able to observe certain of the resting cells formed by the conjugation of two microzoospores.

In his studies upon *Botrydium granulatum* he determined by pure cultures that what has been regarded as a remarkable pleomorphic species really represents two distinct species. His attention was first called to this confusion by the difference in the cell structure of the various forms. In one the chlorophyll bodies are in the form of distinct discs, while in the other the chlorophyll is a single connected plate. In one the cells form a fatty oil but no starch, while the other possesses amylon grains and starch bodies, their structure being like that of the cell of Hydrodictyon. One of these plants is a true *Botrydium*, while the other is the *Protococcus botryoides*, described by Kuetzing in 1845, and in 1855 Cienkowski correctly described its development. Since the genus *Protococcus* is untenable, Klebs proposes the name of *Protosiphon botryoides* for this plant.

He takes occasion to deplore the tendency of some algologists to repeat in the case of the algæ the pleomorphic craze which once brought such confusion to bacteriology and mycology, citing especially Hansgirg, in 1855, and the more recent work of Borzi and Chodat, who claim to have connected a large number of genera in the form cycle of one species. He points out that these investigators did not use pure cultures and were thus led to include in the form cycle different genera appearing in the culture. It has been held by some that if filamentous algæ possess protococcoid forms in one stage of development, then all protococcoid forms are states of filamentous algæ. It is impossible to distinguish the swarming gametes of Chlamydomonas and Ulothrix, still it does not follow that Chlamydomonas belongs to Ulothrix. He insists that in studies of development pure cultures should be used, though pure cultures in the sense in which they are made in bacteria and the fungi cannot be made. Pure cultures and continuity of observation, especially in connecting different stages, should be substituted for mixed cultures and discontinuous observations.

Space will not permit a discussion of his experiments upon other genera of *algæ* and the *fungi*, but the following outline of his experiments upon *Vaucheria* will give an idea of the thorough and comprehensive manner in which his work was conducted.

I. The asexual reproduction through zoospores of *Vaucheria repens* and *clavata*.
   1. Influence of nourishment.
   2. Influence of dampness.
   3. Influence of light; of darkness; of weak light; of the rays of the spectrum; of light intensity; of carbon assimilation.
   4. Influence of temperature; low temperature; high temperature; mean temperature and variations of temperature.
   5. Influence of the chemical peculiarities of the medium.
      A. Inorganic compounds; effect of nutrient salts; change from nutrient salts to water.
      B. Organic compounds; cane sugar; camphor.
      C. Osmotic value of the compounds.
      D. Influence of acid or alkaline reaction.
      E. Influence of oxygen; influence of air pressure; of rarified air.
      F. Influence of flowing water; of friction; of temperature; of oxygen and nutrient salts.

II. The asexual increase in the case of other species of *Vaucheria: Vaucheria ornithocephala;* aplanospores of *V. geminata;* conditions of their formation; aplanospores of *V. racemosa, uncinata.*

III. The sexual reproduction of *Vaucheria.*
   1. Influence of light.
      A. Effect of light as a means of nourishment.
      B. Influence of light intensity.
      C. Significance of colored light.
   2. Influence of dampness.
   3. Influence of temperature.
   4. Influence of chemical peculiarities of the medium.
   5. Influence of oxygen.
   6. Influence of flowing water.
   7. Upon the relation of the male and female sex.

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Codice Messicano Vaticano, No. 3773. EDIZIONE DEL DUCA DE LOUBAT. Roma. 1896.

In the native literature of America that which was the product of aboriginal authors, the pictographic manuscripts, or 'codices,' as they are called, of Mexico and Central America, hold the first rank. Quite a number of them, though generally in an imperfect condition, have been preserved which date from before the

conquest of the country by Europeans. Most of these are the work of tribes speaking either the Nahuatl (Aztec) or the Maya languages; but others are from the Zapotec or Mixtec regions, these representing different linguistic stocks.

The accurate reproduction, by modern methods, of these remarkable monuments of a perished civilization is one of the most valuable services which can be rendered to the study of American archæology; and in presenting in all respects a fac-simile of one of the most perfect, the Codex Vaticanus No. 3773, the Duke de Loubat has added another and a most important item to his many claims on the gratitude of those interested in the ancient history of America. His edition leaves nothing to be desired in point of faithfulness to the original; and that it is in fact a gift to science, being chiefly distributed to public libraries, excites just admiration for the liberality as well as the appreciative scholarship of the donor.

The Codex in this edition is accompanied by two articles from the pen of the well-known archæologist, Father Francisco del Paso y Troncoso, one on the proper sequence of the pages of the manuscript, the other on its probable age and origin. The former is indispensable to its comprehension.

This Codex was included by Lord Kingsborough in his great work published in 1831; but not only was the copy prepared by his artist defective in various particulars, but its pages were erroneously arranged, so that the study of it became hopelessly confusing.

From what is know of the classes of native writings, this Codex is recognized as of Nahuatl origin and is concerned with the ritual year of 260 days, doubtless either in its divinatory applications, or as regulating the fasts, festivals and other religious ceremonies of the temples. The opening pages give the *tonalamatl*, or list of days, and on the last is the picture of a masked figure indicating the astrological relationship of the various parts of the body.

As we have in the 'Borgian Codex' a document from the same locality, and also ritual in its character, there are facilities for the explanation of this Vatican Codex not to be found in other instances.

So far as its history is concerned it rests in obscurity. It was certainly in the Vatican library as early as 1596, and may have reached there about 1550. But, of course, no question can be raised concerning its authenticity, and its composition previous to any European influence in Mexico. We thus have, by the generous action of M. de Loubat, placed within the reach of students probably the best conserved example of that once rich native literature in which were stored the history, religion and science of aboriginal American civilization.

D. G. Brinton.

SCIENTIFIC JOURNALS.

AMERICAN CHEMICAL JOURNAL, FEBRUARY.

A Contribution to the Study of Water Solutions of Some of the Alums: By H. C. Jones and E. Mackay. Various methods have been used in investigations of the conditions existing in a solution from which double salts will crystallize out. The question to be decided was whether the double salt was present as such in solution, or was formed at the moment of crystallization. The methods used may be grouped under the following heads, as they have to do with (*a*) the diffusion, (*b*) the thermal changes, (*c*) the volume changes, (*d*) the solubility, (*e*) the electrical properties, or (*f*) the cryoscopic behavior of solutions of the compounds under investigation. After reviewing these methods the authors state that the aim of the present work was to obtain, from a study of the conductivity of solutions of alums, data which would justify more definite conclusions than had yet been drawn. They have compared the electrical conductivity and cryoscopic behavior of the double salts with that of their constituent salts to see if they corresponded to mixtures. The methods of work, analyses and preparation of various alums are given. The results obtained by the conductivity method show that in dilute solutions the complex alum molecules are broken down completely into the molecules of the simpler sulphates, which dissociate as if alone, while in more concentrated solutions the alums are either partially undecomposed or the dissociation is not complete. Potassium chrome alum apparently exists as such in moderately concentrated