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JOHN WILLIAM DRAPER, M.D., LL.D.

The death of Dr. John William Draper removes from the circle of American Scientists a man who could be least spared, but the great results of his life of usefulness and devotion to science will, for many years to come, remind us of his familiar presence, and his memory will be cherished wherever the physical sciences are known and appreciated.

Born at St. Helens, near Liverpool, England, on the 5th of May, 1811, he came to this country when 22 years of age and took a medical degree at the University of Pennsylvania, and shortly afterwards he received the appointment of Professor of Chemistry and Physiology in the University of New York, where he afterwards remained until the time of his death.

Dr. Draper's scientific career may be studied with profit by all engaged in similar investigations, as an example of close application and persistent work, achieving the highest distinction in his own line of research, without any of those appeals to popular sympathy and support, which too many modern physicists are so eager to receive, and regard as elements of success.

PROF. JOHN WILLIAM DRAPER,
(Chemist and Historian) Died January 4, aged 70.

For more than 40 years Dr. Draper was quietly engaged in careful experimental researches in physiology and molecular chemistry; these researches covered a very large range of subjects, but were more particularly devoted to a study of the chemical phenomena of light in both the organic and inorganic world, a description of which may be found in his work "*Scientific Memoirs, being Experimental Contributions to a Knowledge of Radiant Energy.*" This volume is described by "*The American Journal of Science,*" in its obituary notice of Dr. Draper as "a noble monument to his memory, made of the results of labors which have greatly advanced the sum of human knowledge."

In the department of spectrum analysis and photography, his original discoveries were of great value. He doubled the number of the recognized fixed lines in the spectrum, described those at the red end, demonstrated that the fixed lines might be photographed, and brought all these discoveries to bear on his investigations into the nature of flame and the conditions of the sun's surface. In conducting the long series of experiments which resulted in so many important discoveries, Dr. Draper drew largely on his private fortune, and it is asserted that no private person in America has expended more money in a purely scientific direction; his generosity kept pace with his scientific attainments, for whatever scientific discoveries he made—and they were very numerous—he freely gave to the world. He never took out a patent for any of his discoveries, nor sought to make them a source of personal profit.

In the "Scientific Memoirs," Dr. Draper claimed to have made "the first photographic portrait from the life," and he further states, "I also obtained the first photograph of the moon;" the other claims in this work to scientific discoveries are most remarkable, as the result of the work of one man's investigations in a single line of research.

In 1875 the American Academy of Arts and Sciences awarded the Rumford medals to Dr. Draper for his "*Researches on Radiant Energy.*"

Of the literary work of Dr. Draper we would speak in detail, for the subject has many attractions; but it appears unnecessary to describe books which are read

universally, and form part of the education of every liberal-minded and intelligent man. Dr. Draper's books show that he was a deep thinker in the department of the philosophy of history and human progress, and that he aimed to exalt the intellectual development of man.

The "*History of the Conflict of Religion and Science*," a work which many readers consider is incorrectly represented by the title, proves how broad and liberal were Dr. Draper's views, and it may surprise many to learn, that such opinions were not considered by him inconsistent with religious belief. The materialists appear to have written and published in vain for him, as we are told in the "*American Journal of Science*," that "it is a satisfaction to affirm that he was a theist and a firm believer in a future state of existence, for which the present is only a preparation."

On the 4th of January last, Dr. Draper peacefully surrendered his life, honored and respected by all nations, for his fame had been diffused throughout the civilized world by reason of the translation of his works into both European and Asiatic languages.

Dr. Draper leaves two daughters and three sons, the latter having already achieved distinction in pursuits kindred to the work of their father. As the work of Herschell was continued by his son, so in Professor Henry Draper we find all the special qualities for maintaining the high prestige of the family name ; his recent success in photographing such difficult celestial objects as nebulous matter, and the important discovery of the presence of oxygen in the sun, have placed him in the foremost rank of original scientific workers, and the furthur development of his investigations are anticipated with keen interest by physicists, both in this country and abroad.

