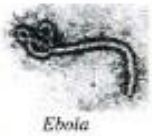
Bacillus subtilis grown on media with food dyes by Eshel Ben-Jacob

Antonie saw "wee animalcules"

Macrophage phagocytizing *E. coli*



Ebola

Gene Chip

Microbiology in the Northeast Branch American Society for Microbiology

A Historical Review

1899 - 1999

In Celebration of the ASM Centennial

Region I, American Society for Microbiology
October 26, 27, & 28, 1999
Worcester Centrum Centre, Worcester, Massachusetts

INTRODUCTION AND ACKNOWLEDGMENTS

This historical review of microbiology in the Northeast Branch has been compiled in honor of the ASM Centennial and is dedicated to all microbiologists in the Branch committed to the microbiological sciences. In it you will find a reprinting of the Volume I (up to 1970) and updates and additions in the Volume II (up to 1999).

The names of some departments at colleges and universities have changed from Microbiology to Biology, Molecular Biology, Molecular Genetics or any combination thereof. Regardless of the department title, microbiological sciences help us to better understand ourselves and our world and the study of the microbial community can lead us to beneficial applications for the environment, the industry, and for the health and well-being of all.

Biotechnology companies are producing new and improved healthcare products and pharmaceutical companies are acquiring are making arrangements with biotechnology firms to facilitate the development of new medicines.

Hospitals have merged to become healthcare systems and some hospital laboratories are performing of providing more and more molecular diagnostic tests.

It has been a tough time in healthcare with the merges and managed care organizations, but a very exciting time in microbiology. One needs only to read the newspaper and the reports in ASM News to see the announcement of the defenses and of new applications.

This past century began with the excitement around a new human tissue culture technique used to isolate the polio virus which opened the way for the isolation of many other viruses in a very short time. As we leave this half century and this millennium, we are excited about the diverse role of microorganisms in molecular biology and genetics and in the development of new technologies.

Microorganisms are an essential an integral part of our lives and as Dr. Stuart Levy said in the Centennial Issue of ASM News, "We must learn to coexist, and ways to better our lifestyle. Rather than try to destroy them, we should aim to control and direct them to our benefit".

I am indebted to Paulette Howarth, Faith and Joseph Tracy, and Jennifer Thomas by the manuscript preparation, to Jeff Karr, ASM Archivist, for his efforts in researching essential material, and to all the contributors without whom there would be no historical review. It is good news to note that three of the previous contributors were able to contribute again to the 1999 volume; Harold Amos, Anne Coghlan, and Ruth Kundsin.

The extent of the historical view was limited only by time. The contributors and I regret any omissions.

Emy Thomas
NEB-ASM Archives
October, 1999

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In Celebration

of the

ASM Centennial

October, 1999

The History of Microbiology in the Northeast Branch of The American Society for Microbiologists

"Before him, Egyptian darkness with his advent a light that brightens more and more as the years give us ever fuller knowledge."

William Osier

1899 -1970

70th Annual ASM Meeting

Boston, Massachusetts • April 26 - May 1, 1970

The Archives Committee on the North-East Branch, American Society for Microbiologists herewith presents its historical review of the early bacteriology of this area as it developed into the expanse of today's microbiology.

This brochure can but give a glimpse of the basic structure of the New England founding workers which has become a truly distinguished building of knowledge. It is hoped that readers will enjoy the orientation.

Boston's history runs time wise almost simultaneously with Baltimore on the east coast, each locale possessing dedicated workers whose names are synonymous with successive increments of knowledge, gained by the knack of Serendipity. Shared experiences instigated further discoveries in the early laboratories, continuing so to date.

It is with real appreciation that we acknowledge the courtesy and generosity of the Lederle Laboratories, Clinical Laboratory Aids Department, in the sponsorship of this brochure for the 70th Annual Meeting in Boston, Massachusetts.

Catharine Atwood
Chairman, Archives Committee

The History of Microbiology
in the North-East Branch
of
The American Society for Microbiologists
70th Annual Meeting

Boston, Massachusetts
April 26 - May 1, 1970

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ORIGIN OF THE SOCIETY of AMERICAN BACTERIOLOGISTS

"Bacteriology as a distinctive science in America undoubtedly obtained its major impetus with the establishment of the Society of American Bacteriologists at New Haven in 1899. The Medical Hall of Yale University, on December 28, 1899, was the scene of the first session, attended by thirty bacteriologists and presided over by Prof. W.T. Sedgwick. At the third session, in North Sheffield Hall, on December 29th, an organization was effected and a constitution adopted. The officers elected for the first year were: W.T. Sedgwick, President; A.C. Abbott, Vice-President; H.W Conn, Secretary-Treasurer; Councilors: H.C. Ernst, Theobald Smith, E.O. Jordan, and A.E. de Schweinitz.

Particularly instrumental in the organization of the Society were Edwin O. Jordan and H.W. Conn. The following extracts, doubtless written by them, give illuminating details concerning the history of the organization.

'The origin of the Society of American Bacteriologists is to be found in a feeling, upon the part of certain members of the American Society of Naturalists, that with the multiplication of scientific societies, there was none whose nature was such as to bring together the large and growing number of investigators who are studying bacteriological topics. It was felt that the rapid development of this subject along biological, agricultural, industrial, as well as hygienic and pathological lines, is creating a special branch of science; and it was believed that an association of investigators in these various lines, would be mutually helpful.

'Influenced by these considerations, three gentlemen: Prof. H.W. Conn, Prof. E.O. Jordan, and Prof. A.C. Abbott, at the meeting of American Naturalists in New York in 1898 determined, after some consideration of plans, to endeavor to obtain the general opinion of bacteriologists upon this matter, and, if this were favorable, to bring them together for the purpose of organization at the meeting of Naturalists to be held in 1899.

'In accordance with this purpose, in October, 1899, there was sent to about forty American bacteriologists, (a) circular letter….The responses to this letter were immediate and emphatic….Some eminent bacteriologists, who a few years ago had expressed a doubt as to the feasibility of such a society, now stated that they considered the time had come for its organization….At the same time that these letters were received, a sufficient number of papers, for presentation at the first meeting, were sent to Professor Abbott, to insure a satisfactory and interesting program....'

Thus was bacteriology launched in America upon a fruitful career, upheld by the hopes of its earnest devotees despite the misgivings and doubts of two or three of its leaders."[1]

THE BOSTON BACTERIOLOGICAL CLUB

Predating the formation of both the Connecticut Valley Branch and the North-East Branch of the Society was a group of men in and near Boston devoting "their days to the pursuit of microbes and their nights to talking about them. Whenever three or four met there was always a discussion on which of the many mooted bacteriological questions might happen to be broached. The late 1890's, when bacteriologists were bacteriologists and studied microbes as biological specimens instead of potentials, radiations, psychological systems and electrophoretic concentrations of isoelectric proteinates", saw the formation of a unique group, The Boston Bacteriological Club. It had no officers, no constitution, no by-laws. At each meeting the date and place of the next was selected. Membership was voluntary, based on community of interest and personal chemotaxis. Strictly masculine, it retained that privilege in 1911 when, a formal secretary-treasurer was appointed, with the responsibility of setting up four annual meetings, and a chairman for each meeting who secured speakers on such subjects as medical, sanitary, industrial bacteriology etc. Such speakers included d'Herelle, Smith, Huntoon, Bronfenbrenner, Brown, Shattuck, Park and a continuing successive host of famous workers. In 1921 consideration was given to a request to admit women members, but instantly denied. In 1941 the membership of the popularly called "Bug Club" had grown from a nucleus of less than ten to seventy-five. Meeting places, originally in a local hotel or a famous eating spot or restaurant, and occasionally a private

home, became most frequently at M.I.T. during 1920-1949. Since 1953 to date, meetings have been held regularly at the Brooks Hospital. The Club purposely held no meetings during 1947-1953 in order to support its sponsored and newly formed North-East Branch of the S.A.B. which extended membership to women.[2]

The Boston Bacteriological Club has continued to thrive, including in its still entirely masculine membership a high proportion of workers in every category of present and pertinent interest and application. This group of men functioned as host to the meetings in Boston of the national organization of the Society of American Bacteriologists on three occasions: in 1910, in 1920, and in 1930. In 1952 members of the Club and the North-East Branch assumed jointly the roles in the local committee for planning and operating the 52nd Annual Meeting, under Dr. J. Howard Mueller then president of the Branch Society and Head of the Department of Bacteriology at Harvard Medical School and Howard E. Lind, chairman of the joint committee and Director of the Sias Laboratories of Brooks Hospital.

The continuity of the Boston Bacteriology Club is evidenced by the following list of Secretary-Treasurers and dates of office:

Samuel C. Prescott	Jan. 1911	-	Oct. 1915
Edward A Ingham	Oct. 1915	-	Oct. 1917
Clair E. Turner	Oct. 1917	-	Apr. 1920
Murray P. Horwood	Apr. 1920	-	Oct. 1927
Bernard E. Proctor	Oct. 1927	-	Jun. 1931
Marshall W. Jennison	Jun. 1931	-	May 1938
Cecil G. Dunn	May 1938	-	May 1949
Howard E. Lind	May 1953	-	May 1964
Delbert Kimball	May 1964	-	Present

BOSTON BACTERIOLOGICAL CLUB MEMBERS WHO HAVE BEEN PRESIDENT OF THE SOCIETY OF AMERICAN BACTERIOLOGISTS

Member	Affiliation	Year of Presidency
Dr. William T. Sedgwick	M.I.T.	1900
Dr. Theobald Smith	Harvard Medical School	1903
Dr. Edwin O. Jordon*	Lawrence Expt. Station	1905
Dr. C.E. A. Winslow*	Formerly M.I.T.	1913
Dr. S. C. Prescott*	M.I.T.	1919
Dr. Milton J. Rosenau	Harvard Medical School	1934
Dr. Charles A. Stuart	Brown University	1956
Dr. Salvatore E. Luria	M.I.T.	1967

*Student of Sedgwick

THE LEO F. RETTGER SOCIETY, CONNECTICUT VALLEY BRANCH

Leo F. Rettger of Yale in 1917 sponsored a series of informal seminars for his students, the sessions usually addressed by Dr. Rettger, with occasional men of science as guest speakers. Ira Hiscock and Friend Lee Mickle recall in 1970 the pleasure of being young invited guests.

This group was formalized as the Connecticut Valley Branch, A.S.M. at a first meeting held November 3, 1922 in Kirtland Hall, New Haven with thirty-three members present to organize with Prof. Leo F. Rettger, President, Dr. Francis G. Blake, Vice-President, Mr. John R. McClelland, Secretary-Treasurer, the president giving a talk on the Aims and History of the then S.A.B. Leo F. Rettger was S.A.B. president in 1917. Officially this was the 15th Branch. As such it served as host to the 25th Annual Meeting of the S.A.B. in New Haven, December 27, 28, 29, 1923 thus early demonstrating active participation in microbiological science.

There have been four excellent joint meetings of the North-East, the Connecticut Valley and the Eastern New York Branches within the last decade.

FORMATION OF THE NORTH-EAST BRANCH OF THE SOCIETY OF AMERICAN BACTERIOLOGISTS

Action was taken in the fall of 1947 by Dr. Cecil G. Dunn, then Secretary-Treasurer of the Boston Bacteriological Club, to initiate formation of a local branch of the Society of American Bacteriologists. After soliciting members of the Boston Bacteriological Club by means of a questionnaire and otherwise in order to ascertain their opinions regarding the formation of a local branch of the S.A.B. and the status of the "Bug Club", communications were made with Dr. LeLand W. Parr, Secretary-Treasurer, and Dr. Grant L. Stahly, Director of Local Branches over a period of several months, starting with a letter to Dr. Parr on October 24, 1947.

A petition was prepared through the efforts of Cecil G. Dunn, who went around to members of the National Society and secured the necessary signatures and forwarded them to Dr. Stahly: the petition was received by him shortly before Thanksgiving and forwarded to Dr. Parr immediately for action by the Council of the S.A.B. On Page 13 of the January News Letter of the S.A.B., the foundation of the North-East Branch was noted, the 24th member branch of the Society.

On April 16, 1948, a notice was sent to individuals in the Boston area who were interested in bacteriology, advising them of an organizational meeting of the North- East Branch of the S.A.B. which was to be held on Saturday evening, April 24 at 7:30 p.m. in the West Dining Hall of the Graduate House, M.I.T. At this meeting, Dr. Charles Stuart was elected President; Dr. Geoffrey Edsall, Vice-President; Dr. Cecil G. Dunn, Secretary-Treasurer; Dr. Howard Lind, Councilor; and Dr. Genevieve Young, Alternate Councilor. Dr. Howard Mueller, Dr. Ralph E. Wheeler, and Dr. Edwin H. Place were made members of an Executive Committee.

The North-East Branch membership, as that of the Boston Bacteriological Club, is drawn from the many hospitals, medical schools, colleges, state and local public health departments, and industrial foundations with active programs covering the constantly developing science of microbiology. Research, application and teaching offer a constant challenge for the discovery of new facts and development of new concepts.

THE DEVELOPMENT OF EARLY BACTERIOLOGY IN BOSTON

It would be difficult to state with accuracy the method of origin and focus of bacteriological interest in the Boston district. There are, however, certain reference points which may serve to fix approximately the period in which the consideration of bacteria and other microorganisms began to be seriously undertaken.

Bacteriological work in America had begun in a sporadic way before 1880. Dr. G. M. Sternberg, Prof. T. J. Burrill of the University of Illinois, who had discovered the bacillus of pear-blight in 1877, Dr. W. H. Welch at Bellevue Hospital Medical College, and Dr. T. M. Prudden at the College of Physicians and Surgeons were all investigating bacteria prior to 1880. In that year Sternberg translated and published in this country the book on bacteriology by Mangin, to which he make extensive additions. This was the first American book on this subject.

In 1880, Prof. W. G. Farlow, the distinguished botanist of Harvard, gave a public lecture on bacteriology in Boston and therefore must have acquired some knowledge of these plants. This lecture stimulated H. W. Conn to undertake studies in this field, with Prof. Councilman at Johns Hopkins in 1881. In 1882 W. T. Sedgwick, at that time a member of the Johns Hopkins staff, gave a popular lecture on fermentation to the employees of the B.&O. Railroad, and in this lecture he described the 'new' microbes which were exciting so much attention as causative agents of disease, following the isolations and proofs established by Koch.
When William T. Sedgwick came to the Institute of Technology in 1883 he brought a deep interest in microbes and public health, and taught his students some bacteriology although no special or formal course bearing this name was established until three or four years later. In 1885 Dr. Harold C. Ernst gave a course of lectures on bacteriology at the Harvard Medical School, and a laboratory course was later established. It is thus probable that the beginnings of bacteriology in the Boston district may be ascribed to the lectures on the botanical side by Farlow, the practical studies of Sedgwick on water and milk supplies, and the studies of pathogens by Ernst.

Sedgwick early became the biologist of the State Department of Health, and in this capacity organized, with Mr. Hiran F. Mills, the Lawrence Experiment Station where studies on water purification and sewage disposal were begun as early as 1887. This is probably the first laboratory devoted to the aspect of bacteriology in America, and Sedgwick may be regarded as the pioneer in Sanitary Bacteriology. During the succeeding decade great interest was developed in Massachusetts cities as a result of the work of the Lawrence station and because of the number of serious outbreaks of typhoid fever which occurred, and which were carefully studied by Sedgwick by what we now should call the methods of epidemiology. While this was going on, the medical schools were developing departments of bacteriology, Prof. Gorham had established a course at Brown University, and work was begun at other colleges. The hospitals and health departments of Boston and some of the other cities and towns had also provided laboratories for bacteriological work. Dr. F.H. Williams of the Boston City Hospital had made valuable investigations on the diphtheria bacillus by 1893, but had to use the meager laboratory resources at M.I.T. in his researches.

The decade from 1885 to 1895 may be regarded as the era of rapid development of the new science of bacteriology in Boston and vicinity, for during this period, or shortly after, work in practically all aspects of the subject had been started at the various institutions of learning, the Massachusetts Department of Health, the City of Boston Health Department, Boston City Hospital and Massachusetts General Hospitals. The latter stimulated by the "information that Johns Hopkins Hospital was surpassing all others".

In this period the Boston Society of Medical Sciences was established and many papers on bacteriological subjects were read at its meetings.

No record of the early days of bacteriology would be complete without the mention of some of the names of those who have added their portion, large or small, to the sum total of knowledge in our field. Here should be mentioned William T. Sedgwick, Theobald Smith, Harold Ernst, Samuel C. Prescott, Wm. Lyman Underwood, Hibbert H. Hill, Charles E.A. Winslow, Homer Gage, William H. Weston, William T. Councilman, F.H. Williams, E.O. Jordan, Frank E. Mallory, Charles V. Chapin, Burt S. Rickards, Francis H. Slack, Calvin G. Page, locally all of whom had made some contributions prior to 1900.

CITY OF BOSTON HEALTH DEPARTMENT

"And the whole is well worth thinking o'er….."

Massachusetts Bay Colony records show a consistently progressive growth of public health laws between 1639-1795 for maritime quarantine, isolation, drainage, sewers, against pollution of Boston Harbor, provision for registration of births, marriages, deaths, attempted direct smallpox vaccination, and provision to supply the town with pure water. All this before the vaguest idea of the germ theory of disease.

June 22, 1797 the first Board of Health in the United States was formed and promulgated the Great Public Health Act giving local or district boards of health authority to abate nuisances and prevent spread of contagion by enforcing cleanliness - this statute remained unchanged for almost 150 years. On March 9, 1799 Paul Revere became Chairman of the Board of Health - this item of non-medical personnel on the board of health remained unchanged for years in many localities.

On July 8, 1800 the successful immunization of his wife and son, using cowpox vaccination, by Dr. Benjamin Waterhouse dramatically protected them during a smallpox outbreak. Following added favorable opinion of Dr. James Jackson, just returned from Europe, the Boston Board of Health officially recommended such vaccination. The change from a town to a city charter in the Acts of 1821, Chapter 110, gave the Board of Health "responsibility for the health, cleanliness, comfort and order of the city" allowing Mayor Quincy to claim a perceptibly lowered death rate to the abatement of nuisances, since all causes of disease were considered of environmental origin.

In 1851 authority was given by legislative act for the appointment of an inspector of milk, said title being carried until 1965 as a successfully initiated and maintained function of the department in establishing regulations for the control of a physically and bacteriologically pure milk supply for a large city, such regulations being adopted generally throughout the country.

In the fall of 1872 the disastrous Boston Fire occurred, at a time when there had been reported several hundred cases of smallpox. For the first time in the city's report there was no mention of sanitary conditions, for the rules and regulations adopted dealt entirely with smallpox and other so-called "zymotic diseases". Such were listed in 1878 in the report of the able Dr. Samuel H. Durgin as "smallpox, measles, diphtheria, scarlet fever, typhoid, typhus, whooping cough and diarrheal diseases - all with high mortality rates.

In 1880-1890 discoveries in the field of bacteriology successively identified the etiological agents of many diseases. The pioneer work of Louis Pasteur, Robert Koch, and Joseph Lister had instigated and established the germ theory of disease ushering in the Golden Age of Bacteriology.

The founding of the City of Boston Health Department bacteriological laboratory was due largely to the identification, treatment, and control of diphtheria, particularly in respect to 1) early diagnosis, 2) antitoxic treatment, 3) recognition of carriers, 4) determination of susceptible persons, 5) prophylactic treatment. The organism C.diphtheriae first was discovered by Edwin Klebs in 1883, first isolated in pure culture by Friedrick Loeffler in 1884, the first production of antitoxin by Emil Von Behring in 1890, and first used by Pierre Roux in 1894. Following the establishment in N.Y.C. of a Division of Pathology, Bacteriology and Disinfection by Dr. Beverley Robinson in 1893, a diphtheria epidemic that same year in Boston made it advisable to introduce the use of antitoxin and to offer bacteriological examination as, "An aid in detecting the disease, and deciding when cases might be safely discharged from isolation".[3]

Dr. Harold C. Ernst was appointed in October 1894 as an agent of the Board of Health with authority to procure such aids and materials as might be necessary for production of toxin for the horses and antitoxin for the patients, in order for the city "Not to be dependent for its supply of this therapeutic agent upon what the governments of France and Germany might see fit to spare, or upon a supply furnished by private individuals, who are interested mainly in pecuniary work and secondly in the interests of the community".

Thus early was acknowledge the tremendous value of the then called antitoxine, later described by Paul Ehrlich: "Antitoxines and antibacterial substances are, so-to speak, charmed bullets, which strike only those objects for whose destruction they have been produced."[4]

Dr. Ernst, stimulated by reports of the International Health Conference at Budapest in September 1894, (ten years after the isolation of C. diphtheriae), in less than a month had his equipment* in running order, although part of the first apparatus ordered from Berlin sank with the steamer "Elbe" in the North Sea. Active cultures were obtained from Washington, Baltimore and New York City and were tested to compare in standard with Pasteur Institute cultures by Drs. Calvin G. Page and S.A. Hopkins. The cultural work by Dr. Ernst was carried on at the Harvard Medical School. Five horses for the production of antitoxin were housed at Gallups Island in Boston Harbor, having been previously tested for glanders with mallein and tuberculosis by tuberculin by Dr. Alexander Burr, the city veterinarian, while guinea pigs for virulence tests were secured from Dr. Charles Minot.

Meticulous records and histories were kept - the annual reports of 1895, 1896, and 1897 have printed in itemized detail the entire work of this antitoxin production. For example the first year's work produced 34, 250 c.c. of serum from six horses, sufficient for 780 dosages. This was divided with 23, 220 c.c. going to the Boston City Hospital where there were isolation wards, 1770 c.c. to the Children's Hospital, and 140 c.c. to the Boston Dispensary, the remainder being retained for experimental purposes. The product used was whole serum of the immunized horses compared to the refined and concentrated plasma of today's product.

Early in 1897 plans were made for the establishment of a laboratory for the Health Department - a public health laboratory as distinguished from borrowing part-time service at the medical school. Dr. Ernst in preparation, production, supply and distribution not only for continued city use, but extension in the "Metropolitan District" predated the present state-wide free distribution of all biological products. His itemization of data is classical, his work was valiant.

By April 1898 laboratory quarters were secured. Dr. Hibbert Winslow Hill was appointed director, to serve both with inspiration and efficiency until 1905. On May 10, 1896 the work of the diphtheria diagnosis was transferred from the Harvard Medical School to the new laboratory. In March the production of diphtheria antitoxin, for which Dr. Ernst had been responsible, was assumed by the Massachusetts State Health Department at its suggestion "that it might relieve Boston of the expense as well as the rest of the State". The horses used for the production of antitoxin at Gallup's Island were sold, while guinea pigs and rabbits were moved to the new quarters.

Within 20 years diagnostic services of the city Laboratory included examinations for diphtheria, gonococci, typhoid, dysentery, tuberculosis, milk and water bacteriology, serological examinations for syphilis (1916), pneumococci, leprosy, meningococci, rabies, streptococci, trichinosis, and anthrax. The basic principle was early and accurate diagnosis and comprehensive reports to physicians, hospitals and clinics submitting specimens from their patients.

The successive appointments of S. Burt Rickards in 1905, Dr. B.L. Arms in 1911, Dr. Francis H. Slack in 1914, Dr. Philip Castleman in 1917 and Dr. Karl R. Bailey in 1923 until 1946. Then work performance was supervised in bacteriology and epidemiology under consultation with Dr. Ralph E. Wheeler of Tufts Medical School. Activities of the laboratory closely correlated with functions of other health departmental divisions. Annual voluntary certification of personnel, performance and equipment, recommended by state legislation in 1939, maintained and initiated growing responsibilities in response to the extension of prevention, education and research. Five moves to successively larger quarters were made as growth of health department services were extended to Boston's increased population. In 1965 economy of operation and consolidation of overall health operations resulted in a merger with functions of the Boston City Hospital creating the Health and Hospitals Department of thy City of Boston.[5]

*See confirming reference in item under Harvard Medical School, Department of Bacteriology.

HISTORY OF THE STATE LABORATORY INSTITUTE, 1952-1970
(For history of North-East Branch ASM)

The State Laboratory Institute of the Massachusetts Department of Public Health was formed about the time of the last ASM* Meeting in Boston, by a union of the "Diagnostic Laboratory" as it was then called, with the Division of Biologic Laboratories which include the Antitoxin and Vaccine Laboratory and the newer Blood Processing Laboratory. The Diagnostic Laboratories, originally consisting of the Bacteriology and Wasserman Laboratories, together with the Laboratory Approval Program, have since added units concerned with Medical Virology, Congenital Metabolic Disorders, and Arbovirus Field studies. The Institute was directed by Dr. Johannes Ipsen until 1960, following which he was succeeded by Dr. Geoffrey Edsall, a former Director of the Division of Biologic Laboratories (1942-1949).

Since 1952 the entire Institute has been housed primarily on the Bussey grounds in Forest Hills, but two important units are based elsewhere: the Virus Laboratory which was started with a small nucleus at the Harvard Medical School in 1946 and remained there until the Spring of 1970; and the Encephalitis Field Station, originally started as a joint activity of the State's Division of Communicable Disease and the U.S. Public Health Service in Taunton, but transferred to the State Laboratory Institute and housed in the Lakeville Hospital since 1964 when the Public Health Service withdrew its facilities.

Since 1956 there has been an active program, based in part at the Encephalitis Field Station and partly at the Virus Laboratory, for the study of the ecology of arboviruses in Massachusetts, principally Eastern Encephalitis virus which has attacked some 50 citizens of the State in three outbreaks with about a 70% case fatality rate. During the course of this study it has been found that Western Encephalitis virus, California virus, Powassan virus and Hart Park or "Flanders" virus are also present among the arboviruses of the area. Space does not permit a recapitulation of even the most important other findings from this unit. The laboratory aspect of this activity has led to the development of new techniques for sensitive measurement of antibodies to viruses and several other innovations.

In 1962 the Diagnostic Laboratories undertook a pilot study to determine the feasibility of performing routine tests on newborn babies for the presence of Phenylketonuria, one of the commonest of the more serious congenital metabolic disorders of infants. Since that time the program has expanded to test all newborn babies in Massachusetts (for the past 7 years) and to include tests for about 15 other congenital anomalies in order to establish their frequency and their seriousness. To date almost 100 cases of PKU alone have been detected. Many innovations in testing technique have also been developed

The Biologic Laboratories have developed, improved and advanced the preparation and control of diphtheria and tetanus toxoids and pertussis vaccine and the combination of these three, together with numerous studies on each of these immunizing agents. The Laboratories have pioneered in the development of purified diphtheria and tetanus toxoids, and the methods developed at the Laboratories are now in use throughout 'much of the world. In more recent years the Laboratories have pioneered in the preparation, testing and clinical use of "human tetanus antitoxin" (tetanus immune globulin) prepared from selected normal human plasmas rather than from hyperimmunized individuals, and have been actively engaged in the experimental preparation of antilymphocyte globulin. The Diagnostic Laboratories have taken part in the development of a statewide program for the prevention' of rheumatic fever, and have greatly expanded the Laboratory Approval Program with the help of a recent Federal grant. A minor distinction for the Virus Laboratory has been the selection of one of its isolates of type B influenza virus in 1966, as the current world-wide reference type B strain and the strain used for type B in the official vaccine formula in the United States. The strain is known as "B/Mass/3/66".

