

are pierced with holes which represent the stems of upright plants, thickets of which were buried by the descending showers or rapidly accumulating sediment of volcanic ash. Here the source of the materials is to be sought in the line of great volcanic vents which crown the summit of the Cascade Mountains, and from which, at intervals, were emitted either floods of lava, poured down on to the plain along the eastern border of the range, or showers of ashes which, borne inland by the prevailing westerly winds, fell on forest, savannah and lake, temporarily destroying animal and vegetable life and forming, when falling or washed into water basins, strata which alternate with fossil beds, the accumulations of quieter times. In other places these tufaceous deposits were washed from all the highlands into the valleys, forming local masses of considerable thickness without the intercalated beds mentioned above.

The accompanying section, copied from my report on the Geology of Northern California and Oregon (Pacific R. R. Report, Vol VI, Geology, p. 47), will illustrate the deposition of these tufaceous rocks in the lake basins where they are interspersed with the fossiliferous beds.

THE SCIENTIFIC SOCIETIES OF WASHINGTON, D. C.

THE PHILOSOPHICAL SOCIETY.—During the month of November three very important papers were read: on the Anomalies of Sound Signals, by President James C. Welling; on the Storage of Electric Energy, by Mr. J. C. Koyl; and on Barometric Hypsometry, by Mr. G. K. Gilbert.

The first named paper was a comprehensive review of the vexed discussion concerning the anomalies observed in the transmission of sound, and the summation of the result in a series of twelve aphorisms. The second paper was by a fellow of Johns Hopkins College, with reference to a series of experiments lately made by him in company with some Washington gentlemen upon an invention for the storage of electricity. Mr. Gilbert's communication had reference to a scheme of measuring altitudes by means of two barometric stations in the same vicinity, the one quite elevated, the other as low as convenient. By this means the influence of the thousand and one local causes affecting the barometer would be more thoroughly brought under the knowledge of the observer.

THE BIOLOGICAL SOCIETY.—The following communications have been made during the past month: on the Philosophy of the Retardation of Development Among the Lower Animals, by Prof. C. V. Riley; Antiquity of Certain Types of North American Non-Marine Mollusca, and the Extinction of Others, by Dr. C. A. White; Recent Explorations of the U. S. Fish Commission, by Mr. Richard Rathbun.

Professor Riley drew the attention of the society to a number of instances where the development of insects had been retarded in the embryo stage for a very long time. This did not refer to the well known retardations of whole broods, but to wholly exceptional cases. The speaker attributed the phenomena to evolutionary causes, and showed how a species might be saved from the wholesale destruction of a very severe winter or other disaster by this means.

Professor White's paper had reference to the survival from very high antiquity of many of the fresh water and brackish water forms, and to the total disappearance of others, for which events no adequate causes can be assigned.

Mr. Rathbun's communication was a review of the work of the Fish Commission from its foundation, illustrated by a map locating every dredging station; by a papier maché model of the Atlantic bottom as far out as the deep soundings, from the mouth of the St. Lawrence southward, and by specimens of the apparatus employed

as well as the fauna discovered. The address was necessarily very comprehensive, but exceedingly interesting. At the same time the attention of the society was called to a pamphlet by Prof. G. Brown Goode, entitled "The First Decade of the United States Fish Commission, its Plan of Work and Accomplished Results, Scientific and Economical, Salem, Mass.: Salem Press, 1881."

THE ANTHROPOLOGICAL SOCIETY.—Three papers were also read before this society in November, to wit: How Shall the Deaf be Educated? by President E. M. Gallaudet; a Navajo Myth, by Mr. R. L. Packard; the Regulative System of the Zunis, by Prof. J. Howard Gore. The education of the deaf must be preceded by a proper classification of the heterogeneous group commonly called deaf mutes. The question of the relative superiority of the sign language and of visible speech was discussed with great minuteness. The author also treated the problem of heredity, of relative intelligence, and of the power of abstraction, with great ability.

Mr. Packard's myth was one taken by him last summer from one of the Navajo tribe and related to the origin of the Navajos.

Mr. Gore has spent some years upon the evolution of deliberative assemblies and the conduct of such bodies. Last summer, being in charge of a surveying party in New Mexico for the government, he availed himself of his opportunities to become familiar with the customs of the Pueblo Indians in such matters. These papers will be published in the proceedings of the Society.

DIAGRAMMATIC REPRESENTATION OF STEREOSCOPIC PHENOMENA.

(Continued from p. 548, Nov. 19th, 1881, in *Transactions of N. Y. Academy of Sciences*).

In a previous article⁽⁸⁾ it has been shown that no reliance can be placed upon the theory of apparent distance in the stereoscope, elaborated by Wheatstone and Brewster, and applied in the diagrammatic explanation of stereoscopic phenomena in all our text books on Physics. We may well ask, therefore, to what extent it is possible, by any diagram, to represent the position of objects as they should appear in the stereoscopic field of view. So far as this is determined by the relation between the visual lines we may secure an approximation only by the following method, in which it must be assumed that we know also the relation between the camera axes at the time the photograph was taken. Since the visual lines may be practically regarded as special secondary axes to the crystalline lenses, it will be found convenient to call them visual axes, and their possible relations, axial convergence, parallelism, and divergence. It may be well also to restate two principles that have been sufficiently demonstrated elsewhere.

I. A point farther or nearer than the point of sight is necessarily seen double⁽⁹⁾ and with imperfect focalization. If farther, the internal rectus muscles of the eyeballs must be slightly relaxed to make it the point of sight; if nearer, they must be contracted. Such relaxation is habitually associated with remoteness, such contraction with nearness, of the point fixed.

II. If an external point is imaged upon corresponding retinal points, the subjective effect is that of union of the two eyes into a central binocular eye, the nodal point of which is the point of origin in all estimates of direction and distance.⁽¹⁰⁾

A brief preliminary proof of a geometrical principle to be applied is also necessary. Let C and C', fig. 1, be two fixed points, and E midpoint between them on a horizontal plane. Let this plane be cut by four vertical planes, parallel to each other, their traces being marked I, II, III, and IV. Let B and Q be any points of plane I, from which straight lines are drawn to E, piercing plane II at A and P respectively. Through C and C' let pro-