

## History of Bacteriology at the University of Notre Dame

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Bacteriology has been taught at Notre Dame for approximately 55 years (1, 2). The course was first listed in the University catalogue in 1890 but the late Dr. John Berteling, one of the earliest students and a member of the faculty at the time, claimed that he taught bacteriology in 1888 (3). The authors were not able to find this record, but other courses in biology were taught much earlier than 1890 (1, 2, 4, 5). Early catalogues did not state the teacher of the subject but it is presumed that Rev. Alexander M. Kirsch, C.S.C., taught bacteriology in 1890 since he was a teacher of natural science during that period (6). Dr. Berteling claimed to have taught Father Kirsch bacteriology and this is quite possible, although Father Kirsch was an older man and had had two years of graduate study in cytology at Louvain. Moreover, the late Dr. Francis J. Wenninger, C.S.C., who was a pupil of Kirsch and knew him well, said that Kirsch had visited Koch's laboratory while in Europe (7).

Kirsch was not primarily a bacteriologist but rather a zoologist and it is interesting to note that for over forty years at Notre Dame, bacteriology was not taught by anyone whose primary interest was in bacteriology. Curiously enough, Notre Dame had a bacteriologist on its faculty before 1900 but he occupied a chair of literature. This man, Dr. Austin O'Malley, had served as bacteriologist for the Marine Hospital in Washington, taught bacteriology at Georgetown Medical School, and was recognized by no less an authority than Osler of Johns Hopkins for his work in introducing diphtheria antiserum to the American medical profession (8). Dr. O'Malley did not teach bacteriology at Notre Dame but he did influence Father Kirsch's thinking on the subject.

The early course, according to catalogue description, was a general one emphasizing non-pathogenic bacteria and the methods for studying them. The description was about the same as one would find today for any modern course in general bacteriology.

The course remained unchanged until 1916 at which time a second course in bacteriology was introduced which laid special stress on infection and immunity to bacteria and the specific infectious diseases (9). During the early period there is little record of who taught bacteriology except for a period of 1905 to 1908 when Rev. Leo. A. Heiser, C.S.C., taught it (10). The subject was probably taught at various times by Dr. Francis Powers, Father Kirsch, Father Wenninger, Rev. Frank O'Hara, C.S.C., and Dr. Regidius M. Kaczmarek. In 1919 a course in immunity was introduced and taught by Kaczmarek. He continued to teach this course until 1924 (11).

Dr. George Albertson, C.S.C., trained in zoology, took over bacteriology and immunology in 1923 (12). This man was to devote his entire time to teaching these courses together with hygiene. He taught bacteriology to one of the authors, Reyniers, in 1928. He was a kindly man, a good teacher and had some knowledge of research. Above all, however, Father Albertson inspired the research efforts of those working under him and constantly served as stimulus for original and basic work.

After the death of Father Albertson in 1929, Father Wenninger, then Dean of Science and Head of Biology, recalled James A. Reyniers in 1931 to teach bacteriology and to continue with the research projects which he had begun as an undergraduate in 1928. Reyniers has taught all of the courses in bacteriology and immunology and several courses in hygiene since 1932 (13).

With the encouragement of Dean Wenninger and others, Reyniers established and started work upon a long range program toward the eventual investigation of some of the fundamental problems concerned with the biology of microorganisms. Except in the field of physiology, few contributions have been made to experimental biology from the study of bacteria. This has obviously been due to the limitations set by the minute size of the bacteria. With this in mind, the first phase of the program was devoted to perfecting those techniques which seemed most likely to circumvent difficulties connected with size. Three techniques seemed to offer promise. They were: the elimination of contamination in order to keep cultures pure under all conditions, micrurgy for working with individual organisms, and mechanization of the viable count for handling large numbers of living units.

When this work was begun, there was one teaching laboratory, a small incubator room, and a small room for sterilization. In these quarters and with meager equipment, Reyniers began to develop the basic micrurgical and germ-free techniques. As the work continued and showed promise, the University administration supplied another room and appropriated a small fund for some badly needed apparatus. In 1932, an undergraduate, Philip C. Trexler, began to work with Reyniers as an assistant in the laboratories. After receiving his M.S. degree in 1936, Trexler became associated with Reyniers and the work on a full time basis, although between 1936 and 1940, he was given several leaves of absence for study at other universities and institutes.

