

pius, and Aster are large genera, and Vernonia provides eight new species. The genus Quercus is important both for the number of species and also on account of their dominance in the forests of the area. *Q. alba*, the white oak, *Q. rubra* and *Q. Schneckii*, red oaks, are widely distributed; *Q. macrocarpa*, *Q. platanooides*, and *Q. palustris* occur on the coal measures; *Q. acuminata* and *Q. tinctoria* are also common.

The ecological survey is detailed, almost too detailed, as it loses conciseness owing to the multifarious subdivisions. The forests, as the prevailing features of the district, receive the most attention; the cliff and marsh associations are also important. The characters of the various formations are carefully delineated, and the text furnishes an estimable addition to the literature of plant distribution, but the area has apparently not been surveyed with the view of plotting on a map, nor are any illustrations provided.

The Evolution of Matter, Life, and Mind. By W. Stewart Duncan. Pp. 250. (Philadelphia: Index Publishing Company, 1907.)

THIS is a *vade mecum* of evolutionism, a sequel to a previous volume in which the author sought to show that feeling and energy are alternate states of matter everywhere. Feeling is given out as energy, and energy is experienced as feeling. Both are spiritual or non-substantial, sister properties or manifestations capable of inhering and co-inhering in one universal substance, the ether. The progress of investigation has enabled the author to make his monism even more definite. Matter is being refined away into a mode of motion in the ether. This ether is "the fountain of all being," "the hitherto unknown God." Prof. Larmor and others are theologians in spite of themselves. Helped by abundant quotations, Mr. Duncan gives a sketch of recent investigations as to the nature of matter, and he points out that he anticipated some of them. In 1893, for instance, he contended that an ordinary ray is a succession of such motions of the ether as beget waves with *longitudinal* as well as *transverse* elements of vibration, and it was only last year that Prof. J. H. Poynting showed that rays of light do exert energy in the direction of propagation. In the present volume he develops some original speculations, e.g. a theory of radiation and gravitation.

The author tells us that we must believe in the spirituality of matter and of the ether. Physical processes are *never* complete chains of sequence. Feeling and energising arise alternately in all matter. Animal matter has sprung from vegetable matter, and the latter from inorganic matter (in the Arctic regions). All that we call "matter" is at least sensitive and capable of feeling. It is so because of what it produces, and it is so because the ether is the fountain of all being, physical and mental. Every receiver of energy passes through two states, which correspond to those of every living personality, a subjective state of feeling which results from influence from without, and an ejective state of energising which results from influence from within. We trust that this is all quite clear.

Mr. Duncan gives an account of the origin of everything—including evil—except the ether, which is a scientific name for God. He traces the evolution of all living creatures and of the human mind, showing that the difficulty of thinking out the long genetic process may be in great measure overcome if we start from a broad enough basis—the psychosis of "matter." In the course of his exposition he quotes the story of a delightful orchid, discovered by Mr. E. A. Suverkrop, of Philadelphia, which sends down a tubular stem into the water when it is thirsty, fills

the tip, and coils it up again. "As the last coil is made the water trickles down upon the roots at the other end." When the discoverer touched the leaves, he was "astonished to see the centre stem convulsively coil itself into a spiral like the spring of a watch." Wonders will never cease. Nor is pathos wanting, for on dry ground "it was almost pitiable to see how the tube would work its way over the ground, in search of water that was not."

Ballistic Experiments, from 1864 to 1880. By the Rev. Francis Bashforth. Pp. 33. (Cambridge: University Press, 1907.) Price 1s.

THE pamphlet is interesting reading as an unconscious revelation of the timidity of thought of our military authority. Afraid to trust its opinion, it waited for approbation to come from abroad before expressing a judgment.

Although carried out with our muzzle-loading guns, Mr. Bashforth's experiments were so careful as to require slight modification only to serve for the newest pattern of modern artillery, and the arrangement of his tabular matter for practical use has been adopted universally, and is never likely to be displaced.

Mr. Bashforth is the creator of the science of modern artillery, but our official world considers this a very improper remark to make, at least in his lifetime.

The rapid progress in electromagnetic science has made possible a great improvement in the chronograph, and further experiment is needed urgently if we are to make the best use of manufacture in the production of improved weapons of war.

LETTERS TO THE EDITOR.

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The Origin of Radium.

IN his two interesting letters published in NATURE of September 26 and October 10 respectively, Dr. Boltwood states that he has obtained undoubted proof of the existence of the parent substance of radium, and that he finds it to be allied in chemical properties with thorium. I may be permitted to describe some experiments which afford independent evidence that the parent substance of radium possesses in a chemical sense the properties of thorium, and that it occurs with the latter.

In experiments made with a new intermediate product obtained from thorium to which I have given the name "mesothorium," I was struck by the fact that old preparations of pure thorium contained relatively large quantities of radium. This appeared all the more noteworthy since the monazite sand from which the thorium is prepared contains only a very small quantity of uranium; the radium corresponding to this small amount must consequently have been separated from the thorium during the complicated processes used in extracting the latter.

A few months ago, therefore, I began a systematic investigation of the quantity of radium in samples of thorium salts of different ages. A weighed quantity of the pure nitrate, generally 10 grams, was dissolved in pure water, and the solution boiled and sealed up. After a sufficient interval the radium emanation was collected by boiling the solution, and shortly afterwards, after allowing the thorium emanation to decay, transferred to an electroscope and measured. Samples of thorium nitrate of very different but accurately known ages were placed at my disposal by the firm of Dr. O. Knöfler. It was found as a result that the older the sample the larger was the quantity of radium contained in it. The oldest sample of all, one dating from 1898, contained the greatest amount. In quite a new sample the quantity of radium was very small, 100 grams of the sample