The Biologic Laboratories are currently in the clinical trial stages of a program for the production of anti-Ah globulin for use in the prevention of erythroblastosis in Rh positive babies of Rh negative mothers. The globulin prepared at the State Laboratory has been found to be one of the most potent and pure made anywhere, and has been selected as a standard by the International Reference Laboratory.

Last year the Laboratories participated in a collaborative study with the National Institutes of Health on the response to Hong Kong influenza vaccine -- shortly to appear in the WHO Bulletin. In this connection many of the staff of the laboratories have collaborated with the World Health Organization and the Pan American Health Organization in scientific working groups, special advisory groups, individual consultation, participation in seminars, etc. in Geneva, Tehran, Manila, Rio de Janeiro, Montevideo, six countries in Southeast Asia during a special long-term consultation, and assistance in the development of various biologic standards, requirements for vaccines, etc.

Perhaps the most important events of the past 18 years have been the purchase of the Bussey grounds and the Laboratory buildings by the Commonwealth of Massachusetts from Harvard University in 1963, and the ground-breaking for a new 8- story 200,000 square foot S15,000,000 laboratory building in December 1969. Key personnel retiring from the Institute in recent years included Dr. William A. Hinton in 1953, (Assistant Director in charge of the Wassermann Laboratory) Dr. Robert A. MacCready, in 1968 (Director of the Diagnostic Laboratories) Miss Helen Gillette in 1963 (Chief of the Bacteriology Laboratory), Dr. James A. McComb, (Director of the Biologic Laboratories), and Miss Genevieve Stuart of the Wasserman Laboratories (1961).

Another way to express the activity of the Institute is to note that since 1952 it has been involved in the publication of 17 papers on ecology of arboviruses, 12 papers on congenital metabolic disorders, 49 papers on tetanus toxin, tetanus toxoid or tetanus immunization, about 35 papers on various aspects of biologic products, immunization, the immune response or related issues, and miscellaneous papers on poliomyelitis, rabies, isolation or hormones, measles, gonorrhea! ophthalmia neonatorum, clostridial infection, salmonellosis, etc.

Dr. Geoffrey Edsall

*In 1960 The Society of American Bacteriologists changed its name to The American Society for Microbiologists.

RHODE ISLAND DEPARTMENT OF HEALTH
A History of Laboratory Services

In 1894, the Rhode Island State Board of Health introduced medical laboratory services by offering examinations of sputum for tuberculosis and throat cultures for diphtheria to private physicians. The Board had no laboratory of its own at that time but utilized private facilities of Dr. Gardner Swarts, executive secretary for the Board.

Dr. Swarts was an associate of Dr. Charles V. Chapin, internationally known as an early advocate of public health methods. For lack of better facilities and an appropriate budget, this venture began in a corner of the old Rhode Island Hospital where Dr. Swarts began his bacteriological analyses. For eleven years it continued in these unpretentious quarters until a room was made available in the basement of the State House in 1905.

Although its beginnings were modest, it is interesting that Rhode Island, the smallest state in the union, became one of the first two states to provide public health laboratory analyses in the medical field. Historical records which survive are not explicit on this point, but one can speculate that the influence of Dr. Chapin was largely responsible for this progressive step.

Gradually the spectrum of analyses provided by the state laboratory broadened by Widal tests for typhoid fever in 1900, and in 1913, the addition of services for malaria and gonorrhea. In 1915, a Laboratory of Pathology and Bacteriology was established by law and Dr. H.S. Bernton appointed director. Subsequently, services expanded rapidly in fields of Pathology, Bacteriology, Serology and Diagnostic Chemistry as scientific knowledge and technology provided the tools for the public health needs of the time.

A philosophy was established in the early .years of the laboratory's existence to provide health services not generally available in the community. This philosophy has determined the laboratory's progress through much of its history. In 1915, a section was introduced providing services for tissue pathology to physicians and small hospitals. During the 1920's one of the few biochemistry units among state health departments began offering blood chemistries and urinalysis. The unit is still in existence providing screening for chronic diseases and diagnostic analyses for the indigent. A toxicology unit was founded in 1928 and today is one of the largest laboratory sections, performing vital analyses for narcotics and a broad spectrum of other toxicological tests.

Throughout most of the Division's existence, Diagnostic Bacteriology and Serology have performed essential services for communicable disease control. Introduction of procedures by these sections reflect the needs and technology of the times, to mention a few; CF test for syphilis and rabies diagnosis in 1915; pneumococcus typing in l916; Kolmer test for syphilis in 1925; Neufeld method for pneumococcus typing in 1935; fluorescent microscopy for TB in 1941; Asian flu studies in 1958; FA for streptococci in 1961; microtechnique for Rubella in 1969. Laboratories for water analysis, dairy products analysis and animal diseases have supported departmental programs for many years.

Some of the most dramatic changes in the laboratory's history occurred in the decade just past. In 1961, an independent clinical laboratory licensing law was enacted, making Rhode Island one of the few states with such legislation. Since that time the laboratories have been deeply involved in administering this act to assure high standards of proficiency among such enterprises. A Metabolic Disease section was established in 1964 and is the sole source in the state for testing for PKU and other disorders which may lead to mental retardation.

Among the most significant changes of the decade were the development of environmental laboratories for Food Chemistry, Food Bacteriology, Pesticides and Air Pollution. Each of these is now a well-established unit providing significant programs for public protection.

During its 76 years of existence the Division of Laboratories has functioned under seven directors; Dr. Gardner Swarts 1894-1915; Dr. H.S. Bernton 1915-1918; Dr. Lester Round 1918-1928; Mr. Harry Pearse 1928-1936; Dr. Edgar J. Staff 1936-1964 (Mr. Harold E. Pearson, acting 1942-1947); Mr. Malcolm C. Hinchliffe 1965-xxxx.

The health department is particularly proud of its laboratories' long years of service to the community. Throughout much of its existence the Division has operated in outmoded and cramped facilities, in a corner of a hospital, in one room in the basement of the State House, and since 1936 in an office building. Nevertheless, it has continuously provided a significant program of services to protect the public against health menaces in communicable diseases, chronic diseases and the environment in general.

Malcolm C. Hinchliffe

CONNECTICUT STATE DEPARTMENT OF HEALTH LABORATORY DIVISION

The State Bacteriological Laboratory was established during 1905 at Wesleyan University under the direction of Prof. W.H. Conn. The first two years, tests were made for evidence of tuberculosis, typhoid fever, diphtheria, rabies and malaria; samples of water, ice and milk were examined and oil was checked for safety by a flash point method.

During 1917 the laboratory was moved to the Connecticut Agricultural Experiment Station in New Haven; CJ. Bartlett, M.D. served as director. The move to Hartford (the State Capitol) occurred during 1924. Friend Lee Mickle, Sc.D. was appointed director and served in that capacity until he retired in 1954; he was succeeded by Mr. Earle K. Borman who died in January, 1969. Mrs. Evelyn W. Hibbard was appointed acting director February 1969 to December 11, 1969. William W. Ullmann, Ph.D. was appointed director December 12, 1969.

Pioneering efforts were made in the establishment of standards for clinical thermometers for sale in Connecticut and provision for a testing service for manufacturers who wish to obtain a permit to use the Connecticut Seal as required by law; a premarital law requiring a test for syphilis; the routine culture of all specimens submitted for tuberculosis examination to remove the uncertainties attendant in reporting only the findings of acid fast organisms from stained smears; the adoption of a method for the identification of all Salmonella isolates as a routine rather than a research project; a fairly complete service for parasitological identifications (unusual in a Northern state); a broad routine service in the identification of Group A streptococci from throat swabbings with a telephone service to physicians on all Group A identifications, the development of a kit for the collection of the throat swabbings which has been adopted in many states and presently is under consideration by WHO for use in tropical countries; a broad testing service for water, sewage, milk, ice cream and milk products; a program of blood clot culturing for the isolation of Brucellae which often aided physicians in establishing a diagnosis of Brucellosis in old chronic cases; and a program of inspection for the registration and approval of various laboratories in Connecticut.

The laboratory presently has a staff of 189 persons and is divided into four sections each headed by an assistant director as follows: The Diagnostic, Sanitary and Toxicological Services Sections and the Laboratory Standards Section.

E. W. Hibbard

BACTERIOLOGY And INFECTIOUS DISEASES AT THE BOSTON CITY HOSPITAL

The Bacteriology Laboratory of the Boston City Hospital began as a unit of the Pathology Laboratory which since 1933 has been the Mallory Institute of Pathology. Under the guidance of Dr. F.B. Mallory, Dr. F. Parker, Jr. became responsible for the Bacteriology Laboratory and it was he who acquired as an assistant Miss Marion Lamb. Together they worked out many of the initial methods and set the high standards that have characterized the laboratory since. Dr. Parker and Dr. G.K. Mallory subsequently became Directors of the Mallory Institute of Pathology with continued support of Miss Lamb and her staff. In 1930 Dr. Robert Nye, then Associate Physician of the Thorndike Memorial Laboratory, was appointed as the first Bacteriologist in charge of the Laboratory on a part-time basis. He was responsible for the laboratory and introduced many innovations. It was Dr. Nye who designed the Mallory Institute of Pathology which provided space for the Bacteriology Laboratory and it was he who supervised all phases of construction and equipment of the Mallory Institute. Miss Lamb and her staff provided the Hospital with diagnostic skills, a keen sense of clinical applicability, and the ability to perceive new and hitherto unknown findings. The diagnostic functions of the Bacteriology Laboratory were closely allied to the clinical activity in infectious disease, particularly under the early leadership of Dr. Edwin H. Place who headed the South Department and Dr. Maxwell Finland who headed the Infectious Diseases Division of the Thorndike Memorial Laboratory. Through these collaborations, and many others with the physicians of the Boston City Hospital and elsewhere, a treasured place in the history of medicine was carved out.

The early studies of Haverhill Fever, of pneumococcal and atypical pneumonias, pyelonephritis, of virtually every new therapeutic agent in the management of infectious diseases, and many other major discoveries were worked out through this collaboration. Generations of House Officers and students moved to other institutions with new insights into the role of the Bacteriology Laboratory in the diagnosis of disease, and with a special awareness of the interrelationship of the Bacteriology Laboratory to clinical medicine.

The Laboratory was increasingly called upon by the Hospital to support its clinical and teaching functions so that the number of cultures processed rose from about 10,000 in 1935 to about 55,000 in 1955 and about 135,000 in 1969.

In 1958 the Board of Trustees of the Hospital decided to create a new laboratory, the Channing Laboratory under the direction of Dr. Edward H. Kass and this laboratory functioned as a unit of the Harvard Medical School in collaboration with the Infectious Diseases Unit of the Thorndike Memorial Laboratory. Dr. Kass was simultaneously named Director of the Bacteriology Laboratory and shortly thereafter the Bacteriology Laboratory became a new department of the Hospital. Still, more recently the Channing Laboratory became part of the Harvard Medical Unit and houses in it all of the Infectious Diseases activity. The new Laboratory for Infectious Diseases, adjoining the Mallory Institute of Pathology on Albany Street, was opened in 1968 and houses in it both the Department of Bacteriology and the Channing Laboratory.

Upon retirement of Miss Lamb, Miss A. Kathleen Daly became the Head Bacteriologist and has continued the tradition of service of the highest quality to the Hospital and to the community, while continuing to discover new agents and clinical forms in which older agents are expressing themselves. Ably supported by Miss Alice MacDonald, Miss Daly has trained a large number of individuals as Bacteriologists in numerous hospitals and Public Health Laboratories in this country and abroad, and large numbers of physicians have worked in the laboratory as part of their training for careers either in medical microbiology, preventive medicine or clinical infectious diseases.

In recent years the laboratory has also assumed responsibility for the Tuberculosis Diagnosis Laboratory at the Mattapan Hospital under the direct supervision of Miss Mary Malloy. There has also been added a laboratory for clinical immunology and in the near future there will be units in virology, parasitology and other new and expanding fields. Through its relationship with the Harvard Medical School and its close and friendly collaborations with interested staff and consultants of the clinical services of the Boston University and Tufts University Medical Schools, the resources of the Department of Bacteriology have served regularly in the training of medical students and House Staff. Within the past ten years Drs. Kass and Finland have trained 80 physicians from fourteen countries outside of the United States all of whom are engaged in similar efforts in their home institutions.

In 1965 the several basic functions of the Health Department of the City of Boston were merged with those of the Boston City Hospital, thus creating a Department of Health and Hospitals one hundred years after the opening of the hospital. The cultural and diagnostic services of the Bacteriological Laboratory were transferred and assumed by the Department of Bacteriology of the City Hospital, thus continuing the availability of laboratory services for Boston physicians and institutions.

Because of the continuous investigative activities in the Channing Laboratory and in the other divisions of the. Harvard Medical Unit, new concepts have continuously been introduced into the Diagnostic Laboratory so that the early use of quantitative methods in certain diagnostic functions, the continued testing of newer antimicrobial agents, the awareness of new developments in Hospital' Epidemiology and many others have received their early testing and exploration in this Laboratory. The opening of the splendid new facility provided a much needed modern physical plant and it is the best tribute to the effectiveness of the Laboratory that it is already crowded and is seeking new ways in which it can meet the needs of the Hospital and of the community.

Edward H. Kass and Maxwell Finland

CHILDREN'S HOSPITAL

The Children's Hospital, founded in 1869 became the Children's Hospital Medical Center in 1949 when nine other hospitals and foundations pooled their abilities and resources to provide better and more complete care for children and young people. Today it is the country's largest hospital for children. Laboratory work in hematology under Drs. James Baty and Louis K. Diamond had already brought the hospital international recognition.

In 1946, John F. Enders, who since 1927 had worked in the Department of Bacteriology and Immunology at the Harvard Medical School, was asked to establish a laboratory for research in infectious diseases at the Children's Hospital Medical Center at Boston. In this laboratory much work on the viral diseases of man has been done under his direction.

In 1954 Dr. Enders was awarded the Nobel Prize for Physiology and Medicine for work done in collaboration with Weller and Robbins at the Children's Hospital on the cultivation of the poliomyelitis virus. The successful propagation of these viruses in cultures of non-nervous tissue cells and the demonstration that attenuation of virulence occurred under these conditions provided the basic techniques essential for the subsequent development of the inactivated and attenuated polio vaccines now in general use. During the course of these experiments hitherto unknown agents were isolated by Robbins and his co-workers from human cases of disease which eventually were classified as a new group: the so called "ECHO" viruses.

Applying comparable procedures, Enders and Peebles in 1954 isolated the virus of measles in human and monkey cell cultures. Enders, Milovanovic and Katz then adapted a strain of measles virus to growth in chick embryo cells. This virus, after growth in this system, became so reduced in virulence for man that it proved feasible to employ it as an attenuated vaccine, as demonstrated by Katz and Enders in 1958. Also, at this time Enders and co-workers were able to show that measles was the agent response for Hecht's giant cell pneumonia, a disease which long had been suspected but not proved to be caused by this disease. Enders' associates, Gresser and Katz, later found that measles virus was frequently present in the urine of patients and could be readily isolated from their blood by using a modification of the cell culture technique.

Soon after the discovery of the development of interferon in 1957 by Isaacs and Lindemann in chick cells exposed to influenza virus, Ho and Enders demonstrated the production of an analogous factor in cultures of human renal and amnion cells infected with poliovirus II. These observations helped to establish the interferon response as a basic phenomenon in many viral infections and to emphasize its potential role as an early defensive mechanism in such conditions.

In 1960 Shein and Enders found that the oncogenic simian virus SV40 exhibited both cytolytic and cell transforming effects in cultures of human renal cells. Also with Shein, and later Diamandopoulos, Enders explored the transforming effect of SV40 in cultures of Syrian hamster cells. Among the more interesting findings in this work was the demonstration that lines of transformed cells originating from a single cell (clones) were capable of producing both sarcomatous and carcinamatous tumor growth when implanted in hamsters. During the course of these investigations the interesting fact was also established that the oncogenicity of clones of original low potential became greatly increased following multiplication of the transformed cells *in vivo*.

Recently Enders and his associates demonstrated by means of the cell fusion method, that it was possible to induce infection in cells which are normally resistant to certain viruses.

John F. Enders

"The tremendous momentum which was generated by the general public in response to the very evident need of Children's Hospital produced the magic name of 'Jimmy', that special every-child whose name is synonymous with the Children's Cancer Research Foundation. He was created by the Variety Club of New England which joined with the Boston Braves and later the Boston Red Sox, the police chiefs of New England, the press, radio and TV, and the children of New England and their parents. It was a unique enterprise, designed to foster and support the research of the Children's Cancer Research Foundation. The Foundation was established March 30, 1947, as an independent affiliating institution through an initial gift from Tent 23 of the Variety Club of New England.

"The Foundation was a fruitful stroke of genius, and to Dr. Sidney Farber belongs the credit for envisioning it, organizing it, and providing continuous leadership to this many-faceted enterprise for more than 20 years. Not only has he been its Scientific Director, but he represents for his large public following the wise, resourceful man of science who speaks eloquently for the cause of medical research."[6]

Dr. George E. Foley in 1947 joined the Department of Pathology of the Children's Hospital at the invitation of Dr. Sidney Farber as the second charter member of the then forming Children's Cancer Research Foundation, to organize the Laboratories of microbiology, becoming chief for programs in Microbiology and Cell Biology and Associate Director for Laboratories.

These laboratories, in addition to the more esoteric problems of diagnostic bacteriology and fungus infection in children with neoplastic disease, particularly the acute leukemias, were devoted primarily to the development of a series of bacterial and fungus bioassay systems in which a broad spectrum of metabolic pathways could be employed for the evaluation of the biological activity of potential chemotherapeutic agents being prepared in rapidly expending programs of organic synthesis emerging in the then-developing era of chemotherapy of neoplastic disease which resulted directly from Dr. Sidney Farber's original observations on the chemotherapeutic effectiveness of Aminopterin (Methotrexate) - an analogue of folic acid - in the acute leukemias of children.

Current collaborative cytochemical studies concern the growth kinetics of human lymphocytic cells, both in *vivo* and following isolation in *vitro*; with particular reference to the acute leukemias and infectious mononucleosis; and the use of fluorescent agents which bind selectively at specific loci in plant and mammalian cell metaphase chromosomes to gain some insight into the functional structure of the mammalian chromosome by means of "mapping" loci which bind preferentially with fluorescent agents exhibiting known affinities for specific components of DNA or RNA.

George E. Foley

NEW ENGLAND DEACONESS

Diagnostic medical bacteriology first became available as a regular service at the New England Deaconess Hospital in 1923. Because of his concern for diabetic patients with infections, the late Elliott P. Joslin, M.D. instituted an affiliation with the Department of Bacteriology of Harvard Medical School for this purpose. When Shields Warren, M.D. became Pathologist at the Deaconess Hospital in 1927, a bacteriology laboratory was established as a division of the Laboratory of Pathology. A major concern at that time was the incidence of staphylococcal infections. In 1934 the laboratory began to determine the effective blood levels of Prontosil - the first of the sulfonamide drugs - and since then antibiotic sensitivity testing has been conducted. From 1941 until his retirement in 1966 Harold B. Kenton, Ph.D. was Bacteriologist, succeeded by David Skinner, M.D. In 1963 Dr. Warren became Consultant in Pathology and William A. Meisner, M.D. became Pathologist-in-Chief.

The pathologists at New England Deaconess Hospital have been committed to the provision of medical care for the patient and to medical education. There have been residents in pathology here since Dr. Warren first arrived. After Bradley E. Copeland, M.D. joined the group in 1950, a specific residency program in clinical

pathology was instituted. These residents are assigned to microbiology for one-third of their appointment. In 1960 the New England Deaconess Hospital - New England Baptist Hospital - Northeastern University School of Medical Technology was established to award a baccalaureate degree to student technologists on completion of the course, one quarter of which is microbiology.

During the past four years the Laboratory of Pathology has expanded the scope of the division of microbiology to include general serology, fluorescent antibody techniques, parasitology, mycology, and the speciation of mycobacteria and the "lesser" gram negative bacilli. Current projects include an expanded application of anaerobic techniques to diagnostic bacteriology, the institution of techniques for the isolation of mycoplasma, and an improved system of quality control.

David Skinner

MASSACHUSETTS GENERAL HOSPITAL

Massachusetts General Hospital founded in 1811 owes its existence to the foresight and ambition of two members of the faculty of Harvard Medical School - Dr. James Jackson and John Collins Warren, son of Dr. John Warren the first professor of Anatomy and Surgery at the school. Ten years later it became a reality when the first patient was admitted to the Bulfinch Building, designed by the renowned architect responsible for the Old State House and Faneuil Hall. Under the dome of Bulfinch was the first public demonstration of the use of ether in a surgical operation in 1846. The first acceptance of Joseph Lister's innovative principles of antiseptic surgery in this country was at M.G.H. in 1869.[7]

BACTERIOLOGY AT THE MASSACHUSETTS GENERAL HOSPITAL 1952-1970

The development of medical bacteriology at the Massachusetts General Hospital may very well serve as the prototype for the history of bacteriology in hospitals in the United States. Recognizing the emerging importance of bacteriology in medical practice, the MGH was one of the first hospitals in this country to create the position of Bacteriologist, which it did in 1926. This action derived to a large extent from the professional interest in bacteriology of two Chiefs of Pathology at the MGH, James Homer Wright and Tracy Burr Mallory.

Louis L. Dienes served as Bacteriologist in the Department of Pathology from 1930 until his official retirement in 1952 when a separate Department of Bacteriology was created under Thomas F. Paine. The present 'Head of the Department, Lawrence J. Kunz, has been in charge of the hospital laboratory since 1952.

The year 1952 marks the last annual meeting of the Society in Boston. These nearly two decades have witnessed extensive changes in the practice of medical bacteriology at the Massachusetts General Hospital, no less than in hospitals all over the world. For in these two decades spectacular advances have been made in both medicine and surgery resulting in increasing emphasis and demands on the practice of medical bacteriology. The every-expanding spectrum of antibiotics and other antibacterial agents and the need for testing susceptibility of microorganisms to these agents represent only one of the several increasingly important impacts on hospital bacteriology. More challenging however, has been the need to define methods for recognizing and identifying microorganisms formerly ignored in diagnostic cultures, but posing serious threats to patients whose defenses have been compromised by steroids, anti-tumor agents and immunosuppressive drugs.

As a consequence of these developments medical bacteriology at the MGH since the last meeting of the Society in Boston has changed drastically, both quantitatively and qualitatively. Quantitatively, the number of specimens processed has risen ten-fold from 13,000 in the year 1952 to a projected 130,000 for the year 1970.

Although a portion of the increase can be accounted for by a small increase in the number of beds, more rapid "turnover" of patients and higher rate of occupancy of hospital beds, the more complex type of illness and more complicated therapeutic measures have required greater number of laboratory procedures for careful monitoring of the patients' conditions.

Qualitatively, considerable resources of the laboratory have been assigned to the delineation of microorganisms isolated in cultures of pathologic specimens. The MGH laboratory has devised methods for routine identification of members of the family Enterobacteriaceae, yeasts, and for a group of nonfermentative gram-negative rods commonly found in clinical material. The laboratory has also adapted procedures devised by others in identifying more recently recognized species of bacteria - notably among the Mycobacteria, and has attempted to expand the number of species of microorganisms that may be readily recognized and identified using classical as well as modern techniques. Rediscovery of the frequency of occurrence of non-group A streptococci in clinical material is an outstanding example of the need for review and recall of standard methods in daily experiences.

In collaboration with colleagues in the Infectious Disease Unit of the Department of Medicine we have studied the significance of Enterobacteriaceae, anaerobes and various serological groups of streptococci in the diseases of patients, many of whom have been recipients of one or more of the newer modes of therapy. Similarly the fascinating and ever- surprising epidemiology of Salmonellosis has been of rewarding interest to this group of collaborators - not only in the unusual aspects of clinical infection caused by Salmonellae but in their role in initiating infection in the modern hospital patient, e.g., through contaminated carmine dye used as a diagnostic tool and in the tube fed patient through contaminated brewer's yeast. As a tribute to the resourcefulness, diligence and resiliency of the modern bacteriology laboratory technician, let it be noted that these qualitative and, especially, quantitative changes in laboratory practice have been accomplished with less than a ten-fold increase in personnel. And this before the age of computerization - an era that we in the MGH laboratory are entering only in 1970.

Lawrence J. Kunz

THE NEW MEDICAL FRONTIER - MYCOPLASMA

Boston enjoys a unique place in mycoplasma research past and present. One of the earliest workers in this field was Dr. Louis Dienes who in 1937 together with Dr. Geoffrey Edsall made the first mycoplasma isolation from a Bartholin's gland abscess in a young woman. Another milestone was the isolation of the agent of primary atypical pneumonia by Dr. Monroe Eaton of Harvard Medical School. Known as the Eaton agent for 20 years, this organism was proved a mycoplasma in 1962. Dr. Dienes still continues working at the Massachusetts General Hospital many years past his retirement and contributes both wisdom and encouragement to all who are interested in mycoplasmas and L-forms. Dr. Dienes and Dr. Eaton form the central core of a coterie of enthusiasts who meet regularly and have become totally absorbed in this new area of research. "In addition to its basic research, Dr. Dienes' laboratory examines cultures from patients for suspected mycoplasma infection. A permanent fixture at the MGH the laboratory has also become an early-warning center for mycoplasma detection."

Our new outcome has been the isolation of mycoplasmas by Dr. Ruth Kundsin, Peter Bent Brigham Hospital, from fetal membranes of spontaneous abortions and premature births. This finding has raised the possibility that mycoplasma infection of the genitourinary tract recognized by Dr. Maurice Shepard as nongonococcal urethritis in the male may exist in the female and yet not be expressed until the stress of pregnancy occurs.

Dr. Ruth Kundsin

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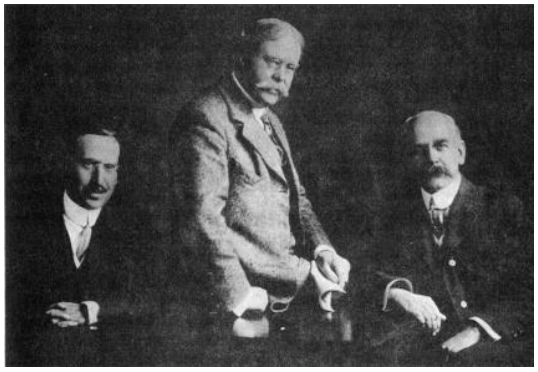
Famed nucleus of the first School for Health Officers jointly sponsored by Harvard University and Massachusetts Institute of Technology in 1913.



Within the past two decades there have been three Nobel Peace Awards to workers in the field of microbiology in the Boston area.

In December 1954 the award was made, jointly to John Franklin Enders, Thomas Hackle Weller and Frederick Chapman Robbins for "their discovery of the ability of poliomyelitis viruses to grow in cultures in various types of tissues."

Nobel Prize Winners 1954
(L-R) Thomas Hackle Weller,
Frederick Chapman Robbins and
John Frankin Enders

In December 1962, the Nobel Peace Prize for Medicine and Physiology was awarded jointly to James D. Watson, Francis Crick and Maurice Wilkins whose collaboration resulted in the elucidation of the double helical structure of deoxyribonucleic acid. Since then geneticists have determined that hereditary information for all species is determined by the sequence of the nitrogenous bases of the DNA molecule.

