

upon the morphology of the water molds and their relatives. While it is impossible to summarize this paper here, the present reviewer wishes to express his hearty agreement with the conclusions reached by the author.

PROTOPLASMIC STREAMING IN PLANTS.

DR. ALFRED J. EWART, of the Birmingham Technical Institute, England, has recently published an interesting book on the physics and physiology of protoplasmic streaming in plants which will attract the attention of cytologists and no doubt help to give a better idea of the mechanism of the streaming cell. The work is the outcome of a series of observations begun nearly ten years ago by the author and continued until quite recently. It takes up first the physics and chemistry of the subject, and this is followed by the physiology, and then by a theoretical and general discussion. A few results may be summarily indicated as follows:

The movement is generated in the protoplasm itself.

The velocity of streaming is largely dependent upon the viscosity of the protoplasm, and hence upon the percentage of water, being more rapid as the water is increased.

Gravity exercises little or no influence upon streaming in small cells, and only a very slight one in large cells.

High temperature affects streaming by decreasing the viscosity, and for each species of plant or cell there are minimal, optimal and maximal temperatures.

No special chemical changes are connected with the streaming of protoplasm.

In the strongest magnetic field little or no effect on the streaming is noticed, but electrical currents may accelerate or, when strong, stop the movement.

Strong light retards streaming, while weak light may accelerate it under certain circumstances.

The book is one which must commend itself to plant physiologists.

FORESTRY IN NEBRASKA.

SEVERAL years ago the Nebraska Park and Forestry Association was organized for the purpose of encouraging tree planting for economic as well as ornamental purposes. This organization has just issued a 'Park and Forestry Manual' which calls attention to the kind of work which such an organization may do for a community. This little manual of nearly one hundred pages contains many suggestive articles. There is first a short article giving the origin of arbor day, followed by one on the 'Forests and Forest Trees of Nebraska.' Following this is another on 'Tree Planting on Nebraska Prairies,' and then in succession 'Propagation of Forest Trees,' 'Raising Evergreens from Seed,' 'The Nebraska Forest Reserves,' 'Tree Planting in School Yards,' 'Trees and Orchards,' 'Success or Failure in Timber Claim Planting and Causes for It,' 'Home Adornment and Public Parks,' 'The Red Cedar for a Screen or Shelter' and 'Annotated List of Nebraska Trees.' This manual might well be imitated by similar organizations in other states.

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MODERN VIEWS ON MATTER.*

THE Romanes lecture was delivered in the Sheldonian Theater, Oxford, on June 12, by Sir Oliver Lodge, F.R.S., principal of the University of Birmingham, the subject being 'Modern Views on Matter.'

The lecturer began by saying that he would discriminate between theses which were generally accepted by physicists and speculative opinions or hypotheses which were now being thrown out on the strength of experimental evidence of an at present incompletely conclusive, but very suggestive, character. The first thesis was that an electric charge possessed the fundamental property of matter, called mass or inertia, and that if a charge were sufficiently concentrated it might represent any amount of matter desired. There were reasons for supposing that electricity

* From the London *Times*.

existed in such concentrated small portions, which were called 'electrons,' and could either be associated with atoms of matter, to form the well-known chemical ions, or could fly separate, as was observed in the cathode rays of vacuum tubes, and in the loss of negative electricity when ultra-violet light fell upon a clean negatively charged surface. The lecturer went on to say: The hypothesis suggested on the strength of these facts is that the atoms of matter are actually composed of these unit electric charges or electrons, an equal number of positive and negative charges going to form a neutral atom, a charged atom having one electron in excess or defect. On this view a stable aggregate of about 700 electrons in violent orbital motion among themselves would constitute a hydrogen atom, 16 times that number would constitute an oxygen atom, and about 150,000 would constitute an atom of radium. The attractiveness of this hypothesis is that it represents a unification of matter and a reduction of all material substance to a purely electric phenomenon. The strongest argument in its favor is that mass or inertia can certainly be accounted for electrically, and that there is no other known way of accounting for it. If matter is not electrical, then there are two distinct kinds of inertia which exactly simulate each other's properties. Assuming this electrical theory of matter, that the atoms are aggregates of electric charges in a state of violent motion, two consequences follow. One of these consequences depends on the known fact that radiation or light, or an ether wave of some kind, is emitted from any electron subject to acceleration; consequently the revolving constituents of an atom must be slowly radiating their energy away, must thus encounter a virtual resistance, and must in that way have their velocity increased. The second consequence is that when the speed of an electrified body reaches that of light its mass becomes suddenly infinite; and in that case it appears not improbable that a critical condition would have been reached at which the atom would no longer be stable, but would break up into other substances. And recently during the

