

stitute of Philadelphia. The chapter on "The Age of the Sun's Heat" is reprinted from *Macmillan's Magazine*, and consists of three parts, treating respectively of the secular cooling of the sun, the sun's present temperature, and the origin and total amount of the sun's heat.

The Psychic Life of Micro-organisms: a Study in Experimental Psychology. By ALFRED BINET. Tr. by Thomas McCormack. Chicago, The Open Court Publ. Co. 12°. 75 cents.

IT may, perhaps, not be rash to venture the statement that in no field of study has the introduction of the comparative method been so helpful as in the study of mental phenomena; of the coordinations between the organism and the environment. It is this that has widened the horizon of the psychologist from the observation of his own individual, adult, civilized consciousness, to the observation of other men and of other races in different stages of civilization, of other ancestries, of other no less interesting though more lowly forms of life, of the embryonic, immature stages of development. It is to the apparently most insignificant group of such phenomena that M. Binet devotes his monograph,—to the psychic life of the lowliest denizens of the earth, forms so simple that even the distinction between animal and vegetable becomes doubtful when their classification is attempted. Many a reader would perhaps be likely to think that an account of the psychic life of micro-organisms might be as brief as that celebrated essay on the snakes of Greenland, which was all contained in the sentence, "There are no snakes in Greenland." M. Binet shows most conclusively, however, that there is psychic life in these unicellular specks of protoplasm; that they exhibit relations to their environment similar in kind, though vastly inferior in degree, to those to which we unhesitatingly attribute an intellectual origin, when we observe them in ourselves or any of the higher animals.

M. Binet classifies these evidences of embryological mental activity into (1) those connected with motion and sensation, (2) those connected with nutrition, (3) those connected with reproduction, and (4) those connected with "social relations." Under the first head we observe that the *Didinium nasutum* (a type of the ciliated infusoria) has the power of reversing its motion, of arresting it, and that for this purpose it makes use of a perfect miniature steering apparatus. We note, too, that the most rudimentary sensation is that of contact, many of these microscopic animals having no other; that after this, sight develops, it being not improbable that certain vegetable forms possess the analogue of an eye. The *Didinium* has vision enough to hurl a shower of darts at its prey, thus paralyzing it, and making it an easy victim; while the *Euglenæ* are sufficiently sensible to color to constantly congregate between the lines F and G of the solar spectrum. The maintenance of life is always the result of a re-action to the environment, and in this "life of relation" a psychic element must enter. In the motions necessary to seize the prey, in the power of selection that enables the organism to seize certain particles and reject others, we have a rudimentary form of choice. In the recognition of the position of the desired food, M. Binet does not hesitate to detect an elementary space-perception. The excitement preceding the times for copulation shown by unicellular organisms suggests an analogue to the emotions. Under the fourth head belongs the formation of a group of cells into a colony, in which the individuals act harmoniously, and each contributes to the general welfare.

These are only a few of the very suggestive observations and comments that M. Binet brings together; and if from the rest of the work a single example of the possibilities this study reveals must be selected, it should be the experiments of Professor Pfeffer on the spermatozooids of ferns. This observer finds that when a solution of malic acid is held in a tube, and a similar solution of one-thirtieth the strength be placed in a watch-crystal in which are the spermatozooids, the latter will leave the watch-crystal for the tube; and not only this, but when the solution in the tube is only twenty times as strong, these organisms remain unaffected. It seems to be the ratio of the intensities of the two solutions that brings about the result, and in this Professor Pfeffer sees an undoubted analogy to the psychophysics law illustrated in the power to distinguish between sensations as tested by Weber, Fechner, and

others. If this law can be thus corroborated, it is a wonderful law indeed.

The general position of M. Binet is thus somewhat in opposition to current views. He combats the view that in the unicellular organisms we have a simple and blind mechanical reflex action between irritable substances and an irritating environment, but holds that rudimentary forms of various psychic functions take their origin here. He pronounces Mr. Romanes' attempt to fix the grade at which the several constituents of psychic function enter into play as artificial and arbitrary, and believes that a more complete study of these lowliest forms of life will establish a more rigid and scientific criterion of mind, and show the substantial unity and primordially of the psychic element. It is certainly a long step from the days when man was defined as a rational animal, denying by inference, to the rest of creation, a share in this possession, to the days when what we can see only with the aid of the most improved results of science is pronounced akin to the most human part of man.

AMONG THE PUBLISHERS.

THE *Atlantic* for March contains an article by Stuart F. Weld, on "The Isthmus Canal and Our Government," which will interest students of politics. The author is strongly in favor of placing the canal under international control, as the Suez Canal has already been placed; and he shows, by quotations from public documents, that our own government has always been in favor of such control, except during a brief period beginning with the administration of President Garfield. Another article of interest is "Personal Reminiscences of William H. Seward," by Mr. and Mrs. Samuel J. Barrows. Mr. Barrows was for a time private secretary to Mr. Seward at the State Department, and during an illness of some months his wife took his place. Hence they have much to tell us about the statesman's official and private life, and they tell it in a simple and pleasant way. Mr. John Fiske continues his articles on American revolutionary history, treating in his usual excellent style of "Ticonderoga, Bennington, and Oriskany." The *Atlantic* has also a paper on "Some Colonial Lawyers and Their Work," by Frank G. Cook, which lawyers will like to read, and the usual variety of lighter articles.

—Mr. John Delay of this city has begun the publication of a series of Gleanings from Foreign Authors, the first number of which now lies before us. It contains "A Love Match," translated from Ludovic Halévy, and "King Apepi," by Victor Cherbuliez. The former is a very pleasant little love-story told by the lovers themselves in extracts from their diaries, which they read to each other after their marriage. The other is less agreeable as a whole, but ends in an amusing and unexpected way. We are not told whether the whole series of which this book is the beginning is to consist of novels, but they will doubtless constitute the greater part; and, if the other volumes are up to the level of this one, they will make an addition to the lighter literature of English readers.

—*Outing* for March is a sporting number. We note the following principal articles: "Fox-Hunting; A Day in the Shires," by Henry H. L. Pearce; "Lawn Tennis in the South," by Henry W. Slocum, jun.; "Snowshoeing in Canuckia," by James C. Allan; "Salmon-Fishing on Loch Tay," by "Rockwood," and illustrated by J. & G. Temple; "Spaniel-Training," by D. Boulton Herrald; "How to Cycle in Europe," by Joseph Pennell; "Amateur Photography," by Ellerslie Wallace; "Winter Shooting in Florida," by F. Campbell Moller; and "Coaching and Coaching Clubs," by Charles S. Pelham-Clinton.

—A catalogue of the contents of the *Magazine of American History* for March reveals great current interest. The leading article describes the "Historic Homes and Landmarks" about the Battery and Bowling Green, New York City. The whole procession of Dutch and English governors who resided in the old historic fort opposite the Bowling Green are passed in review, as well as those who lived in the house built for Washington on the same site. One of its features is the sketch of the site of the City Hotel, of