

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

which so little is generally known. The second article, "America: the World's Puzzle in Geography," is a study by Rev. William Barrows, D.D. President James C. Welling, of the Columbian University, Washington, D.C., replies to Gen. Wilcox in an article on "The Mecklenburg Declaration of Independence;" the well-known author, J. G. Rosengarten, contributes "Du Pont De Nemours;" Gen. Alfred E. Lee discourses upon "German Family and Social Life;" Mr. Maturin L. Delafield writes of Col. Henry Beekman Livingston; and Annie E. Wilson gives an authoritative paper entitled "Thrilling Adventure of a Kentucky Pioneer."

—"The Century Dictionary" is to contain some features new in dictionaries, one of which is the entry of every thing in the one alphabetical order, abbreviations and foreign phrases as well as common words. While the plan of the work excludes biographical and geographical names, yet such adjectives as "Chinese," "Darwinian," etc., derived from proper names, will find place, and be fully defined. A great point with the new dictionary is its encyclopedic treatment of words. It will not stop at definitions, but is said to go into particulars about things to a greater extent than any other book except an encyclopædia, and it gives the information in a condensed, usable form. Such terms as "Bright's disease," "Tweed Case," "electric light," etc., are defined under the words "disease," "case," "electric," etc. Under "case" there are twenty-seven entries of such terms as "Dred Scott Case," "Tichborne Case," etc., in addition to the etymologies and definitions usually to be found in a dictionary. Such terms as "credit mobilier," "bankruptcy laws," "crossed checks," "clearing-house system;" the names of foreign administrative divisions, such as "arrondissement;" legislative bodies, like the "Cortes" and "Bundsrath;" parties and classes, such as "Anarchist," "Nihilist," "Chartist," "Fenian," "Carbonari," etc.,—will be fully defined in "The Century Dictionary;" and it is even understood that the new use of "barrel" ("the money, especially when the sum is large, supplied by a candidate in a political campaign for campaign purposes, but especially for corrupt purposes, etc.") has found a place.

—In the twenty-four years since the late Mr. N. Trübner began to carry out, under the title of *The American and Oriental Literary Record*, the idea of supplying periodically, not only lists of books published in the various countries of the East and throughout the whole of the American continent, as well as of European works bearing upon those countries, but also literary information on books and their authors, the value and usefulness of the *Record* have been fully recognized throughout the literary world. The growing importance and rapid spread of scientific research in the United States on the one hand, and the ever-increasing interest which literary men in England take in the history, antiquities, and civilization of the East on the other, have made it appear desirable to the publishers to expand the original design of the *Record* by assigning ample space to literary and scientific articles on subjects within its scope. They are making this departure with the greater confidence of success, as there is no other periodical in the English language which offers such a solid and comprehensive programme; and, while they invite the co-operation of scholars in the special departments to which their studies are directed, they look forward for continued support to the literary public generally, who have for so many years accorded to the *Record* their signal approbation and patronage. With a view to securing, as far as practicable, the indispensable superintendence by a competent and experienced editor, of the Oriental section of the expanded issue, they have made arrangements with Dr. Rost, of the India office, to undertake the editorial management; and they are confident, that, in intrusting this department to his care, they can rely upon its being directed with impartiality and independence of judgment. In addition to personal notices, such as obituaries and literary notes of works projected or in progress, the publishers intend to devote more space to reviews, independent articles on Oriental subjects, and more especially to periodical statements as to the advance made in the various fields of Oriental research, so as to make the *Record* a depository of information concerning the current state of Eastern literature in all its branches. It is proposed as a first and tentative venture to issue six numbers

annually, which will be published regularly in the middle of every alternate month, each issue to be a full record of the events of the two preceding calendar months. But the publishers hope that they will soon be enabled to issue the *Record* monthly. This, of course, will depend upon the success of their venture. The price of the new series, the first number of which will appear on the 15th of March, 1889, will be ten shillings per annum, payable in advance, or two shillings per number.

—The *Electrical World*, March 2, says: "Last week we reached our highest water-mark, up to that time, in an issue of 72 pages, the size and contents being such as to bring in upon us overwhelming congratulations from friends and readers all over the country. Marking as it did the close of our fifteenth year, the issue was naturally taken as a good exemplification of the great growth of electrical science and industry in the period since the first number was published in 1874; and we felt that at so memorable a milestone on the road of progress we might fairly take the advice once given by a famous statesman after a noteworthy achievement, and 'rest and be thankful.' But we are called upon this week once more to meet larger demands, and, rising to the occasion, we now put forth a number containing no fewer than 96 pages, or a gain of 24 pages over the previous record of a single week before. We cannot but call attention to a stride so tremendous. There is no need for us to enlarge upon it, or to emphasize its importance as evidence of the enterprise of electrical journalism in America, and the vast extent attained by the department represented in the arts and sciences. The number speaks for itself, from the first line to the last, and, big as it is, we know that every page will be turned and read with interest." Notwithstanding the fact that a full report of the Electric Light Convention was given, the current electric news was not neglected.

