

History of Microbiology at
The Ohio State University
1873-1969

Compiled by
Jorgen M. Birkeland
Bruno J. Kolodziej

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The decade following the opening of The Ohio Agricultural and Mechanical College (later, The Ohio State University) in 1873, encompassed the period of the initial development of bacteriology as it applies to the diseases of man and animals. During this period, the scientific world - especially the medical world - was stirred by the revolutionary discoveries of Louis Pasteur, Robert Koch and others. They demonstrated the relationship of microorganisms to the causation of disease and advanced theories of the host reaction and modes of defense. Biologists and medical men from all sections rushed to these European centers to observe, first hand, the work of these pioneers and to introduce these findings into American Colleges and into medical practice. Among those going, were two individuals associated with the fields of biology at The Ohio State University, viz., Dr. A. M. Bleile and Dr. H. J. Detmers.

Dr. Bleile, a native of Columbus, received his general education in the Columbus city schools. He held no degree from The Ohio State University but in 1876 received his M.D. degree from The Starling Medical College, one of the early medical colleges in the midwest. Following his graduation from medical college, Dr. Bleile spent the years 1877-1879 doing graduate work in Europe, primarily in the field of human physiology. These years represent the period when Koch, Pasteur and others were reporting their discoveries in the field of infection and Dr. Bleile observed these discoveries and became very much interested in what was appearing in bacteriology. While apparently Dr. Bleile's primary interest was in scientific

medicine, necessity compelled him to engage in the practice of medicine for 12 years. In 1891 he joined the faculty of The Ohio State University as a Professor of Anatomy and Physiology, which department at that time included in its offerings instruction in physiology, anatomy and histology. While he retained his interest in bacteriology, no formal course was given. When he first became Head of the Department. Dr. Bleile remained as Professor of Physiology in the University until his retirement in 1932.

The economic importance of the diseases of animals was recognized in Ohio from the time of the founding of the University, and early pressure was brought on the University authorities to provide for the training of veterinarians. Dr. Townsend, a member of the original faculty was a graduate in Medicine, but much interested in agricultural developments and in the livestock industry. He gave lectures dealing with these phases of education, especially with diseases of animals. In 1885, the college authorities were authorized to establish a Veterinary College for the training of young men in this field and called Dr. Henry J. Detmers to perfect the organization of this College.

Dr. Detmers (1833-1906) was a German-trained scientist. He had received excellent scientific training in Veterinary Medicine, holding degrees for The Royal Veterinary College of Hanover and The Royal Veterinary College of Berlin, recognized as the leading institutions in their field in Europe. Following his graduation, he practiced his profession in Germany until 1865, when he emigrated to the United States. He continued the practice of Veterinary Medicine for a time, but eventually, because of his superior scientific training, he was called into the educational field,

teaching at the University of Illinois, The Iowa State College, and The Kansas State Agricultural College. In 1878, he became associated with The Bureau of Animal Industry, having been appointed by the U. S. Commissioner of Agriculture (Dr. William A. LeDuc), as an investigator of infectious diseases of livestock. Dr. Detmers returned to Europe during each of his vacation periods to continue his studies, especially those relating to infectious diseases. In this way he became familiar with the science of bacteriology and the rapid advances being made in it.

In 1885, Dr. Detmers gave the first course in bacteriology in the University. This course was primarily designed for the Veterinary students, though it might be elected by students in the Arts College and graduate students among whom was Dr. Morrey. The course consisted of one one-hour lecture per week, during the school year, with elementary laboratory work. The laboratory work consisted largely of the morphological study of the organisms and simple methods of cultivation of selected organisms. His lectures consisted of a direct translation to the class of Frankel's Bacteriology. It is evident that properly qualified advanced students were encouraged to engage in research. Mark Francis, the first graduate in Veterinary Medicine at The Ohio State University, and who later became one of the leaders in the profession, in the United States, was a student in this first class. He has the distinction of presenting the first report of an original investigation in bacteriology from the University. He presented the report of his work on "A Study of Foot Rot in Sheep" at a meeting of the American Microscopic Society in Pittsburgh in 1886. Dr. Detmers himself carried out some of the initial studies on hog cholera.

Among the Arts students electing bacteriology during this early year was Dr. Charles B. Morrey a graduate of The Ohio State University in 1890. Dr. Morrey, a native of Chesterhill, Ohio, received his Doctor of Medicine from The Starling Medical College in 1896. He became Assistant in Latin and Physiology in the University in 1891; Assistant Professor of Anatomy and Physiology in 1899; Associate Professor in 1902; Professor in 1904. He was selected to organize the Department of Bacteriology in December 1902.

From 1891 to 1895, bacteriology was given in both the College of Veterinary Medicine by Dr. Detmers and in the Department of Physiology by Drs. Bleile and Morrey. Later, it was all transferred to the Department of Physiology where a revised and extended course consisting of lectures and laboratory was organized. Dr. Bleile gave the lectures in the course, while Dr. Morrey had charge of the laboratory work.

It is interesting to note that at that time bacteriology was required only of Veterinary, Pharmacy and Home Economics students. It could be used as an elective by other students in the University. The University had no medical or dental colleges at this time and hence no courses were given in these areas. The Starling-Ohio Medical College became an integral part of the University in 1914, as also the College of Dentistry, and courses in Medical and Dental Bacteriology were introduced subsequent to this amalgamation.

In 1897-1899, Dr. Morrey went to Europe, spending two years working at The Pasteur Institute in Paris and The Royal Institute in Berlin. Here he came in contact with the leading workers in the field. On his return, Dr. Morrey suggested that the offerings in Biology be revised, the

division being made so that he could have complete charge of bacteriology, while the other offerings could be under the charge of Dr. Bleile and assistants. Dr. Bleile was not agreeable to this arrangement. He agreed, however, not to oppose the establishment of a new Department of Bacteriology, providing authorization could be obtained from the University. To the surprise of Dr. Bleile, authorization was granted and the new Department of Bacteriology was organized in 1903.

The Veterinary Laboratory was completed, and through the influence of Dr. David S. White, Dean of the College of Veterinary Medicine, the Department of Bacteriology was allotted quarters in this building, where it remained until 1930 when more commodious quarters became available in the new Pharmacy and Bacteriology Building.

Dr. Morrey had been a brilliant student at the University, and from the time of his graduation, he served in some instructive capacity. He was a well-trained bacteriologist and an excellent teacher having the faculty to present clearly the fundamentals of the science without introducing confusing details. Dr. Morrey deserves great credit as a pioneer in the field of bacteriology in the colleges in the United States.

He was among the first bacteriologists in the United States to provide such courses in a University. His concept as how such a department should function in a University, i.e., as a service department for all areas of science, and his policy of organization have proven sound as evidenced by the fact that it remains practically unchanged to date. Research under Dr. Morrey's regime was necessarily limited, not because of his lack of ability nor interest, but because the heavy teaching load, the lack of funds

and inadequate physical facilities made much research impossible.

Dr. Morrey's teaching ability was recognized and appreciated by the thousands of students whom he taught.