Dr. Watson, whose current research interests include the mechanism of protein synthesis and replication of viruses, has been a member of the Biology Department of Harvard University since 1961

Nobel Prize Winners 1962
(L-R Maurice Wilkins, John Steinbeck,
John Kendrow, Max Perutz,
Francis Crick and James D. Watson

In October 1969 the announcement was again of a joint citation: "Karolinska Institute has decided to award the Novel Prize in Physiology and Medicine to Max Delbruck, Alfred D. Hersey, and Salvador Luria for their discoveries concerning the replication mechanisms and genetic structure of viruses." This award best brought to the holder of the William T. Sedgwick Share at the Massachusetts Institute of Technology and honor enhancing his past presidency of the American Society for Microbiologists.

Salvador Luria

BACTERIOLOGY AT THE BETH ISRAEL HOSPITAL

Until the advent of the antibiotic era microbiological activity at the Beth Israel Hospital was small and largely restricted to patient care. In the late 1940's, with the coming of Dr. Sidney Cohen to be its director, the Diagnostic Bacteriology Laboratory became more active. It began to assume a more definitive teaching function. And at present the laboratory is involved in an Infectious Disease Training Program in which internists, surgeons and bacteriologists of both the Beth Israel Hospital and the Children's Medical Center are engaged. The growth of the Department - reflecting an increasingly sophisticated approach to infectious disease on the part of the clinicians rather than reflecting any growth on the part of the hospital - has been rapid so that in the last decade the number of specimens received annually have increased from about 14,000 to 40,000 and the staff has increased from three technicians and one ancillary to seven technicians and three ancillaries.

The late 1940's also saw the beginning of a number of significant bacteriological research programs at the Beth Israel Hospital. The Surgical Research Department began its work on the role of bacterial endotoxin in irreversible hemorrhagic shock and on the use of antibiotics in its control. This program was led by Dr. Jacob Fine and the bacteriological aspects were supervised by the late Dr. Fritz Schweinburg. Dr. Schweinburg also joined with Dr. Alexander Rutenburg in contributing significantly to the correlation of in vitro sensitivities of antibacterials with their clinical use - first with sulfonamides and later with newly discovered antibiotics. In the middle' of' the 1950's Dr. Cohen and Dr. Lippman Geronimus, the present Head of the Diagnostic Bacteriology Laboratory, worked together on the inducibility of staphylococcal penicillinase until Dr. Cohen left to assume the directorship of the Department of Infectious Disease of the Michael Reese Hospital in Chicago. At present, Dr. Geronimus is collaborating with Dr. Donald Glotzer of the Surgery Department in the evaluation of modes of antibiotic prophylaxis of surgical wound infections. And in the Medical Research Department, Dr. David Feingold and his coworkers are studying ways in which cell wall antibiotics may potentiate or be potentiated by other agents to yield clinically useful antibacterial regimens.

We expect that the next two decades will show at the Beth Israel Hospital even more progress in the application of bacteriological science to patient care since the medical staff is increasingly aware of the help a modern laboratory can give.

Lippman H. Geronimus

FACILITIES AND POTENTIALS OF NEW ENGLAND MEDICAL CENTER HOSPITALS

Tufts - New England Medical Center is an alliance of Tufts University Schools of Medicine and Dental Medicine and New England Medical Center Hospital.

The New England Medical Center was formed in 1965 by a joining together of the Boston Dispensary and Rehabilitation Institute, The Boston Floating Hospital for Infants and Children and The Pratt Clinic - New England Center Hospital.

The Boston Dispensary was established in 1796 and is the oldest medical institution in New England. The Rehabilitation Department was established in 1951 but by 1958 had become the first comprehensive institute of its kind.

Outstanding in the history of the Dispensary are the accomplishments of Dr. William A. Hinton. Not only did he originate the Hinton test for syphilis but established a training program for technicians which became the Hinton School for Medical Technicians. Dr. Hinton was the first Negro ever granted a full professorship at Harvard Medical School.

The Boston Floating Hospital was begun in 1894 as a hospital ship for children in Boston Harbor. After its loss by fire its functions became land based in 1931. In its present location it has quickly expanded, offering leadership in pediatric medicine.

The Pratt Clinic - New England Center Hospital, founded in 1938 as the Pratt Diagnostic Hospital, is well known, throughout New England for its diagnostic and research facilities.

Closely associated with the hospital is the Gingham Associates Fund and Program, established in 1932. The fund is most active in medical education in regional areas of New England. Originally this stemmed from a gift of a grateful patient, Hiram Gingham.

In 1953 Dr. Louis Weinstein came to the NEMCH and set up a separate department of Infectious Disease. Since then NEMCH has been a center for both the diagnostic and educational aspects of infectious disease throughout New England. More than 52,000 cultures per year are processed in the clinical microbiology laboratory serving the 330- bed hospital.

Charles M. Bump, Bacteriologist

HARVARD MEDICAL SCHOOL

Predating the genesis of microbiology at Harvard Medical School is the action on September 19, 1782 of the formation of a plan for a medical school by the then President Joseph Willard and the Fellows of Harvard College. On November 22, 1782 came the appointment of Dr. John Warren as first Professor of Anatomy and Surgery, of Dr. Benjamin Waterhouse as Professor of Theory and Physic and in May 1783 Dr. Aaron Dexter as Professor of Chemistry and Materia Medica.

The Harvard Medical School, now nearing the close of its second century of uninterrupted teaching dedicated to the treatment and prevention of the ills of man, was the third medical school to be established in the United States. The first school was organized in 1765 in the College of Philadelphia (now the University of Pennsylvania) and the second in 1767 in King's College (now Columbia University).[8]

DEPARTMENT OF BACTERIOLOGY AND IMMUNOLOGY
HARVARD MEDICAL SCHOOL

The flame of new knowledge was carried across the Atlantic from Pasteur's laboratory to Harvard Medical School.

The first recorded work in bacteriology at Harvard was undertaken unofficially in 1884 by Harold C. Ernst in a small corner of Prof. Bowditch's laboratory of physiology, with equipment and enthusiasm bequeathed him by William S. Bigelow, who had been a student in Pasteur's laboratory. Bigelow, a versatile dilettante in medicine, had at first been refused admission to Pasteur's laboratory. Undaunted, he enrolled in a technician's course in the art of glassware blowing, then an important requirement for bacteriological work. After many weeks, when Bigelow had become extremely proficient, Pasteur happened to notice him doing a difficult piece of work. Impressed with his skill, Pasteur took him as a pupil in his laboratory. Bigelow brought to this country all the necessary bacteriological equipment of that day (the early 1880's). Through Bigelow, Ernst became interested in bacteriology.

In 1885, Ernst was appointed Demonstrator in Bacteriology and gave six lectures to second-year medical students in pathological anatomy. Though complementary to pathology, this venture was apparently not sponsored by that department. The Faculty of Medicine at Harvard in general was not receptive to the germ

theory of disease, and it was under protest that Ernst was permitted to give his course, believed to be the first in this country. The Chair in Bacteriology was established in 1891 when Ernst became Assistant Professor. Though he became Professor in 1895, early records reveal that the departmental operating budget for assistants and apparatus in 1899 was only $2,500. Left mostly to his own resources for the provision of funds for his research, Prof. Ernst's contributions are even more remarkable.

Prof. Ernst's natural inclination to public service, together with the fact that he engaged in private practice until 1895, and served in the out-patient department of the Massachusetts General Hospital until 1900, directed the interests of his department toward the urgent public health problems of his day. The laboratory studied: immunization against rabies, the etiology of suppuration, the colon and typhoid bacilli, cultivation of the gonococcus, cultivation of anaerobes, the viability of tubercle bacilli in natural environments, and the importance of bacteriological diagnosis of sore throats. Appointed an agent of the Boston Board of Health in October 1894, he initiated the production of toxin and antitoxin in the control of diphtheria.

Following Ernst's death in 1922, the Chair in Bacteriology was filled by Hans Zinsser, whose versatility and imagination adapted him to peculiarly effective leadership in a science which was rapidly developing a new body of principle and a broader vision of potential service. His insight into infectious diseases and his passion for science as a last great field for adventure were expressed in many scientific publications, and two autobiographical books.

Zinsser's successor was J. Howard Mueller, who Zinsser had brought with him from Columbia. Mueller had the insight to realize that bacterial growth factors might also be important in mammalian nutrition. His studies of bacterial nutrition led to the discovery of the last known essential amino acid, methionine, and to the isolation of what turned out to be nicotinic acid, though Fildes identified it.

Mueller, who died in 1954, was the last of the permanent chairmen. Funds for several professorships became available, leading to the establishment of a rotating chairmanship. Subsequent chairmen have been: Bernard D. Davis (1957-1968) and Harold Amos (1968-xxxx).

Harold Amos (J.G.B.)

HARVARD MEDICAL SCHOOL

THE EARLY USE OF TUBERCULIN IN AN ATTEMPT TO ERADICATE BOVINE TUBERCULOSIS IN MASSACHUSETTS

In 1917 the U.S. Department of Agriculture established a legal requirement for the destruction of tuberculin-positive cattle; and as we all know, the enormous expense of this program was eventually more than justified by its remarkable success in eradicating milk-borne tuberculosis. What is perhaps less well known is that the Commonwealth of Massachusetts initiated a similar program in 1894, only 3 years after Koch described the use of tuberculin as a diagnostic reagent; but the program was soon aborted. The necessary reforms required over 20 more years of educating the public and the veterinary profession, and of overcoming the resistance of those controlling the meat and dairy industries. It may be of value at this time to review briefly the early battle against infected herds in Massachusetts, for this piece of history suggests a principle that may be relevant on an even larger scale to our times: where large economic interests are involved a long period of public education appears to be required, however heartbreaking the lag, before new scientific knowledge can be effectively converted into legislation.

The briefest look at the history of the control of bovine tuberculosis will emphasize the foresight of the men responsible for the early Massachusetts program. Restrictions on the use of visibly diseased flesh, or of flesh from wasted animals, go back to the pre- Christian era; and strict regulations were widely in force in Europe by the 16th century, when a massive epidemic of syphilis had led to widespread concern with the transmission of communicable diseases. Yet restrictions appear to have become increasingly lax by the 19th

century. And though the discovery of the tubercle bacillus by Koch in 1882 led to rapid advances in understanding the etiology and transmission of tuberculosis, practices in the food industry were slow to change. In spite of the Federal Meat Inspection Laws enacted in 1890 and 1891, the Tuberculosis Commission of the Veterinary Congress of America at the 1893 Chicago Exposition reported: "We have no regular inspection of herds, nor a complete inspection of meat. Even if we had an organized inspection, its result would not teach us how much tuberculosis is present among our cattle …..It is only by an extensive examination with tuberculin, or a thorough and well organized system of meat inspection, that reliable statistics can be obtained."

The vision of the eradication of bovine tuberculosis seems to have been the creation primarily of D.E. Salmon and his junior associate, Theobald Smith, at the Bureau of Animal Industry of the U.S. Department of Agriculture, in Washington. In 1894 these- men, together with Kilbourne, de Schweinitz and Schroeder, published Bulletin 7, a masterpiece of epidemiological, bacteriological, and pathological description and analysis. The dissemination of the organism from the primary site in cattle was accurately traced and statistical evidence was presented for a 1:1 correlation between sources of infected milk and resultant human infection. The Bulletin ended with concrete recommendations. In particular, Smith concluded that though meat and milk contaminated by the tubercle bacilli might be made safe for human consumption by heating under carefully controlled circumstances, this procedure was not reliable in practice: the required temperature of 167° F was not always reached in rural "pasteurization" procedures, or at the center of a rare roast of beef. Bulletin 7 also introduced Theobald Smith's most significant experimental work in this field, which showed that bovine and human type tubercle bacilli were not the same.

In the same year (1894) Drs. H.C. Ernst (first Professor of Bacteriology at Harvard Medical School) and Austin Peters (a Boston veterinarian), after extensive experimental studies, reported to the Massachusetts Legislature that: "(1) Milk from cows affected with tuberculosis in any part of the body may contain infection. (2) The virus (sic) is present whether there is disease of the udder or not. (3) There is no ground for the assertion that there must be a lesion of the udder before milk can contain the infection of tuberculosis. (4) On the contrary, the bacilli of tuberculosis are present and active in a very large proportion of cases in milk of cows affected with tuberculosis but with no discoverable lesion of the udder."

The public, dairy men, and veterinarians reacted initially, for the most part, with disbelief or hopelessness. But the vision of the ultimate eradication of bovine tuberculosis, with the remarkably specific tuberculin test as a guide, was vigorously supported by a few imaginative and persistent investigators. Salmon wrote, "I know from experience that many herds of cows are entirely free from the disease. This may be proved by the history of the herds, and by…the tuberculin test. I believe it is quite possible to breed a race of cattle practically free from the disease; and while this is being done the known infected herds should be destroyed. A great work like this cannot be accomplished by an individual, nor by a single board of health. There must be cooperation, unity of effort, and the combined influence and power of the Nation, the State, and local authorities, the dairy men, and all organizations that are interested."

The force of such statements, the report of Drs. Ernst and Peters, and a favorable report of the Mass. Cattle Commission, under Drs. F.H. Osgood and C.P. Lyman of the Harvard University School of Veterinary Medicine, persuaded the Legislature to pass a bill requiring rigid inspection of herds at frequent intervals, meat inspection, quarantines, and destruction of infected animals. In addition, as the foundation of a state-wide tuberculin-testing program, to be put into effect by 1896, a pilot project was started in 1894 with all cattle imported from outside the state, which were quarantined at Brighton, Somerville, and Watertown. The goal was accreditation of one tuberculosis-free herd after another, with strict interherd quarantine procedures, until the state should be free of bovine tuberculosis. The passage of this advanced legislation may have helped to attract Theobald Smith to Massachusetts, in 1895, to fill a joint appointment at Harvard Medical School and as Director of the Pathological Laboratories of the Massachusetts Board of Health.

Unfortunately, the 1894 program was bitterly opposed by vested interests, who were able to stir up an uninformed public. The accuracy of the tuberculin test, upon which the condemnation of apparently healthy animals rested, was challenged. The scheduled expansion of the program was delayed, and in 1897 a special

Commission of experts was appointed to define the reliability of the test. H.E. Ernst* and Theobald Smith of Boston, and a veterinarian from Pittsfield (George Kinnell), reported the test to be phenomenally accurate and valuable. However, a minority report was filed by the two other veterinarians on the Commission, Charles R. Wood of Lowell and Frank S. Billings of Grafton, who chose to depart from the stated purpose of the investigation and to offer their opinions on the usefulness of the program. They felt that "wanton destruction" of meat "slightly infected" was "little less than farcical". Such meat had been eaten for years "without a great amount of damage being done in regard to the health of the people". This opinion, it should be remembered, came at a time when in some age groups tuberculosis was the commonest cause of morbidity and death, and when 60% of deaths from tuberculosis in children were caused by the bovine organism. Encouraged by this minority report, the Legislature postponed, and eventually abandoned, the earlier plan to extend tuberculin testing to all cattle in the Commonwealth.

Theobald Smith continued to study the two major types of tubercle bacilli, with results that opposed two misconceptions: the dangerous and widespread public belief that bovine tuberculosis could not be transmitted to man, and Koch's insistence, on the other hand, that there was no difference between the bovine organism and that transmitted from man to man. By 1901 Smith's extensive data convinced Koch. Meanwhile, others took up the struggle, and increasing public education on the relevant scientific facts eventually made possible, in 1917, the passage of a Federal Law that proposed essentially the same program as its much earlier predecessor in Massachusetts. As a result, bovine tuberculosis is now a forgotten disease in this country.

Today we face problems in which public health is similarly pitted against economic interests -- for example, cigarettes, air pollution, and noise pollution. Surely the lag in achieving effective legislation will now be much shorter -- though the problems, from their very nature, will rarely lend themselves to so dramatic and permanent a solution. If the prospects of a victory for the public sometimes seem discouraging we may do well to reflect on the fact that young people today, on reading Victor Hugo, have to ask "What is a hunchback?

Margaret R. Olmsted
Bernard D. Davis

* Dr. Ernst in 1879 and again in 1890 had worked in Koch's laboratory, the latter time returning with a supply of "Koch's lymph" or tuberculin.

MICROBIOLOGY AT BOSTON UNIVERSITY SCHOOL OF MEDICINE

Instruction in bacteriology has been an integral part of the curriculum of the Boston University School of Medicine since the pioneer days of the science. The first mention of bacteriology occurs in the Bulletin for 1893 as an offering for the third year class. In 1894 the bacteriology laboratory was described and a practical course offered in the "Autumn term for the third year class". It covered "methods of culturing and differentiating pathogenic 'bacteria". Advanced students were offered "opportunity for original investigation".

In 1901 the course was shifted to the first year, and with the transfer of the pathology laboratory of the Massachusetts Homeopathic Hospital to the medical school, students had "the opportunity to diagnose typhoid fever, diphtheria, and tuberculosis in the bacteriology laboratory". The course was specified at 50 hours and was offered by an instructor and an assistant in pathology.

In 1908, under the direction of Dr. William H. Watters of the Pathology, Department the course offered in the first year was described as: Bacteriology lectures, 60 hours; Bacterial technic, 50 hours; and Bacterial therapeutics (concerning the functions of opsonins and the use of tuberculins and vaccines), with an

unspecified number of exercises in the third year. By 1911 the course was shifted to the second year but was essentially unchanged until 1917, when a total of 125 hours was offered, covering technique, therapy, the preparation of vaccines, antitoxins, the Wassermann reaction, and complement fixation in general. For the first time Bacteriology was offered as a field of specialization for graduate work leading to the Ph.D. degree. Instruction was also started in "immunity and the pathological means of producing it" by Doctors David L. Belding and Sanford B. Hooker, in a laboratory course in Preventive Medicine and Immunity.

Emphasis in the field increased and by 1922 comprised: Bacteriology, 144 hours; Immunity, 81 hours; Parasitology, 25 hours; a total of 250 hours. Emphasis on parasitology was maintained throughout the ensuing years. In 1926 Dr. D. L. Belding was named Prof. of Pathology and Bacteriology and the time allocation and organization of the course remained practically unchanged until 1935 when Pathology was separated as an autonomous department. The new Department of Bacteriology, Experimental Pathology and Public Health expanded the last topic to a 96-hour course offered in the third year. With the onset of World War II, thirty hours of this course were allotted to the discussion of tropical diseases. The curriculum remained essentially the same until 1948 when the department of Public Health and Preventive Medicine budded off as an independent unit and the new Department of Bacteriology restricted its instruction to the second year with a total of 240 hours distributed in general as it had been for the previous ten years.

In 1950, with the retirement of Dr. Belding, the discipline was renamed Microbiology under Dr. Geoffrey Edsall, with no apparent alteration in scheduled times, but with many changes in emphasis and format. In 1952, Dr. Edgar Baker succeeded Dr. Edsall, becoming Professor and Chairman of the department in 1953. Although the scheduled hours did not reflect it, the course was reorganized extensively, with more emphasis on virology and bacterial physiology. In 1966 the number of hours allotted was decreased by twenty per cent, to a total of 185 hours. In the last several years, with the ascendance of the popularity of "core" courses, the total time devoted to microbiology has dwindled to 140 hours, with major emphasis on bacterial physiology and genetics, virology, and immunity. The practical diagnostic aspects of bacteriology are augmented in a subsequent course in "The Biology of Disease".

Apart from the instruction of medical students, the department of Microbiology directs several graduate studies. The purification and characterization of the antigens of *Yersinae pestis* has been a major interest of Dr. Baker Dr. L. Corwin is involved in several studies in the genetic and physiological properties of enteric organisms and their correlations with virulence. Dr. S. Kibrick has been studying *H. simplex* virus as a model for the interplay of immune mechanisms and the persistence of viral infection. The effects of bacterial flora, both normal and pathogenic, on the functions of the intestinal mucosa have been the concern of Dr. S. Broitman. Dr. S. Copperband is particularly concerned with mechanisms of the immune response and of immune tolerance. Initiated by Dr. Alice T. Marston, the department is the center for diagnostic parasitological service for the University Hospital and the Boston City Hospital, as well as for several community health centers in the surrounding area.

Matthew A. Derow, M.D., Ph.D.
Asst. Prof. Microbiology
Boston University School of Medicine

BACTERIOLOGY AT TUFTS MEDICAL SCHOOL

Tufts Medical School, open alike to men and women, bestowed its first doctor-of- medicine degrees in 1893 as qualified to be "the family physicians of New England". As such the Division of Bacteriology in the Department of Pathology aimed to orient medical students to know the subject under the practical headings of Diagnosis, Treatment and Prevention. "For the past 25 years, under the successive deanships of Drs. O'Hara, Brayman and Maloney, the bacteriology, parasitology and virology teaching and research had the uniquely qualified instruction of Drs. Ralph E. Wheeler, Robert A. Rustigian and Asst. Professor, Mrs. J.

Howard Mueller. A comprehensive program of student immunization created 'medical graduates possessing the most formidable aggregations' of antibodies that any medical school has yet produced."[9]

A unique research was that conducted in collaboration with the General Electric Company in "helping to eliminate the growth of molds and yeasts from the fuel cell used to power the Gemini capsules in their early gyrations around the earth", thereby winning a Gemini emblem for Dr. R. E. Wheeler.

Today's relevance of microbiology in comprehensive medical education is enhanced by the faculty coverage under Dr. James T. Park and Dr. H. Edward MacMahon heading a comprehensive oriented staff of seven.[10]

HARVARD SCHOOL OF PUBLIC HEALTH

Under the joint direction of President Lowell of Harvard and President MacLaurin of M.I.T., an Administrative Board consisting of Wm. T. Sedgwick, Chairman; Milton J. Rosenau, Director and George C. Whipple, Secretary was placed in charge of a new School for Health Officers in 1913. Jointly sponsored, the activities of the school were divided among the three campuses of M.I.T., Harvard Medical School and Harvard College with original faculty members Dr. Richard Cabot, Dr. David Edsall, Dr. Theabald Smith, and Miss Ida Cannon, the latter of the famed Medical Social Service of the Massachusetts General Hospital; also Dr. Alice Hamilton, Dr. Gordon M. Fair and Dr. Philip Drinker. In 1918 due to the limitations of its title, the name was changed to School of Public Health with courses in: preventive medicine and sanitary science, personal hygiene, public health administration, laboratory courses, communicable diseases, sanitary and municipal engineering and demography. Courses offered through the School of Tropical Medicine included parasitology and entomology, climatology, tropical bacteriology and pathology as well as venomous animals.[11]

Legal restrictions preventing the granting of joint degrees to students of the three teaching colleges necessitated the separation of the Harvard and M.I.T. School of Public Health in 1922. Dr. Roger I. Lee became Dean of the independent Harvard School of Public Health, long referred to as the Father of the School of Public Health. Succeeded by Dr. David Edsall as Dean, a large Rockefeller Foundation grant allowed for endowment as well as acquisition of the former Infant's Hospital building on 55 Shattuck Street, thus providing for the reorganized School.

Upon the retirement in 1935 of Dr. Edsall after marked success as joint Dean of the School as well as the Medical School, its guidance was assumed in 1939 by Dr. Edward G. Huber. During his tenure it was felt that "students of infectious disease are living in an era which is comparable in rapidity of discovery and intellectual adventure to that which transformed medicine in the period between Pasteur and Ehrlich. Ultramicroscopic virus agents have been known for a long time - ever since the observation of tobacco mosaic in 1892 and the discovery of an invisible agent as the cause of foot and mouth disease in 1897.

"In the ensuing years there was a natural tendency among investigators to assume the possibility of filterable agents in almost all diseases which were obviously infections, but in which bacterial causation could not be determined. It was, in fact, not until 1920 that the subject began to develop precision, but by 1939 not only have innumerable diseases of animals and of man been conclusively linked with virus causation, but special techniques have been devised for virus study by which determinations of size and chemical constitution have been made possible.

"The field of tissue culture has expanded in such a way that it now holds a place as important in medicine as bacteriology itself; and since many of the conditions now known to be caused by those ultra-microscopic agents are among the most important known epidemic diseases, there has developed at the same time a special epidemiology to which methods of virus investigations are applicable. The Symposium of Virus and Rickettsial Diseases held at Harvard Medical School in 1939 by its indigenous group who have worked for some years on one phase or another of the problems of virus disease, resulted in the publication of the papers

presented, which represent accurate and scholarly reviews of literature on certain virus diseases, compiled and critically appraised by competent individuals. This was undertaken because it was hoped that at the present state of virus investigation - a stage which we may regard as merely the beginning of an era in medicine which already equals in importance the most brilliant period of modern bacteriology - a contemporaneous survey might be found useful."[12]

This pertinent orientation and constantly increasing research has produced rewarding accomplishments. Under the Deanship of Brig. General James S. Simmons followed by that of Dr. Hugh R. Leavell until his retirement in 1963, and followed by the appointment of Dr. John Crayton Snyder as dean. The School now has the tremendous increased facilities of the new Health Sciences Laboratories contiguous to its original Rotch Building and adjacent to Harvard Medical and Dental Schools, the Countway Library of Medicine, the Children's Medical Center and the Peter Bent Brigham Hospital. It seeks "the advancement and dissemination of knowledge relating to human health and well-being" by the annual dissemination throughout the world of its graduates into the fields of active science or teaching. "Over the past two decades approximately one fourth of all the alumni have undertaken careers in teaching and research following graduation from the School." Emphasis in 1968-69 through a newly established Center for Community Health and Medical Care is "an expression of Harvard's determination to contribute to the nation's effort to facilitate and improve the application of the biomedical sciences toward the improvement of the health of the peoples of this country and other countries of the world".[13]

A CENTURY OF LIFE SCIENCES AT M.I.T.[14]

One does not ordinarily associate the subject of the life sciences with the early history of M.I.T. When the Institute opened its doors in 1865, one of the six original courses of instruction was "Science and Literature". Some biology was included in this course because President William Barton Rogers, Professor of Geology and Physics, had considerable interest in paleontology and probably taught some biology.

It was soon apparent, however, that the Institute needed a full-time professor whose responsibilities would be primarily in the life sciences. Indeed the need was so critical that President Rogers suggested that the salary for the new biologist be paid out of his own stipend of $2,500 per year. With this inducement, Dr. Samuel Kneeland, a medical clinician, was appointed the first Professor of Zoology and Physiology in 1867. Further impetus to the teaching of biology was afforded by the subsequent appointment in 1878 of Alpheus Hyatt as Professor of Paleontology and Zoology. Hyatt was a student of Agassiz at Harvard and was well trained in classical biology and paleontology and contributed greatly to the development of biology at M.I.T. It was he who organized and became the first president of the Marine Biological Laboratory at Woods Hole in 1888. Since then, M.I.T. has been closely associated with marine research at Woods Hole.

In 1871 a new course (VII), "Natural History", was established to prepare those "whose ultimate objective is the special pursuit of geology, mineralogy, botany, zoology, or to prepare for medicine, pharmacy, or rural economy". This course flourished under Kneeland and Hyatt and was further strengthened in 1883 when William Thompson Sedgwick, a graduate of Yale University, came from Johns Hopkins University as an Assistant Professor of Biology. In the following years, under Sedgwick's leadership, M.I.T. won renown as a center for the life sciences relating to microbiology and public health. Sedgwick himself was broadly trained in biochemistry and in basic medical sciences at Yale. He then transferred to Hopkins where he studied the effects of drugs upon the nervous system and received the Ph.D. degree in physiology. Upon coming to M.I.T., however, he began to apply the new knowledge of microbiology, developed in Europe by Pasteur and Koch, to the fields of sanitation and public health. In a brilliant series of studies he and his students succeeded in relating an epidemic of typhoid fever, which swept down the Merrimac Valley, to the contamination of the river by sewage which drained into it. Further investigations of this type firmly established Sedgwick as the "father of American epidemiology" and have provided detailed knowledge of the relationship of disease to pollution of water supplies.