VEGETABLE PATHOLOGY.

By T. J. Burrill, Ph. D.

It is not an easy accomplishment to separate physiology from pathology when, instead of dealing with the definitions of words, we attempt to classify the operations taking place within a living object, by placing them in the one or the other category of activities and effects. Indeed there is no well marked and uniformly acceptable line of division. We may speak of one as normal and healthful and the other as abnormal and injurious; but these vary with the standpoint from which our judgment is made, and with the conditions which modify, this way and that, the results.

If these things are true as regards the vital processes of animals, they are much more evidently true concerning those of plants. In the latter, the standards of health and disease are not so well agreed upon; less attention has been given to the life processes and their results; the individuality of the plant has been less recognized, and its own particular good or injury less regarded. If an apple-tree produces for *us* a crop of good sized, highly flavored, richly colored fruit, we do not stop to ask whether these luscious pippins are the results of physiological or pathological operations, judged from the standpoint of the *tree*. If a cabbage has its terminal bud enormously developed so as to be called a head, the monstrosity never calls forth a compassionate word of sympathy as *we* enjoy the crisp and savory production, for a New Year's dinner. The ink with which we preserve our thoughts, flows no less freely because of a peculiar wound in a particular tree by a particular insect, and a most wonderful malformation of the growing tissues in consequence. We have not listened to the masterly disquisition of a learned and betitled oak upon *septicemia* or the curiosities of *traumatic tumors*. We have heard no complaints from suffering, bleeding grape vines; no uneasy groans from plants perishing through the withering effects of blight and mildew.

But the terms physiology and pathology do have a meaning answering to the operations and conditions of health and disease in plants as well as in animals. The grasses of the fields and meadows may flourish in the luxuriance of bountiful supply and perfect adaption, their vital forces being attuned and harmonized into combinations of causes and consequences, all conspiring to the good of the individual and the welfare of the species; or these members of the vegetable kingdom, may, through unfavorable conditions, through privation, through the attack of enemies, become dwarfed or distorted, weak or disproportioned, unfruitful or incapable of growth and self-perpetuation.

Without attempting to give in this place a classification of the diseases of plants, much less a description of the many that are now known and more or less clearly understood as to origin and progress, we proceed to give some account of a few of the more general facts and phenomena connected with our subject.

THE PROCESSES OF PHYSIOLOGY AND PATHOLOGY IN PLANTS ARE SLOW.

Except in the case of violently disturbing causes, like fire, frost, caustic chemicals, etc., disease or death never attacks a plant in the sudden and unheralded manner frequently known in animals. It is true that what has been called "blight," a very indefinite and loosely applied term, is usually supposed to be the work of a day or a night, perhaps of an hour; but the facts have not been known by those who make this supposition. If by "blight" is meant the results of a tornado or even of a sirocco, with which we of Illinois can claim some acquaintance after the last summer's experience—if these are meant, we cannot say that "blight" is not sudden; but the effects of such agencies should be classed as injuries rather than as diseases, There are really no exceptions to the rule that true pathological operations in plants are slow in their progress. The healing of wounds offers us a good illustration, if we examine the process in plants compared with that in animals. If from a healthy, rapidly growing tree, we cut off a limb close to the trunk, making a wound one inch in diameter, a whole year will scarcely suffice for complete healing, while in most animals a clean cut of this kind may be covered with newly produced tissue in a fortnight. We talk about the *circulation* of the sap; but in plants the fluids do not circulate in any proper sense. The slow movement which does take place is at best a process of *soaking*. When water is most rapidly ascending in the stem of a leafy plant to supply the loss by transpiration, one foot per hour is more than is commonly gained; and this is altogether exceptional speed for movements in plants generally. This feeble distribution of the fluids in living vegetation is no doubt one of the reasons for the slow workings of disease. Again the want of sympathetic