During the period 1903-1906, Dr. Morrey carried the entire teaching load of the Department. Increased interest in the science of bacteriology with resultant increases in enrollments made additions to the staff necessary. In 1906, Dr. Eugene F. McCampbell was added with the rank of Instructor. Dr. McCampbell was a native of Ohio, his father being a prominent attorney in Marysville, Ohio. Dr. McCampbell received his collegiate training at The University of Chicago, from which institution he received his Bachelor's degree in 1904, his Doctor of Philosophy Degree in 1911, and his Doctor of Medicine degree from Rush Medical College in 1912. He was made full Professor of Bacteriology in 1910, serving in this same year as Chairman of the Department while Dr. Morrey was spending an additional year (1910-1911) in Europe. Dr. McCampbell was granted a leave of absence in 1911 to enable him to complete his graduate work at the University of Chicago. On his return in 1912, he was made Executive Officer of The Ohio State Department of Health, retaining only nominal contact with the Department of Bacteriology, giving a series of lectures on problems of Public Health. He became Dean of the College of Medicine in 1917, serving in this capacity until 1927, when he resigned to devote himself to the practice of medicine. Dr. McCampbell was a brilliant student and an inspiring teacher, but one whose primary interests were in the fields of pathology and the practice of medicine. With the ability he possessed in medicine and public health organization, he severed his

connections with the Department shortly after his return from the University of Chicago.

In 1910, W. A. Starin came to the Department as an Instructor, passed through the various academic ranks, and received his full professorship in 1918. During the war years (1940-1947), he served as Acting Chairman of the Department. In 1947, he was promoted to the Chairmanship. He remained an active member of the staff until his retirement in 1948.

Dr. Starin began his study of bacteriology under the tutelage of Marshall A. Barber. He received his Master's degree at the University of Kansas in 1908. During his term of service at the University, he was granted two years' leave of absence, one of which (1914-1915) was spent at the University of Michigan under Dr. F. G. Novy and the other (1922-1923) at the University of Chicago, under Drs. H. G. Wells and E. O. Jordan, specializing in Immunology and Food Bacteriology. He also did graduate work at The Johns Hopkins School of Hygiene and Columbia University. He received his Ph.D. from the University of Chicago in 1923.

During the years following 1910, the interest in the subject increased and enrollments in the department mounted. Additions to the staff became imperative. In 1928, Dr. H. H. Weiser, who had received his Master's degree from The Ohio State University, was made an Instructor in the Department, primarily charged with the development of courses in Food Bacteriology, Dairy Bacteriology and Sanitation. He served as Instructor 1928-1941, as Assistant Professor 1941-1947, and Associate Professor 1947 to date. Granted a leave of absence, Dr. Weiser received his Ph.D. from Iowa State College in 1936. Dr. Weiser has been quite successful in the

development of his special fields and in securing funds to aid in carrying on his projects. Dr. Weiser was an excellent teacher and a capable director of research.

Many other members were added to the staff during the period of 1910 to 1935. Since most of these positions were of subordinate rank, they were usually filled by individuals planning for other types of work and were, for the most part, temporary appointees. Among those who at one time or another were members of the staff, the following are those holding the rank of Instructor or Assistant Professor, with their terms of service:

a) Andrew M. Jensen (1913-1914) Instructor. Dr. Jensen was a graduate of The Veterinary College and was interested in veterinary bacteriology. Dr. Jensen was accidentally infected with the glander's bacillus, resulting in a fatal outcome.

b) H. B. Froning (1914-1915) Instructor. Mr. Froning was a chemist, but interested in Industrial Bacteriology.

c) Vera McCoy Masters (1915-1916) Instructor. Assistant Professor (1920-1923), when she retired; to return in 1930 with the same rank. She retired permanently in 1933.

d) R. F. Jukes, Instructor (1923-1928). Mr. Jukes received his Master's degree from The Ohio State University and his M.D. from the same. He retired to engage in the practice of medicine.

e) Fred Speer, a graduate of the Veterinary College, The Ohio State University, Instructor (1921-1923), Assistant Professor (1923-1933). He conducted the course designed for the veterinary students. Dr. Speer retired to engage in the practice of his profession and in farming.

f) D. F. Holtman, Instructor (1932-1943). Received his Master's degree from the University of Kansas, his Ph.D. from The Ohio State University. Resigned to become Chairman of the Department of Bacteriology in The University of Tennessee.

In 1935, Dr. Morrey, who had served the University for nearly 40 years, was retired and made Professor Emeritus. After canvassing the field for a successor, Dr. N. Paul Hudson was selected. Dr. Hudson obtained his Ph.D. from the University of Chicago (1923), his M. D. from Harvard (1925). Following the receipt of his M.D. degree he served with the International Health Board, investigating Yellow Fever in Africa. On his return he joined the faculty of the Department of Bacteriology of the University of Chicago, from which position he came to The Ohio State University in 1935. With his natural ability and the wide experience he had in bacteriological investigations and in the educational field, he came well equipped to assume the duties of Chairman. Recognizing the increasing importance of microbiology in its relation to man, and under the stimulus of a new organization, the University contributed more liberally than previously to the physical needs of the Department and to an increased staff. Specialized personnel were obtained to develop the various fields of the subject. The general policy of making the department a service unit for the University with all branches of the subject concentrated in one place was retained. With time and equipment available, and a young well-trained staff, both research and teaching were expanded. Under the direction of Dr. Hudson, all activities of the Department were greatly accelerated and graduate work stressed. As evidence of this increased activity at the graduate level, it may be noted that during the period prior to 1935 only five Ph.D.'s had been granted.

Dr. Hudson brought with him a corps of young men to head up the various special areas. Dr. Oram C. Woolpert, a Ph.D. and M. D. from the University of Chicago, assumed direct charge of medical and dental bacteriology, and, in conjunction with Dr. Hudson, initiated and supervised the research in the medical field; Dr. Floyd Markham, a Ph.D. from the University of Chicago, gave the bacteriology to the veterinary students; Dr. J. M. Birkeland, Ph.D. from the University of Chicago, developed a general survey course in bacteriology designed to acquaint general students in the University with the fundamentals of the science. He also gave lectures relating to Public Health. Dr. G. L. Stahly, Ph.D. from Iowa State College, was placed in charge of General Bacteriology and Bacterial Physiology. Dr. Weiser was retained to develop Dairy and Industrial Bacteriology. Later Dr. Margaret Heise, Ph.D., The Ohio State University, was added to the staff to have general charge of pathogenic bacteriology for the non-professional students.

The outbreak of World War II caused many changes in the Department both as regards personnel and the conditions under which the work was carried on. Early during the war, Dr. Hudson was granted a leave-of-absence to aid in the direction of research relating to Biological Warfare being carried on at Camp Detrick, Maryland. He remained in military service for more than two years, returning to active duty as Chairman of the Department in 1945. Dr. Woolpert entered the medical service of the Army as Major, where he rendered distinguished service, being mustered out a Colonel and made Director of Research being centered at Camp Detrick. He decided to remain in Government service and resigned his position with

the University in 1946. He continued in this position at Camp Detrick until 1952, when he returned to the University as Director of The Research Foundation and with a position as Research Professor in the Department of Bacteriology. Dr. Markham left the University to serve with the Health Division of the Army, serving in the European theater, principally in Italy and North Africa. Shortly after his return, he resigned his position in the Department to become associated with one of the large biological houses in the country.

