The extensive plantings made by the Southern Pacific Railroad in the San Joaquin Valley region over twenty years ago and the lessons indicated thereby are not mentioned. General Stratton's forty-five acres in *E. globulus* and *E. viminalis* planted in 1869 in Alameda County, probably the first artificial forest west of the Rocky Mountains, seems to have escaped notice. The late B. B. Redding, for many years land agent of the Central Pacific Railroad, and Professor E. W. Hilgard, of the University of California, and others have written and preached much on the general text.

A useful addition to Professor McClatchie's memoir and one in harmony with its general scope would be a climatic map similar to that published some years ago by the Southern Pacific Railroad Co. In this the thermal zones of the state are exhibited; these zones are governed by topographic features and can not be understood by reference to latitude. One word more as to the propagation of the eucalypts from seed. Judging by my own experience from imported seed, *E. amygdalina* and *E. robusta* germinated as readily as radish or turnip seed, when sown in a cold frame.

Rob't E. C. Stearns.

Los Angeles,
February 21, 1903.

SCIENTIFIC JOURNALS AND ARTICLES.

The April number of the *Botanical Gazette* contains two cytological papers. The first is the beginning of an article on 'Oogenesis in *Saprolegnia*,' by Professor Bradley M. Davis, in which he presents newly observed facts regarding the formation of the egg and the behavior of the cœnocentrum. The concluding part of the paper will be devoted to theoretical considerations. The second is by Professor David M. Mottier, on the 'Behavior of the Chromosomes in the Spore Mother-cells of Higher Plants and the Homology of the Pollen and the Embryo-sac Mother-cells.' He describes mitoses in the microspore and megaspore mother-cell of typical angiosperms, and homologizes these processes. The occurrence of a single megaspore is regarded as a derived condition, four being the primitive number. In continuing his notes on North-American grasses, Mr. A. S. Hitchcock describes as a new species *Willkommia texana*. In view of the fact that the concluding paper in Professor F. O. Bower's important series on the 'Morphology of Spore-producing Members' is not likely to be published in full for some months, the editors have published in advance an abstract of the memoir, which contains a general discussion of the results reached in the four previous papers of the series, and of their bearing on a theory of sterilization in the sporophyte. MacDougal's memoir on the 'Influence of Light and Darkness upon Growth and Development of Plants' and Graebner's volume on the 'Heaths of Northern Germany,' are reviewed, together with other current literature. Among 'Notes for Students' Mr. J. Arthur Harris contributes a review of recent teratological literature.

The May number of the *Biological Bulletin* of the Marine Biological Laboratory contains the following articles:

Helen Dean King: 'The Formation of the Notochord in the Amphibia.'

Leo Loeb: 'On the Coagulation of the Blood of some Arthropods and on the Influence of Pressure and Traction on the Protoplasm of the Blood Cells of Arthropods.'

S. J. Holmes: 'Phototaxis in Volvox.'

SOCIETIES AND ACADEMIES.

THE SAN FRANCISCO SECTION OF THE AMERICAN MATHEMATICAL SOCIETY.

The third regular meeting of the San Francisco section of the American Mathematical Society was held at Stanford University on April 25, 1903. Fifteen members of the society were present. Professor Haskell was elected to succeed Professor Wilczynski on the program committee. The following papers were read during the two sessions of the section:

Professor E. J. Wilczynski: 'Invariants of systems of linear partial differential equations, and the theory of congruences.'

Dr. D. N. Lehmer: 'Preliminary report on a table of smallest divisors.'

PROFESSOR H. F. BLICHFELDT: 'Note on linear substitution groups of finite order.'

PROFESSOR R. E. ALLARDICE: 'On some curves connected with a system of similar conics through three points.'

DR. SAUL EPSTEEN: 'Necessary and sufficient condition for the existence of invariant subgroups.'

PROFESSOR G. A. MILLER: 'On reciprocal groups.'

DR. H. C. MORENO and PROFESSOR G. A. MILLER: 'On the non-abelian groups in which every subgroup is abelian.'

MR. W. A. MANNING: 'On the class of primitive substitution groups.'

MISS IDA M. SCHOTTENFELS: 'Generational definition of an abstract group simply isomorphic with the simple substitution group $G_{20160}{}^{21}$.'

DR. T. M. PUTNAM: 'Certain subgroups of the quaternary linear fractional group of determinant unity, in the general Galois field.'

The paper by Dr. Epsteen was presented by Professor Wilczynski. The secretary read the paper by Miss Schottenfels. The other papers were presented by their authors. The next meeting of the section will be held in December at the University of California.

G. A. MILLER,
Secretary.

NEW YORK ACADEMY OF SCIENCES.

SECTION OF ASTRONOMY, PHYSICS AND CHEMISTRY.

AT the meeting of the section on May 4, Professor Ernest R. von Nardroff read a paper on 'A New Interferometer Method for Measuring the Refractive Index of a Transparent Plate.'

This method was planned to avoid the use of compensation, which leads to grave errors unless in the compensating material the ratio of the velocities for any two wave-lengths is the same as in the substance being measured. It is frequently impracticable to fulfil this condition, as for example by using as a compensator a second plate of the same material. Air compensation is of course out of the question.

