The section consists of alternating slate and gray sandstone layers, of a few feet thickness. The slate usually has numerous fossil plant impressions in it, but the sandstone here is barren of recognizable organic remains.

The specimens of the genus *Leaia* Jones, are in general well preserved and show the surface markings distinctly (see Fig. 1).

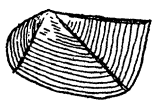

FIG. 1. X 2.

FIG. 2. X 2.

They correspond closely with the description and figures of *Leaia tricarinata* Meek and Worthen,[5] of the Illinois and Indiana Coal Measures. The size of an average specimen from Rhode Island is: length, 8.5 mm.; height, 5 mm. The presence of a well-marked third carina along the dorsal margin and the twelve to sixteen slender concentric ridges, as well as the agreement in size, make it seem safe to call the Rhode Island specimens *Leaia tricarinata.*

Several specimens of the genus *Estheria* Ruppel occur in the same layer with *Leaia* (see Fig. 2). They vary slightly in size and proportions, but all show the generic characters well. The surface markings are not as distinct as in the specimens of *L. tricarinata,* but most of the *Estheria* specimens show from nine to thirteen faint concentric striæ. The size of an average specimen from Rhode Island is: length, 7 mm.; height, 5 mm. The specimens are not sufficiently well preserved to permit of a specific determination.

In the Conemaugh Series of the Carboniferous of Pennsylvania, Dr. P. E. Raymond[6] has noted the presence of *Estheria* and *Leaia tricarinata,* with plant remains, in a red and gray shale layer occurring just below the Ames limestone, which is midway in the Conemaugh Series. Fossils of the two genera occur in several horizons of the Coal Measures. In Illinois *L. tricarinata* ranges from the lower part of the Lower True Coal Measures, to high up in the Upper Coal Measures, therefore neither genus is a good horizon marker. If we regard the *Estheria, L. tricarinata* horizon of the Conemaugh Series as of the same age as that at Central Falls, R. I., we should then be calling this horizon of the Narragansett Basin Series the equivalent of the middle of the Lower Barren Measures of Middle Pennsylvanian age.

WINTHROP P. HAYNES
CAMBRIDGE, MASS.,
October, 1912

[5] *Geol. Surv. Ill.,* Vol. 3, pp. 541–543.

[6] *Ann. Carnegie Mus.,* Vol. V., No. 2 and 3, 1909, p. 173.

THE ELECTROMOTIVE FORCE PRODUCED BY THE ACCELERATION OF CONDUCTORS

THE possibility that electromotive forces may be produced by the mechanical acceleration of electric conductors was first thoroughly considered by Maxwell,[1] and the actual presence of such electromotive forces in *electrolytic* conductors was shown by Colley[2] in 1882.

The desirability of obtaining similar electromotive forces in accelerated *metallic* conductors has long been recognized by the writer. At a meeting of the Harvard and Massachusetts Institute of Technology Physical Chemical Society, held at the Harvard Union in the spring of 1906, he stated that a potential difference was to be expected between the front and rear ends of a metallic conductor which is suddenly stopped, since there will be a tendency for the electrons to continue in motion. Since that time he has often spoken to his colleagues, both privately and at informal scientific meetings, of the desirability of making measurements of this kind in order to obtain information as to the mass of the carrier in metals, and in particular has described as a possible form of apparatus a coil of wire oscillating about its own axis with some form of commutator to permit the detection with an ordinary galvanometer of the alternating current which would be generated.

During the past year at the University of Cincinnati, with the help of his assistant, Mr. Earl W. Osgerby, the writer has carried out

[1] Maxwell, "Treatise on Electricity and Magnetism," 3d edition (1892), Vol. II., 211 et seq.

[2] Colley, *Wied. Ann.,* 17, p. 55, 1882.

an elaborate series of measurements on the electromotive forces produced by the acceleration of electrolytes, varying the nature of the solutions used, the magnitude of the acceleration, and the distance between the front and rear electrodes, and is now preparing for publication a description of the work. The experiments were performed, however, primarily as a preliminary to similar work with metals in order to test the quantitative theory as to the magnitude of the effect which would be much larger in electrolytes than in metals, and in order to determine the most suitable form of apparatus for the work. Mr. Osgerby and the writer did, however, carry out some experiments with metallic conductors, but at the time were unable to detect any effect, as further modification of the apparatus is necessary before it will be sensitive enough for metals.

In a recent number of SCIENCE (November 1, 1912) the writer was surprised to observe that Professor Daniel E. Comstock, of the Massachusetts Institute of Technology, has not only apparently attempted to reserve this field of experimental investigation, but to put forward as a new discovery the probability that such electromotive forces would be produced by the acceleration of metallic conductors. The possibility of such electromotive forces has certainly been recognized since the time of Maxwell. In *electrolytic* conductors their actual presence has been shown by the experiments of Colley, and the similar electromotive forces which arise from the action of centrifugal force on electrolytic conductors were demonstrated by Des Coudres[3] and have been thoroughly investigated by the present writer.[4] In another, to obtain effects dependent on the *metallic conductors* Maxwell,[5] Lodge,[6] and Nichols[7] have all attempted, by one method or another, to obtain effects dependent on the "mechanical momentum" accompanying the passage of electricity, but have failed, owing to the lack of sensitiveness of their apparatus. That the conception of "free electrons" necessarily includes the production of an electromotive force in accelerated metals is certainly the common knowledge of physicists who are familiar with the work of the above investigators.

The writer has no desire to reserve a field which is the property of all physicists, but at the present time wishes to report that his experiments are sufficient to show, as would be expected, that the electromotive force produced in accelerated metals is certainly much smaller than that produced in accelerated electrolytes, and to state that the apparatus is now being improved with the hope of detecting the effect in metals.

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November 9, 1912

[3] Des Coudres, *Wied. Ann.*, 49, p. 284, 1893; *ibid.*, 57, p. 232, 1896.

[4] Tolman, *Proc. Amer. Acad.*, 46, p. 109, 1910; *J. Amer. Chem. Soc.*, 33, p. 121, 1911.

[5] Maxwell, *loc. cit.*

[6] Lodge, "Modern Views of Electricity," 3d edition (1907), p. 89.

[7] Nichols, *Physik. Z.*, 7, p. 640, 1906.

THE AMERICAN SOCIETY FOR PHARMACOLOGY AND EXPERIMENTAL THERAPEUTICS

THE fourth annual meeting of the society was held in Cleveland on December 30 and 31. There were two executive and three scientific sessions.

The most important outcome of the Cleveland meeting, as far as the Pharmacological, Physiological and Biochemical Societies are concerned, was the formation of a federation designed to knit these societies more closely together, while yet jealously preserving the individuality of each component. The meeting of delegates with full power to act from each of the three societies, took place during the last informal dinner and smoker at the Colonial Hotel on December 31. The delegates from the Physiological Society were Drs. Meltzer, Lee and Cannon; from the Biochemical Society, Drs. Lusk and Wells; from the Pharmacological Society, Drs. Sollmann, Loevenhart and Auer.

Dr. Meltzer was elected temporary chairman and Dr. Cannon temporary secretary. The outcome of the proceedings of this conference committee will be best shown by a transcript of its minutes:

"The following motions were voted unanimously:

"That a federation of the three societies be hereby established.