—The *Forum* for March contains the first of a series of essays on the fine arts. It is by Charles Elliot Norton, and is an attempt to give a definition of the fine arts, — a task of no small difficulty. The author thinks they may be defined as "the arts of expression in forms of beauty created by the imagination," and supports this view by an able discussion. He holds that these arts are "the only real test of the spiritual qualities of a race;" and he has some very uncomplimentary but, we fear, very true remarks about the deficiencies in this respect of the American race. Another article in the *Forum* which at first attracts attention is that by Cardinal Manning on "The Bible in the Public Schools;" but the article itself is disappointing. It is little more than a tirade against the public schools themselves as being irreligious; and, as for the reading of the Bible in the public schools of this country, he opposes it, though he is glad it is read in the schools of England. Mr. St. George Mivart has an article on "Darwin's Brilliant Fallacy," in which he reiterates his well-known views in opposition to the theory of "accidental variations," holding that a new species arises from "pre-ordained, definite variations due to the spontaneous re-action of the innermost nature of an organism." The article contains nothing particularly new, but in another paper the author promises to consider the subject of human reason, and to show that its origin is not explainable by Darwinism. Besides these papers, the *Forum* has one by Miss Kate Stephens on "Advanced Education for Women," showing the rapid progress that such education is making; another by Dr. Bacon, advocating the delivery of letters by carriers from every post-office in the Union; and other articles on various topics, which we have not space to particularize.

—Roberts Brothers will soon publish a new edition of "A Modern Mephistopheles," which first appeared in the No Name Series. The author's name, Louisa M. Alcott, is now printed on the title-page for the first time. It was one of the famous No Names, the authorship of which was never guessed by any one. The story resembled Hawthorne's style so much, that at its publication many attributed it to him. Appended to the volume is another story called "A Whisper in the Dark," — a story written many years ago, but which never appeared in book-form.

—The *Revue Scientifique* proposes to open its columns to a symposium of facts relating to heredity in man. Its object is to collect reliable instances of unusual cases of heredity, and to subject the material thus gathered to a rigid analysis, in the hope of

shedding new light on this most important topic. The editor of the *Revue*, M. Ch. Richet, the well-known physiologist and psychologist, requests that all who have facts to present will send them to him. His address is 111 Boulevard Saint-Germain, Paris, France.

—Harper & Brothers have just ready "The Correspondence of John Lothrop Motley," edited by George William Curtis. Mr. Motley's daughters have collected these letters, chiefly addressed to the writer's family and to Oliver Wendell Holmes. They contain the autobiography of one of the most striking figures in American literary history. The author of "The Rise of the Dutch Republic," "History of the United Netherlands," and "The Life and Death of John of Barneveld," studied the history of liberty in an essentially American spirit. Wendell Phillips was his school chum, Bismarck his fellow-student at Göttingen; and as United States minister to London, Holland, and Austria, he made personal friends of all the literary and political celebrities of his day. Few lives have been so full of incident of universal interest. The work is in two volumes, and has a portrait.

—The Leonard Scott Publication Company (New York, 29 Park Row) has reprinted the famous Bismarck Dynasty article from the *Contemporary Review* for February (price 15 cents), a large special edition of that number having been exhausted on the day of publication. The authorship of the article continues to be the theme of much speculation in England. The Empress Frederick has thought it necessary to disclaim it, and so has Sir Morell Mackenzie. Many of those who claim to know, attribute it to Mr. Stead, the editor of the *Pall Mall Gazette*. Mr. Labouchere says he almost knows it was Mr. Stead, and sundry characteristics can be pointed out which lend color to this view. In the mean time eight editions of the *Review* have been called for in England.

—A novel feature in magazine literature was introduced in the *Nineteenth Century* for February. The editor has invited a number of his friends to send him from time to time, in the shape of letters to himself, remarks upon any books which in the ordinary and natural course of their reading may strike them as being worth special attention. He has suggested to them, that, whenever a book is thus met with, a letter about it should be written to him, giving the same advice as to a friend, and in much the same sort of easy fashion. He hopes in this way to obtain fresher and more spontaneous criticism than can possibly be always produced under the prevailing system of "noticing" books "sent for review." The first instalment of this series consists of a notice of Margaret Lee's novel "Divorce," by Mr. Gladstone; of the "Lyrics," and "A Village Tragedy" by Margaret Woods, by Frederick Harrison; Dean Burgon's "Lives of Twelve Good Men," by P. E. Prothero; Sir George Young's "Sophocles," in English, by W. S. Lilly; "Notes of Conversations with the Duke of Wellington," by Augustine Birrell; Miss Rives's "The Quick or the Dead?" and "Virginia of Virginia," by Hamilton Aide; M. Jusserand's "Wayfaring Life," by the Rev. Dr. Jessopp; and George Pellew's "In Castle and Cabin," by John Morley.