During much of this time, the staff remaining depleted, the Department was necessarily limited again to the teaching of the subject matter, with marked curtailment of research.

In 1942, Mrs. G. A. Bole joined the staff of the Department as lecturer and curator. She held a Master's degree in bacteriology from Columbia University and had spent a number of years as a bacteriologist in the laboratories of the Ohio State Department of Health. She developed a stock culture collection to a level comparable to that found anywhere and assisted in the laboratory with the medical and dental courses.

In 1946, Dr. Hudson resigned as Chairman of the Department of Bacteriology to become Dean of the University's Graduate School. Following his retirement from the University, Dr. Hudson was awarded an honorary degree in recognition of his contributions to teaching, research, administration and his service to the government.

Dr. Starin who had served as Acting Chairman during the war years (1940-1946) was made chairman in 1947. In 1948, Dr. Starin retired after thirty-eight years of dedicated service to the University. At the time of

his retirement from the University in 1948, Professor Starin was given a testimonial dinner attended by several hundred of his former students and associates. At this time, a lectureship was established in his honor by the alumni of the Department.

It was not until 1947 that it was possible to rebuild the faculty and restore it to pre-war conditions and to add additional staff to complement the post-war educational growth. Several faculty were added immediately. Dr. M. C. Dodd, a graduate of The Ohio State University, with a Ph.D. from the University of Michigan, was selected to take over the work in Immunology. Dr. L. C. Ferguson, D.V.M. from The Ohio State University and a Ph.D. from the University of Wisconsin, took over the work as related to veterinary science and animal husbandry. Dr. J. W. Riddle, Ph.D. from this Department, replaced Dr. Woolpert in teaching bacteriology to medical and dental students.

In 1948, Dr. Jorgen M. Birkeland was appointed Chairman of the Department. Dr. Birkeland was committed to the previously established policy of maintaining the department as a service unit, as well as, the center for graduate education in bacteriology for the entire University. Under Dr. Birkeland's leadership the post-war rebuilding and expansion of the department continued.

In 1949, Dr. Chester I. Randles, Ph.D., The Ohio State University, was secured to expand the field of bacterial physiology in the Department. Dr. Melvin S. Rheins, Ph.D. The Ohio State University, was appointed to take over the academic responsibilities of pathogenic bacteriology for all sectors of the University.

In 1950, Dr. Jack N. Baldwin, Ph.D., Purdue, joined the department to assist in laboratory instruction in the medical and dental areas, as well as, in the general field of nonpathogenic bacteriology.

In 1953, Dr. Edward H. Bohl, D.V.M. and Ph.D., The Ohio State University, was added to service veterinary medicine.

An examination of the academic contributions and research activities of the individual faculty members and their graduate students in the Department between the mid-thirties and 1960 reveals the true growth and development of knowledge of bacteriology. Academically, new courses and major programs were introduced in response to new developments in the field. A course entitled, "Microbiology and Man" was organized by Dr. Birkeland with the design to give an appreciation and understanding of the nature and role of microorganisms to human welfare. This course was a science service course within the general education curriculum. In the true spirit of this course, Dr. Birkeland authored a book entitled, "Microbiology and Man" published in 1942, which served as the text for the course for a number of years.

A major program in General Microbiology and Physiology evolved. The beginning or introductory course in microbiology has always been considered of special importance. Originally taught by Drs. Morrey and Starin, it was given to Dr. Stahly in 1935 to develop. Dr. Weiser shared in the teaching. Dr. Stahly organized the first course dealing with the physiology of bacteria. Later, the course was assigned to Dr. Randles and expanded into several courses.

Dr. Weiser developed the area of Food and Dairy Microbiology. This included the development of separate courses for Dairy Microbiology, Food Microbiology and Advanced Food Microbiology. Years of teaching these courses prompted Dr. Weiser to write a general text entitled, "Practical Food Microbiology and Technology," published in 1962.

In the early development of the Department, pathogenic and medical bacteriology and immunology emerged in unison. From 1917 to 1935, Dr. Starin and Dr. Morrey were responsible for this teaching. From 1935 until the onset of World War II, Drs. Hudson and Woolpert taught bacteriology to medical and dental students, pathogenic bacteriology, and medical microbiology. When Drs. Hudson, Woolpert and Markham entered the military service, their courses were assigned to the remaining staff. After Drs. Hudson and Woolpert left the Department permanently, the course in medical microbiology was taught by Drs. Starin, Dodd, Rheins and Riddle.

In 1941, Dr. Margaret D. Heise who just received her Ph.D. in the Department was retained to teach pathogenic bacteriology. In 1949, Dr. Rheins took charge of this area and developed the courses.

When Dr. Dodd joined the Department, he was given the responsibility of developing the area of immunology. He did so by organizing a series of courses and under his direction immunology developed into an extensive major program.

Basic service courses were taught by most of the faculty. Courses included: Microbiology for Dental Hygienists; Microbiology for Nurses; Basic Microbiology for Science Teachers.

Veterinary bacteriology was taught by members of the Department. Dr. Markham was given the responsibility of its organization. Dr. Ferguson took charge of this area in 1947 and was succeeded by Dr. Edward Bohl in 1953.

In 1961, the name of the Department was changed to the Department of Microbiology to reflect developments in the field and to describe more accurately areas of interest and responsibility.

Between 1960 and 1966 several new staff members were added to the faculty to either organize new courses and give research expertise in areas deficient to the Department or to add additional staff members to rapidly evolving programs.

In 1960, Mrs. Elizabeth M. Mote, M.A. from the University of Chicago, was added to the staff to assist in teaching in the microbiology service courses. Also, Dr. George Malaney, Ph.D. from The Ohio State University joined the faculty to further develop water and sanitary microbiology. In 1960, Dr. William Boyd, Ph.D. from the University of Cincinnati, was added to the physiology-ecology area. In 1963, Dr. Frank W. Chorpenning Ph.D. The Ohio State University, was appointed and given the responsibility of maintaining the serology area. Also appointed was Dr. Patrick R. Dugan, Ph.D., Syracuse University, to take charge of the water microbiology area. Dr. Richard Sinsley was added to assist in the development of dairy and food microbiology. Also in 1963, Dr. Julius P. Kreier, V.M.D. University of Pennsylvania and Ph.D., University of Illinois, was added to take charge of veterinary bacteriology.

In the midst of the faculty expansion, several developments followed which were influential in shaping the Department as it is in its present form.

Dr. Birkeland retired from the Chairmanship in 1964. Dr. Rheins was appointed Acting Chairman in 1964. In 1965 he was appointed Chairman. In 1966 he resigned the Chairmanship and served as Acting Chairman until 1967. In 1965, the teaching of medical microbiology was transferred to the College of Medicine. The College of Medicine created a "Department of Medical Microbiology" to satisfy two needs. First, to have their own faculty present a course in medical microbiology. Secondly, there was a need for a faculty of medical microbiology to train teachers and researchers in their own field.

