viewer as rather meager, many of the more important phenomena connected with ultra-violet light not being mentioned. The same criticism might be made of the chapter on the infra-red spectrum which includes a page on cathode rays and four pages on X-rays. The three chapters on photometry, illumination and the eye are the least satisfactory in the whole book. The treatment is academic, scanty and contains little that is valuable and modern, but it is a decided advance to include these subjects at all in a general text on light.

Part IV., on the mathematical theory of light, gives an excellent presentation of the electromagnetic theory in six chapters totaling one hundred pages. The opening chapter on the nature of light, giving the gist of a number of the author's papers on the subject, needs no apology on the ground that it is original material. The final chapter is on the relative motion of matter and ether.

Numerous problems are given at the end of each chapter. These and the general presentation and arrangement of matter make the treatise well adapted for class-room work for third year students in the average university. If supplemented by a little modern technical optics it would serve very well as an introduction to applied optics.

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John Shaw Billings. A Memoir. By Fielding H. Garrison, M.D. New York and London, George P. Putnam's Sons, 1915. Pp. 432.

I was first brought into contact with Dr. Billings in the Satterlee Army Hospital, Philadelphia. He was the executive officer and not long after my being ordered there I was appointed assistant executive officer. This threw us much together. One evening in his quarters he became unusually free and confidential in his conversation and in an infrequently interrupted monologue he told me in detail the story of his early life and trials. These are sufficiently set forth in this admirable volume. That one could overcome such obstacles and finally reach the international fame which crowned his later life is an inspiring lesson to every young man and especially every young doctor.

The last time I saw him was not long before his death. He took the time to show me all over his latest triumph, the New York Public Library.

Before he was fifteen he bought a Latin grammar and dictionary in order to translate the classical quotations encountered in his always omnivorous reading. With a geometry, some Greek books, etc., he eked out his knowledge sufficiently to enter Miami University, graduating in arts in 1857 and in 1859 in medicine. His early struggles with poverty (during one winter he lived on 75 cents a week) were much lightened by his becoming demonstrator of anatomy in 1860.

In 1861 he began his wonderful career first as an army surgeon. His remarkable powers of work and of organization were at once called into play. This was the first phase in his professional life. From the field he was sent to the surgeon general's office. In this new sphere he soon became the first medical bibliographer not only of our time, but of all time. I remember seeing him more than once flanked right and left by two appalling piles of journals checking title after title for cataloging. The result was year after year the great Index Catalogue of the Surgeon General's Library and later the Index Medicus, the two greatest contributions ever made to medical bibliography.

These two services in the field and in the library, with much labor in the museum, would be enough for most men. But he added a third career in sanitation and hospital construction. In the course of his life he planned seven great buildings, the Johns Hopkins Hospital being the first and the New York Public Library the last. While as Dr. Hurd has pointed out the "housekeeping" part of that hospital was not perfect, yet we must remember that even Jupiter sometimes nods. In one of these somnolent spells Billings actually used candelabræ as a plural.

As a statistician and scientist he won a prominent place. His address in 1881 at the International Medical Congress and in 1886

at the British Medical Association were veritable triumphs.

His final seventeen years at the New York Public Library were the culmination of his laborious and distinguished life.

Samuel D. Gross, Weir Mitchell and Billings were by all odds the most widely known American medical men in the last half of the nineteenth century.

Dr. Garrison's book is delightful. He is judicious in his selection from Billings's Letter and Addresses. His style and his general review of the various stages of Billings's development and of his character and personality leave nothing to be desired. The only regret I have is that he takes as I think a backward step in using the archaic and souperfluous "u" in labour, endeavour and their similars.

W. W. KEEN

SPECIAL ARTICLES

EFFECT OF COLORED LIGHT ON THE MOSAIC DISEASE OF TOBACCO

IN connection with extended work on the mosaic disease of tobacco in this section of the Connecticut Valley, it was found that plants grown under shade or tents appeared to be much less affected with the mosaic disease than those grown in the open. This fact had previously been noted by Sturgis[1] in Connecticut, and the writer, in conjunction with other work on this disease, outlined experiments relative to a study of light conditions on the intensification or reduction of the disease.

While the writer's preliminary work was in progress, his attention was called to a paper by Lodewijks[2] published in 1910, which dealt with the effects of colored light on mosaic diseased plants. As a result of his experiments Lodewijks stated that a cure was effected by blue light; red light diminished the disease, and suffused light checked it somewhat. This is not the place for an extended discussion of his methods of experimentation, but in brief it may be stated that the diseased leaves of the plant were enclosed in a cloth hood of the desired color, the apparently healthy basal leaves remaining uncovered and exposed to normal daylight. After some time the hoods were removed and the plants examined for symptoms of the mosaic disease. The results obtained, if substantiated, would be of great interest and value. In order to satisfy himself the writer duplicated in so far as was possible the work of Lodewijks, employing the same methods and cloth hoods of approximately the same texture as those used by him in his experiments. The hoods were allowed to remain over the plants for thirty days; at the end of this period they were removed and the plants carefully examined for visible symptoms of the disease. The results obtained were in brief as follows:

The plants covered with the red cloth hoods showed a diminished color variation between the light and dark green areas of the diseased leaves, and all new growth showed a more or less pronounced mottling. After remaining a week exposed to normal daylight, all the new growth was badly diseased. Healthy plants inoculated with juice from the treated leaves became diseased in from ten days to two weeks. Control inoculation remained healthy. From the above results it may be stated that there is a diminution in color variation in diseased leaves, not of a permanent character, however, and the active principle of the disease remains very virile and highly infectious.

Similar experiments carried on with blue cloth hoods gave the following results: On three plants after thirty days' treatment no visible symptoms of the mosaic disease were observable, although there was a slight tendency towards curling noticeable on a few leaves of the new growth. One other plant, however, showed a slight mottling on two of the young leaves. Two weeks after the hoods were removed, the first three plants did not show any marked symptoms of the mosaic disease other than a faint mottling of a few

[1] Sturgis, W. C., "On the Effects on Tobacco of Shading and the Application of Lime," Conn. Agr. Exp. Sta. Ann. Rept. 23: 252–61, 1899.

[2] Lodewijks, J. A., Jr., Zur Mosaikkrankheit des Tabaks. Rec. Trav. Neerlandais, Vol. 7, 107–29, 1910.