At the same time that Sedgwick was carrying on this outstanding research program, he set up a curriculum designed to train premedical students (Course VIIB). This course included chemistry, physics, general biology, comparative anatomy, histology, and physiology as the core subjects and is not unlike the current curriculum for premedical students in many universities. It was probably the first in the United States to place the preparation for medicine on a firm scientific basis. Such training was far ahead of its time, however, and it was not well thought of by most medical schools which preferred candidates who had majored in liberal arts.

In 1889 a new Department of Biology was established under Sedgwick's leadership which not only included premedical training but emphasized bacteriology and sanitary biology. The early work on water supplies led to similar studies on food supplies and major interest was aroused in the bacteriology of foods which was further developed under Samuel C. Prescott, '94. The emphasis of the department upon public health problems led to a change in name to "Biology and Public Health", in 1911. Although the research program of the department was primarily in sanitation, the training of students remained basic. Professor Sedgwick (with E.B. Wilson) wrote the textbook "An Introduction to General Biology" in 1886 which emphasized the use of type organisms for teaching basic principles. As late as 1940, students were still dissecting the earthworm and the fern in the Biology laboratory course in accordance with Sedgwick's directions. Today students in the same beginning laboratory use the ultracentrifuge and the oscilloscope to study molecular and systems biology and to illustrate these same basic principles.

After Professor Sedgwick's death in 1921, Professor Prescott headed the department until 1942. He also served with distinction as Dean of Science during the last 10 years of this period. In collaboration with William L. Underwood, '98, a part-time member of the department, Prescott developed procedures for the sterilization of canned foods which were basic to the development of the canned food industry in the United States. An exhibit of this proud achievement is now in the Boston Museum of Science. From this work on food sterilization an interest developed in all aspects of the preservation and processing of foods which led to the establishment of the new field of Food Technology at M.I.T.

In 1936, a committee made up of President Karl T. Compton, Vice-President Vannevar Bush, '16, and Professor John W.M. Bunker proposed that M.I.T. develop a new type of biology, Biological Engineering, which would utilize basic knowledge of physics, math, and chemistry as well as the fields of engineering. A new curriculum was devised to train students for this new field and Francis O. Schmitt came to M.I.T. in 1942 to head the new department, now called "Biology and Biological Engineering". Training in public health was abandoned at this time because this field had become dominated by the medical profession. The new curriculum offered majors in biology and food technology, as well as biological engineering with emphasis on biophysics and biochemistry.

The teaching and research relating to foods developed to such an extent that it became necessary in 1948 to establish the first Department of Food Technology in the United States under the guidance of Professor William L. Campbell, '15, a leader in the food industry. At this time, the title of the original department reverted to "Biology". The subject of food technology at M.I.T. was further developed to world prominence in many areas under the leadership of Professor Bernard E. Proctor, '23, who from 1952-1959 pioneered the sterilization of food by irradiation. In 1961, Professor Nevin S. Scrimshaw became head of a new graduate Department of Nutrition and Food Science, in which emphasis has been given to problems of biochemistry, human nutrition and the metabolism of foods as well as continuing the emphasis on food chemistry, bacteriology, and food engineering.

The Department of Biology was reorganized in 1955 by Professor Irwin W. Sizer, and molecular biology was further developed with emphasis upon biophysics, biochemistry, microbiology, and physiology-developmental biology. In addition to the undergraduate and graduate training, a strong program for postdoctoral training of M.D.'s as well as Ph.D.'s has been developed.

In 1964, a Clinical Research Center was established at M.I.T. to provide facilities for all of the Faculty who wish to carry on research with human patients and volunteers. This facility, which further strengthens

M.I.T.'s efforts in postdoctoral medical training and research, is extensively utilized by both the Departments of Biology and of Nutrition and Food Science.

A new Center for the Life Sciences was established in December, 1965, when the Whitaker Building was dedicated. The Center will include all of the teaching and research of the Departments of Biology and of Nutrition and Food Science. This program will encompass all of the work in the Whitaker and Dorrance buildings as well as many of the laboratories in the Communications Center and in the Daggett Building. The Center for the Life Sciences will make possible the integration and coordination of courses, seminars, and research in the two departments while maintaining the autonomy of each. It should also restore to M.I.T. the original concept of the Life Sciences developed under Professor Sedgwick.

Although the life sciences are mainly concentrated in the Departments of Biology and of Nutrition and Food Science, they have become so important that there is scarcely a department at M.I.T. or a research center which is not concerned in some way with the life sciences. The training of students is still primarily the prerogative of these two departments with about 100 undergraduates enrolled in the life sciences and about 80 graduate students in Biology and a similar number in Nutrition and Food Science. Both departments are involved in extensive post-doctoral training programs.

The Directory of Current Research for 1965 lists 1,203 research projects at M.I.T. Of these about one-quarter are clearly in the field of the life sciences. Only one-third of these, however, are carried on in the Life Sciences Center. The remainder are scattered throughout the Schools of Engineering, Science, and Humanities with special concentration in the Departments of Psychology, Physics, Chemistry, and Electrical Engineering, and in the Research Laboratory of Electronics.

Many influences are now at work throughout the world to increase scientific endeavor in the life sciences. The creation of the Center for Life Sciences and the completion of the Whitaker Building assure that the life sciences will continue to be one of the principal teaching and research interests at M.I.T., extending and broadening the contributions in biophysics, biochemistry, microbiology, physiology, food science, and nutrition which have brought growing distinction to the Institute since its founding more than a century ago.

Professor Irwin W. Sizer

BACTERIOLOGY AT M.I.T.

Bacteriology at M.I.T. has a long tradition, tracing back to Professor William Thompson Sedgwick, the first president of the Society of American Bacteriologists. It is my privilege to occupy the Sedgwick Chair in Biology, named after this great pioneer in health science and sanitary bacteriology.

A modern microbiology program was initiated at M.I.T. in the Biology Department in 1959. Today its staff consists of 6 persons of professional rank, with about 25 graduate students and 20 postdoctoral fellows and associates. Our main areas of interest are bacterial physiology and genetics and viral reproduction.

One of the most important developments in recent years, both at M.I.T. and elsewhere, has been the increasing role of microbiology in the general biology curriculum. Not only biochemistry, but also introductory biology, genetics, and cell physiology are taught increasingly with materials and examples derived from procaryotic organisms. The main reason for this is the effort to integrate the main findings of molecular biology, based on work with bacteria and viruses, with the biochemistry and physiology of living organisms in general. The use of microorganisms makes it possible for undergraduate students to carry out relatively sophisticated experiments in the comparably short time of university terms.

It is my feeling that microbiology is contributing and will continue to contribute valuable and powerful insights into the most intimate phenomena of life, both at the frontier of research and in the education of modern biologists.

Salvatore E. Luria, M.D.

BOSTON UNIVERSITY

Boston University's Department of Biology presented its first course in Microbiology in 1945 given by Dr. Genevieve Young. Under-graduate offerings increased to include, in addition to the basic course in general microbiology, an advanced course in Pathogenic Bacteriology and Immunology and a service course for students in the School of Nursing. Graduate courses later offered virology, microbial physiology, microbial genetics, marine and soil microbiology, mycology and immunology.

Members of the faculty have been:

Genevieve Young	Dorothea Raacke	Galen Jones*
Ernest Blaustein	Gwendolyn Stewart	Wesley Tiffney
Clair Folsome*	Philip De Palma	Lynn Margulis

*Presently not staff members.

SIMMONS COLLEGE

Simmons College, incorporated in 1899, opened in 1902, and established its Department of Biology in 1906, offering courses in Microbiology and Public Health. It has been fortunate in having on faculty such people as Edith A. Beckler, Curtis M. Hilliard, Catherine A. Witton and most recently Philip M. Richardson. Department course offerings have been strengthened by close cooperation with members of the Massachusetts Department of Public Health. Robert A. MacCready and Joan B. Daniels were special instructors in Bacteriology, Immunology and Virology for a number of years. The Biology Department looks forward to continuing a strong program in microbiology in its developing applications in life sciences.

Anne E. Coghlan, Ph.D.

EMMANUEL COLLEGE

A course in Microbiology was introduced at Emmanuel College in 1922, three years after its founding. The then known fundamental structure and physiology of microorganisms were taught, keeping pace with newer concepts in bacterial and viral genetics, pathogenicity, microbial control and immunity. The intent of the course is to alert students to areas of research and work in the fields of genetics, physiology, biochemistry, cytology, public health, industrial microbiology, and medicine. Its overall purpose is to prepare students for research, graduate school, laboratory technician work and teaching.

In the past, students of microbiology at Emmanuel have contributed in the areas of research, public health, hospital laboratory work, insurance health publications, teaching and industry. Present students in this course are encouraged to see the importance of exploring life functions at the molecular level through the study of microbes. Faculty and student research is concerned with molecular and developmental biology.

Sister Frances Donovan

MICROBIOLOGY AT WELLESLEY COLLEGE

Wellesley College, founded in 1870, was opened in 1875 as a liberal arts college; for women to become acquainted with the main fields of human interest, to be capable of integrating knowledge from different fields and to be prepared for continuous scholarly growth and responsible participation in society. Thirty-three years later, the biology department offered a specialized course.[15]

Dr. Lincoln Ware Riddle gave the first course in bacteriology in 1908 and two years later, Dr. Laetitia Morris Snow joined him.

"Bacteria, Yeasts and Molds in the Home" was the title of the first course in microbiology, which the students called "Bugs in the Home" and in which Dr. Rebecca Craighill Lancefield, later of Streptococcal renown was enrolled. Subsequently, Miss Snow taught the General Bacteriology course until 1939.

With the development of the microbiological sciences following World War II, the course offerings were expanded under the tutelage of Delaphine G.R. Wyckoff (1938-), to reflect these developments as courses in Advanced Bacteriology and Immunology and Virology were added to the curriculum. Presently, there is an additional staff member, Dr. Mary M. Allen (1968-) whose prime interest is in the procaryotic algae, and who is initiating a course in Microbial Physiology and Cytology.

Research interests of the staff have included bacterial flora of various soil types, anti- bacterial agents, marine bacteria and microbial processes and their regulation.

Delaphine G.R. Wyckoff, Ph.D.

HISTORY OF MICROBIOLOGY AT THE UNIVERSITY OF NEW HAMPSHIRE

The first instruction in microbiology at the University of New Hampshire began in 1906 when a course in Mycology (fungi and bacteria) was offered by Charles Brooks of the Botany Department and a course in Dairy Microbiology was taught by Frank Tinkham of the Dairy Department. A course entitled Bacteriology was introduced by Professor Brooks in 1909, which involved a study of the morphology and classification of bacteria, culture methods and the relation of bacteria to such processes as decomposition, fermentation, and disease. Dr. Caroline Black, Department of Botany, taught courses entitled General Bacteriology and Bacteriology during the period 1910-1918. Fred Werkerthen taught these courses during the next year but was replaced by Dr. Mabel M. Brown, who then taught courses in General Bacteriology, Applied Microbiology, and Agricultural Bacteriology during the period 1920-1927. Miss Marion Mills, a botanist, replaced Dr. Brown in 1927 and taught the bacteriology courses until 1932.

In 1932, Dr. L.W. Slanetz was appointed as the first full-time Instructor in Bacteriology at the University as a member of the Botany Department. In 1935, the name of the Department was changed to Botany and Bacteriology and Mr. Joseph Naghski was admitted as the first graduate student and graduate assistant in Bacteriology in 1936. The courses taught during the period 1932 to 1940 included General Bacteriology, Applied Bacteriology, Advanced Bacteriology and Seminar.

In 1941, the Departments of Botany and Bacteriology and Zoology were combined into a Department of Biology with Dr. Slanetz serving as Chairman of the Section of Bacteriology in the Department. Dr. H. Gilbert Crecelius joined the Department as an Instructor at that time and Dr. Clara H. Bartley was appointed as an Assistant Professor in 1945. Mr. Arthur Howe and Mr. Arthur Shanahan served as Instructors in the Department during the period 1943 to 1952, when Dr. Crecelius terminated his appointment to enter military service.

In 1947, the Department of Biology was dissolved and Bacteriology became a separate Department in the College of Liberal Arts with Dr. Slanetz as Chairman. Dr. Theodore G. Metcalf joined the faculty in 1956, Dr. William R. Chesbro in 1959, Dr. George J. Hageage in 1963, Dr. Galen E. Jones in 1966, Dr. Fred T. Hickson in 1968, and Peter A. Ladanyi in 1969.

A milestone in the development of the Department occurred in 1960 when the name was changed from Bacteriology to Microbiology, the Department moved into excellent new facilities on the middle floor of the Spaulding Life Science Building, and a Ph.D. program in Microbiology was established. Thus, from a very modest beginning in 1932, teaching and research in microbiology has increased greatly at the University, assisted in no small measure during the last fifteen years by Public Health Service research and training grants. Currently the Department consists of four professors, one research associate, one assistant professor, one instructor, and three teaching assistants. There are an average of forty undergraduate majors and twenty graduate students enrolled in microbiology each year. Eight Ph.D. degrees have been granted since the beginning of this program in 1961. The courses now offered by the Department include Public Health and Sanitation, General Microbiology, Advanced Microbiology, Environmental Microbiology, Marine Microbiology, Pathogenic Microbiology, Immunology and Serology, Problems in Microbiology, Microbiological Literature and graduate level courses in Systematic Bacteriology, Microbial Physiology, Microbial Cytology, and Microbial Genetics. Approximately 150 students were enrolled in the course in General Microbiology in 1969 and from about 10 to 90 students in other courses offered by the Department.

Dr. Metcalf is currently serving as Acting Chairman of the Department, while a search is being made for a new Chairman to replace Dr. Slanetz who terminated his Chairmanship on July 1, 1969, to assume the Deanship of the School of Health Studies at the University. The faculty plan to continue to maintain a Department of Microbiology that represents all areas or phases of this science. Increased emphasis will be given to marine microbiology since the Department has been provided major research and teaching facilities in a new Estuarine Laboratory located at Great Bay, Durham, New Hampshire.

Dr. L. W. Slanetz

BACTERIOLOGY AT THE UNIVERSITY OF RHODE ISLAND

Teaching and research in bacteriology began at the University of Rhode Island in 1908 when Dr. Philip B. Hadley came from Brown University to join the staff of the Agricultural Experiment Station as animal pathologist. The Department of Bacteriology was established in 1912, with Dr. Hadley as head, and offered three courses: general bacteriology, advanced bacteriology (i.e., special work), and seminar. The department retained close affiliation with the Agricultural Experiment Station, however, and the department staff were also on the staff of the Experiment Station. This fact dictated their research orientation, which concerned principally diseases of poultry.

Dr. Hadley was succeeded in 1920 by Dr. Henry G. May, who continued much the same type of work as his predecessor, and left the courses practically unchanged in formal outline.

Following Dr. May's untimely death in 1926, Dr. John C. Weldin was brought from Iowa State College to the combined post of Professor of Bacteriology and Professor of Animal Breeding and Pathology in the Experiment Station. Since his principal interest was in the systematic relationships of the intestinal bacteria, his research and that of the department for the next few years concerned chiefly bacillary white diarrhoea of chickens and related subjects. He promptly revised one of the courses to emphasize diagnosis of communicable diseases and immunology, and in 1931 introduced a laboratory course in sanitary, diary, and food bacteriology, and formal courses in pathogenic bacteriology, systematic bacteriology, and immunity and serology.

The department was separated from the Experiment Station sometime between 1935 and 1940, and since then the research programs have been those of the various faculty members. They include the mechanism of

the formate-pyruvate exchange reaction in *S. faecalis*, O-R controlled reactions in enteric bacteria, microbial degradation of hydrocarbons, RNA and protein synthesis in *E. coli*, serologic classification of Shigella, and the mechanism of antibody syntheses.

Microbiological research is not restricted to the Department of Bacteriology. More than 25 microbiologists are members on the University faculty in various departments or are on the staffs of closely associated U.S. Government laboratories situated on university property. Research projects include the study of fungal and viral diseases of plants, viral diseases of animals, viral and bacterial diseases of shellfish, microbial pollution of seawater, the effects of chemical pollutants on marine algae and protozoa, preservation of fish products, and isolation and characterization of drugs from marine algae.

Philip L. Carpenter
University of Rhode Island

BROWN UNIVERSITY HONORS DR. CHARLES A. STUART

A memorial lectureship in the name of Charles A. Stuart has been sponsored jointly by the University, Merrill Chase, Samuel Formal, Helen B. Stuart, friends, students and professional associates. Long director of the Brown University Department of Microbiology, Dr. Stuart was president of the Society of American Bacteriologists in 1956, also of the North-East Branch of the Society.

Mrs. Stuart is currently organizing material relative to the work of Dr. Stuart for the University Archives, which will be available to the American Society for Microbiologists upon completion.

MICROBIOLOGY AT THE U.S. ARMY NATICK LABORATORIES

The several microbiological laboratories, located within the U.S. Army Natick Laboratories, in Natick, 20 miles west of Boston, investigate a diversity of problems, now pertinently directed to Federal army applications, but equally applicable and desirable for civilian assumption.

Bacteriology Group, Pioneering Research Laboratory (Dr. Hille S. Levinson), is primarily concerned with basic research in bacterial spore physiology, and has been studying aspects of the activation, germination, and post-germinative development (outgrowth) of bacterial spores. Some recent investigations include kinetics and thermodynamics of the physiological processes in the development of a spore into an actively growing vegetative cell; genetic alteration of the requirements for spore germination; the sequence of events during heat inactivation of spores; ultrafine structural changes during germination and outgrowth; effects of spore chemical composition on germination characteristics; spore activation by heat, water vapor, or aqueous ethanol; nucleic acid synthesis during germination and outgrowth; and differences in nutritional requirements for spore germination and post-germinative development.

Mycology Group, Pioneering Research Laboratory (Dr. Emory G. Simmons), engaged in research on microscopic fungi, with emphasis on those groups which are capable of destructive attacks on several classes of natural or manufactured material. Systematic studies and identification of strains are used as fundamental tools in correlating contributed information from field and experimental work in deterioration, pathology, biochemistry, and microbiology. The Group maintains the Culture Collection of Fungi of the Army Material Command. This assemblage of several thousand living isolates is worldwide in scope but is especially rich in molds associated with contamination or decay problems of tropical and subtropical regions. Particularly destructive isolates are used in prevention of deterioration studies and in screening of resistant materials; others support research in related microbiological disciplines.

Additionally, an Applied Microbiology Group (Dr. Arthur M. Kaplan), a Microbial Chemistry Group (Dr. Frederick W. Parrish), a Microbiology Division, Food Laboratory (Dr. Durwood B. Rowley), and an Experimental Pathology Laboratory (Dr. Joseph Previte) are actively engaged in research.

Hillel S. Levinson

INDEPENDENT RESEARCH-BASED SERVICES IN THE SCIENCES

The North-East Branch area of the American Society for Microbiologists includes besides hospitals, colleges, state and local health departments, many private microbiologically involved institutions, whose staffs are of high professional standing in their several categories, and whose membership strengthens the North-East Branch.

The complex and varied applications of microbial activities reach into many fields of endeavor, research and opportunity. The functioning of such groups, many of long standing, has produced enormous strides in the world of industry and science, contributing not only to the limitless possibilities of continued study of bacterial inter-relationship, but also to the understanding and improvement of health in the entire field of life sciences.

The Lahey Clinic Foundation, now including the Sias Research Laboratories, The Millipore Corporation, the H.P. Hood Diary Foundation, The Whiting Milk Company, Inc., Arthur D. Little, Inc., and Charles River Breeding Laboratories, Inc. are but a few of such groups performing its constant phenomenal development.

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Laboratories in the past have contributed to overall bacteriological knowledge in increasingly specialized fields. The breadth and depth of the scopes of these several categories are such that there is "no field of human endeavor…..where the microbe does not play an important and often dominant part".[16]

Today, there is a galaxy of scientists which has created entirely new disciplines. "We have produced and will produce people who can do the same in future generations."[17]

The opportunity and possibility of that future is a challenge and hope to every member of the American Society for Microbiologists.

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FOOTNOTES

[1] Cohen, Barnett - Archivist, S.A.B. for 41st Annual Meeting in 1940, Jour. Bact., Vol. 39, Pg. 1-2
[2] Records of Boston Bacteriological Club
[3] Prescott, S.C. - Communication re Boston Bacteriology 1930
[4] Ehrlich, P. - 17th Intern. Cong. Med., London 1913; publ. London 1914, Pgs. 93-111
[5] Early and Consecutive Annual Reports of City of Boston Health Dept.
[6] Snedeker, L. - 1969, One Hundred Years at Children's Hospital, Pgs. 35-36
[7] Leaflet, Mass. Gen. Hosp. FACTS 1969
[8] Harvard Medical School Bulletin, 1968-69, Pg. 14
[9] Wheeler, R.E. - Tufts Med. Alumni Bulletin, Vol. 17, No. 1, March 1958
[10] Current TUSM Bulletin
[11] Curran, J.A. – H.S.P.H. Alumni Bulletin, Vol, 23, No.1, Jan 1966, Pgs 2-4.
[12] Zinsser, H. - Foreword in H.S.P.H. Symp. in Virus & Rickettsial Diseases, H.U. Press 1940, Pgs. V-VII
[13] H.S.P.H. Register 1968-69, Pgs. 38 & 173
[14] Sizer, I.W. - Technology Review, Feb. 1966, Pgs. 17-19
[15] Leaflet, Continuing Education Program, Wellesley College, 1970
[16] Waksman, S.A. - Pres. Address 1942, Jour. Bact. No. 1 Jan. 1943
[17] Brown, H. - Pres. Report, Calif. Inst. Technology, 1968-69, Pg. 11

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Microbiology in the Northeast Branch American Society for Microbiology

A Historical Review Volume II

1970 - 1999

In Celebration

of the

ASM Centennial

October, 1999

BROWN UNIVERSITY SCHOOL OF MEDICINE

Brown University consists of the college, an undergraduate college for men and women, with courses leading to the degrees of Bachelor of Arts and Bachelor of Science. The graduate school provides courses leading to a number of Masters and Doctor of Philosophy degrees. The program in medicine leads to the degree of Doctor of Medicine. Dr. Charles Stuart, a faculty member at *Brown University*, was a member of the original Boston Bacteriological Club (or "Bug Club") and, in 1948, became the first President of the newly organized Northeast Branch of the Society of American Bacteriologists (S.A.B.). Dr. Stuart was elected President of the S.A.B. in 1956.

In 1972, *Brown University* approved a Program in Medicine leading to the M.D. Degree.

In 1975, full accreditation as a four-year medical school was granted and the first M.D. degrees were awarded in June to a graduating class of fifty-eight students.

In 1983, the Division of Biology & Medicine was reorganized and two administrative units were developed within the Division: the Program in Biology, and the Program in Medicine. Clinical departments were formed within the Program in Medicine.

In 1984, the University approved a new medical education continuum, the Program in Liberal Medical Education (PLME).

In 1991, the University Corporation voted to change the name of the Program in Medicine to the *Brown University School* of Medicine.

The Medical School is affiliated with eight teaching hospitals. Faculty in the clinical departments are based at these hospitals. These hospitals include the following Rhode Island hospitals: The Emma Pendleton Bradley Hospital, Butler Hospital, Memorial Hospital of Rhode Island, The Miriam Hospital, Rhode Island Hospital, Roger Williams Medical Center, The Veterans Administration Medical Center, Women & Infants Hospital of Rhode Island.

The AIDS Program was established in 1988 to provide a focus for the planning and implementation of Brown's research, education, community services, and patient care needs related to AIDS. As an integral part of the Medical School the program coordinates University-wide projects and integrates AIDS-related research efforts in more than a dozen academic laboratory and clinical centers.

Kenneth H. Mayer, M.D., professor of medicine and community health at Brown, and Chief of Infectious Disease at Memorial Hospital, has led the New England Behavioral Health Study, a five-year NIH-funded investigation into the heterosexual spread of HIV. Dr. Charles Carpenter, Physician-in-Chief of the Miriam Hospital and Professor of Medicine at Brown, and Dr. Mayer have been funded by the Centers for Disease Control and Prevention to study the natural history of HIV in women (HERS cohort). Dr. Mayer has been funded by the NIH to oversee the New England site HIVNET study, which is assembling a cohort of high risk HIV men and women across the U. S. to assess their readiness to participate in anti-HIV vaccine and microbicide studies.

Judith Heelan, Ph.D., Director of Microbiology, Memorial Hospital of Rhode Island
Clinical Assistant Professor of Pathology and Laboratory Medicine, Brown University,
School of Medicine. January 10, 1996.

ESSEX AGRICULTURAL SCHOOL

The Essex Agricultural School was established in 1913. Programs of study were established for secondary and post-secondary students. During these early years, the people of Essex County developed a growing

interest in the school, which resulted in the continued growth and expansion of educational programs and services.

In 1962, by Act of the General Court, the name of the school was changed to Essex Agricultural & Technical Institute to better reflect the expanded curriculum. In September of 1972, the Institute was authorized by the Massachusetts Board of Regional Community Colleges to conduct programs leading to the Associates Degree in Applied Science.

The Institute, in addition to four year high school, is also comprised of a two year College that offers its AAS Degree under the auspices of North Shore Community College and the Massachusetts Higher Education Coordinating Council.

Since its founding, a gradual change in emphasis from production and management to the more technical aspects of related business and industry has taken place. A number of microbiology courses have been taught since 1970-72, including Introductory and Clinical Microbiology required in the following fields: Animal Health Technology, Veterinary Technology, Food Science and Safety, Surgical Technician and Practical Nursing. Specialized secondary courses include Veterinary Parasitology, Food Service Sanitation (National Certificate course which is required for Culinary Arts), Dietetics, Food Science, and Food Microbiology, a required course for Food Science and Safety which entails the detection of food borne pathogens in food samples. Quite a few of the graduates are working in Microbiology in their respective fields and participation in ASM is encouraged from day one.

As of July 1, 1999, due to the breakup of Essex County government and special state legislation, the College Division of Essex Agricultural & Technical Institute will be merged with North Shore Community College. All Essex Agricultural & Technical College Division programs and services will continue uninterrupted, but as part of the Massachusetts Community College system.

Gregory Reppucci is Professor of Food Science and works closely with companies on product development on new food products and microbiological safety. He has been the Education Chairperson of the Northeast Branch since 1996.

Gregory Reppucci

HARVARD MEDICAL SCHOOL

Dr. Bernard Davis' arrival as Chairman of the Department in 1957 signaled a new emphasis on bacterial genetics and metabolism. He himself has made important contributions to the methodology of isolating metabolic mutants of *E. coli* by the penicillin method. He and collaborators had established the biosynthetic pathways of several amino acids, including the aromatic amino acids, pantothenate, and some intermediates of the tricarboxylic acid cycle.

Dr. Davis recruited to the Department Dr. Luigi Gorini, Dr. Jonathan Beckwith, Dr. Frederick Neidhardt, Dr. E.C.C. Lin and Dr. Dan Fraenkel. The period from 1957 through 1970 was one of furious and exciting science and opened recombinant DNA technology for the exploration of regulatory mechanisms at the level of transcription in bacteria.