At the meeting in February, 1966, the Faculty Council of The Ohio State University approved and submitted to the Board of Trustees the recommendation of the Council on Instruction to reorganize certain biological disciplines and create the College of Biological Sciences, to become effective July 1, 1966. This recommendation was approved by the Board of Trustees. With this approval Microbiology was transferred from the College of Arts and Sciences to the newly established College of Biological Sciences. The academic necessity for the organization of the new College was one of curriculum reorganization in all of the disciplines of biological sciences. Reorganization from the standpoint that each discipline in the College would serve as an academic service unit for all disciplines within the College and University. Inherent in this curriculum reorganization was the reassessment of all course offerings in the Department, modification of existing courses to insure modern concept in biology, and addition of certain courses to existing programs wherever necessary and remove unwarranted courses from the curriculum. Another necessity for the College was the expansion of

research necessary for graduate education and for the development of prestige for the University within the scientific community. To promote these plans the University supported the incept of the College by allocating funds for the hiring of more faculty to satisfy curricular needs and financed the purchase of new research equipment.

In keeping with this spirit and support from the University, the Department revised its curriculum to meet the needs of the College and the University, hired additional faculty wherever the need was essential, and purchased laboratory equipment essential for teaching and graduate research. It should be noted that in the Fall of 1967, Microbiology had assumed a majority of the space in the Bacteriology-Pharmacy Building which was essential in it development and expansion.

Because of all this reorganization and expansion, there was a demand for additional faculty. In 1964, Dr. David A. Wolff, Ph.D. from The University of Cincinnati, was added to develop courses and a research program in virology. Also, Dr. Nancy J. Bigley, Ph.D. from the Ohio State University, was appointed to partake in the further development of immunology. In 1965, Dr. James I. Frea, Ph.D. from the University of Wisconsin, was added to partake in the further development of the physiology-ecology area. In 1966, Dr. Robert M. Pfister, Ph.D. from Syracuse University, was added to develop the area of microbial cytology. Also in 1966, Dr. Bruno J. Kolodziej, Ph.D. from Northwestern University, was appointed to partake in the development of microbial physiology-ecology.

In the "Plan for Organization, College of Biological Sciences" which was accepted by the College Faculty was the proposal for the dissolving of the five existing Departments and creation of several Academic Faculties. In these plans, an Academic Faculty of Microbiology would have been a natural evolvement; however, there was a group of faculty whose intent was to evolve a faculty of Cell Biology. Since this was not reasonable at this time, a proposal was made that these individuals join the proposed faculty of Microbiology because of common interests. On November 2, 1967 the faculty of the Department of Microbiology met with the group of individuals interested in Cell Biology. As a result of this meeting it was agreed that a new Faculty of Microbial and Cellular Biology be proposed. On December 4, 1967, the College Faculty approved the establishment of the Faculty of Microbial and Cellular Biology.

Upon this approval the following College faculty members joined the existing Microbiology faculty: Dr. Thomas J. Byers, cell biology; Dr. Thomas I. Diamondstone, biochemistry; Dr. Donald K. Dougall, plant biochemistry; Dr. David G. McConnell, molecular biology; Dr. Wayne B. Parrish, cytology. Since then Dr. Benjamin Wise and Dr. William R. Sharp have been added to the Faculty.

In 1967, Dr. Matthew C. Dodd succeeded Dr. Rheins as Chairman of the Department of Microbiology. Dr. Dodd directed the evolvement and stabilization of the Academic Faculty of Microbial and Cellular Biology and has dedicated himself to make this the most viable and productive unit in the College.

In the past few years three outstanding faculty members of the Department of Microbiology have retired from the University, Professor Emeritus. In 1966, Dr. Stahly retired after 31 years of service. In 1968, Dr. Weiser retired after 40 years of service. In 1969, Dr. Birkeland retired after 34 years of service.

In 1969, the teaching responsibility of veterinary microbiology was completely assumed by the College of Veterinary Medicine -- an end to a historical relationship.

The History of Research
Department of Microbiology
at The Ohio State University

From 1903 to 1935, the Department of Bacteriology had become the Center of all Bacteriological study at the University. During these years the focus has continuously been on teaching. This included teaching bacteriology to all sectors of the University. Even though the burden of teaching was heavy, research activities were in evidence. Dr. Morrey's intention for the organization of the Department was to combine bacteriological teaching and research. Early research was mostly concerned with the pathogenic nature of various bacteria on humans and domestic animals and in the rapidly emerging discipline of immunology.

The beginnings of research in the Department emerged mainly with Dr. Morrey and later with Dr. Starin. However, it should be noted that Dr. E.F. McCampbell (1906-1912) and Dr. J.F. Conneffe (1909), a half time assistant to Dr. McCampbell, did some early research on typhus fever with fatal results to Dr. Conneffe. Dr. Conneffe contracted the disease in Mexico followed by death in January, 1910. Dr. Andrew M. Jensen (1913-1914) who was very interested in veterinary bacteriology but was primarily interested in research on glanders, a disease prevalent to horses at this time. Dr. Jensen working with morbid tissue in the laboratory was accidentally infected with the glanders' bacillus, resulting in a fatal outcome.

Vera McCoy Masters received the first Master of Science degree from the Department of Bacteriology. The title of her thesis was "The Relation of the Bacillus of Bovine Tuberculosis". The first Ph.D. was awarded to Edward H. Boyer in 1920. The title of his dissertation was, "The Chemical Nature of Antigenic Substances in Bacillus Coli." The work was carried out in Dr. Morrey's laboratory. Dr. Morrey's research interests were quite diverse but focused mainly in two areas. Firstly, in the area of pathogenic bacteriology which included the study of organisms that were etiological to man and domestic animals or that were naturally associated with them. Secondly, in the area of immunology which included some early pioneering work on antibody production and the antigenic nature of various substances.

Dr. Starin's early research was closely aligned to Dr. Morrey's. His early research concerned itself mainly with the study and isolation of pathogenic microbes of man and domestic animals and of microbes normally associated with them. His over-all research included: studies on in vitro identification of various diseases; physical and chemical control of disease producing organisms; toxin and endotoxin producing bacteria and the nature of toxin production; and biochemical, serological and immunological studies on certain pathogenic bacteria.

In 1935, Dr. N. Paul Hudson became Chairman. With this appointment came University recognition of the science of bacteriology. The University granted increased funds for additional physical equipment and for specialized personnel to develop the various growing areas of

bacteriology. The areas of bacteriology maintained, expanded and developed were: General bacteriology, Pathogenic bacteriology, Veterinary bacteriology, Dairy, Food and Industrial bacteriology, Immunology and Bacterial Physiology. Research interests were inherent to each of these areas.

Pathogenic Bacteriology, Immunology, Virology

As stated above, research prior to 1935 was mostly confined to the pathogenic-immunology area.

Dr. Hudson initiated and supervised research which was concerned with the study of various animal viruses. However, he concentrated on the Influenza Virus, the antigenic relationships of various strains of the virus, and on the hemagglutinating nature of the virus.

