, and still the company would profit by the substitution. If the labor expended upon the tremendous mass of material now on record in the great engineering offices throughout the west had been judiciously supplemented by field-sketching on the plane table, a very great addition would have been made to our topographic knowledge, and I believe that such results could be brought about by well-directed efforts on the part of the proper persons.

LETTERS TO THE EDITOR.

*** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Pseudoauroræ.

DR. HATCH'S description of "Pseudoaurora Borealis" in your issue of Dec. 2, 1892, calls to mind a peculiar phenomenon which I once witnessed here, and which may have some bearing on pseudoauroræ in general if not on the particular species observed by Dr. Hatch.

About three years ago, as I was returning from the business part of the village of Plattsburgh, N. Y., my attention was taken by two long, white, brilliant, quivering streamers in the south-west, which at times seemed to shoot up and nearly reach the zenith. This was an unusual direction for such a display, and I at once turned toward the north to note its character there. Buildings prevented a good view, but I saw several streamers though none so brilliant as those in the south-west. Hastily taking the phenomenon for a true display of the aurora, I hurried home, only noting on my way that the streamers were brighter now in one direction, and now in another. It was not until I had called others out to witness the display, and remained quiet myself for a moment, that I discovered that one very brilliant streamer seemed to be situated directly back of the known position of one of our arc lamps, and what was still more curious it refused to move from that suspicious position. This streamer varied remarkably in brightness, now being short and faint, and again long and brilliant. Along with these greater changes in intensity there were more rapid and lesser changes, and in addition to these a constant shimmering of the light. There were also slow wave-movements of brighter portions which ran from below upward, or crossed the streamer from left to right. It was movements of this nature, so like the curtain movements of the true aurora, that led me for the moment to refer the phenomenon to the aurora itself, and the many beams, which sometimes ran so high as to suggest a corona overhead, and which varied in relative intensity if one was moving about, only helped to confirm the error. Plattsburgh has had electric street-lamps for seven years or more, yet this one display stands practically alone by itself. The streamer which I studied most was over a lamp something more than a thousand feet away, and was viewed across some village lots with many buildings clustered around the position of the lamp. The lamp itself was thus hidden from view, though it hung over the centre of the street and could cast no high shadows save alone those of the top of the lamp and its wires. These, of course, helped to cut up the beam of light. I do not think that a dark arch was present, though I can conceive that one of Professor Hazen's shadows might have been thrown by a group of trees or buildings in such a manner as to produce one, had some convenient cloud been situated in the background. I attribute the phenomenon to the peculiar condition of the atmosphere at the time. We were in a very light frost-fog and the vertical and lateral movements of brighter waves were probably due to denser portions of this frost-cloud, drifting along with the air-currents. The varying light of the arc lamps served to make these movements seem the more complex. I think it very probable that color was in many places present, due to a halo encircling each lamp, although I do not recall having noticed it. From Dr. Hatch's description it would seem that the two phenomena are not the same, as when he retired from the lamps the "aurora"

vanished, yet the phenomena I have described were seen from quite a distance, although if I moved about the streamers changed in relative brilliancy. I have many times thought of this appearance when I have looked over published reports of auroræ from voluntary observers, and it may be well to show that all unusual night-lights are not auroræ.

From Dr. Hatch's proximity to the lamp, "about the angle of 60° to the burner" (is this altitude, zenith distance, or an angle measured from some street lines?), it may be possible that his phenomenon has some relation to the halos which may be frequently seen around the arc lamps here. When near the lamps the halo is small and, under proper atmospheric conditions, very brightly colored; at a greater distance the halo is larger but the colors not so distinct. In either case if you can witness the upper half of this halo *as if it were on the celestial sphere*, you will have a large "luminous arch" "consisting of pencils of light radiating upward from a dark arc, . . . the pencils constantly changing in length, and having an apparent movement laterally" if the head is moved in the least while noting different portions of the arch. The "coloration of the pencils" will be also "unmistakable." See Dr. Hatch's reply to Professor Hazen in *Science* for Jan. 20, 1893.

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Continuous Rain.

A REMARKABLE phenomenon was observed in the town of Athens, Ohio, late in the fall, which has awakened wide interest, viz., continuous rain during a succession of clear, beautiful days. This was noticed extending for a considerable distance just below the crest of a hill, and lasted through the day, from soon after sunrise till about sunset. The drops of water were at no time large, but they reached their maximum size about two or three o'clock in the afternoon.

The subject attracted the attention of professors in the Ohio University, and it was soon determined that the phenomenon must be due to the precipitation of vapor which had been carried through an old railroad cut for several hundred yards. There had recently been completed and set in operation extensive brick-works, where three large ovens were continually in operation, and from which hot currents of air steadily shot upwards. In the moulding of the bricks, water is mixed with clay, and an enormous amount of hot, watery vapor was passing into the air above the ovens, supplemented by large quantities from the stacks of a large "dryer," which was kept at a high temperature. It is estimated that in all fully forty-five tons of water were at this season daily evaporated.

