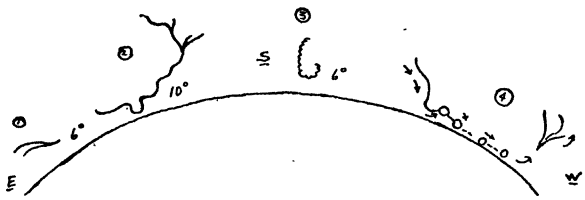
OBSERVATIONS OF LIGHTNING

I AM enclosing some rough drawings of lightning as seen by me last night at Chatham, N. J. I don't imagine these are especially significant, but it was the second time in my life that I have seen ball- or chain-lightning, and the first time I ever saw any lightning as indicated in Fig. 3. This last was very snake-like,



FIGS. 1, 2 and 3.—All cloud phenomena. Fig. 4 ball or chain. Dashes indicate progress of single ball, which apparently came to earth as (O—O) a 2-ball chain, and then was dissipated in the direction of arrow in form indicated—a kind of flame. Fig. 3 is a type I have never before seen. I made these drawings at the time, during 5 storms lasting, with intervals of an average of 5 minutes, from 6 P. M. until 3:30 A. M., July 9–10, 1930. In Fig. 2 note the U-shaped discharge. The area was as above indicated: East, South, and West. There were several zenith flashes of great intensity, the general color being white, and quite blinding.

or perhaps worm-like; I wish I could have photographed them, but drew them immediately, which was the best I could do. In this connection, one discharge, so blinding that it left everything positively black, obligingly wrote itself in black by means of vision persistency, and so I was able to put it down.

I note that Mr. Allard, in *The Scientific Monthly,* is doubtful as to the actual appearance of certain discharges, not trusting his eye. Why couldn't he have photographed the same flash that he saw, and then compared the picture with his visual impression?

My vision is super-excellent for lightning, a comparison of photographs with visual remembrance perfectly coinciding, and I am quite sure that Fig. 3 is a faithful reproduction. The U-shaped one may be common, for aught I know, but I never remember seeing anything exactly like it. These five storms were quite distinct, and not recurrent, an average interval of five minutes spacing them from about 6:00 P. M. July 9 to 3:30 A. M. July 10. The quality of the thunder referred to by Mr. Allard changed from what I may characterize as heavy paper-tearing to dull, heavy, jarring echoes which made a distinct impact on windows and doors. I had the radio turned on—a very sensitive set—and got the discharges instantly, *i.e.,* evidently at the exact time of the explosions, the actual sound not reaching me until some time after the radio sound. I estimated the average distance, with one exception, at 2½ miles, and it was easy to prove that the radio emanations were those of the actual discharge. One or two flashes were so swift that I was virtually unable to see them, although looking directly at them, seeing them only by persistence of vision, as above noted.

The one exception above mentioned came after a five-minute interval of absolute quiet (rather exceptional), and struck a tree 50 ft. distant, cutting it directly in half, laterally, which I believe is also unusual. The sound of course was no more than a whipcrack.

HAMILTON CRAIGIE

JULY 10, 1930

COCOS AND VALENCY

I WISH to call attention to two statements in the August 1 issue of SCIENCE. In reference to the generic name *Cocos,* Murray's dictionary, which devotes much space to a discussion of the source of the word, states that Spanish and Portuguese authors are unanimous in the opinion that it is derived from the Spanish noun *coco,* "grin," on account of the face-like markings at the base of the fruit.

I wish, however, specially to protest against the inference to be derived from the statement on page 101 (Professor Fajans' lecture) that the sole honor of the suggestion of the doctrine of valency is due to Kekulé. It is clear that Frankland in his paper presented to the Royal Society in 1852, detailing the discovery of the organo-metallic bodies, embodied such statements as entitle him to the honor of setting the theory of valency in notice. It is also worthy of note that Couper in 1858 first set forth (in *C. r.,* 46: 1157, 1858) the use of bonds connecting atoms in the manner of our now familiar structural formulas.

HENRY LEFFMANN

SCIENTIFIC BOOKS

Die Paläobotanischen Untersuchungsmethoden. DR. RICHARD KRÄUSEL. Jena, Verlag von Gustav Fischer, 1929.