—The New England Publishing Company have just published "One Hundred Lessons in Composition," by W. H. Huston of Toronto, which contains 400 practical exercises in composition, and is the sixth volume in their library of Teachers' Help Manuals. It will shortly be followed by "Manual of Rhymes, Selections, and Phrases," by Oscar Fay Adams; "Forty Friday Afternoons," by forty prominent masters, each giving what he considered his best exercises for a Friday afternoon; and "Common-Sense Exercises in Geography," a book of exercises — not questions — adapted to all grades and to the best American text-books. They have also just ready "School Music," by W. S. Tilden, of the State Normal School, Framingham, Mass., a series of papers from the *American Teacher*.

—The *Critic* observed the seventieth anniversary of the birth of Mr. Lowell, which occurred on Feb. 22, by printing seventy letters and poems from American and English men and women of letters, among whom are Tennyson, Whittier, Gladstone, Holmes, and Stedman.

—Mrs. Frank Leslie has sold to W. J. Arkell, of *Judge*, her *Frank Leslie's Illustrated Newspaper*, both English and German,

the transfers to be made May 1. Mrs. Leslie will retain and personally direct her other publications.

—Emin Pacha forms the subject of a paper by Elbridge S. Brooks in the February *Wide Awake*.

## LETTERS TO THE EDITOR.

\* \* \*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.  
The editor will be glad to publish any queries consonant with the character of the journal.

### The Soaring of Birds

MAY I ask space for a few comments on Professor W. H. Pickering's letter on the above subject, in *Science* of Feb. 22?

Professor Pickering holds that a bird which is moving with motionless wings in a horizontal wind is acted upon by three forces: (1) its weight; (2) a force "due to the excess of the velocity of the wind over the velocity of the bird," by which, since it is represented as horizontal and to leeward in his diagram, I suppose he means the friction between bird and wind; and (3) a force "due to the resistance of the air acting on the wings of the bird," which I take to mean the force derived from the impact of the air particles on the wings. This third force he assumes to have a direction opposite to that of the resultant of forces (1) and (2), and therefore to have one component vertically upward, and another to windward. This assumption seems to me to be erroneous. The horizontal component of such a force must surely be to leeward, as was pointed out by Hubert Airy in *Nature*, xxvii. p. 336; and the inaccuracy of this fundamental assumption of Professor Pickering would seem to invalidate his whole argument.

But let us follow it further. Force (3), he says, depends on the velocities of bird and wind, and he assumes first that these velocities are such that it is equal to the resultant of forces (1) and (2). In that case he says the forces acting on the bird will be in equilibrium. They would be, certainly, if the above assumption were true. "The bird," he then says, "will therefore continue to revolve about its mean position." How can a body which is in equilibrium revolve about a mean position? It must surely move with a uniform velocity in a straight line. He says again, "While these forces are in equilibrium, the bird is slowly drifting in the same direction as the wind." Why so? If the bird is in equilibrium, he must have the same velocity as he had at the instant at which he came to be in equilibrium, and that may or may not have had the same direction as the wind. In fact, if it is true, as Professor Pickering assumes, that the forces acting on the bird can be in equilibrium, the bird can move to any distance, in any direction whatever, with motionless wings. He has but to get up a velocity in the desired direction by using his wings, and then to poise his wings so that the forces acting on him may be in equilibrium. Since this result is contrary to experience, it makes the possibility of the bird's being in equilibrium under the given conditions doubtful; and it is obvious, that if force (3) has a leeward component, as I hold it must, its being equal to the resultant of (1) and (2) does not involve the vanishing of the resultant of all three; indeed, that whatever assumption may be made as to the magnitude of (3), the resultant of (1), (2), and (3) cannot possibly be zero.

Finally, Professor Pickering assumes the velocities of wind and bird to be such as to make force (3) greater than the resultant of (1) and (2). In that case, if the assumption criticised above were correct, the bird would be acted upon by a resultant force directed upwards and to windward, as Professor Pickering states. But if force (3) is directed upwards and to leeward, it will be obvious that the resultant force on the bird will be necessarily directed to leeward, and will not necessarily be directed upwards; and it follows, that, even if the velocities of wind and bird be assumed to be such that force (3) is greater than the resultant of (1) and (2), the bird's path will not necessarily have a general upward direction.

J. G. MACGREGOR.

Dalhousie College, Halifax, N.S., Feb. 27.

### A New Departure in Effigy Mounds.

It was first asserted by Dr. J. M. De Hart that there are to be found exceptions to the ordinary rule followed by the mound-builders in the outlines of their quadruped animals; i.e., that in-