student of chemistry, it would seem better to give the Rhesus monkey's blood factor some other symbol. After reading the article in question some sufferers from "conjugal childlessness," with knowledge of chemistry but not biochemistry, might hope to effect a cure by injections of colloidal rhodium.

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AN INTERESTING REFERENCE TO LENGTH OF DAY AS AFFECTING PLANTS

DR. S. F. BLAKE, of the U. S. Department of Agriculture, has called my attention to an interesting reference in which length of day is considered a factor affecting the distribution of plants.

Arthur Henfrey, in his book "The Vegetation of Europe," published in 1852, discusses the flora of the British Islands in relation to the flora of Continental Europe. On page 169, he discusses the ranges of different groups as affected by various factors of climate, including maritime and continental influences.

It is interesting that he recognizes one portion of British plant life as apparently dependent upon length of day or the amount of direct sunlight, rather than upon mean temperature or other conditions of the climatic complex. Such plants, he theorizes, are circumscribed by lines which coincide with the parallels of latitude.

It is apparent in this theorem, which he had amplified no farther by discussion or experimental data, that Henfrey plainly saw the implications of length of day in the natural distribution of plants. His ideas, however, appear to have gotten no farther than the stage of philosophical statement. It was not until 1920, about sixty-eight years later, that our present experimental knowledge of length of day began.

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SCIENTIFIC BOOKS

BELOVED SCIENTIST: ELIHU THOMSON

Beloved Scientist: Elihu Thomson, a Guiding Spirit of the Electrical Age. By DAVID O. WOODBURY. With a foreword by OWEN D. YOUNG. xiii + 358 pp. 16 plates. Whittlesey House, McGraw-Hill Book Co., 1944. $3.50.

A REALLY good and lovely biography is a much rarer thing than a good and lovely life, so much richer is nature than man's art. Here is an extraordinarily good biography of one of the less widely popularized, but very potent figures in that generation of adventurers, discoverers and inventors who brought on what we call "the electrical age."

The subject of this book has all the marks of a Horatio Alger hero, but with the additional realism of association with many other such heroes who were his predecessors or competitors in the electrical age. By what amounts almost to a stroke of genius this biography is entitled "Beloved Scientist," for it characterizes so perfectly the amiable personal qualities which distinguished Elihu Thomson from many other inventors of his period and which greatly endeared him to all who knew him.

This book contains a most interesting account of the principal inventors of the "Electrical Age." It is much more than a biography of one person, for it is really a history of the electrical industry and its founders. Here one finds intimate and yet full-length word portraits of Edison, Brush, Westinghouse, Steinmetz, Pupin, Lempe, Van Depole, Maxwell, Kelvin, Tyndall, Gramme, Helmholtz, Crooks, Hertz, Roentgen, Silvanus Thompson and Marconi. The book is full of sketches of significant and yet little known events in the lives and labors of many of these men.

So far as Elihu Thomson is concerned he fits into this assemblage as one of the most interesting and inspiring of them all. His youthful precocity, his years of laboratory experiments in his own home, his high-school career as student and later as teacher and professor and finally his great career as inventor are described in a most interesting manner. His interest is shown not merely in electricity but in almost everything that he observed in nature or art. His curiosity regarding the causes of things was universal; for example, he made experiments to find out how laughing gas produces anesthesia and concluded that it was due to the absence of oxygen necessary for cerebral activity. He had little faith in the ordinary practitioner of medicine and always insisted on knowing why certain prescriptions were given—usually without getting a satisfactory answer, which then stirred him up to make experiments of his own.

While he was still in the Central High School of Philadelphia he was greatly interested in photography and in making lenses for microscopes and telescopes. He also began experiments on what we would now call a telephone. After he had joined the teaching staff at the high school his experiments extended to everything in connection with electric energy and its utilization. One extraordinary experiment of his has been commemorated at the Benjamin Franklin High School by a tablet which states, "This is the birthplace of wireless, 1875"; for there he found that electric waves were transmitted through the air and through

brick walls to a distance of about 100 feet. In 1875 a fundamental invention of his was the three-coil dynamo; another was the electrical magnetic regulator. The Centennial Exposition of 1876 gave him such a stimulus with respect to electric lighting that it led to a large number of his inventions in that field.