Dr. Woolpert's research activities in many respects were closely allied to Dr. Hudson's. His research interests included the study of the pathogenicity of several strains of Actinomyces and the experimental use of animals and animal tissue for the propagation of the human influenza virus, the vaccinia virus and poliomyelitis virus.

Dr. Birkeland's research interests transcended many areas; however, a good deal of his efforts were centered around bacterial diseases, viral diseases and immunological responses. In this respect, he directed studies that were concerned with physical and chemical controls of bacteria which included the study of lethal effects of X-rays on bacteria and neutron bombardment of species of Penicillium notatum. He had a keen interest in tuberculosis. Several of his studies dealt with the

fatty acid metabolism of mycobacteria, especially, M. tuberculosis. This included fundamental work on the oxidative enzymes of this species, and their identification in cell free extracts. He and several of his students studied the cellular, serological and hypersensitive responses of tuberculosis infected animals. They employed the hemagglutination technic to study antibody response to infection and to tuberculin. They studied the leucocytic response of tuberculous animals. He also directed several studies on the effect of temperature and humidity on the susceptibility of experimental animals to virus infections. He studied the cytopathology of virus infected kidney cell cultures. He directed some studies on germfree animals infected with certain Enteroviruses. Research was also carried on the comparative studies of Histoplasma capsulatum and a Trichosporon-like organism.

In 1946, Dr. Matthew C. Dodd was added to the faculty and since then he and his students have conducted extensive research in immunology and serology. Dr. Dodd's initial research included studies on the cultural, morphological and cytochemical properties of several bacterial pathogens; the antigenic properties of chemically treated and antibiotic resistant strains of various organisms; preparation and use of Anti-Human Globulin Serum; and an investigation of the sites of antibody formation by the use of radioactive antigen. Later his research activities began to center around the role of hypersensitivity and auto-immunization in diseases. His groups studied the auto-immuno phase of acquired hemolytic anemia. They carried out research on the serology of this human disease and the relationship of virus and enzyme modified red cells to it.

This included an extensive investigation of tissue culture technics for the study of erythrophagocytosis by macrophages for possible clues to the destructive mechanism. Studies also in detail were the hemagglutination and hemagglutinin responses in tuberculosis, with red cells sensitized with enteropathogenic E. coli, in antisera to virus treated erythrocytes. Also studied, were serologic properties of hemagglutinins and viral antibody in antisera to virus-modified erythrocytes; properties of antisera to erythrocytes modified by virulent and avirulent strains of Newcastle's Disease virus; studies of the enteropathogenic E. coli; studies on human low density lipoprotein; studies of A/Asian Influenza viruses; methods for the detection of antibodies to penicillin, etc. Immunologic studies were carried out on properties of various anti-sera, to platelets and leukocytes. In the 1960's, Dr. Dodd's group did extensive research on auto-immune diseases; auto-immune responses; demonstrated the antigenic nature of ribosomes and soluble ribonucleic acid; the use of immunofluorescence for the in vivo detection of auto-antibodies and auto-antigens; and studies on the immunogenicity of the antigen-antibody complex. His research activities continued into the present with recent findings on the immuno-chemical properties of nucleoprotein antigens from normal and malignant tissues; immunological properties of human gingival tissue; immuno-chemical analysis of membranes of normal and malignant canine tissue; and serologic specificity of antibodies to ribonucleic acid in normal and rheumatoid arthritis.

Dr. Riddle joined the staff in 1947. His interests included the use of tissue culture technics in attempt to study: Toxoplasma; antibody

production; conditions favoring erythrophagocytosis; Newcastle Disease Virus; and an attempt to isolate viruses from human hepatitis and warts. He was also concerned with the immunological specificity of human low-density lipoproteins possibly related to atherosclerosis.

Dr. Melvin S. Rheins joined the faculty in 1949. His early research interests were concerned with antigens of Mycobacterium tuberculosis and a serologic study of antibody response to this and related mycobacteria. He also studied the relationship between the antigens of M. tuberculosis and antibodies present with the disease, as well as the auto-immune response of tuberculosis. In the 1960's, Dr. Rheins continued his research interests on tuberculosis, as well as, extending his research interests into other areas. These included: the study of the hemagglutinating properties of several pathogenic organisms including M. tuberculosis; the study of antinuclear substances in tuberculosis and histoplasmosis; experimental immunity to tuberculosis using microsomal fractions; and the characterization of lipids of Shigella dysenteriae.

Dr. Jack N. Baldwin joined the Department in 1950. Dr. Baldwin's primary interests at this time were in bacterial genetics and the mechanisms of virulence of pathogenic bacteria, particularly staphylococci. He continued his studies with properties of the toxin and hemolysins and on the phage-typing characteristics of virulent staphylococci, and later on the demonstration of the transduction of penicillin resistance in lysogenic strains of this species. He also studied some genetic linkages in S. aureus which included the locus for the synthesis

of methionine, the tryptophane loci and the determinant controlling penicillinase production by transduction in lysogenic strains.

Dr. Frank W. Chorpenning was added to the faculty in 1963. His research interests are centered around the specificity characteristics, origin of normally occurring antibodies and in the immunochemical specificity of bacterial antigens. He has studied the isolation, purification and immunochemical characterization of the Rh₀(D) active lipoidal material extracted from human erythrocytes. He has also carried out studies examining the occurrence in animals of normal antibodies which react to heterogenetic bacillary antigen, tried to chemically analyze this antigen, and carried out immunological analysis on purified crossreacting bacillary antigen.

Dr. Nancy J. Bigley joined the faculty in 1964. Since Dr. Bigley was associated with Dr. Dodd's research activities since 1957, her research was closely aligned to his. Dr. Bigley and her students were interested in the comparative properties of normal and malignant canine tissue. Their research included: auto-antibody detection and characterization of immunoglobulin binding by means of immunofluorescence; DNA-RNA hybridization; and immunochemical properties of deoxyribonuclear proteins. Her students also studied: the immune response to human and rabbit ribosomal RNA, production of anti-polyoma serum and electron microscopy of cells infected by polyoma virus, and the mechanism of cellular immunity in experimental salmonellosis.

In 1964, Dr. David A. Wolff was added to the faculty. His specialty is animal virology. Dr. Wolff established a cell culture (tissue culture)

laboratory. His major interest is in the examination of the role of lysosomes in the development of viral-induced cell damage. His work includes: the cytochemical and biochemical detection of lysosomal enzyme activities and the use of antiviral compounds in studying the relation between lysosomal enzyme release and cell damage. Other studies include the purification of viruses and sub-cellular organelles and the mechanism of viral plaque development.

Veterinary Microbiology

The department has always maintained close relations with veterinary medicine, both in teaching and research. Prior to 1935, some of the research carried out in the department was concerned with problems involved with pathogenic diseases of various domestic animals.

In 1935, Dr. Floyd Markham was added to the staff specifically to teach veterinary bacteriology. His research studies were centered around the study of the leucocytic response of mice to hemolytic streptococci infection and to the epidemic influenza virus. His other studies included the study of the contents of the Bovine rumen and the Genus Listeria.

