BACTERIOLOGY, ITS RELATION TO PHARMACY AND ALLIED SCIENCES.*

BY LOUIS GERSHENFELD.

Bacteriology is an infant of many affiliations, always displaying unusual talents and with the possibility of attaining its maturity in the near future. Forced to await the perfection of instruments of magnification, it remained for the Jesuit Kircher, and the Dutch linen draper, Leeuwenhoek, in 1675, to pave the way for the birth of this science. Though the latter, as well as other pioneers of the seventeenth century, had foreseen the parasitic theory, many authors denied it while others admitted it only as a daring supposition, inasmuch as a positive proof supporting such doctrine was always wanting. Agostino Bassi, a Lodigian physician (born in 1773), may be proclaimed as the true founder of the doctrine of pathogenic microbes. The works published by Bassi in 1835 are sufficient proof to convince anyone that he was a precursor of Pasteur and Koch, as well as the founder of the entire doctrine. His work does not fail to make a profound impression, but this ably formulated doctrine entered but slowly into the domain of science, until 1850, when Dovaine, together with Rayer, demonstrated a specific pathogenic microbe as the direct agent of a general infective disease (anthrax).

Numerous investigations were begun and due to the excessive enthusiasm in the acceptance of the parasitic doctrine, the insufficiency of the methods of research were frequently supplied with the imagination of the experimenters. Due to this fact, the edifice, so ably raised, quickly crumbled under the blows of the stringent criticisms of different investigators, and everything thus far formed as an aid, together with the doctrine itself, fell into discredit. It is not my intention in this theme to repeat the history of this long conflict (for a complete account is described in Loeffler's work on "The Development of Bacteriological Doctrine").

Bassi's fundamental ideas, more fully developed by Pasteur with his different studies, were not accepted, however, until after the publication of Koch's researches on infective diseases, in 1878. The latter's work was made possible due to the improvement of technique that was made available, after the introduction of the microscope with immersion objectives (invented by Amici and improved by Stephenson), and the discovery of the use of aniline dyes by Weigert in 1875.

Thus, briefly stated, is what took place before science began to satisfy one of its supreme aspirations, *The Knowledge of Causes*, and yet have within its realm one of the greatest of branches that interests both mankind and the universe. Thus brought forth by man's eager and active desire to *know*, bacteriology was soon put into service to help and to save. The problems encountered were touched by botanists, physicians, chemists, pathologists, physiologists, physicists and pharmacists; and their solution soon shed light upon biological principles of the broadest application. Pathology, especially experimental pathology, was recreated and physiology was soon linked with it. New life was given to zoölogy and botany received additional inspiration. By the methods used in studying the pathogenic bacteria, contagion was made apparent and modern hygiene (personal as well as industrial), public health sanitation and preventive medicine

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thus became established. Who knows if surgery would have ever developed would not bacteriology have supplied its chapter of antisepsis? And apart from the sciences, I doubt if there is a field of human activity that is not already calling upon bacteriology to assist it in its progress. Agricultural pursuits and industries, too numerous to mention here, have and are extending their hands to receive it.

The scope of bacteriology, as one may thus see, is a wide one, with numerous fields and avenues before it, as yet undeveloped. All this time this branch of science has been held under sway by those closely allied members of science that claim to be her *Pater*, though in reality, bacteriology has been produced because of the necessity of the finding of a brother to keep the brotherhood of science intact.

With a definite purpose, the teaching of bacteriology has come in a comparatively brief time to play a very important part in the scientific education of all; and bacteriology is being taught now in most all of the educational institutions. But is the bacteriologist usually thoroughly trained? Has he a broad foundation upon which to erect a sound superstructure? Can a finished product be evolved from a knowledge of bacteriology which has been acquired in the short period of six or eight weeks of a regular college course? and still fit one to handle this vast subject as it is applied to domestic science, agriculture, botany, dairying, water and sewage purification chemistry, pharmacy, medicine, dentistry, veterinary medicine, public hygiene and sanitation, pathology, industrial hygiene, the industries at large, etc. The range of activity and influence of this subject is indeed large and I contend that it is impossible to confine it to the usual curriculum of the medical school only. As a science, bacteriology, though borrowing and giving to other fields of study, possess its own technique and its own methods of investigation and experimentation; and I think the time is close at hand when we will see this field subdivided into its different avenues, as has been found necessary when dealing with chemistry and other sciences. The future of bacteriology is rich in alurement of interest, in promise of results and in a greater possible benefit of mankind.

What would bacteriology be to-day had there been no Pasteur, the chemist? What would bacteriology do to-day without Dakin, the chemist? Yes, and what would bacteriology, as a whole, amount to without its assistance of that closely related science, chemistry? And still it is a known fact that few bacteriologists are not even familiar with the elementary principles of chemistry, which is not only an adjunct but essential to every student in bacteriology, so as to have a correct understanding of what is before him.

This is in addition to the broader and greater problems before us which may be classified under biochemistry and animal or plant physiology, where extensive training in both bacteriology and chemistry is an absolute necessity.

With the realization of what is before her, bacteriology is just beginning to emerge from her peculiar state of disorder and it is time for pharmacy, as a science among other sciences, to quickly realize her own chaotic position and take advantage of what is before her and what bacteriology has to offer. Not since the days of Pasteur (when numerous pharmacists were coöperating with him in his field

of endeavors) was there a more appropriate time for the professionalizing of pharmacy than there is at present during prevailing conditions.

The average graduate from a reputable pharmacy school (especially if the student was a high school graduate) has had a sufficient preliminary training in inorganic, organic, and analytical chemistry, preliminary bacteriology and hygiene, and allied subjects to be able to take advanced post-graduate study (at least one year) in chemistry, bacteriology and advanced pharmacy, to quite readily assume the responsibilities and master the situations that will confront him in a professional pharmacy, where the many-sided problems should be more of a scientific and of a professional character, rather than commercial, if pharmacy is to still keep its roll among the sciences. Students thus trained to deal with medical bacteriology, perform the commonly applied clinical tests and further apply their knowledge in quest of scientific research, will greatly benefit themselves financially, socially and otherwise; and they will raise pharmacy to that high professional standard that it should and I hope will possess.

Let us all remain alert and take advantage of that which bacteriology has to offer us and which pharmacy can well handle. Let us approach it with the right spirit and with this most fertile field for study and investigation let us try to bring pharmacy back to where we all (I am sure) would like to see it and where it rightfully belongs.

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THE USE OF SACCHARIN AS A SUGAR SUBSTITUTE.*

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The United States Government having restricted the use of sugar employed by the druggist to the extent of 20 percent of his requirements, we are confronted with the problem of meeting this restriction in the most practical way.

Various substitutes for sugar have been recently suggested, some of them absurd, and all of them of doubtful utility.

In my opinion, the very best way to conform to this regulation is to make up the 20 percent reduction in sweetening power entailed by governmental requirement, by the employment of an equivalent amount of saccharin carefully calculated with respect to its sweetening power, and mathematically correct.

Such a method I am prepared to suggest, and herewith present the same in detail.

In view of the present status of saccharin, it would of course be necessary to secure permission from the United States Food Administration, basing our plea for the necessity of its use as a temporary recourse, to be employed for the period of the war only.

I am of the opinion further, that much of the prejudice against saccharin heretofore existing, has been the result of unsupported statements which have been made against the use of that substance.

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