

center of the dome of the firmament, whose vault was composed of bands and changing masses of streaming light, the quivering waves of which were surging upward toward the disk of blue at its apex. A brighter arch spanned the northern horizon, and this also was undergoing constant transformation.

It was not the light itself, marvellous as were its mass, zones, banners and steamers, that most thrilled the observers. Such a vast display of light in constant *movement* had never before been seen nor imagined by any of us. The whole heavens shuddered and staggered, shivered into a swirling chaos and reformed again and again in new and still more weird aggregates of shimmering light. Light streamed and wavered, rippled, flickered and pulsated. Now it was in broad waves reaching to the zenith, and now in vibrating bands. Here a broad cone shot up from the northern horizon until its apex pierced the very mid-heavens, and in the twinkling of an eye it was gone. There, from the shifting zones around the zenith, ripples of light passed upward to the blue apical disk. To the naturalist no more apt figure of this rippling motion could be suggested than the waves of light passing along the meridional bands of phosphorescent *Otenophora*.

Again, a delicate fringe of pencil points would appear on the upper edge of one or more of the shifting zones and then shoot upward with inconceivable rapidity in sharp vibrating pencillings of light. As mentioned before, the focus of all these movements was the zenith itself, which seemed to be undergoing an intense bombardment of waves, ripples and searchlights from all sides, although subsidiary lateral movements were also in evidence.

Marvellous as was the rapidity of movement, the rapidity of change or kaleidoscopic effect was no less astonishing. Over and over again one of the observers would try to call attention to some particularly vivid display, only to find it utterly gone before the others could turn their eyes in the direction indicated. These changes were much more rapid than in other auroras seen by the writer.

Nothing but electrical phenomena could approach their instantaneous shiftings.

At first the light was all pure white radiance, exactly that of electricity. Later certain areas took on a rose color, and still later the display more closely resembled that of ordinary auroras, being concentrated in the broad arch across the northern sky and showing more variety in colors.

So absorbed were the observers in this grand spectacle of light in motion that it was long before they noted the peculiar effect of the light upon themselves and their immediate surroundings. Then we saw that it was a perfectly diffused light, coming in practically equal intensity from all points of the sky. A more *unreal* scene could hardly be imagined. It was unlike moonlight, for there were no shadows nor shadings. On that account all objects seemed much less brilliantly illuminated than they really were. It was most like the light of early dawn; but still different, for in the dawn the light, although diffused, is all from one side. Objects were distinctly visible, but flat. Our companions' faces could be seen quite plainly, but lacked individuality. The opposite shore of the lake could be seen much more distinctly than in bright moonlight and objects inside the house were quite distinct, even if small.

How long the display lasted we do not know, although one of the party reported it as striking as ever well past midnight. Finally the chill of the night and the aching of our strained necks drove us indoors with the conviction that never again should we see such a stupendous spectacle of light in motion.

C. C. NUTTING

STATE UNIVERSITY OF IOWA

INCREASING DEPTH OF FOCUS WITH THE SWING-BACK

TO THE EDITOR OF SCIENCE: The writer admits his membership in the not inconsiderable class of field workers who are never satisfied with their photographic results. A little discovery, however, recently enabled him to improve the focus on certain classes of deep-focus pictures and he excuses the description

of a method of procedure which may be well known to photographers by the fact that it appears to be unknown to nearly all of the working geologists and zoologists with whom it has been discussed.

The utilization of the swing-back to eliminate distortion in the photographs of high buildings has long been known; the subject of this note is the application of the same method to increasing the depth of focus where both foreground and distance are desired, the swing-back being so manipulated as to increase the distance between the lens and the foreground portion of the photographic surface and to lessen the distance to the background portion of the same. The method is of course inapplicable where the objects in the foreground are high, and the element of distortion might bar it for some pictures, but useful applications of the method are many and will occur to all.

LANCASTER D. BURLING

OTTAWA, CANADA

SCIENTIFIC BOOKS

Grundlagen und Methoden der Paleogeographie. Fundamental Problems and Methods of Paleogeography. By DR. EDGAR DACQUÉ, Privatdozent an der Universität München. Gustav Fischer, Jena, 1915.

Dacqué's notable work is a comprehensive review of the literature of paleogeography and of the opinions of many geologists, representing German, Austrian, French, English, American, Swedish, Norwegian, Dutch and Italian thought, regarding the problems of the science. The list of authors cited comprises nearly five hundred names. The citations are so arranged that the views of any thinker on a specific problem are stated in appropriate context with those of others who may or may not agree with him. For the most part they are abstracts or interpretations, but Dacqué's presentation is accurate and impartial to a degree which may even seem lacking in discrimination, since speculations and respectable theories are treated with similar consideration. There is, however, a certain justification for this attitude, paleontology being in a

very speculative stage of development and its problems being open to various tentative solutions. The work having been prepared for courses of lectures given at the University of Munich in 1912-13 and 1913-14 is marked by a didactic character. The advanced student will therefore find in this comprehensive review much that may seem elementary; he will also find much that is suggestive and helpful.

The chief value of the work for American readers lies in the numerous references to foreign writers and to views which are given more serious consideration by European geologists than they commonly are among Americans. In so far as American thought has been influenced by Chamberlin's far-reaching and fundamental studies, it has abandoned some theories to which Dacqué gives credit and has advanced to concepts which he does not discuss.

The introduction and the history of the literature of paleogeography for the past thirty-five years occupy the first forty pages of the work, and are followed by a discussion of the surface and structure of the earth. The statement includes the tetrahedral theory, as well as the disruption of the moon from the earth on the site of the Pacific Ocean, and closes with a consideration of the constitution of the earth on the assumption that the spheroid consists of a core of nickel iron separated from the known lithosphere by a zone of molten, yet rigid, magma, which allows horizontal displacements of the crust to occur. There is a certain parallelism with Barrel's hypothesis of an asthenosphere or zone of weakness, but German speculation suggests the possibility of horizontal movements of the outer crust far in excess of any that have been postulated by American investigators. Thus Dacqué discusses, as being within the range of credible hypothesis, wanderings of the pole amounting to twenty-five degrees of latitude and the even greater displacements of the continental masses postulated by Wegener.

Changes in the position of the pole might occur through absolute change in the position of the earth's entire mass with reference to the axis of rotation, or through relative move-