Dr. Lloyd C. Ferguson took charge of this area in 1947. Dr. Ferguson carried out research that was concerned with the demonstration of cellular antigens in human erythrocytes, the bovine cellular antigens and the cellular antigens of Hereford cattle. These included the studies of the inheritance of bovine cellular antigens. He also carried out research which was concerned with the immunology of blood types; with oral streptomycin therapy in dogs, and with the pathogenesis of and antibody response to Leptospirosis of swine.

In 1953, Dr. Edward Bohl, who was a student of Dr. Ferguson, succeeded him. Dr. Bohl did research on the pathogenic nature of Leptospirosis in hamsters and swine. He studied the cytopathogenic effect of hog cholera virus and pseudorabies virus in tissue culture and the properties and epidemiological behavior of porcine enteroviruses. Dr. Bohl also studied Colibacillosis and the course of infection with a porcine enterovirus in germfree piglets.

In 1963, Dr. Julius P. Kreier had undertaken the direction of veterinary microbiology. Dr. Kreier's research interests center around host-parasite relations of certain blood-borne parasites. These studies included: the immunologic studies of rats infected with Plasmodium berghei; serological studies of chicks infected with Plasmodium gallinaceum; and erythrocyte survival in infected animals with Plasmodium cynomolgi, Plasmodium berghei, Plasmodium gallinaceum. He has also been concerned with virus diseases of animals. These include: the study of the porcine virus; the distribution of PPLO, PLV and Parainfluenza agents in sheep; the pathogenesis of fowlpox virus.

Dairy and Food Microbiology

Dr. Harry H. Weiser who joined the Department in 1928 was given charge of the development of Food and Dairy bacteriology. Since then, until his retirement from the Department in 1968, Dr. Weiser directed the teaching and research in this area. Dr. Weiser's early work was primarily in dairy bacteriology with special emphasis on cheese. He did some studies on: Propionibacterium shermanii in Swiss cheese making; classification

of swiss cheese starter cultures and factors affecting their activity; bacteriological and biochemical studies of Italian cheese starter organisms. He supervised studies on: non-proteolytic alkali forming bacteria from dairy products; growth and biochemical features of microorganisms grown in cow's and soybean milk; metabolic studies on psychrophilic bacteria isolated from milk; some biochemical changes induced in milk by certain saprophytic organisms; survival of E. coli in milk and other dairy products; electrophoretic techniques in the study of milk from mastitic cows; the influence of DDT on the organisms found in milk. In the later 1940's, Dr. Weiser began to investigate problems concerned with food and water. As related to food, some of his research was concerned with: the effects of certain microbes on the spontaneous oxidation of carotene; the bacterial flora of frozen egg products; microflora of creamed chicken and chicken salad; the effect of certain antibiotics upon survival of microorganisms in various food products; use of antibiotics in the processing and preservation of beef; microbiology of table salt, brines, salted foods and crushed ice; the effect of cooking on survival of Salmonella organisms in chickens; microbiological study of precooked frozen dinners. His research also included studies of antibiotics on certain food related microorganisms, resistant strains of these and the effect of some of them on food preservation. He also examined the influence of antibiotic feeding on the keeping quality and antibiotic content of poultry products. His studies also included the isolation and some physiological studies of rumen microorganisms. His most recent research has dealt with the dietary effects of chlortetracycline on resistance to certain bacterial infections.

Microbial physiology-ecology

In 1935, Dr. Stahly was added to the Department. His responsibility was to develop a course in bacterial physiology and a research program in this area. Dr. Stahly's research interests were quite varied. His early research interests are somewhat indicative of the state of bacteriological research of that time, that is, research activity in the study of pathogenesis and use of pathogenic organisms as experimental agents. This is reflected by his early interests in the study of: the acquisition and retention of heterophile antigen by bacteria; nutritional requirements for bacteria of the Genus Brucella; study of the aerobic metabolism of Brucella abortus; some relationships between growth and pathogenicity for mice of hemolytic streptococci; and growth requirements for streptococci. His research interests also included studies on the: production, separation, and identification of carotenoid pigments produced by some microorganisms; an assay of antibiotic substances by nitrate reduction in susceptible bacteria; the use of S. aureus in the assay of glutamic acid; the use of L.mesenteroides as an assay agent for certain vitamins; and the preparation and use of certain radioactive compounds for studies of sites for antibody formation. He studied the effects of Beta particles from radiophosphorus on bacteria. He isolated nutritional requiring variants of Bacillus globigii, Saccharomyces cerevisiae, and Pseudomonas aeruginosa produced by Beta particles from Radiophosphorus. He studied the morphological and physiological characteristics of some of these variants. Dr. Stahly's later work was mostly concerned with dextran production. This included the studies: on the factors involved in dextran production of L.mesenteroides;

on the effects of cultural factors on dextran production; and on the purification, properties, and mechanism of action of the enzyme dextran-sucrase.

Dr. Chester I. Randles was added to the faculty in 1949. Dr. Randles' research interest efforts have been largely directed toward metabolic processes or pathways of a variety of microorganisms, primarily with respect to aerobic energy metabolism, and involving both autotrophs and heterotrophs, pathogens and non-pathogens. This is reflected by his studies on the oxidative metabolism of Neisseria catarrhalis; oxidation of glucose by Pseudomonas; and sulfur oxidation by Thiobacillus species. He also directed research that was concerned with: the bacterial metabolism of sorbitol and other polyhydric alcohols; mannose production by Pseudomonas fluorescence; the microbial utilization of ethylene glycol; factors involved in capsule elaboration on Pastuerella pestis. He also studied the chemistry, structure and microbial degradation of a Pseudomonas glycopeptide which exhibited Rh₀(D) specificity. Dr. Randles later studies have been directed toward autotrophy and ecology. Particular interests here have been with various types of sulfur bacteria and their habitats, including acid-mine waters, "sulfur" springs and western Lake Erie. At present his primary studies are directed toward the Western Lake Erie ecosystem which presents an excellent problem ecosystem for systems analysis and a fine subject for microbial ecology studies. In this regard, Dr. Randles is part of an interdisciplinary effort to study water quality in Lake Erie through systems analysis. His contribution to the model will be the study and use of oxygen as a measure of the Western Lake Erie physico-biological system. He is also part of the research team within the department that is studying "The Ecologic Impact

of the Interactions Among Microorganisms and Aquatic Contaminants in Lake Erie."