The virologists of the Department, Dr. John Enders and Dr. Monroe Eaton were joined by Dr. Yolanda Low and Dr. Luis Meléndez at the Primate Center. Dr. Eaton continued to work on aspects of influenza pathogenesis with special interest in hemagglutinin. Dr. Alice Huang moved from M.I.T. and the Thorndike Memorial Laboratory at Boston City Hospital to the department, now renamed the Department of Microbiology and Molecular Genetics, and pursued her interest in vesicular stomatitis virus (VSV).

Dr. Albert Coons, meanwhile, continued his pioneering fluorescent antibody experiments moving to influenza virus in addition to further exploring antibody production by B cells in collaboration with Dr. Charles Ambrose, a newly arrived faculty member.

In the early 1970's Dr. Bernard Fields was invited to join the Department as a full professor and to assume at the same time the role of chief of Infectious Diseases at Brigham & Women's Hospital. His subsequent research with Reo virus launched a phase of analysis and dissection of an animal virus unique for that time. Specific proteins of the virus were identified for tropisms and binding domains assigned. Dr. David Knipe joined the department in the early 1980's and assumed direction of an interdepartmental virology committee that designed a program for a Ph.D. degree in Virology. His primary interest has been to uncover the genes and factors responsible for latency of herpes viruses.

Beginning around 1970 the number of graduate students and of postdoctoral fellows expanded rapidly and the Department offered appointments to faculty whose laboratories were in the Harvard Hospitals. Those appointments included Infectious Diseases clinician-scientists as well as Ph.D. investigators. Both the graduate student program and the postdoctoral programs, heavily supported by training grants from NIH, have produced a number of outstanding investigators for the disciplines. The alumni are to be found in industry as well as in academic positions, largely in USA, but in other countries as well.

Dr. Fields became the first non-rotating chairman of the Department in 1982 and Dr. John Mekalanos succeeded him in 1996 after Dr. Fields' untimely death. Among the major figures of recent years are Dr. Priscilla Schaffer, now chair of the Microbiology Department at the University of Pennsylvania, Dr. Elliott Kieff, Dr. Ronald Desrosiers, Dr. Ruth Sager, Dr. John Collier, and Dr. John Gehrke, and Dr. Charles Stiles. Dr. Roberto Kolter's group has uncovered unusual phenotypes in enteric bacteria surviving in stationary phase and in biofilms.

Under the leadership of Dr. Mekalanos and Dr. Collier a major thrust of the department has been the regulation of the production of virulence factors by pathogenic bacteria and the mechanisms of penetration of target cells by specific toxins. The larger group active in this area includes Dr. Michael Starnbach, Dr. Catherine Lee and Dr. John Young. Dr. Ann Hochschild, Dr. Bruce Mayer, Dr. Jae Jung and Dr. Sergei Sokol extend the molecular and developmental approaches to viral and bacterial regulation.

Harold Amos, Ph.D.
Honorary Associate of Eliot House
The Maude and Lillian Presley Professor of Microbiology and Genetics, Emeritus
Chairman of Department, 1968-1982

MICROBIOLOGY AT THE MASSACHUSETTS COLLEGE OF PHARMACY

Massachusetts College of Pharmacy started in 1823. The first record of an official microbiology course taught at MCP was in 1954 by Dr. Raymond Vanderwyk. Since 1986, microbiology has been taught by Professor James J. Barbato and new microbiology courses have been added to the curriculum including Virology and Anti-infectives. The College is committed to providing future pharmacies with a strong background in microbiology.

James Barbato, Ph.D.

LIFE SCIENCES AT the MASSACHUSETTS INSTITUTE OF TECHNOLOGY (MIT)

By 1970, life science research and teaching at MIT was carried out in two departments, Nutrition and Food Science, and Biology. The leader of Nutrition and Food Science was the world-famous human nutritionist, Nevin Scrimshaw, who had arrived in the early sixties to expand the scope of the Food Technology Department. Scrimshaw brought in talented people and established a world class department. This

department became a model for future biotechnology departments around the globe. It dealt with human nutrition, nutritional biochemistry and pathology, food chemistry, engineering and toxicology, industrial microbiology and biochemical engineering, neural and endocrine regulation and oral science. The Department established a Clinical Research Center and operated the Biochemical Engineering Graduate Program which was a cooperative effort of the Department with the Departments of Biology and Chemical Engineering. An undergraduate program was set up and enrollment increased to 150 while the graduate program reached about 200 students. Scrimshaw retired from leadership of the Department in 1980 and was succeeded by Gerald Wogan, food toxicologist. The emphasis shifted away from nutrition and the name changed to the Department of Applied Biological Sciences. It was comprised of approximately 30 faculty members and continued to be one of the most productive departments at MIT both in terms of publications and receipt of outside funding. Despite its success, the Department was suddenly eliminated in 1988 by a committee composed of the MIT President, Provost and Dean of Science. The former members of that Department have been awarded six memberships in the National Academy of Science, three in the National Academy of Engineering and three in the Institute of Medicine. The two microbiologists, Anthony J. Sinskey and Arnold L. Demain, are now members of the Biology Department.

The MIT Biology Department is a world leader in the world of molecular biology and genetics. In 1970, the leader of the Department was famed microbial physiologist, Boris Magasanik, who had assumed leadership in 1967. The Department's growth included the establishment in 1972 of the Center for Cancer Research by Salvador Luria and later the Whitehead Institute for Biomedical Research. Gene Brown became Head of the Department in 1977 and remained until 1985 when he became Dean of Science. At that time, Maurice Fox assumed leadership, followed by Richard Hynes and for the last five years, Phillip Sharp. The Department has about 60 faculty members, almost 300 undergraduates and 170 graduate students. It continues to be ranked first among U.S. Departments of Biological Sciences and is home to five Nobel Laureates: Salvador Luria (now deceased), David Baltimore, Susumu Tonegawa, Gobind Khorana and Phillip Sharp. 23 members of the Department have been elected into the National Academy of Science. A 1996 awardee of President Clinton's Science Medal is Alexander Rich. The Department is mainly housed in three buildings, the Cancer Center, the Whitehead Institute, and the 70 million dollar state-of-the-art Biology building occupied in 1994. The Whitehead Institute has recently completed a 30 million dollar expansion. Although much of the activities of the Biology Department deals with higher forms of life, microbiology is alive and well in this world-famous Department.

Arnold L. Demain, Ph.D.

MICROBIOLOGY AT NORTHEASTERN UNIVERSITY

Northeastern University celebrated its centennial in 1998. It is well-known for having one of the strongest and most innovative Cooperative Education programs in the world, with 6000 students being employed at 1500 different sites all around the globe. From the microbiological standpoint, this translates into students being able to work for two years prior to graduation in a variety of different research and hospital positions.

From its beginning as a two-quarter sequence for Biology majors and Medical Laboratory technologists, microbiology at Northeastern has branched out to encompass coursework and research in all areas of the discipline. Dr. Fred Rosenberg joined the department in 1961 as an environmental microbiologist bringing expertise in environmental and public health microbiology. In the following years, Dr. Charles Gainor, D. Janis Gabliks and Dr. Frank Crisley joined the faculty, contributing to the areas of immunology, medical microbiology and food microbiology, respectively. These areas of interest were augmented in the 1970's and 1980's by Dr. Kostia Bergman (Microbial Genetics), Dr. Jacqueline Piret (Streptomyces Genetics) and Dr. Maryellen Povino-Bodnar (Virology). In 1997, a new chairman and Giardia expert, Dr. Ed Jarroll joined the department, and in 1998 Dr. Slava Epstein was added to the faculty, contributing his knowledge of microbial ecology. The department now boasts courses and research opportunities in all areas of microbiology. A strong Ph.D. program awards the degree under the umbrella of the Biology Department.

Fred Rosenberg, Ph.D.

NORWICH UNIVERSITY

Norwich University is the oldest private military college in the United States. It was founded by Alden Partridge in 1819 and is the home of the citizen soldier. Students who enroll in the Corp of Cadets follow a disciplined military regime, while civilian students lead a more traditional collegiate lifestyle. The University offers 12 degree programs in the sciences including degrees in biomedical technology and biology. The biology department offers a number of microbiology courses which are required in specific degree programs that may be taken as free electives. Some of the courses offered include: introductory, medical and food and environmental microbiology, and parasitology. Dr. Edward Carney, a microbiologist with a special interest in environmental virology and Dr. Roy Bair, a parasitologist with an interest in avian parasites, teach the above courses.

In the late 70s Dr. Gary du Moulin enlisted Dr. Edward Carney, a microbiologist at du Moulin's alma mater, Norwich University, as the educational coordinator to the Northeast Branch ASM, from Vermont. This initial association led over the past two decades to the organization of and/or joint sponsorship of numerous workshops and symposia both at Norwich and at other sites throughout Vermont and New Hampshire. Students from the University were and continue to be frequent attendees at these professional events. Several students over the years have been invited to participate in research at Dr. du Moulin's laboratory. These research initiatives resulted in the contribution of several microbiology papers to both branch and national meetings. Many of the meetings and workshops held in Vermont and New Hampshire involved collaborative efforts with the Vermont Department of Health, National Laboratory Training Network and, for a recent Chemical Hygiene workshop, the Vermont Chapter of Sigma Xi. As we move into the new millennium, joint initiatives are being planned to keep pace with advances in microbiology and biotechnology. Continued emphasis will be placed in increasing student's exposure to these two exciting career paths.

Edward Carney

RHODE ISLAND PROGRAMS

Traditional four year baccalaureate institutions have general microbiology courses offered as part of their biology major and nursing programs (Providence College, Rhode Island College, Salve Regina and U. Mass. Dartmouth and U. of Rhode Island). General microbiology is also offered at the Community College of Rhode Island as part of the chemical technology curriculum. The establishment of nursing curricula at two year institutions has led to introductory microbiology courses at Bristol Community College and Community College of Rhode Island. Medical technologist (Rhode Island College, U. Dartmouth, and U. Rhode Island) and medical technician programs (Bristol Community College and Community College of Rhode Island) include a variety of clinically oriented microbiology courses. The University of Rhode Island offers a M.S. in medical laboratory science. Most recently, Bryant College and Roger Williams University have introduced biotechnology minors for their students.

Many of the faculty involved at educational and medical institutions in southeastern Massachusetts and northern Rhode Island have been active in ASM and/or the Northeast Branch/ASM including Julia Blazek-D'Arezzo (Local Councilor '79-'84), Judith Heelan (Local Councilor '85-'87), Paulette Howarth at BCC (president NEB/ASM, '92-'93, Nat'l. Councilor,'97-'00), and Jaclynne Laxon (Local Councilor '95-'97, President-Elect NEB/ASM, '99-'00). Robert Krasner of Providence College has been active in the Northeast Branch as a former Education Chairperson, and has been especially active at the national level. He organized and promoted a program of lectures and discussions focusing on educational issues for the national meeting in 1988. The success of that program and subsequent annual programs supported by the Board of Education and Training have resulted in the establishment of a separate ASM Division (Division W) for microbiology educators. Dr. Krasner then served as Division W Councilor for three years. Selected as an ASM Annual History of Microbiology Lecturer and currently sponsored by the Pasteur Foundation, he has been presenting lectures on Louis Pasteur across the nation.

Jaclynne Laxon

SALEM STATE COLLEGE

Salem State College's Biology Department has 17 full-time faculty members, two full-time lab instructors, two full-time laboratory technicians, and a Clerk shared with the Chemistry/Physics Department. The Chairperson of the Biology Department is Susan Case. Currently, the department has approximately 220 Biology majors enrolled in one of six programs within the department. Programs include a BA degree, a BS degree, or a BS degree with a concentration in one of four areas (Environmental Biology, Marine Biology, Medical Technology, or Nuclear Medicine Technology). A fifth concentration, in Aquaculture, will be offered for the first time in fall 1999. The department also is in the process of developing a concentration in Cell/Molecular Biology.

The department offers two courses in microbiology, one for Biology majors and one as a support course for Nursing majors. The course for Biology majors includes an independent research component. All students must design and implement a small research project which is then presented to the class and other members of the department during a poster session. The instructor, Dr. John Metcalfe, presented the results of this new educational strategy at the national meeting of ASM in 1998. The department recently added a non-majors course entitled "HIV and the Immune System".

Several students have conducted independent research projects in microbiology. Both were presented at the 1st Annual Salem State College Undergraduate Research Symposium in May 1998, and one was presented at the 12th National Conference on Undergraduate Research in April 1998.

Most graduates enter the work force. Many recent graduates now work for local biotechnology companies such as Genzyme, Genetics Institute and Collogenesis, to name just a few.

Involvement with Northeast Branch - ASM
In the past (1987-1991), the Northeast Branch-ASM has provided support for the department's annual ***Darwin Festival.*** In 1991, the Branch provided general support, but in the others the Branch sponsored a specific speaker. These speakers were: 1987 Lynn Margulis; 1988 Richard Beaudoin; 1989 Barry Hall; 1990 Thomas Gilmore.

Susan M. Case

SIMMONS COLLEGE

Simmons College was founded in 1899 and among its first programs of study were rigorous courses in the sciences. The college was aided in the early years by association with faculty from Massachusetts Institute of Technology, notably among them, William T. Sedgewick. The science courses led to specialization in Biology, Chemistry, Nursing and Public Health.

The Department of Biology was organized on 1906, offering courses in microbiology and public health. Early faculty included: Edith A. Beckler, Curtis M. Hilliard and Philip M. Rikardson. The latter two were members of the Boston Bacteriology Club. Among those teaching microbiology were: Catherine A. Witton, Mildred L. Coombs, Josephine Morello (’57), Anne E. Coghlan (’48) and Martha D. Berliner. Specialists from both the Massachusetts Department of Public Health and from Harvard Medical School offered courses in Pathogenic Microbiology, Virology and Immunology. Those contributing to such coverage were: William A. Hinton, Robert A. MacCready, Kenneth Girard, Joan B. Daniels (’30) and Iolanda Low.

Numerous graduates went on to careers in microbiology, immunology and public health. Among those in Massachusetts are: Grace M. Thorne (’66), Director of Clinical Microbiology, Cubist Pharmaceuticals, Cambridge; Judith T. Barr, (’67), Dean of School of Pharmacy and Allied Health, Northeastern University, Boston; Mary Jane Ferraro, (’69), Director of Microbiology Laboratory, Mass General Hospital, Boston.

Anne E. Coghlan
Dean of Sciences and Professor of Biology, Emerita
August 23, 1999

SUFFOLK UNIVERSITY

Suffolk University was originally founded in 1906 solely as a law school where working people could better themselves by studying for the practice of law at night. By 1934, the College of Arts and Sciences was founded to expand this role to undergraduate students in the Boston Area. Since that time, with the addition of the Frank Sawyer School of Management in 1937, Suffolk has become a full-time university offering courses in virtually all areas of study.

Microbiology began to develop with the initiation of a Biology major and a special program designed to qualify students for certification as medical technologists in 1960. This was initiated by the founder of the Biology Department, Dr. Robert S. Friedman, and carried on through the present by medical technology coordinators, Dr. Arthur J. West, Dr. Beatrice L. Snow, Dr. Hayes Lamont and, beginning in 1982, by Dr. Henry L. Mulcahy. At present all biology majors are required to complete a microbiology course with laboratory. Other courses have been introduced over the years, originally to support the medical technology program but now to include all basic science aspects of their title topic. Immunology, once a classic clinical course, now encompasses immunogenetics and all modern aspects of this field. The original Pathogenic Microbiology course has been modified to become Advanced and Pathogenic Microbiology, where current literature is presented by students in class and molecular microbiology, virology and cell culture are emphasized in the laboratory. Dr. Bernice Martin presently teaches Cell Biology and Principles of Cell Culture, both with a strong laboratory experience.

Microbiology at Suffolk in 1999 is dedicated to furthering the student's education through rigorous course and laboratory work with faculty research emphasis on student oriented experiences. During the years 1990-95, Dr. Mulcahy was privileged to serve on the Education Committee of the Northeast Branch, American Society for Microbiology.

Henry L. Mulcahy, Sc.D.

TUFTS UNIVERSITY SCHOOL OF MEDICINE

Tufts University School of Medicine was established in 1893 and is well-known as the leading producer of physicians in New England. From that moment until 1962, bacteriology, virology and parasitology were represented by the Division of Bacteriology within the Department of Pathology. Tufts first established a Department of Microbiology in 1962 at the time that J. T. (Ted) Park was recruited to serve as the first Chair. Park was already well-known as a distinguished microbial biochemist for his discovery that the bacterial cell wall is synthesized from nucleotide-linked precursors (then called Park nucleotides and now known as nucleotide sugars) and for his demonstration that penicillin kills bacteria by inhibiting their ability to synthesize the cell wall. One of Park's first decisions was to separate microbiology from immunology, the latter remaining within the Pathology Department. Park recruited six additional faculty members over the course of the next six years. The first of these was Moselio Schaechter, a microbial physiologist who had described the essential parameters of bacterial growth during training in the laboratory of the Danish microbiologist, Ole Maaløe. Next, H. Vasken Aposhian, a virologist, left Arthur Kornberg's group at Stanford, to join our faculty. Aposhian left in 1970 to become Department Chair at the University of Maryland School of Medicine. In 1965, Edward Goldberg was induced to leave Alfred Hershey's lab at the Cold Spring Harbor Laboratory to set up a lab at Tufts studying phage genetics, transcription and morphogenesis. Michael Malamy was recruited in 1966, after completing postdoctoral training at Princeton, with Arthur Pardee, and at the Institut Pasteur, with Jacques Monod and Francois Jacob, during which he studied the regulation of the *lac* operon. Edward Wise, a graduate of Park's lab, also joined the faculty at that

time, but moved to Burroughs-Wellcome in 1972. In 1967, Andrew Wright moved across the river from his postdoctoral position at MIT (with Phillips Robbins) to start a new lab studying the interactions of *Salmonella* phages with their host cells.

In 1968, the name of the department was changed to Molecular Biology and Microbiology to distinguish our emphasis on molecular genetic approaches to microbial physiology from more traditional ways of thinking about the subject. At that time, molecular biology was still a new science that pertained almost exclusively to bacteria and viruses.

Park resigned as Chair in 1970, turning over the governance of the department to Elio Schaechter. Two appointments in the next five years increased the faculty to a small, highly cohesive group of seven. Abraham L. (Linc) Sonenshein, a graduate of Salvador Luria's lab at MIT and of Pierre Schaeffer's group at the Université de Paris, arrived in 1972 to establish a research group that focused on the regulation of spore formation in *Bacillus subtilis.* Three years later, John M. Coffin, who trained with Howard Temin in Wisconsin and with the molecular virologist Charles Weissmann in Zurich, arrived to study the molecular genetics of retroviruses. Mark Challberg came from The Johns Hopkins University in 1978 to initiate studies on adenovirus replication, but left in 1982 to take a full-time research position at the NIH.

In the 1960's and early 1970's, government support of basic research was at a high point, but, starting in the mid-1970, harder times appeared. This pressure, coupled with the desire to show the immediate relevance of research in response to ongoing social upheaval, induced many of our colleagues at other institutions to shift their efforts to mammalian cells. Wholesale conversions of microbiology departments were not uncommon. We held our ground, however, and were rewarded by the development of two areas of research that validated maintaining a strong presence in fundamental microbiology. The revolution created by the introduction of recombinant DNA technology occurred almost simultaneously with the realization that the mysteries of bacterial pathogenesis could be unraveled using the basic tools of molecular microbiology. Several department members began to take an active interest in microbial virulence mechanisms, realizing that their expertise in microbial genetics would serve them well in this field. Thus, Malamy took on the anaerobic pathogen, *Bacteroides fragilis,* as a research system and Wright began to study *Hemophilus influenzae* and, later, *Helicobacter pylori* and *Mycobacterium tuberculosis.* Sonenshein expanded his interest in spore formers to include *Clostridium perfringens and C. difficile.*

We also began to recruit new faculty members interested in microorganisms not previously represented. In 1979, we enticed Michael Gill to move his lab from Harvard to Tufts, bringing to our department his interest in pathogenic mechanisms and his expertise working with bacterial toxins. In 1990, we suffered a major blow, both personally and professionally, when Gill died of a sudden heart attack while playing tennis. Ralph Isberg came from Stanley Falkow's lab at Stanford in 1985 to set up a group studying pathogenesis of *Yersinia pseudotuberculosis and Legionella pneumophila.* Carol Kumamoto, who was initially recruited by the Physiology Department, moved her research unit to our department, bringing with her projects involving protein secretion in *Escherichia coli* and differentiation in the pathogenic fungus, *Candida albicans.* Kumamoto had previously studied secretion in bacteria with Jon Beckwith at Harvard Medical School and in eukaryotic cells with Robert Simoni at Stanford. In 1986, Claire Moore was recruited from the MIT lab of Phil Sharp; she had invented the first system for studying mRNA 3' end processing in vitro and expanded that work to the *Saccharomyces cerevisiae* system. Dean Dawson, a yeast geneticist who had trained with Jack Szostack at Massachusetts General Hospital, arrived in 1988 and began to study the mechanism and regulation of meiotic recombination and chromosome segregation.

Stuart Levy, a physician who had trained in medicine and biochemical genetics at NIH and had held a secondary appointment in Molecular Biology and Microbiology since 1971, joined our department in 1990 as a full member, bringing together his research efforts in bacterial and human drug resistance, along with his Center for Adaptation Genetics and Drug Resistance.

When Elio Schaechter retired from the Chairmanship in 1993, after 23 years on the job, Linc Sonenshein served as Acting Chair while a national search was conducted to identify a new Chair. Catherine L. Squires

agreed to move from Columbia University to Tufts and arrived in 1994. Squires had trained at UC Davis with John Ingraham, at UC Santa Barbara with Nancy Lee, and at Stanford with Charles Yanofsky. Her arrival signaled a new round of faculty hiring, leading in 1996 to the recruitment of Andrew Camilli and David Lazinski. Camilli, a pathogenic microbiologist studying *Vibrio cholerae* and *Streptococcus pneumoniae*, was a student of Daniel Portnoy at the University of Pennsylvania and a postdoctoral fellow with John Mekalanos at Harvard Medical School. Lazinski came from the Fox Chase Cancer Research Center, where he had begun a detailed investigation of the hepatitis delta virus with John Taylor. A third new faculty member, Joan Mecsas, was hired with the expectation that she would open her lab at Tufts in 1999. Mecsas is currently a senior postdoctoral fellow with Stanley Falkow at Stanford.

The Department launched a graduate program in Molecular Biology in 1965 and had granted 94 PhD.'s, and 4 M.S. degrees as of the end of 1998. The program renamed itself Molecular Microbiology in 1994 to emphasize its orientation toward the use of bacteria, fungi and viruses as experimental systems.

As a basic science department, Microbiology at Tufts has maintained a strong emphasis on mechanistic studies of fundamental aspects of bacterial, fungal and viral growth, development and infection. We have also benefited from fruitful collaborations with the clinical departments of Tufts affiliated hospitals, particularly at the New England Medical Center. In addition to maintaining a strong graduate program, we have been responsible for teaching introductory and pathogenic microbiology to medical, veterinary and dental students. Our goal has been to stress concepts, mechanisms and problem-solving, often at the expense of extensive surveys of factual material.

The faculty includes members who have received particularly distinctive recognition. John Coffin holds a research professorship from the American Cancer Society and Ralph Isberg is a Professor of the Howard Hughes Medical Institute. Isberg was also a winner of the Eli Lilly Award of the American Society for Microbiology. Coffin, Naomi Rosenberg and Catherine Squires have all been awarded the Zucker Prize for research excellence. Elio Schaechter is a former President of the American Society for Microbiology and Stuart Levy is the current President (1998-99). Levy is also a winner of the Hoechst Marion Roussel Award in antibiotic chemotherapy. Isberg, Andrew Camilli, and David Lazinski were designated special scholars of the Searle, Pew, and Sackler Foundations, respectively.

David R. Snydman, M.D.

UNIVERSITY OF MASSACHUSETTS DARTMOUTH

The University of Massachusetts Dartmouth (UMD) is a small comprehensive university, one of five campuses of the University of Massachusetts system. From Southeastern Massachusetts Technical Institute (SMTI) in 1962, it became Southeastern Massachusetts University in 1969, and changed to its present name in 1991 during reorganization of the UMass system. The Master's Degree is offered in a dozen departments, including all science departments. Microbiology is taught in the departments of Biology and Medical Laboratory Science.

ASM members in the Biology Department include:

Dr. Yukio Asato joined the department in 1971 and retired as Professor in 1996. He taught Genetics, General Microbiology, and Advanced Bacterial Genetics, among other courses. His research focused on the molecular biology of the cyanobacterium *Anacystis nidulans*, especially the entrainment by light of the diurnal relationships of synthesis of DNA, RNA, and protein.

Dr. Deborah Ellis joined the Biology Department as Assistant Professor in the fall of 1998 and has already taught courses in General Microbiology, Marine Microbiology, and a seminar on extremophiles. She has ongoing research on five projects: on coral black disease; novel microbial isolates from Bahamian Blue Holes; microbial parasites of the cranberry fruit worm; human gastrointestinal pathogens in the environment

(in collaboration with J. Tang, American Type Culture Collection); and molecular genetic identification of crab populations (in collaboration with N. O'Connor, UMD).

Dr. Robert Leamnson, Professor of Biology, joined the department in 1978 and was a member of ASM until 1996. He taught Molecular Biology and Virology, and participated in research on identification of marine organisms by restriction fragment length poymorphisms, and (in collaboration with P. Schenk of Brown University) research toward development of an HIV vaccine.

Dr. Dorothy Read, Professor of Biology, joined the department in 1978 and has taught Advanced Genetics, Marine Biotechnology, Medical Microbiology, Immunology, and proseminars in Microbial Evolution; Plasmids, Phage, and Transposons; and Genetic Engineering. Her research has included molecular genetics of lambda and other bacteriophage; molecular basis of plasmid transfer; and genetics of sulfur metabolism in *Thiobacillus versutus*. Her current research focuses on transcription activation of genes in two bacterial species, a carbon-starvation-induced gene in *E.coli* and a gene regulating adhesion and motility in the soil *Pseudomonas fluorescens* (with S. B. Levy, Tufts University). Both have potential applications in bioremediation of contaminated soil.

Dr. Bal Ram Singh, Associate Professor of Chemistry & Biochemistry with a joint appointment in Biology, joined UMD in 1990. His extensive research program includes projects on the structure, function, and genetics of botulism and tetanus toxins.

All have directed the research of graduate students in their respective areas of research interest.

ASM members in other departments include, Dr. Frank Scarano, Assistant Professor of Medical Laboratory Sciences, who joined the department this year and teaches Medical Bacteriology and Clinical Microbiology. He is collaborating with Dr. Ellis in Biology (see above) on research. His research interests are in clinical microbiology, specifically antibiotic resistance and molecular epidemiology.

Dorothy L. Read

UNIVERSITY OF NEW HAMPSHIRE

Instruction in microbiology at the University of New Hampshire began in 1895 as a course in Dairy Bacteriology and Cheese Making, offered by Professor Rasmussen in the Dairy Department. In 1908, Professor Charles Brooks of the Botany Department taught a course entitled Mycology, which emphasized both fungi and bacteria. In the following year, a course in dairy microbiology was offered by Frank Tinkham of the Dairy Department. A course entitled Bacteriology was introduced by Professor Brooks in 1909, which included a study of bacterial morphology and classification, culture methods, and the relationship of bacteria to such processes as decomposition, fermentation, and disease. Dr. Caroline Black, Department of Botany, taught General Bacteriology and Bacteriology during the period 1910-1918. Fred Werkerthen taught these courses during the next year and was then replaced by Dr. Mabel M. Brown, who taught General Bacteriology, Applied Microbiology, and Agricultural Bacteriology during the period 1920-1927. Miss Marion Mills continued those courses until 1932.