AN important feature of post-bellum developments in Germany is the issue of a number of admirable handbooks and general works which are usually constructed with great thoroughness. A recent addition to this group of works is a small but important volume by Professor Richard Kräusel, of the University of Frankfurt am Main. In it he treats in a thoroughly satisfactory way of paleobotanical methods of investigation. A work of this sort is obviously much needed, as the literature on the subject is very

widely scattered and has been developed not only at the hands of the paleontologists proper but also by botanists. The work under consideration begins with a statement in regard to the bearing of paleobotany on a number of important theoretical and practical problems such as stratigraphy, sedimentation, the origin of coal, paleoclimatology and paleogeography. There follows an excellent account of methods of fossilization and preservation of fossil plants. In spite of its necessarily brief character this exposition is carried out in a masterly fashion. Following this is an account of the methods of collecting fossil plants. This is subdivided into older fossils and peat, each of which of course has its own particular methods of procedure.

A very important chapter is that which deals with methods of research. This is most comprehensive and covers bleaching, photography, the use of fluorescence and Roentgen rays. The investigation of peat and more recent material comparable with it also figures in the account. Naturally a very important part of this chapter deals with anatomical and microscopical investigation, and that must rank as one of the most important parts of the book since it treats in a thoroughly satisfactory way all the technical methods which have been developed in connection with the investigation of fossil plants, particularly those which are of more recent origin. Under this heading naturally come the preparation of thin sections, the preparation of polished surfaces, the use of etching methods and the preparation of relief surfaces. Under the heading of maceration the methods of Walton and Ashby, to some extent founded on those developed by Nathorst in earlier years, are described. Under the heading of preparation of thin sections the various new developments which have added greatly to our knowledge of fossil plants are satisfactorily described. This chapter ends with microchemical methods which are a comparative novelty in paleobotany but destined to have an important future.

The fifth chapter is especially devoted to coal and its constituents. It is of interest to note in this connection the author's open-mindedness which becomes apparent in his remarks in regard to Tertiary brown coal. He pointedly asserts that it is no longer possible to regard the brown coal deposits of the northern hemisphere as derived from formations comparable with the Dismal Swamp of America. This point of view is refreshing in relation to the extremely reactionary attitude of the mass of American geologists in regard to recent investigations on coal. One wonders if the United States will have the undesirable preeminence of being the last country to adhere to the *in situ* hypothesis of the origin of coal, just as it was the last country to adhere to the seed-bearing character of arboreal cryptogams such as the Lepidodendrids and Calamites. It has been wittily remarked that Oxford is the place where good German theories go when they die. As far as paleobotany is concerned, the United States appears at the present time to rival that ancient institution of learning.

The volume under review contains, in view of its size, a large number of illustrations which visualize not only the apparatus used in various paleobotanical investigations, but also results which have been obtained by the apparatus and methods described in the volume. The author is to be congratulated on producing a much needed and extremely valuable work which will be indispensable to all geologists and paleontologists who are in any way interested in fossil plants.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN INDIVIDUAL JACOBSEN GERMINATOR

THE Jacobsen apparatus for testing seeds has certain advantages over other methods which have led to its adoption, especially in Europe, in seed control stations. For forest seeds in particular it has proved the most satisfactory method. Its advantages may be summed up in the statement that it permits better control, and thereby standardization, of the physical conditions for germination, especially moisture and oxygen supply.

The apparatus as generally used consists of a large pan, ordinarily of zinc or galvanized iron, kept filled to a certain level with water. A constant level can be maintained conveniently by means of a Mariotte flask arrangement. Wicks attached to small cotton pads are supported on glass strips or on a perforated cover, and dip into the water. In some modifications, *e.g.,* Toumey's, other arrangements of wicking are used to furnish the water supply. The sample of seed is placed on a filter paper or special blotter in contact with the wick and covered by a small glass bell jar having a small aperture in the top. The distance between the seed and the water level determines the rate at which water can be supplied to the seed. Temperature is usually regulated by heating or cooling the water in the pan.