During these years of the early 1930's, the academic program in bacteriology had expanded to include several courses in hygiene and some advanced courses in research and techniques. Graduate assistantships were granted to one or two promising students per year and these men worked two and one-half years toward their Masters degrees on the apprenticeship basis. These men assisted in teaching laboratory courses and also assisted with the research program which by this time had begun to attract wide attention. The administrative officers of the University especially President Charles L. O'Donnel, C.S.C., Vice-President John F. O'Hara, C.S.C., and Dean Wenninger, had become much interested in and sympathetic toward the research. They made available

more and more facilities and funds. With the exception, however, of Trexler, Reyniers was not supplied with technically trained help.

In 1933 Reyniers was made Head of the Laboratories of Bacteriology, to be devoted to research. In 1937 he became Director of the Laboratories.

By 1936 the program had expanded in size and scope and was now occupying five laboratories and an office in the old Science Hall. At this time, Father John O'Hara was President of the University and under his direction and leadership, plans were made for a new Biology Building, one floor of which was to house the Laboratories of Bacteriology. Work was begun in the summer of 1936 and the building was dedicated in the spring of 1937. At this time, the junior author of this paper received his B.S. degree in Pharmacy and began work toward an M.S. degree under Reyniers and Trexler. These three men, Reyniers, Trexler, and Ervin have, since that time, administered the research and teaching of the Laboratories of Bacteriology.

The much more adequate quarters in the new building provided some twenty-two laboratories and offices primarily devoted to research. Included among these are special rooms for the animal colony, for the experiments in micrurgy, for the study of cross infection, and for the germ-free experiments. In addition to the three men named above the staff is now made up of six full time research technicians, three assistant technicians, a stock room attendant, an animal keeper and a machinist.

With this staff, the first phase of the research program, i.e., the laying of a sound foundation of principles, techniques, and apparatus, has been practically completed. This has been made possible by working the year around and by devoting many hours in addition to the ordinary academic program. Apparatus has been built in which it is possible to perform almost any bacteriological experiment including animal inoculation, without danger of contamination. In this same apparatus guinea pigs, rats, chickens, rabbits, dogs, flies, fish, plants and monkeys have been raised free from detectable contamination. Limitations in the field of animal nutrition have caused considerable deviation from the main problem in theoretical bacteriology. These animals have been used in a variety of problems such as the problem of dental caries in cooperation with the Zoller Dental Clinic of the University of Chicago. From time to time circumstances have made it necessary to make immediate application of the technique. As an example, units of cubicles have been designed for the elimination of cross infection in hospital wards. Cubicles of this type have been installed and used in the Cradle in Evanston, Illinois, for four and a half years.

Micrurgy developed along many lines, one of which resulted in a method of single cell isolation. This was not much more involved than the standard plate method for obtaining pure cultures.

Preliminary studies of the mechanization of the viable count were made in 1932. Since then, circuits, as yet unpublished, similar to those used in counting the discharges of Geiger-Mueller tubes have been developed. With these circuits plates having over a thousand colonies

may be counted in less than a minute with an accuracy not approachable by the human eye in routine work.

The first formal presentation of these techniques and their use was made at a Colloquium on Micrurgy and Germ-Free Techniques held at the University of Notre Dame in 1939. At this meeting papers were read which summarized the instrumentation and use of the germ-free, micrurgical and cubicle techniques. These papers along with those of other men working in related fields have since been published in book form.<sup>1</sup>

In normal times academic program in bacteriology at Notre Dame offers the following courses; Biology of Bacteria, Bacteriology for Engineers, Elements of Immunity, Epidemiology, Elementary Hygiene, and Personal and Community Hygiene.

The research program is being carried on with the generous support and encouragement of the present University administration headed by the Reverend J. Hugh O'Donnell, C.S.C., President. The advent of war has demanded that all long range research programs be curtailed in favor of immediate applications. It is hoped, however, that these techniques may be applied to the advancement of the pure science of micrology after the war.

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13. *Ibid.*, 1932-1943.

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<sup>1</sup> Reyniers, J. A., Ed., 1943. *Micrurgical and Germ-Free Methods*. Charles C. Thomas, Publisher.