A major milestone occurred in 1932 with the appointment of Dr. L. W. Slanetz as the first full time Instructor in Bacteriology, within the Botany Department in the College of Agriculture. In 1935, the name of the Department was changed to Botany and Bacteriology and Mr. Joseph Naghsie was admitted as the first graduate student and graduate assistant in Bacteriology. The courses taught during the period 1932 to 1940 included General Bacteriology, Applied Bacteriology, Advanced Bacteriology, and Seminar. In 1941, the Departments of Botany and Bacteriology, and of Zoology combined into a Department of Biology with Dr. Slanetz serving as Chairman of the Section of Bacteriology. Dr. H. Gilbert Crecilius joined the Department as an Instructor and Dr. Clara H. Bartley was appointed as an Assistant Professor in 1945. Arthur Howe and Arthur Shanahan served as Instructors during the period 1943 to 1952. In 1947, the Department of Biology

was dissolved and Bacteriology became a separate Department, moving to the College of Liberal Arts. Dr. Slanetz was appointed as chair.

Dr. T. G. Metcalf joined the Department in 1956 where he taught a number of the medically oriented courses. He also served as coordinator of the Medical Technology Program and established an extensive research program in the area of public health virology. This research focus complemented the ongoing work of Drs. Slanetz and Bartley in public health bacteriology. Dr. Metcalf served as department chair from 1969 to 1971, following Dr. Slanetz's appointment as the first Dean of the School of Health Studies (now called the School of Health and Human Services). In 1980, Dr. Metcalf relocated to Baylor College of Medicine; he has since retired.

In 1959, Dr. William R. Chesbro joined the Department and provided expertise in the area of food and dairy microbiology. As a microbial physiologist, his research has focused on bacterial growth. Dr. Chesbro served as department chair following Dr. Metcalf's departure. Although officially retired, Emeritus Professor Chesbro maintains an active research program in the Department. In 1966, Dr. Galen E. Jones was recruited to the University as the first director of the Jackson Estuarine Laboratory and Professor of Microbiology. He established both a research program and courses in marine microbiology and played a major role in the development of the interdisciplinary Marine Program on this campus. He served as department chair during the late 1970s. After 25 years with the University, Dr. Jones retired to La Jolla, CA.

Dr. Robert M. Zsigray joined the Department in 1970. Over the years he has taught many of the courses in our Department, most consistently Microbial Genetics. He has also been a long-time participant in the interdepartmental Cell Culture course. His major research focus has been on the genetics of *Yersinia pestis*. Dr. Zsigray served as the department chair from 1980-1983 and since 1995 has again held that position. In 1971, Dr. Thomas G. Pistole was hired as the first immunologist in the Department. His research programs have included invertebrate immunology, with a focus on the horseshoe crab, and on microbial immunology, with emphasis on *Salmonella* and group B streptococci. He served as department chair from 1983 to 1992.

Dr. Richard P. Blakemore joined the Department in 1977 and established a research program based on his earlier discovery of magnetotactic bacteria. In recent years his research activities have included metal-microbe and plant-microbe interactions. He served as department chair during 1992-1995. Dr. David Balkwill also joined the Department in 1977, as our microbial cytologist. He subsequently moved to Florida State University. In 1980, Dr. Florence Farber was appointed as our virologist. She subsequently accepted a position at the National Institutes of Health.

In 1985, Dr. Frank Rodgers joined the Department, bringing expertise in medical microbiology and microbial cytology. His research focuses on the pathogenesis of disease due to intracellular bacteria. Dr. Aaron Margolin was appointed in 1987 in the area of public health microbiology. His teaching and research activities focus on virology but include bacterial and protozoan systems as well. Dr. Margolin's research program includes extensive interactions with federal, state, and local government agencies. In the 1990s two additional faculty members joined the Department: Dr. Louis S. Tisa, whose research interests center on developmental biology of the Actinomycetales, signal transduction, and ion transport; and Dr. Frank Caccavo, Jr., whose specialties include marine microbiology, microbial geochemistry and bioremediation.

Accompanying these faculty appointments have been other major changes. In 1960, the department name was officially changed to Microbiology. In that same year two other major events occurred: the Ph.D. program in Microbiology was established and the department moved into the new Spaulding Life Science Building. In 1987, after 40 years in the College of Liberal Arts, the Microbiology Department returned to its agricultural roots in the renamed College of Life Sciences and Agriculture and re-established its association with the New Hampshire Agricultural Experiment Station. Currently all of the biological sciences departments are now administratively located in this College.

At present there are approximately 85 undergraduate Microbiology majors enrolled in our program. As part of the Department's teaching philosophy nearly all the undergraduate offerings have a full laboratory

component. Each research laboratory provides undergraduate research experiences for interested students. There are over 20 graduate students enrolled in either the M.S. or Ph.D. degree programs.

In 1994, the Department moved into the newly constructed Rudman Hall. This facility houses teaching and research programs that emphasize cellular and molecular biology and contains core support centers, including a BL3 facility, the DNA sequencing unit, and the laboratory animal quarters.

Many other people have contributed to the development of the Microbiology Department. Special mention is due to two individuals. Alberta Moulton was employed as a laboratory technician for over 40 years. Robert Mooney, instrumentation technologist who, after more than 25 years with the Department, continues his support of our teaching and research mission. He also serves as an important link with departmental alumni.

Thomas Pistole and Robert Zsigray

WELLESLEY COLLEGE

Wellesley College, founded in 1870 as a liberal arts college for women, began holding classes in 1875. Thirty-three years later, in 1908, Dr. Lincoln Ware Riddle gave the first course in bacteriology. In 1910 Dr. Laetitia Morris Snow joined the faculty and taught General Bacteriology until 1939. She taught the first microbiology course, "Bacteria, Yeasts and Moulds in the Home," which students called "Bugs in the Home."

Course offerings in the microbiological sciences were expanded during the career of Dr. Delaphine G.R. Wyckoff, from 1938 to her retirement in 1972. Courses in Advanced Bacteriology, Immunology and Virology were added to the curriculum. Dr. Mary Mennes Allen, a cyanobacteriologist joined the Department of Biological Sciences in 1968, initiating a course in Microbial Physiology and Biochemistry. Dr. Rebecca Lerud (1972-74), a general microbiologist, Dr. Neal Machtiger (1974-78) and Dr. David Hendricks (1978-85), both virologists, and finally, Dr. Beverly Blazar (1985-), a virologist/immunologist, have added versatility to our teaching. Microbiology is also integrated into the teaching of cell biology and molecular biology within the department.

Research interests of the staff have included bacterial flora of various soil types, antibacterial agents, marine bacteria, microbial processes and their regulation, cyanobacterial biochemistry, herpes viruses, and Epstein-Barr virus biology and immunology. Undergraduate research is a very crucial part of our teaching/research program.

Mary Mennes Allen, Ph.D.

MICROBIOLOGY AND INFECTIOUS DISEASES AT THE BOSTON CITY HOSPITAL AND THE CITY OF BOSTON DEPARTMENT OF HEALTH AND HOSPITALS

In response to the diphtheria epidemic in Boston in 1893, Dr. Harold Ernst of the Harvard Medical School was appointed by the Boston Board of Health in 1894 to produce horse serum antitoxin for the treatment of diphtheria. Horses kept on Gallup's Island in Boston Harbor were immunized with toxoid produced in Dr. Ernst's laboratory. This activity became the basis of both the Boston Health Department Laboratory (1898) and the State Laboratory (in 1896).

In 1898, the Boston Health Department opened a microbiology laboratory under the direction of Dr. Hibbert Winslow Hill. Over the next 50 years, this laboratory served the city and its clinics by providing diagnostic services for infectious diseases, and testing of milk and water. Meanwhile, at the Boston City Hospital (founded in 1864 as a response to cholera), the Bacteriology Laboratory developed as a component of the Pathology Laboratory, which became the Mallory Institute of Pathology in 1933. The new Bacteriology

Laboratory was designed and directed by Dr. Robert Nye, who had been assistant director of the Massachusetts Antitoxin and Vaccine Laboratory. It served the hospital and its clinics. Much of the outstanding reputation of the Bacteriology Laboratory derived from the work of Marion Lamb, who began in 1913 and retired as senior bacteriologist and supervisor in 1960.

In 1895, the "South Department" of Boston City Hospital was founded as the first separate contagious disease hospital in the United States, with seven buildings and 250 beds. The South Department was under the direction of Dr. John McCollum from 1895 to 1909 and Dr. Edwin Place from 1909 to 1950. The department predominantly cared for patients with diphtheria, poliomyelitis, meningococcal disease, scarlet fever and rheumatic fever. The South Department pioneered in the application of tracheal intubation and antitoxin in the treatment of diphtheria, the use of respirators to treat poliomyelitis and the investigation of the etiology and treatment of scarlet fever. In 1932, 22,846 cultures for diphtheria bacillus were processed in the Bacteriology Laboratory

The Thorndike Memorial Laboratory opened in 1923. In 1927, Dr. Maxwell Finland began his long and productive career at Boston City Hospital and the Thorndike Memorial Laboratory. He became a founder of the specialty of Infectious Diseases. Among his many areas of pioneering work was the diagnosis and treatment of pneumococcal disease, the introduction to clinical practice and use of sulfonamides, penicillin and other antimicrobials, the early recognition of antimicrobial drug resistance, the introduction of organized hospital infection control and epidemiology, and the training of medical students, residents and fellows in the practice of infectious diseases and clinical microbiology. He trained a long list of notable figures in the field and collaborated with many others. The microbiologists and research associates who worked with him over many years became legendary: Frances McNerlin, Clare Wilcox, Mildred Barnes, Ellen Doyle and Mary Kendrick.

The Channing Home was established in Boston in 1857 as the first tuberculosis hospital in the United States. In the 1950s, with the decline in tuberculosis and the need for hospitalization, Dr. Theodore Badger, the Chief of Staff of the Channing Home suggested that the bequest that funded the home could be better used to support research in tuberculosis and other pulmonary and infectious diseases. This plan was approved in 1958 and in 1963 the Channing Laboratory building opened at Boston City Hospital. This research facility now also housed the Bacteriology Laboratory of the Hospital. In 1958, Dr. Edward Kass became the associate director and the Director of Medical Microbiology at the Mallory Institute of Pathology. In 1963, he became the Director of the Channing Laboratory and the Division of Bacteriology at the Mallory became the Department of Medical Microbiology at Boston City Hospital. The Channing Laboratory became a major center of infectious disease, infection control and clinical microbiology research. In the clinical laboratory, Marion Lamb was succeeded as Head Bacteriologist by A. Kathleen Daly, assisted by Alice MacDonald. In 1965, the health department laboratory was merged into the Department of Medical Microbiology of the Boston City Hospital as part of the creation of the Department of Health and Hospitals of the City of Boston. In 1968, Dr. Finland retired.

In 1977, the Channing Laboratory moved to Harvard Medical School and ultimately the Brigham and Women's Hospital. Boston University School of Medicine became the sole medical school affiliated with Boston City Hospital and Dr. William McCabe became the Director of the Laboratory of Infectious Diseases and the Division of Infectious Diseases. Dr. Kurt Stottmeier became the Director of the Medical Microbiology Laboratory and continued in his role as Director of the State Mycobacteriology Reference Laboratory, which was located at the Department of Health and Hospital's Mattapan Hospital, which thereafter moved to the State Laboratory Institute. Kathleen Browne succeeded Miss Daly as Head Bacteriologist. Dr. Jerome Klein, previously of the Channing Laboratory, remained at Boston City Hospital as Chief of Pediatric Infectious Diseases.

In 1979, the Laboratory for Infectious Diseases was named after Maxwell Finland, who remained affiliated with Boston City Hospital until his death in 1987. The Finland Laboratory continued to house the clinical microbiology and serology laboratories through the early 1990s, when the hospital itself was replaced by a new building and the laboratory was transferred to the new centralized laboratory. The Finland Laboratory

remained a center for research in the pathogenesis of infectious diseases, immunology, antimicrobial agents and infection control practices. Human immunodeficiency virus and the complications of AIDS became an increasingly larger part of the research and clinical activities. In 1990, Dr. McCabe retired and was succeeded by Dr. Peter Rice. In 1993, Dr. Stottmeier was succeeded by Dr. Daniel Shapiro. Dr. Stephen Pelton succeeded Dr. Klein as Chief of Pediatric Infectious Diseases.

In 1996, Boston City Hospital merged with University Hospital of the Boston University Medical Center to become Boston Medical Center. The microbiology laboratories of both components were merged. Dr. Shapiro continues as Director of Clinical Microbiology. Health department functions are now assigned to the Boston Public Health Commission. Dr. M. Anita Barry is the Director of Communicable Disease Control for the Public Health Commission and is also on the staff of Boston Medical Center.

Alfred DeMaria, M.D., Assistant Commissioner, Bureau of Communicable Disease Center (CDC), MDPH

BRIGHAM AND WOMEN'S HOSPITAL

In the early decades of the Peter Bent Brigham Hospital, its house officers did the laboratory work, including the bacteriology, in small laboratories near the wards. Some guidance was provided by Professor Hans Zinnser at the Harvard Medical School across the street, and his Department of Bacteriology and Immunology also provided prepared media.

A separate bacteriology laboratory was set up and supervised by Dr. Charles Janeway in 1940. Located below the amphitheater, it featured a steam-heated closet as incubator. That laboratory moved in 1964 to similarly cramped and overheated space nearby. It stayed there until one day in 1980 when it expanded tenfold into the new Brigham and Women's Hospital.

On that day, the bacteriology staffs of the three hospitals that had agreed to merge, the Peter Bent Brigham (Hollis Bodman, Supervisor), the Robert Breck Brigham (Jack Gottlieb, Supervisor), and The Boston Hospital for Women, Lying-In Division (Theresa Emery, Supervisor), found themselves in the same big room beginning to merge. The Boston Hospital for Women brought a Virology Laboratory, which had been developed by Dr. Stella Biano.

Medical Directors after Dr. Janeway included Jay Sanford, Paul-Fremont Smith, Thomas O'Brien, and in recent years Andrew Onderdonk, Fred Wang and Alexander MacAdam. Technical directors over the past 40 years have been Grayce Van Lathem and Hollis Bodman. The professional acuity and good humor of its members continue to imprint the laboratory's work.

In the 1990's Brigham and Women's Hospital joined with Massachusetts General Hospital to become Partner's Healthcare System.

Thomas O'Brien, M.D.

THE CHANNING LABORATORY

The Channing Laboratory evolved from the Channing Street Home for Sick and Destitute Women, which served as a treatment center for tuberculosis patients from 1857 to 1958. The Trustees of the Channing Home established a research laboratory dedicated to research of infectious and pulmonary diseases after the closing of the home. The first Director of the Channing Laboratory, Dr. Edward H. Kass, expanded the activities to include epidemiology and the study of chronic diseases. In 1975, the Channing Laboratory became a part of the now Brigham and Women's Hospital. The Channing Laboratory was initially housed in space adjacent to Boston City Hospital and subsequently at the old Angell Memorial Animal Hospital on Longwood Avenue before moving to permanent state-of-the-art research space at 181 Longwood Avenue in 1997.

In 1989, Dr. Kass retired and Drs. Dennis Kasper and Frank Spiezer became the co-directors of the Infectious Diseases and Epidemiology sections respectively. The number of research publications from Channing scientists over the years is swaggering. The early work of Drs. Maxwell Finland and Edward Kass set the standard for subsequent research investigators. Today, Channing Laboratory is recognized for research leading to a vaccine for Group B *Streptococcus,* understanding the role of capsular polysaccharides of bacteria in virulence and as potential vaccine candidates, the molecular biology of Epstein Barr Virus and for research related to obligate anaerobes in health and disease. In addition, Channing Laboratory is known as the site for the Nurses and Physicians Health Study, ongoing epidemiologic investigations of over 80,000 subjects for over two decades. Senior scientists involved in microbiologic research at Channing Laboratory include Drs Dennis Kasper, Elliott Koff, Fred Wang, Gerald Pier, Andrew Onderdonk, Mike Wessels and Jean Lee. The Channing Laboratory continues to be one of the premier research laboratories associated with the Brigham and Women's Hospital.

Andrew Onderdonk

EVOLUTION OF MICROBIOLOGY AT LAHEY CLINIC FOUNDATION

Lahey Clinic, LC, right in the heart of Kenmore Square, a short distance from Fenway Park in Boston, was founded as a specialty diagnostic outpatient clinic. Back in the 1970s at the Kenmore Square campus, Clinical Bacteriology and limited Parasitology was carried out in two very small rooms, each no larger than a contemporary walk-in incubator! At that time, LC formed a strong alliance with the Northeastern University co-operative work education program and nearly 50% of the staff throughout the Department of Clinical Laboratories was comprised of NU co-op students! Among the most "venturesome" co-op students were Marvin Swartz, Eleanor Broderick (now Swartz!), and Harriette Nadler, who dared to delve into diagnostic bacteriology. Starting as a co-op student, Marvin soon assumed responsibilities as supervisor.

Unbelievable as it may seem, the procedures although consistently up-to-date with current practices, predated the systematic standardization of bacterial identification and antibiotic susceptibility testing procedures. Imagine that little more than one dozen species of gram-negative rods were recognized as clinically important and multiple pathogens were often tested together for antibiotic susceptibility!

In 1980, LC purchased a 50-bed hospital, Brooks Hospital, in Brookline, MA. Acquisition of the hospital enabled LC to plan a major expansion into a large surburban campus (Mary Clapham) to be located in Burlington, MA, conveniently located just next door to the Mall! It was then decided to centralize all clinical bacteriology procedures at the Brooks Hospital necessitating shipment of bacteriological specimens from Boston to the Brookline facility, despite the havoc of Red Sox traffic... Mary Sullivan, a laboratory supervisor at Brooks Hospital, subsequently took charge of the combined in-patient and out-patient Bacteriology services when Marvin had left to join "Uncle Sam". The bacteriology laboratory was a modest addition to the hospital on the basement floor adjoining the morgue, autopsy room, and facing the parking lot! A small general laboratory accommodated the needs of hospital patients whereas the core laboratory facility was still located at Kenmore Square.

Del Kimball was the manager of the Brooks Hospital Clinical Laboratory and one of the core members of the Boston Bacteriology Club (initially with membership restricted to men) and Bill Curby was the manager of the Sias Research Laboratory which conducted diverse biophysical and microbiological investigations including the development and patenting of The Curby Biodetector, a specialized electronic particle counter, which could be applied for hematological (NASA Blood Preservation Experimentation associated with the Columbia 19XX Shuttle Missions) or microbiological studies (Nadler et al….)

When Mary retired in 1973, Harriette Nadler joined as the Chief Microbiologist, after finishing almost 5 years of service with the Mass. Dept. of Public Health Diagnostic Virology Laboratory. The first milestone was the incorporation of the Vitek instrumentation into routine practice. [Isn't it hard to reconcile the addition of an instrument designed to enumerate bacteria on the moon's surface to the routine equipment of a

clinical bacteriology laboratory?] Then followed the planning for expansion of the bacteriology laboratory into a "full service" 2000 sq ft clinical microbiology laboratory (routine bacteriology, parasitology, mycobacteriology, mycology, anaerobic bacteriology) for the new Burlington campus. Each laboratory function occupied a specially designed separate room and finally Clinical Microbiology was now integrated with Hematology, Chemistry, Blood Bank, on the same floor and under the same roof!

And at long last the Lahey Clinic Foundation (Boston and Brookline) became the centralized and expanded Lahey Clinic Medical Center (Burlington) in 1980.

During 1980-1987, the clinical microbiology laboratory services further evolved. Other milestones achieved were computerization of laboratory reporting, incorporation of teaching programs for Medical Technology students and Pathology residents, and numerous scientific contributions to major professional meetings and committees. The Lahey Medical Center Microbiology Team (Harriette as the Chief Microbiologist, Linda Mele [Sweeney] and John Baker as Supervisors, along with a team of very motivated and competent technologists, took pride in their readiness to diagnose "unusual" or "emerging" etiological agents or "opportunists", e.g., *Brucella melitensis*, *Coccidioides imitis*, or *Cryptosporidium* and to scientifically evaluate, and incorporate where appropriate, "nonculture-based" technologies for *Chlamydiae*, *C. difficile*, and other "emerging pathogens".

In 1987, Harriette left to complete her PhD. studies at Northeastern University and redirect her career path to anti-infective drug development within the pharmaceutical industry. Harriette was succeeded by Cindy Needham (1986-99), who served as ASM secretary during her Lahey years, and previously was Director of Microbiology at Boston University Medical Center. Cindy was succeeded by Kim Chapin. The laboratory continues the tradition of providing a high quality service which is well respected internally and externally.

Harriette Nadler, Ph.D.

MASSACHUSETTS GENERAL HOSPITAL - 1971-1995

As the last edition of the history of the Northeast Branch went to press 25 years ago, Dr. Lawrence Kunz was Director of the Bacteriology Laboratories of the Massachusetts General Hospital. During his 30 year tenure, Dr. Kunz oversaw the computerization of the Laboratory and initiated the use of automated systems for identifying bacteria and for antibiotic susceptibility testing when these techniques became available. During Dr. Kunz's leadership, the number of cultures processed annually increased enormously along with an increase in patient population, and the diagnostic functions of the laboratory became closely allied with the clinical activity of the Infectious Disease Unit under the long term direction of Dr. Morton N. Swartz.

Upon Dr. Kunz's retirement in December of 1982, Dr. Mary Jane Ferraro, who had been Assistant Director since 1976, assumed the Directorship of the soon to be expanded Bacteriology Laboratories. In the late 1980's, both Virology and Parasitology (formerly under the aegis of the Infectious Disease Unit) became integrated with the Bacteriology, Mycology, Serology and Mycobacteriology sections of the former Bacteriology laboratories to create the current Microbiology Laboratories within the department of Pathology. The Microbiology Laboratories currently handle over 200,000 specimens each year. In addition to the responsibilities involved with managing the rapidly growing laboratory complex and her research on antibiotic susceptibilities, Dr. Ferraro has made significant contributions to the science of Microbiology as author and editor.

Dr. Kathryn L. Ruoff began working in the Microbiology Laboratories in 1980 and currently serves as Assistant Director. Her research on streptococci and other catalase-negative gram positive cocci has become well known. Although the Laboratory began investigating and using some molecular diagnostic techniques in the late 80's, it was not until 1994 that a Molecular Diagnostic section was started for difficult-to-culture microorganisms. Dr. Angela Caliendo joined the Laboratories in 1994 as Assistant Director and has assumed responsibility for both the Molecular Diagnostics and Virology sections.

A unique legacy has been left to the Massachusetts General Hospital in the research of the late Dr. Louis Dienes. Serving as Bacteriologist in the Department of Pathology from 1930 until 1952, he was the first to discover the presence of mycoplasmas in human infections and to demonstrate their biological properties and pathogenic potential. His laboratory, with Sarabelle Madoff as research assistant, became a mecca for all interested workers. Miss Madoff has made valuable contributions to basic research in this field and currently research in the laboratory focuses on the mycoplasmas as potential co-factors in HIV disease.

Many innovations have occurred in Microbiology in the last 25 years, including changes in nomenclature of many bacterial species, the emergence of newly identified bacteria and the introduction of specialized, automated methods for their identification. The laboratories have had to cope with an increase in the number of organisms considered to be pathogenic due to the participation of opportunists in infections in the ever increasing immunocompromised population. Furthermore, changes in antibiotic resistance patterns, due to increased and inappropriate antibiotic usage, have made the laboratory indispensable in formulating appropriate antimicrobial agent utilization policies, in monitoring nosocomial infections, and in the therapeutic management of infectious diseases. The expertise and the dedication of the Microbiology Laboratories technologists and their contributions to the clinical diagnosis of infectious diseases are highly regarded by the Massachusetts General Hospital.

In addition to these clinically-oriented activities, the Laboratories have always played an important role in teaching. Pathology Residents and Infectious Disease Fellows are trained in the Laboratories, and frequent lectures, rounds and other activities provide opportunities for learning about the latest developments in the many specialized areas of Microbiology.

Compared with 25 years ago, the Microbiology Laboratories of the Massachusetts General Hospital have assumed greater responsibility in the diagnosis and the treatment of infectious diseases. The activities of the Laboratories have made clinicians aware of the diversity of the microbial world and the changing spectrum of microorganisms in disease. The Microbiology Laboratories continue to expand and grow, and are fully prepared to face the future and the challenges posed by newly emerging bacterial, viral and parasitic diseases.

In the 1990's Brigham and Women's Hospital joined with Massachusetts General Hospital to become Partner's Healthcare System.

Kathryn Ruoff, 1996

MEMORIAL HOSPITAL OF RHODE ISLAND

The Memorial Hospital of Rhode Island is a 294 bed hospital serving over 180,000 people in Pawtucket and the Blackstone Valley region of Rhode Island. Its Family Care Center is the practice base for the Brown University School of Medicine's residency program in family medicine. Memorial is also the site of the nationally recognized Pawtucket Heart Health Program and a new rehabilitation center.

Memorial Hospital has a very clear mission: a not-for-profit health, teaching and research center serving Blackstone Valley, East Bay, and Bristol County, Massachusetts. Its focus is on primary care and preventive medicine. Yet it is in every way a full-service, multifaceted hospital providing advanced diagnosis and treatment in a teaching-research environment.

Dr. John F. Kenney, who came to the hospital in 1914 and later served as Chief of the Medical Service until 1946, pioneered in-house medical education at Memorial. Yet, it has been the affiliation beginning in 1969 with the Brown University Program in Medicine, that has been catalytic to the flowering of medical education and research at Memorial. Since then, several thousand of the best young medical students, interns, residents, and research fellows in the country have studied and practiced at Memorial.

Today, Memorial is the second-largest teaching hospital in the state. It is home to Brown's Family Medicine Residency, and it is responsible for teaching medical professionals about rehabilitation and restorative care.

Being a leading teaching hospital has vitalized the medical-research activities of *Memorial.* Today, the hospital has more than a dozen research projects supported by nearly $4 million of federal funds, ranking it as among the top two research hospitals in Rhode Island. In 1993, the National Institutes of Health (NIH) of the Department of Health and Human Services (DHHS) awarded a multi-institutional team, headed by *Memorial Hospital of Rhode Island,* an $8.8 million contract for a major national study of women's health issues. The Women's Health Initiative is the largest observational study and clinical trial on the national level to look at factors that affect the health of post-menopausal women.

Memorial Hospital of Rhode Island has been a leader in AIDS research for years. The hospital was the principal site for the New England Behavioral Health Study, a five-year NIH-funded investigation into the heterosexual spread of HIV in the greater Providence area. This important study, led by Kenneth H. Mayer, M.D., *Memorial Hospital's* Chief of Infectious Disease, determined that one-third of the women and 15 percent of the men locally acquired the AIDS virus heterosexually.