In 1963, Dr. Patrick R. Dugan joined the Department. Dr. Dugan's interests are physiology-ecology with emphasis on water microbiology. He and some of his students have been doing research on the chemoautotroph Ferrobacillus ferrooxidans. This includes: an investigation of the mechanisms of iron oxidation; acid production and its relation to pollution; model mechanisms of iron oxidation; and energy supply for Ferrobacillus sp. His interests also include the study of the activities of microorganisms in acid mine waters such as: the oxidation and reduction of iron and sulfur; microbial sulfate reduction; microbial flora of acid mine water, acid formation and acid removal; and microbial dissimilatory sulfur cycle in acid water. These studies have yielded a number of interesting bacteria for further physiological studies. Dr. Dugan and his students are currently studying two of these in some detail, Thiobacillus ferrooxidans and Zoogloea ramigera a floc forming organism. With Thiobacillus ferrooxidans studies are being done on mechanism of iron oxidation and on the inhibition of this mechanism by certain non-toxic nutrients. With Zoogloea the research has been concerned with the isolation, and identification of Zoogloea species, the relationship between the zoogleal matrix and floc formation, the fine structure and composition of the matrix, the relationship of this matrix and floc formation with uptake of metallic ions, and the structure of this exocellular polymer and its relationship to bacterial flocculation. Dr. Dugan is also part of an interdisciplinary effort concerned with the study of water quality of Lake Erie using a systems approach. In this regard, he is responsible for the microbiological considerations in the System. He is also part of the research team within the Department involved in the study of "The Ecologic Impact of the Interactions Among Microorganisms and Aquatic Contaminants in Lake Erie." One of his

studies on this project is the evaluation of the pesticide content of "particulates" suspended in Lake Erie Waters.

Dr. James I. Frea was added to the faculty in 1965. Dr. Frea's interests are physiology-ecology and with the "non-typical" bacteria. His research interests have centered around the isolation and classification of species of the Order Actinomycetes. Most of the research activity in this area is being done with Streptomyces sp. In this regard, he and his students have made comparative studies of the morphology, cytology and physiology of Streptomyces fradiae and some of its asporogenic variants. These studies included the measurement of protein, ribonucleic acid, and deoxyribonucleic acid synthesis; DNA base composition; types of RNA; and the effect of inhibitors on the cellular systems. Dr. Frea is also part of the research team within the Department that is studying the "Ecologic Impact of the Interactions Among Microorganisms and Aquatic Contaminants in Lake Erie." His immediate interests in this program is the effects of particulates suspended in Lake Erie on Actinomycetes isolated from the Lake. He is also interested in the significance of nitrogen fixation and methane production in the Lake.

In 1966, Dr. Robert M. Pfister joined the faculty. Dr. Pfister's interests are microbial cytology-physiology-ecology. He and his students are interested in the structure-function relationship of intracytoplasmic vesicles and of the structure of the poly-beta-hydroxybutyrate granule of Bacillus cereus. Dr. Pfister is the Research Coordinator of the research team within the Department on the project

granted by the U.S. Department of Interior through the State of Ohio Resource Center, Ohio State University entitled, "The Ecologic Impact of the Interactions Among Microorganisms and Aquatic Contaminants in Lake Erie." He has supervised the majority of the technical work that has been done on this project. This includes the isolation of nearly 300 aerobic heterotrophs; evaluating the morphological and biochemical character of these; methodology of particle separation, and an electron-microscopic observation of some of these particles. He and some of his students are interested in the various aspects of the constituents of Lake Erie. This includes: the comparative studies on heterotrophic microorganisms isolated from Lake Erie and Antarctica with emphasis on temperature profiles and DNA composition. Also inclusive is the examination of the relationships between suspended particulates of Lake Erie, clay particles, pesticides and some of the heterotrophic bacteria isolated from the Lake. Studies are also being done on bacterial-algal associations. Dr. Pfister is also part of an interdisciplinary effort concerned with the study of water quality of Lake Erie using a Systems approach. In this regard he has concern for the microbiological considerations in the System.

Dr. Bruno J. Kolodziej was appointed to the Department in 1966. Dr. Kolodziej's major interests are microbial physiology-ecology. He and some of his students have been interested in several aspects of mineral metabolism on bacterial sporulation. The methodology of neutron activation is being used in the analysis of the incorporation of various

inorganic micronutrients as a function of growth and sporulation. This study includes a comparative study of cation uptake by various spore-formers and non-sporeformers. Cellular cation associations are an inherent part of this study. A study is also being done on the possibility of cation control of the terminal electron acceptor of the respiratory mechanisms during growth and sporulation. A study is being done on the electron transport patterns as a function of growth, sporulation and germination of Bacillus megaterium. Dr. Kolodziej is also a part of the research team within the Department involved in the study of "The Ecologic Impact of the Interactions Among Microorganisms and Aquatic Contaminants in Lake Erie." His interests are centered around the types and concentrations of metallic cations in solution, in the suspended particles, in the bottom mud and their relationships to the Lake ecosystem. The effect of increased levels of certain cations on certain microorganisms isolated from the Lake will be studied with a consideration of a cation-particle absorption effect contributing to a dilution response.

Microbial and Cellular Biology - 1969

Purpose of the Faculty.

The Academic Faculty of Microbial and Cellular Biology is an integral part of the College of Biological Sciences. In this capacity, this Faculty provides programs in teaching and research in various aspects of Microbiology and Cell Biology.

The present educational objectives of this Faculty are:

1. To provide undergraduate and graduate curricula in microbiology and cell biology.
2. The continuation of its service function to the University by presenting service courses in microbiology to those that desire the knowledge of the fundamentals of this art and science.
3. To provide research activities that provide the opportunities for graduate student research.
4. Presently, this faculty offers M.S. and Ph.D. degree programs in Microbiology and is in the process of developing a graduate degree program in Cell Biology.

Programs of the Faculty-Curriculum, Research

Introduction

The functions of this Faculty can be directly described under a general broad program covering cell structure and function; however, there are three specific prominent programs emerging according to the particular orientation, interests, and activities of this Faculty. These are conveniently labeled:

1. Host-parasite relations (Immunology-Pathogenic)
2. Microbial physiology-ecology
3. Cell biology

Each of these programs include teaching, research and service functions.

The fundamental program, from which the other three programs arise, is the overall cell structure and function program. Included is the: structure-function of viruses, bacteria and other unicellular or cellular organisms, and structure - function of cells of multicellular organisms.

Host-Parasite Relations.

The host-parasite area represents a kind of relation between an organism and its environment which is of great significance not only from the standpoint of the parasite but also from the standpoint of host responses, especially at the cellular level. In recent years, the study of these relations between microbes and their animal hosts, and essentially infectious diseases has been completely reoriented from the classical medical approach, to the study of the biological phenomena underlying these relations, namely, mechanisms of virulence and host resistance. The old and the new concepts are inherent in the current course offerings by the Faculty aligned with this

area. The following are courses associated with this area:

1. Principles of Infection and Resistance - a study of host-parasite relationships, with emphasis on pathogenicity and immunity.
2. Microbial Parasitism - an overview of parasitic relationships with emphasis on host response as influenced by route of contact, nature of etiologic agent(s), host species, and environmental influences.
3. Pathogenesis and Immunology of Infectious Diseases - a consideration of microbiological and immunological aspects of representative types of infectious diseases.
4. Bacterial Pathogens - emphasis on the nature of representative bacterial disease agents.
5. Pathogenic Protozoology - various pathogenic protozoa of animals; host-parasite relationships; pathogenesis of protozoa diseases; structural characteristics of parasites.
6. Basic Virology - the basic physical, chemical, and biological properties of animal and bacterial viruses including intracellular replication and subcellular responses to virus infection.
7. Advanced Virology - laboratory study of viruses and some of the virus diseases of animals and man; methods of isolation, propagation, identification, diagnosis, and controls are considered.
8. Immunology and Immunochemistry - a thorough treatment of the basic phenomena involving antigens and antibodies, their physico-chemical natures, and immunological reactions.
9. Advanced Immunology - advanced studies of immunological phenomena, with emphasis on the physical and chemical aspects of antigens and antibodies.