Thomson's discoveries and inventions during his high-school career were made in conjunction with Professor Edwin J. Houston, who generally claimed the major credit for his minor part of the work. In 1880 Thomson decided to leave the profession of teaching and to devote himself to a career as inventor. He accepted a call to organize the American Electrical Company at New Britain, Conn., and accompanied by one of his high-school seniors, E. W. Rice, he removed to that place. Amidst great difficulties there he carried out a series of remarkable experiments leading to several important inventions, among them the lightning arrestor and electrical welding. This was a period of breathless haste in patenting inventions. Among the leaders in this race were Edison, Thomson, Brush and Westinghouse. In the rough-and-tumble battle of the patents Thomson proved to be a shrewd business man as well as a great inventor, and when the New Britain Company tried to sell out surreptitiously to a competitor, it was found that Thomson controlled all his patents.

The Thomson-Houston Company was then removed to Lynn, Mass., where under wise business management it grew and expanded into one of the great electrical companies of that period. Many other inventors were added to the staff, many great inventions were patented. The "battle of the currents" was waged between Edison, who stood for direct current, and Thomson, who favored alternating current. Similarly, a battle was fought between Edison's incandescent light and the arc light of Brush and Thomson. In the end the alternating current, with Thomson's protective grounding, and the incandescent light won the larger support.

A partial list of his nearly 700 patents includes the lightning arrestor, electric welding, three-coil dynamo, cream separator, repulsion motor, magnetic blow-out, improved transformers, distributors, trolley-car and train control, improved x-ray tubes, high frequency radio apparatus, etc.

Infringement suits between the Edison General Electric Company and the Thomson-Houston Company led in 1892 to the consolidation of the two in the General Electric Company with one principal branch at Schenectady, N. Y., and the other at Lynn, Mass. Thomson and his associates then turned to the application of his "repulsion motor" to the fruitful field of electric traction; he devised the leading type of electric meter, he experimented with x-rays and wireless.

After 1900 Thomson retired from the race of invention and devoted much attention to consultation and cooperation in many scientific and educational lines. For 37 years and until near his death at the age of 83, he continued to take an active part in the general advancement of science. He had from his earliest youth been greatly interested in astronomy, and in these later years of leisure he cooperated with Percival Lowell and W. H. Pickering and especially with George Hale. He undertook to make of fused quartz the 200-inch mirror for the Mt. Palomar telescope, but after long and costly experiments found that it was impracticable. He served for a time as acting president of the Massachusetts Institute of Technology and for many years on its board of trustees. On March 13, 1937, he died at his home in Swampscott, full of years and honors.

EDWIN G. CONKLIN

SPECIAL ARTICLES

RELATION OF DUAL PHENOMENON IN PENICILLIUM NOTATUM TO PENICILLIN PRODUCTION

DIFFICULTIES in penicillin production have been reported recently by a number of those engaged in this work. Foster, Woodruff and MacDaniel[1] state that cultures of *Penicillium notatum* Westling "tend to lose spontaneously their ability to form penicillin either entirely or partially," and that "frequently degenerated cultures show a marked reduction in the tendency to sporulate abundantly." An additional complaint concerns the increase in yellow pigment which accompanies this degeneration.

In view of the nature of the difficulty we have made a single spore analysis of a stock culture of the fungus according to the method of Hansen and Smith.[2] The results have shown that *P. notatum* is a dual fungus, composed of two distinct constituents associated together in culture. This is the dual phenomenon discovered by Hansen[3] in 1938 and which has been found to be characteristic of most if not of all fungi.

The two components of *P. notatum* are a normal conidial or *C* type and an abnormal mycelial or *M* type. The *M* type arises repeatedly as a mutation in physiologically aging colonies of the *C* type, even though the culture be started from a single conidium.

[1] J. W. Foster, H. B. Woodruff and L. E. MacDaniel, *Jour. Bact.*, 46: 421, 1943.

[2] H. N. Hansen and R. E. Smith, *Phytopath.*, 22: 953, 1932.

[3] H. N. Hansen, *Mycologia*, 30: 442, 1938.