On January 27, 1995, *Memorial Hospital* was named a subcontractor for a national study to identify persons at high risk of contracting the AIDS virus. The study will lay the foundation for testing an AIDS vaccine when it becomes available. The award was announced by the National Institute of Allergy and Infectious Diseases, part of the National Institutes of Health. Eight medical sites throughout the nation were selected for the study, with $5.36 million earmarked for the project. *Memorial* is part of a three-medical center consortium that includes the Fenway Community Health Center in Boston and The Miriam Hospital in Providence. While Fenway is the "lead" agency, the principal investigator of the project is Kenneth H. Mayer, M.D. Dr. Mayer also is medical research director at Fenway and professor of medicine and community health at Brown University's School of Medicine. The consortium will seek to enlist approximately 500 recruits for the study.

While no vaccine has yet been developed, several possible vaccines are undergoing laboratory testing. If a possible vaccine seems reasonably effective, it will be prepared for what is called Phase III Efficacy Trials - or widespread trials on human subjects. Many believe that a potential vaccine may be ready for testing within two to three years.

Subsequent studies, once an effective preventive HIV vaccine is found, will involve recruiting hundreds of participants at the above listed sites. Other infectious disease specialists at *Memorial Hospital* include Marguerite Neill, M.D., and Steven Opal, M.D., who is also the director of the Brown University School of Medicine's Infectious Diseases Fellowship Program.

Judith S. Heelan, Ph.D., Director of Microbiology, Memorial Hospital of Rhode Island
Clinical Assistant Professor of Pathology and Laboratory Medicine, Brown University, School of Medicine, 1996.

METROWEST MEDICAL CENTER

MetroWest Medical Center is a healthcare system that provides community-based healthcare services to residents of 25 towns in the MetroWest region. The system includes Framingham Union Hospital, Leonard Morse Hospital, MetroWest Wellness Center and Southside Health Center.

In 1992, MetroWest Medical Center was formed through the merger of Framingham Union Hospital and Leonard Morse Hospital, combining two hospitals each nearly 100 years old.

Janet Verna had been longtime supervisor of the microbiology department at Framingham and taught many medical technology students from their Medical Technology Program. At Leonard Morse Hospital, Barbara

Servetnick had been supervisor of the microbiology department where she has purchased one the first Vitek Automicrobic Systems in the state. In 1983, Emy Thomas became supervisor and was very active in the Northeast Branch ASM serving as National Councilor and President. She is presently supervisor of the combined departments.

Thomas Treadwell, M.D., has been Director of Microbiology since 1985 and Chief of Infectious Diseases. He came to Framingham from a fellowship at Boston City Hospital's Maxwell Finland Laboratory for Infectious Diseases where he co-authored various publications with William McCabe M.D., Alfred DeMaria M.D., Peter Rice, M.D., Kathleen Browne and Margaret Johns. He founded Framingham's first HIV clinic in 1986 to ensure that patients have access to the medications they need and new developments in HIV treatment and most recently founded the town's first homeless clinic. He also directs the House Officer program affiliated with Boston University.

Raymond Koff, M.D., is Chief of Medicine and is well known for his long term work with hepatitis C as well as the investigator for many protocols involving treatment of hepatitis C.

Dr. Chinhak Chun, M.D., Infectious Disease Consultant and Chair of the Infection Control Committee, provides guidance and direction to microbiology and is starting a travel clinic at Leonard Morse.

Emy Thomas

NEW ENGLAND DEACONESS HOSPITAL

In 1966, David Skinner, M.D. became Head of Microbiology at the New England Deaconess Hospital where he was responsible for training Medical Technology students from Northeastern University and residents in Clinical Pathology. One of these residents Paola DiGirolami, M.D. received her last year of training in Clinical Pathology with Dr. Skinner in 1974-75.

After two years at Cambridge City Hospital where she did plenty of hands-on work in microbiology as well as being involved in the teachings of medical technology students and in anatomic pathology. In July, 1977, she returned to the New England Deaconess and joined the Pathology group. She became Director of Microbiology in 1978. Dr. Skinner had retired in March 1977 and Dr. Dwight Lambe, a well-known bacteriologist specializing in anaerobes, who had joined in 1976, left for the University of Eastern Tennessee in March 1978.

Since then her department has been particularly well known for its parasitology expertise, serving as a reference lab. Judith Kimber MT (ASCP) gave several ASCP workshops in Parasitology, together with Dr. DiGirolami. Regional Mycology workshops sponsored by Northeast Society of Pathology (NESP), staffed by Denise Korzeniowski and other Deaconess technologists, were also offered.

Karen Eichelberger has been supervisor of the microbiology department since November 1976, during which time she has maintained an annual presence at the national meetings presenting posters on various subjects including parasitology, blood culture evaluations, virology and antimicrobial susceptibility co-authored with Dr. DiGirolami and many technologists from the clinical lab.

Dr. Robert C. Moellering, Jr. has been the Physician-in-Chief and Chair of the Department of Medicine at the New England Deaconess Hospital since 1981. He came to the Deaconess from Massachusetts General Hospital following his residency and fellowship in infectious diseases. He is the Herrman L. Blumgart Professor at Harvard Medical School and has a research lab, where for more than 25 years, he has conducted research involving mechanisms of action, mechanisms of interaction and resistance, and the pharmacology of antimicrobial agents. His main focus has been on the enterocci and he has authored widely followed recommendations for appropriate treatment of serious enterococcal infections in patients. In 1994, he was the

recipient of the ASM Hoechst-Roussel Award. Among his colleagues are George M. Eliopoulos, also of the Deaconess Medical Center.

In 1996, New England Deaconess and Beth Israel Hospitals merged to become Beth Israel Deaconess Medical Center, part of CareGroup. The microbiology departments recently consolidated at the East Campus of the BIDMC under the directorship of Dr. DiGirolami and the supervision of Karen Eichelberger. Drs. Qinfang Qian and James Kirby joined the medical staff in Microbiology this summer, 1999.

Paola DiGirolami, M.D.

TUFTS NEW ENGLAND MEDICAL CENTER HOSPITAL 1970-1999

Dr. Louis Weinstein maintained his status as the Chief of the Division of Infectious Diseases from 1957 until 1975. Among his colleagues were Richard H. Meade, III, Charles A. Ellis, M.D., who directed the clinical microbiology laboratory from 1970 until 1981, Michael Barza, M.D., and Te-Wen Chang, M.D. Dr. Weinstein stepped down in 1975 and moved over to the then Peter Bent Brigham Hospital.

Sherwood L. Gorbach, M.D., a former fellow of Dr. Weinstein, was recruited from UCLA to become the Division Chief in 1975. He brought a number of physicians and scientists with him, including John G. Bartlett, M.D., Francis P. Tally, M.D., Andrew Onderdonk, Ph.D., and Barry Goldin, Ph.D. This era began a very productive one of scientific research in the pathogenesis of anaerobic infections. Dr.'s Gorbach, Bartlett, Chang and Onderdonk made the discovery that antibiotic associated colitis was due to toxin producing *Clostridium difficile*. Their paper in the New England Journal of Medicine in 1977 was the first description of this association and it initiated a number of studies on treatment, and pathogenesis of this disease. The anaerobic research laboratory also initiated studies on transferable antibiotic resistance among *Bacteroides fragilis* and related species. In addition, studies of the relationship of bowel flora to breast and colon cancer were undertaken.

Another notable addition to the New England Medical Center was the recruitment of Sheldon M. Wolff, M.D. from the National Institutes of Health, to become the Chief of Medicine. He brought a number of other infectious disease researchers including Dr.'s Jeffrey Gelfand, Keith McAdam, Mark Klempner, and Charles Dinarello. This group formed the basis for the Division of Experimental Medicine within the department of Medicine. Notable for their contributions were the discovery of interleukin 1and the receptors responsible for action, as well as regulation. Dr. Wolff was one of the members of the Institute of Medicine advisory panel on Toxic Shock syndrome and he chaired the advisory panel on the Acquired Immunodeficiency Syndrome at the time of the first scientific consensus conference to discuss this newly emerging infectious disease. Additional faculty added to the Division of Infectious Diseases included the addition of David R. Snydman, M.D. as the hospital epidemiologist in 1978. He also was appointed a clinical investigator at the State Laboratory Institute.

In 1979 Dr. Wolff also recruited another former fellow of Dr. Weinstein, Gerald Keusch, M.D. to head a newly formed Division of Geographic Medicine. This was one of 4 such units funded by the Rockefeller foundation to promote the study of infectious diseases in the underdeveloped world using modern scientific approaches. Dr. Keusch continued his studies of Shiga toxin producing *E. coli* as well as the relationship of nutrition to infectious diseases of children in the underdeveloped world. Dr. Keusch also recruited a number of investigators including Mercio Perreira, M.D., Ph.D., and David Wyler, M.D.

The Clinical Microbiology laboratory expanded under the very capable direction of Linda Perry, MT (ASCP) who has been the supervisor from 1969 to the present time. She has been very ably assisted by Jayne Tirrell, MT (ASCP) who has been the assistant supervisor since 1971. The laboratory was located in the medical school until the completion of the construction of new Floating Hospital for Children in 1981. The laboratory directorship changed in 1981 with the arrival of William Martin, Ph.D. from UCLA. The laboratory consolidated research aspects of viral diagnostics and immunoserology of infectious diseases in 1981 with

help from a newly appointed pediatric infectious disease specialist, H. Cody Meissner, M.D., who became the Chief of Pediatric Infectious Diseases in 1989. The clinical microbiology laboratory supported a number of studies, including studies of the pathogenesis of intravenous catheter associated infections, descriptions of Capnocytophaga infections, and outbreaks of Respiratory Syncytial Virus Infections in children with congenital heart disease, and superantigen stimulation by bacteria associated with Kawasaki syndrome.

In 1986 Sherwood Gorbach stepped down as the Chief of Infectious Diseases and Dr. Keusch was asked to become the chief of a division that included the former groups of infectious diseases, experimental medicine, and geographic medicine. This group developed a wide ranging research agenda. Studies on *Borrelia burgdorferi*, Shiga toxin (vero toxin producing *E. coli*) and the relationship with Hemolytic Uremic syndrome and its pathogenesis, cryptosporidium, and other parasitic infections were part of the group research efforts. Dr. Dinarrello was awarded the Jung award for his work with endotoxin and interleukin 1.

In 1986 Dr. Martin left the hospital to enter industry and Francis P. Tally, M.D. became the director of clinical microbiology. His tenure was brief and he, too, left to become the director of antimicrobial drug research for Lederle laboratories. David R. Snydman, M.D. became the director of Clinical Microbiology in 1987, and has remained the director until 1998. The clinical microbiology laboratory grew in the number of personnel and scope of work. At its peak it employed 30 individuals and processed about 120,000 specimens annually. Rapid viral diagnostic testing, HIV testing, automated blood cultures and molecular techniques became routine for some aspects of testing in the last decade. However, like all hospital based laboratories, the hospital became subject to the changing health care pressures and the volume of specimens and personnel were reduced.

When Dr. Gorbach left the hospital he became the head of the nutritional epidemiology section in the Department of Community Health in the Tufts University School of Medicine. His group developed the Nutrition for Life project which explored nutrition in HIV infection. It has been funded by the NIH for the past 5 years.

With the reorganization of the infectious diseases service, Dr. Keusch recruited additional faculty, namely Paul Skolnik, M.D., Jim Noble, M.D., and more recently David Hamer, M.D., Debra Poutsiaka, M.D., David Stone, M.D., Barbara McGovern, M.D., Linden Hu, M.D. and Matthew Waldor, M.D., Ph.D. He also recruited Honorine Ward, Ph.D. and David Acheson, Ph.D.

Dr. Sheldon Wolff also recruited Allen Steere, M.D., one of the co-discoverers of Lyme disease, to head up the Rheumatology section at the hospital. Dr. Steere arrived in 1987 and continued his studies on the epidemiology and pathogenesis of Lyme disease.

In 1998 Dr. Keusch stepped down as the chief of Geographic Medicine and Infectious Diseases to assume the directorship of the Fogarty Center of the NIH. David R. Snydman, M.D. was named the chief of the Division of Infectious Diseases.

Other notable work in microbiology in the last twenty years included the first infusion in the world of an intravenous gamma globulin product, Cytomegalovirus Immune Globulin (developed by the Massachusetts Public Health Biologic Laboratories), and the development and completion of all the clinical trials led to the eventual licensure by the FDA. In addition, studies of Respiratory Syncytial Virus Immune Globulin were conducted at the hospital in the pediatric service.

The infectious disease service has been the recipient of many awards and grants, including three NIH sponsored training grants, and national recognition for a number of the faculty, including Dr.'s Dinarello, Gorbach, Keusch, Klempner, Snydman, Waldor and Wolff.

David R. Snydman, M.D.

ST. MARGARET'S HOSPITAL FOR WOMEN (1870-1993), BOSTON, MASSACHUSETTS

St. Margaret's Hospital for Women, an affiliate of Tufts, began in 1870 when an abandoned baby was found by the Daughters of Charity and taken to Carney Hospital in Dorchester to be cared for. By 1874, almost 1500 infants had been born and cared for in a special ward at Carney. In 1883, a new building was built on Cushing Avenue in Dorchester and named St. Mary's Infant Asylum and Lying-In Hospital. A maternity department was built as a private pavilion in 1910, making possible the care of both mother and infant. Eventually the name was changed to St. Margaret's Hospital for Women. Over the years the hospital developed state-of-the-art technology and expertise to care for critically ill infants. By the 1970's it was one of only two hospitals in the Boston area which provided care for both high-risk mothers and high-risk infants. The tertiary care that was provided in the Intensive Care Nursery enabled babies delivered at between 26 and 35 weeks gestation to survive.

The Department of Pathology was started and directed by Dr. Wadi A. Bardawil in 1957. Dr.Bardawil established a state-of-the-art department and remained at the hospital until 1972 when Dr. Farid Louis replaced him. Research always featured prominently in the contribution of St. Margaret's to the community and the world. Under the direction of Dr. Anthony J. Sbarra, Ph.D. microbiologist and biochemist, the Department of Medical Research and Laboratories attracted many Ph.D. and M.D. scientists from around the world. Among them were Drs. John Baumstock, Robert Gilfillan, Alice Jacobs, Ron McRipley, Etsie Ouchi, Robert Strauss, and Jan Zglicynski. Their research on the biochemistry of phagocytosis of bacteria by polymorphonuclear leukocytes contributed significantly to the understanding of the body's defenses against infection. They discovered, along with other experts, that the lysosomal enzyme myeloperoxidase (MPO) which was released during phagocytosis appeared to form a potent anti-microbial system with H2O2 and a halide. In later years Dr. Sbarra and Dr. Ratnam Selvaraj linked the cytotoxicity of the MPO system triggered by bacterial infection, to the predisposition of fetal membranes to rupture, causing premature rupture of membranes (PROM). Other enzymes systems released during phagocytosis were shown to be linked to induction of labor. Thus preterm delivery could be related to infection. Another area of interest of the research laboratory was the antimicrobial activity of amniotic fluid. Dr. Sbarra and Dr. Gail Thomas demonstrated bactericidal and bacteriostatic effects of amniotic fluids on *Chlamydia trachomatis*, *Mycoplasma hominis*, and *Ureaplasma urealyticum*. This explained why these common genital pathogens were rarely isolated from amniotic fluid. These researchers were the first to isolate *Chlamydia trachomatis* from an amniotic fluid. One more endeavor in research was the study of the relationship between optical density of amniotic fluid and its lecithin/sphingomyelin (L/S) ratio. This correlation allowed doctors to obtain a quick determination of fetal lung maturity.

In the early 1990's, the Catholic Archdiocese of Boston decided that St. Margaret's Hospital should be combined with a general hospital in the area. In 1993, St. Margaret's relocated to St. Elizabeth's Medical Center in Brighton. Today some of the original buildings are used to house and train unwed mothers and provide many other supportive services.

Gail Thomas

VETERANS AFFAIRS MEDICAL CENTERS

The medical centers are located in Bedford, MA, Boston, MA, Brockton, MA, Manchester, NH, Providence, RI, Togus, ME, West Roxbury, MA, and White River Junction, VT. Their medical school affiliations include: Boston University, Dartmouth University, Harvard University, Tufts University, and the University of Massachusetts.

Each of the facilities is involved in multiple areas of research related to various aspects of the medical field. In the 1970’s, Doctors John Bartlett, M.D. and Andrew Onderdonk, Ph.D., while working at the Boston VA, developed the cytotoxin assay for the demonstration of *Clostridium difficile* toxin in stools and a model for psuedomembranous colitis in the hamster. This assay is still the gold standard for demonstration of *C.*

difficile toxin B. Also in the early 1970's, Robert Rustigian, M.D. and Stewart Winston, M.D. while at the Brockton VA, worked extensively with the measles virus and subacute sclerosing panencephalitis. Robert Arbeit, M.D. of the Boston VA is considered one of the world experts in the field of Pulse Field Gel Electrophoresis and its use in epidemiological investigations.

Stephen Brecher, Ph.D. is Director of Microbiology at the Boston VA, and is currently an ASM Foundation Speaker. He has contributed his expertise, most notably on antibiotic resistance, on numerous occasions to the Northeast Branch in the form of lectures and organization of various programs and in teaching medical students.

William Thiemke, Ph.D. is Director of Microbiology and Immunology at the West Roxbury VA, and is currently president of the Northeast Branch. He teaches medical students, has a particular interest in mycology, and designed the original website for the Northeast Branch.

Within the past few years, the Department of Veterans Affairs was divided into twenty-two Veterans Integrate Service Networks (VISN). Of the VA Medical Centers within the area of the Northeast Branch, all belong to VISN-1. The microbiology department of the Brockton VA was consolidated at the West Roxbury VA in the 1980's and further consolidation of all the microbiology departments is in process.

William Thiemke, Ph.D.
August 4, 1999

CONNECTICUT STATE DEPARTMENT OF PUBLIC HEALTH
BUREAU OF LABORATORY SERVICES

The State Bacteriological Laboratory was established during 1905 at Wesleyan University under the direction of Prof. W.H. Conn. The first two years, tests were made for evidence of tuberculosis, typhoid fever, diphtheria, rabies and malaria; samples of water, ice and milk were examined and oil was checked for safety by a flash point method.

During 1917, the laboratory was moved to the Connecticut Agricultural Experiment Station in New Haven; C.J. Bartlett, M.D. served as director. The move to Hartford (the State Capitol) occurred during 1924. Friend Lee Mickle, Sc.D. was appointed director and served in that capacity until he retired in 1954. He was succeeded by Mr. Earle K. Borman who died in January, 1969. Mrs. Evelyn W. Hibbard was appointed acting director February 1969 to December 11, 1969. William W. Ullmann, Ph.D. was appointed director December 12, 1969 until his retirement in November, 1976. Mr. John J. Redys was appointed director in November, 1976 and retired in January, 1980. Jesse Tucker, Ph.D. was appointed director from February, 1980 until his retirement in February, 1992. Sanders F. Hawkins, Ph.D. was appointed acting bureau chief in March, 1992, and bureau chief in August, 1993 to present.

Early in the history of this laboratory, from 1924 through 1970, pioneering efforts were made in the establishment of standards for clinical thermometers for sale in Connecticut and provision for a testing service for manufacturers who wish to obtain a permit to use the Connecticut Seal as required by law; a premarital law requiring a test for syphilis; the routine culture of all specimens submitted for tuberculosis examination to remove the uncertainties attendant in reporting only the findings of acid fast organisms from stained smears; the adoption of a method for the identification of all Salmonella isolates as a routine rather than a research project; a fairly complete service for parasitological identifications (unusual in a Northern state); a broad routine service in the identification of Group A streptococci from throat swabbings with a telephone service to physicians on all Group A identifications, the development of a kit for the collection of the throat swabbings which had been adopted in many states and was under consideration by WHO for use in tropical countries; a broad testing service for water, sewage, milk, ice cream and milk products; a program of blood clot culturing for the isolation of Brucellae which often aided physicians in establishing a diagnosis of

Brucellosis in old chronic cases; and a program of inspection for the registration and approval of various laboratories in Connecticut.

Between 1970 and 1995, many improvements have been made. At present, the division of biological sciences tests human clinical specimens, food, water and dairy products for bacterial, viral, parasitic and fungal agents of public health significance. Current test methods and new technologies are continually evaluated on the basis of sensitivity and accuracy; rapid turnaround time; cost-effectiveness; client needs and public health significance. Examples of improvements to test methods made on the basis of these criteria within the past ten years are listed below.

Radiometric detection of mycobacteria was introduced in 1984; it improved sensitivity and reduced detection time by 50%. High performance liquid chromatography for identification of mycobacteria significantly reduced turnaround times while greatly reducing costs. Enzyme immunoassays were introduced to improve sensitivity, reduce turnaround times and reduce costs of testing for varicella-zoster virus, measles, mumps, parvovirus and toxoplasma. Relatively insensitive cultural methods for detection of the common sexually transmitted diseases, gonorrhea and chlamydial infection, were replaced by highly sensitive and rapid DNA probe technology. As the significance of *Campylobacter jejuni* and *E. coli* 0157:H7 as agents of severe enteric diseases with occasional fatal complications was recognized, routine screening of stool specimens for these agents was instituted. Several new agents of disease appeared within the past ten years and tests were offered as soon as public health significance was recognized; important examples include human immunodeficiency virus and AIDS; Lyme disease; parvovirus, cat scratch disease, tick-borne *Ehrlichia* sp. and Hantavirus. And finally, the Colilert test replaced membrane filtration for coliform bacteria for most water samples; the new test method reduced turnaround times, reduced costs and improved sensitivity.

The laboratory staff has remained relatively stable (208) over the years with slight fluctuations. The laboratory has been reorganized many times but currently there are four divisions each headed by a division director as follows: biological sciences, environmental chemistry, toxicological and clinical chemistry divisions.

Sanders Hawkins

MASSACHUSETTS DEPARMENT OF PUBLIC HEALTH STATE LABORATORY INSTITUTE (1894 -1999)

A DEDICATION, AN ANNIVERSARY (1)

The year was 1894. The "worker of miracles," Louis Pasteur, was nearing the close of his illustrious career (1822-1895). Scientists trained in the recently built Pasteur Institute were pursuing their research in distant parts of the world. One of them, Alexandre Yersin, was in Hong Kong, where he isolated the plague bacillus. Paul Ehrlich and Emil von Behring, the German bacteriologists who were born within a day of each other, were observing their 40th birthdays. Studies in microbiology indicated that infective agents were responsible for the spread of diseases. This knowledge provided the basis for rational methods of prevention and treatment, including vaccination.

In 1894 in Massachusetts, the State Board of Health, working from the premise that public health is a proper responsibility of the state, began the production of diphtheria antitoxin in its newly established Antitoxin and Vaccine Laboratory in Forest Hills. This was the nucleus of a laboratory group that was to develop into the Division of Biologic Laboratories. The Diagnostic Laboratory was born at the same time when the Board recognized the importance of having a trained bacteriologist to head the Antitoxin and Vaccine Laboratory and to enlarge the state's fledgling program for the bacteriologic diagnosis of infectious disease. The Biologic and Diagnostic Laboratories were merged to form the State Laboratory Institute in 1960.

On October 11, 1974, the Department of Public Health held dedication ceremonies for the first new building of the State Laboratory Institute (a chronology of the Institute appears at the end of this article). For the first

time in the 80 year history of the Division of Diagnostic Laboratories, all its units were now housed under one roof. A second-floor covered walkover connected the new building with the Division of Biologic Laboratories. The move from former quarters in the Bussey Building to the new State Laboratory Institute Building was a leap from the 19th century history of microbiology to the modern technologies of the late 20th century.

THE BUSSEY BUILDING [1]

For more than 100 years, the Bussey Building had been a landmark familiar to travelers on the Jamaica Way, part of the "Emerald Necklace" roadway designed by Frederick Law Olmstead. Constructed in 1870 in the fashionable Victorian Gothic style of that period, the Bussey Building dominated the landscape overlooking Harvard University's Arnold Arboretum. But, few passersby knew what took place in the massive stone structure, with its solid buttresses, stone lintels and heavy slate roof.

The building was the gift of Benjamin Bussey, a native of Canton, Massachusetts, who was described alternately as a pirate, a silversmith of note, a rich gentleman farmer, an amateur geneticist, one of the most distinguished philanthropists of his time (1757-1842), and a shrewd and colorful benefactor of Harvard College. In his will, Benjamin Bussey provided for both the land and an endowment for a school of agriculture and horticulture. The remainder of his estate was earmarked for the support of the Law and Divinity Schools of the College.

In honor of its benefactor, Harvard College named the new campus, built on the site of the Bussey farm in Forest Hills, the Bussey Institution, which opened its doors in 1871. Classrooms and laboratories for professorships in farming, applied zoology, agricultural chemistry, horticulture, botany and entomology were housed there.

The relationship of the Department of Public Health to the Bussey Institution began in 1894, the year when the Massachusetts Board of Health, as the Department was then called, began the production of diphtheria antitoxin. Horses were immunized against "diphtherid" at the stables of the Bussey Institution, and the serum processed at the laboratory of the Board at the State House. Recognizing the need for a trained bacteriologist, the Board obtained the services of Theobald Smith, M.D., a researcher and gifted teacher, acknowledged as one of the greatest American bacteriologists. Dr. Smith outfitted his laboratories in the Bussey Institution and increased antitoxin production. At the same time, diagnostic services were begun with the examination of cultures for diphtheria. In a short time, the bacteriologic diagnosis of infectious diseases included examination for tubercle bacilli and for malaria.

When the General Court of 1903 authorized the State Board of Health to produce and distribute antitoxin and "vaccine lymph" (smallpox vaccine), the two functions of the laboratory, production and diagnosis, were separated. A new Antitoxin and Vaccine Laboratory was constructed on land adjacent to the Bussey Institution and occupied in July 1904. The Diagnostic Laboratory was moved to the State House, where it remained for 50 years.

The Bussey Institution was closed in 1936, and the Bussey staff was transferred to the Harvard Biological Laboratories in Cambridge. During World War II, the Medical Corps of the United States Army renovated the Bussey Building and occupied it until 1946. The Diagnostic Laboratory moved back to the facility in 1947. At the same time, the Wassermann Laboratory, which had been added to the Department's laboratory services in 1915 and was located at the Harvard Medical School, moved to the Bussey Institute. William A. Hinton, M.D., the laboratory director, had initiated his pioneering work in syphilis serology at the Wasserman Laboratory. In 1952, the Institute of Laboratories was founded, consisting of the Biologics, Diagnostic and Wasserman Laboratories. The Virology Laboratory was founded in 1955-56 at the Harvard Medical School, under the direction of Joan Daniels, Chief of Laboratory. Early activities included field mosquito collection activities initiating our Eastern Equine Encephalitis surveillance. There was a gradual extension of services providing for the laboratory diagnosis of viral infections by culture and serological techniques. In 1970, the Virology Laboratory moved to 600 Washington Street and in 1972 to the Institute of Laboratories.

The two decades following the end of World War II saw a tremendous expansion of the activities and programs of the Diagnostic Laboratories, which in 1956 included a staff of seven bacteriologists. It became obvious that the venerable Bussey Building, despite its memorable history, could no longer serve the requirements of a modern laboratory program. In 1963, the Commonwealth of Massachusetts purchased the Bussey grounds and the laboratory buildings from Harvard University. Ground breaking ceremonies for the new headquarters of the State Laboratory Institute took place in December 1969 on land adjacent to the old building. As the modern structure began to rise above the Jamaica Way, the Department began a sustained effort to preserve the Bussey Building. Overtures to historical societies, schools and universities brought no responses. State funds to carry out a formal architectural and engineering survey to determine the exact physical status and estimated cost for refurbishing the historic building were not available. After several years of fruitless meetings, correspondence and communication, the Department was forced to face the inevitable. The Bussey Building was doomed. As soon as the State Laboratory Institute moved into the new building, the wrecker's ball began its work.