present year a break-up of the most massive atoms has been observed by Rutherford, and has been shown to account for the phenomenon of radio-activity, some few of the atoms of a radio-active substance appearing to reach a critical stage, at which they fling away a small portion of themselves with great violence, the residue having the same property of instability for some time, until ultimately it settles down into presumably a different substance from that at which it started. The matter flung away appears to be a light substance not very different in atomic weight from hydrogen or helium, and it is surmised that possibly certain chemical inert elements may be the by-products of radio-activity; and that this process of dissociation of the atom may constitute the evolution of the chemical elements, such as has, on theoretical grounds, already been speculatively surmised. An analogy, the lecturer said, may be drawn between this supposed gradual collapse of an atom and the contraction of a nebula, which at certain stages becomes unstable and shrinks off a planet, the residue constituting an extremely radio-active mass or sun. But, whereas the astronomical changes observed in cosmic configurations of matter occur in a time reckoned in millions of years, the changes to be expected in the more stable atoms would seem likely to require a time reckoned in millions of millions of centuries; but, nevertheless, according to known laws, and on the hypothesis of electric constitution, the change seems bound ultimately to occur; and so a state of flux and decay is hypothetically recognized, not only in the stars and planets, but in the foundation-stones of the universe, the elemental atoms themselves. A process of regeneration, however, is also thinkable, and would occur if the separate electrons were ever to aggregate themselves together by their mutual attractions into fresh material. And, inasmuch as the life of a highly radio-active substance must be very limited, being, perhaps, not more than a few thousands of years in some extreme cases, it appears necessary to assume that some such regenerative process is constantly at work, and that, just as we have

sons of various ages and exhibiting the process of evolution in different stages, so it may be that the progress of research will lead us to recognize the existence of atoms of matter in like case, some recently formed, and some very ancient; and the whole argument seems to lead to an atomic astronomy of surpassing interest.

SCIENTIFIC NOTES AND NEWS.

M. AMAGAT, of the Paris Polytechnic School, has been elected a member of the Paris Academy of Sciences in the section of physics, and Dr. H. A. Lorentz, professor of physics at Leiden, has been elected a correspondent in the same section.

LORD KELVIN and Lord Lister have been elected honorary members of the Royal Society of New South Wales.

LORD LISTER, in recognition of his 'long and valuable services to the country and particularly to surgery by the discovery and application of the antiseptic treatment,' has been admitted to the honorary freedom of the Merchant Taylors' Company, London.

DR. W. J. MCGEE has been appointed chief of the Department of Anthropology and Ethnology at the Louisiana Purchase Exposition.

DR. PHILIP HENRY PYE-SMITH, F.R.S., has been reelected chancellor of the University of London.

DR. G. VON ESCHERICH, professor of mathematics, has been made rector of the University of Vienna.

THE University of Groningen has conferred an honorary doctorate of mathematics and astronomy on Dr. C. Easton, director of the Observatory at Rotterdam.

DR. F. HOFMANN, professor of experimental hygiene at Leipzig, has celebrated the twenty-fifth anniversary of his professorship.

DR. B. E. LIVINGSTON, instructor in plant physiology in the University of Chicago, has been granted a research scholarship in the New York Botanical Garden, beginning September 1, 1903.

For the Michigan State Geological Survey Dr. A. W. Grabau will continue his studies of the Dundee and Traverse Limestones of the state, which are proving of great economic value. The survey has just issued a report on Portland cement, clay and coal, and soon expects to issue one on gypsum by Professor G. P. Grimsley. Dr. F. E. Wright, of the Michigan College of Mines and Geological Survey, is conducting some investigations of the copper-bearing rocks of the Porcupine Mountains. Mr. Leon J. Cole has prepared a study of the growth of the St. Clair Delta. Mr. Robert Muldrow is mapping the quadrangle around Detroit for the U. S. Geological Survey in conjunction with the State Survey. Mr. Lane's papers on the water supply of Michigan being entirely exhausted, the State and U. S. Geological Surveys are actively engaged in preparing for revised and extended editions. Messrs. R. E. Horton, W. M. Gregory and W. F. Cooper are engaged in this work.

THE present board of visitors of the Royal Observatory, Greenwich, is composed as follows: Sir W. Huggins, Professor H. H. Turner, Professor W. G. Adams, Professor J. Larmor, Sir J. N. Lockyer, Lord Rayleigh, Lord Rosse, Sir A. Rücker, Sir W. Abney, Sir R. Ball, Professor R. B. Clifton, Dr. J. W. L. Glaisher, Professor G. H. Darwin, Rear-Admiral Sir W. J. L. Wharton, Mr. W. D. Barber.

DR. J. E. DUTTON and Dr. J. L. Todd, principals of the Trypanosoma Expedition of the Liverpool School of Tropical Medicine, have returned to England from Senegal, where they have been investigating trypanosomiasis, a human disease similar to the tsetse fly disease which is the chief cause of mortality among the horses.

THE following British civil list pensions have been granted: £100 to Mrs. Adelaide Fanny Eyre in consideration of the services of her late husband, Mr. Edward John Eyre, the Australian explorer and Governor of Jamaica; £120 to Mrs. Zare Elizabeth Blacker in recognition of the services of her late husband, Dr. A. Barry Blacker, who lost his life