In the present method, in which no use is made of white light fringes, the transparent plate, a microscope cover-glass for instance, is mounted on a special stage perpendicular to the path of one of the beams in a Michelson interferometer. With sodium light, bands are seen that are generally distorted through lack of perfect parallelism between the surfaces of the plate. The stage is now rotated forward about a vertical axis through an angle of 45° up to a fixed stop, thus increasing the path through plate. Slowly turning the stage backward, the bands passing a fixed point in the field are carefully counted until the plate returns to the perpendicular position, when the motion of the bands reverses. A new count is now made while the stage is turned past the perpendicular, backward 45° to a second fixed stop. Generally these counts differ by a few tenths of a band, owing to imperfect mounting of the stage as a whole on the interferometer, but they may be averaged without sensible error. Since the light passes through the plate twice, one half the number of bands counted should be taken to represent the increase of optical path, N. The thickness, t, of the plate at the part of it observed in the interferometer may be measured by means of a micrometer caliper or a spherometer. The following exact formula, much simplified through the use of precisely 45° of rotation, gives the value of the refractive index, μ.

$$\mu = \frac{\frac{1}{2} + \left(1 - \sqrt{\frac{1}{2}} - \frac{N\lambda}{t}\right)^2}{2\left(1 - \sqrt{\frac{1}{2}} - \frac{N\lambda}{t}\right)}$$

For sodium light where the wave-length, λ, is 0.0005893 mm.

$$\mu_{Na} = \frac{0.5 + \left(0.2929 - \frac{0.0005893\,N}{t}\right)^2}{2\left(0.2929 - \frac{0.0005893\,N}{t}\right)}.$$

This method has been extended to the measurement of doubly refracting plates, such as mica. The plate must contain in its plane at least one of the axes of the so-called ellipsoid of elasticity, and must be mounted with this axis vertical. The bands may be observed through a Nicol prism having its shorter diagonal vertical.

A second paper was presented by Dr. G. B. Warring, on 'Some Peculiarities of the

Gyroscope,' in course if which were given some interesting experimental details observed from experiments carried out by Dr. Warring. These experiments are to be performed before the academy, at a future meeting. S. A. Mitchell.

COLUMBIA UNIVERSITY GEOLOGICAL JOURNAL CLUB.

April 24.—In reference to some original work Dr. Julien reviewed a paper by August Rosiwal, 'Ueber geometrische Gesteinsanalysen,' from the Verhandlungen der Kaiserlich-Königlichen Geolog. Reichsanstalt for 1898.

May 1.—Mr. H. C. Magnus reviewed Bulletin 56 of the New York State Museum. The Bulletin gives many interesting data concerning the 1901 state geologic map. It also gives an excellent review of the geologic surveys of the state, with a table at the end correlating the terms used by the different surveys. Professor Kemp reviewed from the *American Journal of Science,* April, 1903, 'The Mechanics of Igneous Intrusions,' by R. A. Daly.

May 8.—Dr. A. F. Rogers reviewed 'A Three-circle Goniometer,' by G. F. Herbert Smith; Mineralogical Society of London, vol. 12, 1900. Miss Florence Henry reviewed 'The Animal Ecology of the Cold Spring Sand Spit,' by C. B. Davenport. Dr. Geo. I. Finlay reviewed Bulletin 182, U. S. G. S. This bulletin, by F. L. Ransome, treats of the 'Economic Geology of Silverton Quadrangle, Colorado.' Professor Kemp called attention to the 'Geology of the Celebes,' by Professor Bücking, and to Bulletin 213, U. S. G. S., on the economic geology for 1902. This contains the abstracts of some papers not yet issued by the survey. H. W. Shimer.

ANTHROPOLOGICAL SOCIETY OF WASHINGTON.

The 345th regular meeting was held April 14. Professor Friedrich Hirth, of Columbia University, occupied the evening, reading a paper entitled, 'The Early Development of Chinese Civilization.' Professor Hirth exhibited examples of early Chinese art and explained the symbolism and the hieroglyphic characters that are found on ancient works of art and their relation to modern characters. The inception of Chinese culture Professor Hirth places at the second millennium B. C., noting the unreliability of Chinese written accounts as to the early times. About 120 B. C., Bactrian Greek art influence found its way into China, of which examples were shown consisting of designs on the backs of metal mirrors and of rock carvings. The developments of architecture, writing and printing were traced. Professor Hirth affirms that in art Japan stands entirely on the shoulders of China. The paper was discussed by Messrs. Flint, Spofford and McGee. A vote of thanks of the society was tendered Professor Hirth for his instructive paper.

Walter Hough,
Secretary.

DISCUSSION AND CORRESPONDENCE.

A TROPICAL MARINE LABORATORY FOR RESEARCH.

To the Editor of Science: The subject which Dr. A. G. Mayer has so ably introduced for discussion under the above title is of such importance as to call for careful consideration from biologists. It is also beset with difficulties of a peculiar character, the recognition of which will largely determine its success or otherwise. Of the desirability for such a permanent laboratory and of the great results to biology which would accrue from its establishment there can scarcely be any divergence of opinion. Granted the means for its support the primary discussion will center around the best means for attracting the greatest number of able workers, involved in which is the important question of the most suitable site.

The suggestion for the establishment of a biological laboratory in the tropical Atlantic is by no means new. Ten or more years ago the subject received the public support and encouragement of the late Professor Huxley and Professor Ray Lankester, and was discussed in the English *Times* and various scientific journals, while the Institute of Jamaica has at times made recommendations of a like character.

Three or four years ago a committee of American botanists, composed of Professors D. H. Campbell and D. F. MacDougal, visited