The plant is situated in the valley of the Hockhocking River, close to a cut made many years ago for a projected railroad, and this cut leads directly to the rise of land where the observations were made. The observer at the University Weather Station reports that the prevailing wind was at this time in a direction such as would carry the hot air, laden with moisture, through this artificial passage. The air was, in all probability, carried partly up the hill and there dissipated along the side. About this time it must have come in contact with a cold current near the crest of the hill, and precipitation followed, causing this unusual rainfall. The conclusion that the precipitation was due to these causes is strengthened by the fact that not until the manufacture of bricks at this place was begun was any such phenomenon observed, so far as is known.

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Natural Selection at Fault.

IN the issue of *Science* for Jan. 20 there appears, under the above heading, an article from the pen of J. W. Slater. The conclusions there arrived at do not necessarily follow from the facts cited. That animals of the Felidæ by tormenting and playing with their victims often lose their prey, which otherwise might have been devoured, is well known to every observer. The facts, however, that this is most frequently done by the younger animals, and generally at a time when they are not greatly in need of food, are overlooked. Besides, what seems to be the most important consideration in the case, is that by means of this play that quickness and precision of motion so essential to success in procuring food are acquired, so that doubtless the gain in the end is much greater than the temporary loss occasioned by the accidental escape of a victim now and again.

In reference to the cackling of the hen, it may be that this animal has been so long domesticated that it is impossible to draw inferences with any degree of certainty from its conduct in this respect. Every house-wife, though, who has kept hens, is well aware that their cackle is very deceptive, that it is generally not commenced till they have got a little distance from the nest, and may, very likely, in most cases, serve to attract attention to themselves and away from their nests. Several of the wild birds that nest on or near the ground, when suddenly disturbed, escape in a manner evidently intended to attract attention to themselves and away from their brood. The action of the domestic hen may generally serve a similar purpose, and yet at times fail or even produce an opposite result.

Neither does it appear that the human ear is any more a case in fault. The principle of natural selection does not necessarily require the loss of a useless member unless it is positively . jurious — a hindrance in the struggle for existance. The out ear is not that; it may even serve a purpose. Writers on acoustic tell us that it serves to some extent to condense or concentrat the sound-waves. Even if it serves no other purpose than to improve the personal appearance, its retention would still be in perfect accord with the theory of natural selection.

Besides, it cannot be shown that the human ear is not now undergoing a process of atrophy. Grant that the outer ear has been of no use to our fathers for many generations, it would not necessarily follow that children of to-day should be born earless. All evidence goes to show that changes of this character are so gradual as to escape notice. The fact mentioned by Mr. Slater, that, owing to disuse, the outer ear has lost its power of motion so far supports the theory of natural selection. That the ear is not entirely gone, as he thinks it should be, may be due to its still being of service or to lack of sufficient time since it became useless.

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Leaf Impressions in the Eocene Tertiary of Alabama.

THOSE working geologists who are interested in what Professor Lester F. Ward[1] terms "The New Botany" may be somewhat surprised to learn that in the Eocene Tertiary strata of Alabama there is a promising and unexplored field for the paleobotanist. In fact there is reason to believe that a careful study of the plant-life existing in the Mississippi embayment during the well-marked subdivisions of the Tertiary will throw some light upon the knotty problems of the interior.

While the study by Lesquereaux of the Mississippi Lignitic was of interest and affords the present main means of correlating the trans-Mississippi Tertiary with that of the Gulf Coast, the value of this work for this purpose is somewhat diminished by the doubts as to the exact age of the several horizons in which the leaf impressions occur. On the other hand, the geological section so accurately established for the Tertiary in Alabama affords a key for the critical solution of age-problems in the Gulf Region. Between beds of marine shells, whose faunal features have been determined with relation to kindred deposits on the Atlantic border, are beds of sandy clays containing well-preserved leaf impressions. These are found in the Lower Tertiary at Bells Landing on the Alabama River, where numerous dicotyledonous leaves occur in the stratum between the Bells[2] Landing and Greggs Landing marine shell beds. In the middle Tertiary of the Claiborne group both at the typical locality[3] and on Barrows Mill Creek, a tributary of Conecuh River, Covington County, are extensive occurrences of fine fossil leaves.

The State Geological Survey of Alabama has some few specimens from each of these localities but no systematic collecting has been done and no determination of species has been made.

[1] Science, Vol. XXI., No. 521, p. 43.
[2] Bull. 43 U. S. Geol. Survey, 1887, p. 47.
[3] Am. Jour. Sci., 3d Ser., Vol. 31, 1886, pp. 2 2-209.