10. Isoantigens of Man and Animals - advanced genetic, chemical, and immunological studies of isoantigens, including those in erythrocytes, leucocytes, platelets, body fluids, and tissues.

Research associated with this program, as it now exists, is concerned namely with the cellular and molecular aspects of a variety of immune phenomena in animals ranging from the cellular and molecular aspects of antibody production, cellular immunity, immunology of nucleic acids, resistance in tuberculosis and other bacterial and viral diseases, immunochemistry associated with tissue antigens related to the immunology of cancer and correlary studies of the heterogenetic antigens of bacteria and isoantigens of human tissue.

Microbial Physiology-Ecology

The physiology-ecology program is directed toward examining the relationships between the unicellular forms and their environments, water, soil, food, etc. The following are courses related to this area:

1. General Microbiology (I) - fundamental principles of microbiology and of the characteristics of microorganisms emphasizing their morphology, classification, visualization, isolation, cultivation and maintenance, growth and death.
2. General Microbiology (II) - fundamental principles of microbiology emphasizing the physiology, ecology, and genetics of microorganisms.
3. Physiology of Bacteria (I) - nutritional requirements of bacteria, mechanisms of anaerobic dissimilation of carbon compounds, and industrial fermentation.

4. Physiology of Bacteria (II) - bacterial enzymes, mechanisms and energy relationships in respiration, nitrogen metabolism, and bacterial syntheses.
5. Advanced Topics in Bacterial Physiology - laboratory study of bacterial physiology by a variety of techniques.
6. Food and Dairy Microbiology - the role of microorganisms in normal and abnormal fermentations in foods and dairy products; related sanitation and public health problems.
7. Advanced Food Microbiology - advanced studies in the metabolism of microorganisms involved in preservation and food processing using radioisotopes, chromatography, and electrophoresis.
8. Aquatic Microbiology - the nature and activities of bacteria in the aquatic environment with emphasis on the different physiological types found in the Lake Erie region.
9. Water Microbiology - a basic study of the relationships and influence of aquatic environments on microorganisms and the effect of microbial metabolic processes on the quality of water.
10. Microbial Cytology - a thorough study of morphology, fine structure and composition of microorganisms and the relation of these to cell function.
11. Microbial Genetics - a thorough study of microbial genetics with emphasis on bacteria and viruses.
12. Applied Microbiology - a study of the metabolic activities of microorganisms exploited to produce useful chemical reactions or commercial products.

13. Special Groups of Microorganisms - a study of the morphology, physiology, and ecology of "non-typical" bacteria, actinomycetes, mycobacteriales, spirochaeles, filamentous S bacteria and others.

The research associated with this program is concerned with the interaction between microbial cell metabolism and the cellular environment with special interests in certain autotrophs, aerobic sporeformers, "non-typical" bacteria and bacteria associated with certain blue-green algae. This includes aspects of energy metabolism, mineral metabolism and nitrogen metabolism. Also of interest are the effects and interactions of microorganisms on the ecology of the aquatic environment.

Cell Biology

This program essentially is concerned with cellular aspects such as development, specialization, differentiation and control mechanisms, and the manner in which these relate to multicellular organisms. The following are courses associated with this area:

1. General Cellular Biology - study of generalized subcellular structures and metabolism emphasizing dependence of function on structure, principles of organization and biosynthesis, and capture and utilization of energy.
2. Protozoan Growth and Reproduction - a consideration of factors regulating the growth and multiplication of selected protozoans with emphasis on the roles of environment and genome and on molecular mechanisms.

Research interests focus on cellular growth and development in such organisms as protozoa, algae, fungi and ferns. In these studies, much attention is being given to problems affecting growth such as; environmental factors

control mechanisms, genetic aspects, cell interactions, optimal conditions for selected metabolic processes and the replication and control effects of cellular organelles.

Service Courses

1. Microbiology in Relation to Man - a general microbiology course for any student in the University.
2. General Microbiology (I) - a general microbiology course for science majors.
3. Basic Microbiology for Science Teachers - a specially designed general microbiology course.
4. General and Pathogenic Microbiology for Dental Students - general microbiology with special reference to the oral cavity.

New Facilities

The Graduate Research Center for Biological Sciences will be completed in the Summer, 1970. This Faculty will move in its entirety to this new building. It will house all of its teaching laboratories and all research laboratories. This Faculty will occupy the third, fourth, and fifth floors. With these new modern teaching and research laboratories will come new and additional research equipment and animal facilities.

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3. Dr. Matthew C. Dodd, Research in the Department of Bacteriology as Related to Medicine, 1934-1958.
4. Birkeland, Jorgen M. and collaborators. Some Notes on the History of Microbiology in Ohio. 1833-1963.
5. Personal inquires with other Faculty members - Bruno J. Kolodziej.

Faculty of Microbial and
Cellular Biology - 1969.

Immunology-Pathogenic Program
Professors

Dr. Matthew C. Dodd, Chairman
Dr. Jorgen M. Birkeland (Emeritus)
Dr. N. Paul Hudson (Emeritus)
Dr. Melvin S. Rheins
Dr. Oram C. Woolpert (Emeritus)

Associate Professors

Dr. Frank W. Chorpensing
Dr. Julius P. Kreier
Dr. David A. Wolff

Joint Appointees

Dr. Edward H. Bohl, Professor (OARDC)
Dr. Lloyd C. Ferguson, Professor (OARDC)
Dr. Colin R. MacPherson, Professor, Pathology
Dr. Samuel Rosen, Professor, Dentistry
Dr. Samuel Saslaw, Professor, Medicine
Dr. George P. Wilson III, Professor, Vet Surgery & Radiology
Dr. Ted H. Suie, Associate Professor, Ophthalmology
Dr. Ronald L. St Pierre, Assistant Professor, Anatomy

Instructors

Mrs. Elizabeth M. Mote
Miss Barbara Troendly

Microbial Physiology-Ecology Program
Professors

Dr. Chester I. Randles
Dr. Grant L. Stahly (Emeritus)

Associate Professors

Dr. Patrick R. Dugan
Dr. Robert M. Pfister
Dr. James I. Frea

Assistant Professors

Dr. Bruno J. Kolodziej

Joint Appointees

Dr. Robert H. Miller, Associate Professor, Agronomy

Instructor

Miss Ann M. Ackermann

Cell Biology Program
Associate Professors

Dr. Thomas J. Byers
Dr. Donald K. Dougall
Dr. Wayne B. Parrish

Assistant Professor

Dr. William R. Sharp
Dr. Benjamin N. Wise

Adjunct Professors

Dr. Richard A. Dilley
Dr. Marvin R. Lamberg
Dr. Hilton H. Mollenhauer
Dr. Minochen C. Reporter