What remains of the Bussey Building - the huge stone emblem that rested above the old entrance - now reposes prominently in the lobby of the new building. Engraved on the stone is the interim motto of Harvard College, *Christa et Ecclesiae, Veritas,* a silent reminder of the past. As enduring as the stone, however, are memories of giants who worked diligently, modestly to eradicate disease, to save lives, and to add to the store of human knowledge.

THE STATE LABORATORY INSTITUTE BUILDING[1]

Often referred to as "The Fortress" and "The Battleship," the new State Laboratory Institute Building was taking form on the high ground overlooking the Arboretum. The use of reinforced concrete for the entire exterior of this building, designed in the current style of "brute modern" architecture, accented the solidity. On its interior, a beautiful, modern laboratory had been constructed. Built to provide a complete testing, research and teaching center, this highly specialized building was designed in collaboration with the medical and professional staff of the Institute in close cooperation with the Center for Disease Control in Atlanta, Georgia.

STATE LABORATORY INSTITUTE - 1999

The SLI celebrated its 100th anniversary in 1994. The six program divisions of the Institute, the Infectious Disease Laboratories, Environmental Laboratories, Drug Analysis Laboratories, Newborn Screening Laboratories, Laboratory Training, and Quality Assurance, work closely at the same location with the Bureau of Communicable Diseases, which conducts health surveillance and disease control activities.

In 1998, management of the State Laboratory Institute facilities was transferred to the University of Massachusetts Medical School (UMMS). In addition, the Biologics Laboratories were transferred organizationally to UMMS. The Biologics Laboratories, a USFDA licensed facility, manufactures, tests, and develops biologics. In addition, the Massachusetts Department of Public Health contracts with UMMS to operate its New England Newborn Screening Program.

The New England Newborn Screening Program provides screening for metabolic, endocrine, infectious diseases and hemoglobinopathies, and follow-up. The Program services Massachusetts, New Hampshire, Vermont, Rhode Island and Maine. This year the laboratory will begin screening for medium-chain acyl coA dehydrogenase deficiency, cystic fibrosis and several rare metabolic disorders.

Today, the State Laboratory Institute programs in infectious and environmental public health employ approximately 450 full-time personnel. These laboratories provide support to surveillance, service and regulatory programs of the Department of Public Health, such as the Food and Drug Division and Environmental Health Assessment, as well as to health care providers in Massachusetts.

INFECTIOUS DISEASES LABORATORIES

The Infectious Diseases Laboratories provide physicians, clinics, independent clinical laboratories, hospital laboratories and boards of health with specialized services to aid in the identification, control, treatment and prevention of infectious diseases. Many of these services are not available elsewhere and can only be performed by public health laboratories.

The **Enteric Laboratory** provides culture and serologic identification of enteric bacterial pathogens such as *Salmonella, Campylobacter and Shigella*, to aid in the control and prevention of disease and assist in the investigation of foodborne outbreaks.

The **Food Laboratory** provides routine testing of dairy products, and food samples suspected of being contaminated or involved in a foodborne outbreak investigation. Evaluation officers in the **Milk Laboratory Certification Program** employ a combination of on-site laboratory inspections and proficiency samples to assess the competency of Massachusetts milk testing laboratories.

The **Pulsed Field Gel Electrophoresis Laboratory** determines the genetic relatedness of organisms and is used as a tool in outbreak investigations. In addition, the laboratory is one of four Regional Laboratories in the national PulseNet System.

The **Reference Laboratory** provides a specialized reference service for all clinical, commercial and hospital laboratories in Massachusetts. It provides the identification of rare and unusual bacteria that cannot be identified by the instruments and techniques used in most clinical laboratories.

The **Sexually Transmitted Diseases Laboratory** aids the Division of Communicable Disease's prevention programs in the diagnosis, treatment and control of *Chlamydia trachomatis, Haemophilus ducreyi, Neisseria gonorrhoeae* and *Treponema pallidum.* It provides microscopic, culture, immunologic and nucleic amplification identification of these disease causing agents. These services are offered for STD clinics, family planning clinics, and prisons. Confirmatory testing is provided for all laboratories in Massachusetts.

The **Mycobacteriology Laboratory** is one of the largest in the United States, receiving about 26,000 clinical specimens and 1000 reference cultures annually. The laboratory identifies all mycobacteria, performs drug susceptibility studies, conducts research, and provides training. Techniques such as RFLP and DNA sequencing are used as epidemiologic tools.

The **Virus Isolation Laboratory** is responsible for the diagnosis of communicable viral diseases. It is devoted to the surveillance, detection and identification of arboviruses in the state, principally Eastern equine encephalitis, as well as other common and unusual viruses responsible for acute and chronic enteric and respiratory illnesses. The laboratory also conducts surveillance for influenza each year and participates, through the U.S. Centers for Disease Control and Prevention, in the WHO Global Influenza Surveillance Program.

Viral Serology performs sensitive and sophisticated tests and performed to help physicians make the proper diagnosis of various viral diseases, including mumps, measles, rubella, adenovirus, and polio.

The HIV Laboratory and Serosurveillance Program[2] has provided testing in support of the Massachusetts Department of Public Health anonymous and confidential Counseling and Testing programs since the mid-80's and for the CDC sponsored HIV seroprevalence studies since 1988. A grant has recently been awarded to conduct HIV seroincidence studies. The Clinical Investigations Laboratory, previously called the Hepatitis Reference Laboratory, expanded its services to respond to a demand for expert consultation and to fill a need for difficult diagnostic services for severely ill patients.

The **Rabies Laboratory** analyzes animals suspected of being rabid and provides emergency testing services to ensure any citizen exposed to rabies prompt and appropriate treatment. The laboratory has maintained

intensified surveillance during the raccoon rabies epidemic, which has spread up the Atlantic coast in recent years.

The **Pertussis Serology Laboratory** performs a single serum serology test for IgG pertussis toxin antibody, which is diagnostic for *Bordetella pertussis*. Most other laboratories require two sera, acute and convalescent, and require a significant increase in pertussis antibody titer in order to confirm or rule out a pertussis infection. Our laboratory uses a test that was developed at the State Laboratory Institute and accepted by the FDA as diagnostic for pertussis. This test specifically quantitates the concentration of IgG pertussis toxin antibody present, with a value of 20 μg/mL indicative of a current or recent infection. This test serves as an important supplement to the isolation and identification of the organism by culture techniques. Whereas, the greatest likelihood or recovering *B. pertussis* from a nasopharyngeal specimen is within two weeks following the onset of symptoms, the serological test is recommended later than two weeks following the onset of symptoms.

DIVISION OF ENVIRONMENTAL LABORATORIES [3]

The **Environmental Laboratories** analyze foods to ensure their freedom from contaminants and assay environmental and human samples to detect the presence of harmful chemicals. Human samples are also analyzed to measure exposure to hazardous chemicals. The **Childhood Lead_Poisoning Program and Laboratory,** started in March, 1973, identifies children who may be damaged by high blood levels of lead and aims to prevent future exposure to the hazards of lead by controlling the environment.

DIVISION of DRUG ANALYSIS

The **Department of Public Health Drug Laboratory** is one of three Massachusetts Laboratories that is authorized by the legislature to perform analysis of illicit drugs confiscated by law enforcement agencies. The other two laboratories are the State Police Crime Laboratory and the University of Massachusetts Medical School Drug Laboratory. The DPH Laboratory is responsible for the testing of seizures from all cities and towns with the exception of those in Worcester County, which are tested by the medical school drug laboratory. The DPH main Laboratory is in Jamaica Plain, and it has a branch laboratory on the campus of the University of Massachusetts at Amherst. The goal of the DPH Laboratories is to have all samples analyzed within two weeks of receipt; results are used in criminal cases. Heroin, cocaine and marijuana constitute the bulk of the samples received. Other samples analyzed consist of steroids, designer drugs, drug store thefts, body cavity samples, etc. The geographic distribution of drug seizures indicates the widespread nature of the general problems of drug abuse.

TRAINING PROGRAMS [4]

The **Massachusetts State Training Program.** The Massachusetts Public Health Laboratory Training Office is committed to excellence, leadership and innovation in continuing education and training. The Office seeks to improve the quality of laboratory services and testing through the promotion, design, development and facilitation of high-quality, cost effective training programs and products. These services are provided in response to public health strategies, direct needs assessments, emerging and re-emerging communicable diseases and newly developed diagnostic technologies.

The **National Laboratory Training Network** (NLTN) is a training system sponsored by the Association of Public Health Laboratories (APHL) and the Centers for Disease Control (CDC). The NLTN is comprised of seven regional offices all located in a Public Health Laboratory. Each Office serves a number of states and is staffed by an APHL Regional Coordinator and a CDC Training Advisor who have education and experience in clinical laboratory training. The NLTN offices strive to provide low cost, high-quality continuing education for testing personnel in medical, public health, and environmental laboratories throughout the U.S. and its territories.

INTERNATIONAL EXPERIENCE [5]

The State Laboratory Institute has more than 40 years of experience hosting post-doctoral and technical professionals for residencies and traineeships in microbiology, laboratory sciences and biologics manufacturing. In addition, SLI staff have developed and presented training programs in many countries.

Current collaborations are in Vietnam, India, Russia and Eritrea. State Laboratory staff have conducted needs assessment and developed action plans for implementation of major components for international ministries of health. An example of these projects is the development of a "Strategic Action Plan for the National Institute of Biologics" for the Government of India. This plan included an assessment of current system capacity for the regulation of biologics and a detailed action plan for training and physical resources required to implement WHO standards for biologics manufacture. A second example is the development of a comprehensive training program for HIV antibody testing which included lectures, slides and laboratory exercises with modules for training trainers and technicians.

References

1. MDPH, Vol. 3. No 4. Fall 1974.
2. Vol. 1, No. 1, SLI Newsletter.
3. State Laboratory Annual Reports.
4. Massachusetts State Training Program and National Laboratory Training Network.
5. State Laboratory Institute Bulletin

HIGHLIGHTS IN THE HISTORY OF THE STATE LABORATORY INSTITUTE MASSACHUSETS DEPARTMENT OF PUBLIC HEALTH

1894 Diphtheria antitoxin produced in horses at the stable and main building of Harvard's Bussey Institute in Forest Hills under the ad hoc direction of Joseph C. Goodale, M.D.

1895 Theobald Smith, M.D., appointed first full-time Director of Antitoxin and Vaccine Laboratory; instituted diagnostic laboratory services.

1896 Sputum examination for tubercle bacilli and blood films begun for malaria.

1897 Diagnostic service facilities transferred to the State House.

1904 Smallpox vaccine (bovine) and silver nitrate manufactured in new two-story brick stable and laboratory building.

1912 Typhoid vaccine production begun.

1914 Bacterial diagnostic services under Miss Edith Beckler placed in the newly created Division of Communicable Diseases.
Newly named Division of Biologic Laboratories directed by Milton J. Rosenau, M.D., Harvard Medical School.

1915 Free syphilis serology testing begun by William A. Hinton, M.D., Chief of new State Wasserman Laboratory located at Harvard Medical School. Schick test materials manufactured by the Biologic Laboratories.

1916 Rabies diagnostic services begun under the direction of Dr. Hinton.

1917 Typing of pneumococci from pneumonia patients begun by the Diagnostic Laboratories

1918 Diphtheria toxin-antitoxin for active immunization produced in a newly extended wing of the Laboratories. Anti-pneumococcus serum produced (until 1949) by Biologic Laboratories.

1920 Benjamin White, Ph.D., named the first full-time Director of Biologic Laboratories.

1925 Production of antitoxin for scarlet fever, and antiserums for measles, influenza bacillus, and other agents begun.

1927 Hinton's improved flocculation test for syphilis devised and utilized until 1973.

1932 Diphtheria toxoid produced, gradually replacing toxin-antitoxin for active immunization.

1933 Convalescent serums of human origin obtained and distributed for treatment of poliomyelitis and scarlet fever.

1934 Placental extract, the precursor of immune serum globulin, prepared in collaboration with Dr. Charles F. McKhann, Harvard Medical School, and distributed for prevention and modification of measles.
Elliot S. Robinson, M.D., succeeded Dr. White at Biologic Laboratories.

1939 One hundred clinical laboratories enrolled in the Diagnostic Laboratory's Laboratory Approval Certification Program newly created by Legislature.

1941 Blood products, including normal serum albumin and immune serum globulin, initiated during the next decade.

1942 Goeffrey Edsall, M.D. succeeded Dr. Robinson as Director of Biologic Laboratories.

1946 Blood fractionation begun in new Biologics building as part of collaborative program with Massachusetts hospitals.

1947 Diagnostic Laboratory and Wassermann Laboratory relocated and united in the Bussey Building from which the Diagnostic Laboratory had moved 50 years earlier.
Robert A. MacReady, M.D., succeeded the recently retired Miss Beckler.

1949 James A. McComb D.V.M., succeeded Geoffrey Edsall, M.D., in charge of Biologic Laboratories since 1942. Tetanus toxoid, diphtheria toxoid, and pertussis vaccine with modern levels of purity and potency were developed.

1952 All laboratory activities consolidated administratively into the Institute of Laboratories, with Johannes Ipsen, M.D., as Superintendent.

1955 Virology Laboratory founded at Harvard Medical School under Joan Daniels.

1961 Dr. Edsall succeeded Dr. Ipsen as Superintendent.

1962 First mandatory neonatal metabolic defect screening program in the nation (phenylketonuria) begun by Diagnostic Laboratories. Human-origin tetanus immune globulin introduced to replace the reaction-prone horse serum product.

1964 Encephalitis Surveillance Field Station, originally established 8 years earlier at Taunton, now a Diagnostic Laboratory activity permanently quartered at Lakeville. Data gathered served as valuable background for 1973 and 1974 outbreaks.

1965 Comprehensive streptococcal throat culture program initiated to reduce rheumatic and nephritic complications.

1966 Fluorescent treponemal antibody tests used to augment the Hinton syphilis test.

1969 Groundbreaking for new State Laboratory Institute Building.

1971 A major training program and implementation of hepatitis B screening of blood donors carried out, first of its kind in the nation.
Morton, A, Madoff, M.D., succeeded Dr. Edsall who retired after a decade as Superintendent. George Grady, M.D., now Director of Biologic Laboratories. Dr. Kenneth Girard, Ph.D., Acting Director of Diagnostic Laboratories since Dr. MacCready's retirement in 1968.

1972 Full-scale production and distribution of Rh Immune Globulin for prevention of neonatal disease.

1974 Beginning in January, new building occupied in phases. Virus Laboratory and newly created Lead Poisoning Control Program included. All laboratory activities except the Encephalitis Field Station now together with common support services.

1978 Hypothyroidism screening in newborns implemented.

1980 License issued for Varicella Zoster Immune Globulin (VZIG) for prevention of chickenpox in immunosuppressed children.

1912 Confirmatory HIV testing provided for hospitals, physicians, blood banks, and anonymous test sites.

1988 Ralph Timperi, M.P.H., appointed Director of the State Laboratory Institute and Assistant Commissioner of Public Health.

1990 Universal screening of newborns for sickle cell disease begun. Was issued the sole U.S. license for CMV-IVIG to prevent life threatening infection in kidney transplant patients.

1993 Universal screening of children for lead poisoning begun.

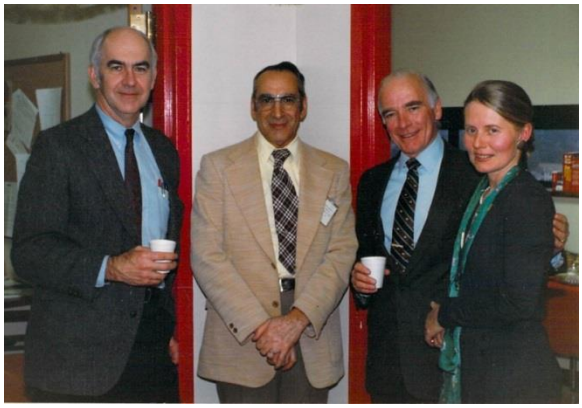
We would like to acknowledge the advice and suggestions of Ralph Timperi, Director of the State Laboratory Institute and Assistant Commissioner of Public Health, in the preparation of this history.

Massachusetts State Laboratory Institute - Mycobacteriology

Director of Mycobacteriology
Kurt Stottmeier, 1986

Mycobacteriology Laboratory Staff, 1986
Irene George 2nd from left & Kurt Stottmeier,(R)

Barbara Werner (L) foreground and
Joel Maslow (L) background, speakers at a
Massachusetts State sponsored workshop, 1996



(L-R) George Grady, James Gentile, Thomas
Kearns and Helga Stottmeier

(L-R) Edward Nardell, Paul Farmer (Workshop
Dinner-Speaker) and Barbara Werner, 1998

HIGHLIGHTS IN TUBERCULOSIS CONTROL IN MASSACHUSETTS (1850-1999)

1850 Lemuel Shattuck from Boston suggests keeping a register of tuberculosis cases and encourages local boards of health in the battle against TB, calling it "the great destroyer of human health and human life".

1850-1890 Sanatoria for care of patients with TB were established in Boston including the Channing Home, the House of the Good Samaritan and Cullis Consumptives Home. Vincent Bowditch founded the Sharon Sanatorium in Sharon, Mass.

1898 Rutland State Sanatorium opened. First state sanatorium for tuberculosis in the nation. Theobold Smith distinguishes bovine from human tuberculosis

1861-1900 The death rate from TB in Massachusetts declined from 365/100,000 to 190/100,000

1895-1949 A total of 29 hospitals and sanatoria were used in Massachusetts to provide care and treatment of tuberculosis, exclusively or in conjunction with other diseases, with a total bed capacity of 4,202 beds. These were as follows: 4 State sanatoria, 849 beds; 8 County sanatoria, 1,321 beds; 9 Municipal sanatoria, 1,251 beds; 6 Private and semi-private sanatoria, 156 beds; and 2 Federal hospitals, 625 beds.

1935-1945 Over 1.5 million hospital days annually in 4,200 beds for tuberculosis care, with a waiting list. Typical patients during this period had: far advanced disease; came from all segments of society; desired hospitalization as there were long waiting lists; a good social support system (family ties, cultural support, psychologically normal, and employable)

1944-1963 Enter the tuberculosis drugs; waiting lists dry up and hospitals experience low occupancy.

1958 "NEED FOR CHANGE" report by Department of Public Health. Eighteen of the 29 hospitals and sanatoria, with 2,785 beds, provided 616,863 patient days of care for tuberculosis at a cost of $11,685,809. The estimated average cost per patient day was $18.94, and the hospital occupancy was about 60 per cent.

1961 Reorganization of tuberculosis control, giving authority to the State Health Department for control and eradication of tuberculosis, signed into law as Chapter 608, Acts of 1961.

1963 State Health Department consolidated all tuberculosis care and treatment into 6 hospitals having 1,387 beds available for tuberculosis. These were at Mattapan Sanatorium, 590 beds; Middlesex County Hospital, 350 beds; Norfolk County Hospital, 180 beds; Worcester County Hospital, 122 beds; Western Massachusetts Hospital, 140 beds; and Lakeville Hospital, 5 beds. Of approximately 1,250 patients with tuberculosis in the 12 hospitals that were admitting tuberculosis patients in late 1962, only 824 were in, or transferred into, the 6 hospitals under the Department of Public Health program. The 6 hospitals provided 301,250 patient days' care. The average cost was $20.50 per diem.

1964 The Division of Tuberculosis Control began to develop and support out-patient diagnostic and treatment facilities and services as an alternate to extended in-patient care of tuberculosis.

1966 Out-patient clinics expanded to 59. Patient days reduced to 198,768 in 6 hospitals.

1969 Department position paper on "UTILIZATION OF UNNEEDED TUBERCULOSIS HOSPITAL BEDS" suggested orderly program to discontinue beds in tuberculosis hospitals rather than phase out hospitals. Worcester County Hospital elected to discontinue tuberculosis care in favor of chronic disease care. Five tuberculosis hospitals remain; patient days reduced to 121,607; cost increased to $37.85 per diem.

1970 Contracts were made with three general hospitals for the in-patient care of tuberculosis: Berkshire Medical Center, Salem Hospital, and Bay State Medical Center (Springfield Hospital Medical Center). Patient days reduced to 103,313; average cost increased to $54.37.

1972 Contract with St. Vincent Hospital, Worcester, for tuberculosis in-patient care. Patient days reduced to 62,477.

1973 The state TB clinic at Pine Street Inn was established

1975 Position paper on "THE PROVISION OF HIGH QUALITY LONG-TERM CARE OF TUBERCULOSIS AND THE DESIGNATION OF APPROPRIATE BEDS TO MEET THIS NEED. Long-term hospitals reduced to three: Mattapan Hospital, with 25 beds, Middlesex County Hospital, with 25 beds and Norfolk County Hospital, with 25 beds. General hospitals increased to 5; patient days reduced to 26,111; Cost increased to $158.60 average per diem rate.

1976 Mattapan Hospital tuberculosis in-patient care program phased out, patients absorbed by Middlesex County hospital and Norfolk County Hospital.

1977 Norfolk County Hospital tuberculosis in-patient care program phased out, leaving only Middlesex County Hospital as last long-term tuberculosis care hospital out of 29 hospitals operating before 1950. During the 70's and 80's, the patient picture changed remarkably compared to earlier years. TB patients now were: from the lowest socioeconomic group, most had far advanced disease, often apathetic or lacked interest in their health (personal and public); and had serious medical and social problems (alcoholism, homelessness, unemployable).

1989 The hospitalization days were reduced to 3,172 and the cost increased to $428/day at the single remaining in-patient facility

1990 During the early 1990's, the patient picture continued to change. In addition to alcoholism, homelessness and being unemployable as social problems, patients now had drug addictions, the emergence of HIV, and emerging drug resistance to complicate the picture. They also began to come from different areas of the world – Southeast Asia, the Caribbean and Latin America, and the problem of undocumented status for persons who were here without legal grounds, became a patient management issue. HIV dementia and other mental illness exacerbated the care delivery situation. With this in mind, the Division recognized the need for a more secure, structured in-patient setting that would allow for the behavioral interventions that were needed to get patients through a complete course of therapy. In order to accomplish this, the in-patient unit at the Middlesex Hospital was closed and a new Tuberculosis Treatment Unit (TTU) was opened at the Lemuel Shattuck Hospital.

1996 The TTU became the Northeast Regional Resource Center for Tuberculosis, and welcomed TB patients from other Northeast states without similar facilities. These were patients who needed expert medical consultation and/or behavior modification strategies.

1999 By 1999, the bulk of TB care (80%) continued to be provided in the 26 TB outpatient clinics located in hospitals throughout the state. There were 27,312 visits to these clinics in FY98. The impact of managed care is yet to be felt in TB case management, but the future is uncertain.

By Thomas J. Kearns, Director, Division of Tuberculosis Control, 5/24/77.
Updated by Susan Etkind, Director, Division of Tuberculosis Prevention and Control, 1/27/99.

VERMONT DEPARTMENT OF HEALTH LABORATORY: A BRIEF HISTORY

The Vermont State Public Health Laboratory was created by an act of the State Legislature on October 26, 1898. The laboratory first opened its doors in 1899 as the "State Bacteriological Laboratory". It later was renamed the "State Laboratory of Hygiene" and now is officially known as the Vermont Department of Health Laboratory, commonly referred to as the Vermont State Public Health Laboratory.

The laboratory has been housed in four different buildings over the last 100 years. The building in which it currently operates was built in 1952 for the entire Department of Health. Since then the department has outgrown the facility and moved into other locations. The laboratory, which now fills the entire 25,000 square feet of the building, remains as the sole occupant. The building was refurbished and remodeled in 1987.

Dr. Jo Linsley was the first Laboratory Director of the Vermont State Public Health Laboratory and served in that capacity for its first two years. Over the years there have been seven others in that position, the latest being Dr. Burton Wilcke who assumed the position in 1988. Dr. Wilcke now also serves as the Director of the Division of Health Surveillance. The laboratory is part of the Division of Health Surveillance, a division of the Department of Health which also includes Epidemiology and Public Health Statistics.

The legislative mandate for the state laboratory is as follows: "The laboratory shall make chemical and bacteriological examination of water supplies, milk and food products and examinations for the detection and control of communicable diseases; and shall carry on such work in relation to the health of the residents of the state as the board [of Health] shall direct". (18 VSA Section 501). Over the last 100 years the Vermont State Public Health Laboratory has provided laboratory services through the performance of analyses, providing reference services to other laboratories, certifying laboratories, facilitating or providing training to laboratorians, and participating in developmental work. The laboratory has continuously provided services in all these areas, although in the 1950's there was more developmental work being done when Chief Microbiologist, A. Hajna, developed and published improved methods for the isolation of Salmonella. At about the same time Harold Stowe, head of the Chemistry Section, was published on improved methods for the collection of blood samples for clinical chemistry analyses.

The mix of analytical services has changed as services became available through the health care delivery system and private environmental laboratories. Some analytical services that were provided in the past but have been discontinued include: testing for diabetes, screening for streptococcal pharyngitis, premarital testing for syphilis, and routine dairy testing (now done by the Department of Agriculture). Some traditional public health laboratory services continue to be provided such as: chemical and microbiologic testing of drinking water, fluoride testing, alcohol testing for the state's DUI program, TB, rabies, sexually transmitted diseases, and gastroenteritis testing. The varied workload of the last ten years has also included radiochemistry, serological testing for vaccine preventable diseases and expanded viral disease testing.

As we move into the 21st century the Vermont State Public Health Laboratory will continue to adapt and change its range of services based on public health needs. The laboratory will become more involved in molecular microbiology, toxicology, biologic and chemical terrorism response, as well as the use of new technologies in the monitoring of waterborne and foodborne diseases.

It is interesting to note as we head into the 21st century that some of the same communicable diseases which were with us 100 years ago such as streptococcal disease and pertussis, and which helped to justify having state public health laboratories, still exist today. Meanwhile, new threats and challenges are emerging. Many of those challenges will require the continued support of laboratory-generated data and information.

Burton Wilcke

THE HISTORY OF LAL AND ASOCIATES OF CAPE COD, INC.*

During the last 25 years Associates of Cape Cod (ACC) has grown from a staff of 5 people working in a basement to 65 full-time employees in a fully modernized FDA licensed facility. In the Fall of 1997, Seikagaku Corporation of Tokyo, Japan purchased ACC from the Stanley Watson Trust. This is the history of how an academic research interest in detecting endotoxin grew to become a major supplier of *Limulus* Amebocyte Lysate (LAL) for the international research and pharmaceutical markets.

Discovery of LAL

Associates of Cape Cod, Inc. was founded by Dr. Stanley W. Watson in 1974 to produce LAL for detecting endotoxin derived from the cell walls of gram-negative bacteria. The scientific basis of this assay was discovered in the 1950's by Dr. Frederik Bang from The Johns Hopkins University while working at the Marine Biological Laboratory. He observed that certain species of bacteria injected into the bloodstream of healthy horseshoe crabs caused massive intravascular clotting. Later, Dr. Bang and his student Jack Levin, showed that endotoxin extracted from gram-negative bacteria caused the clotting reaction and that a clot formed in a test tube when endotonin was added to an extract of the horseshoe crab single blood cell called an amebocyte, Drs. Bang and Levin determined that the reaction is an enzymatic cascade driven by activated proteases sequestered in the amebocytes. We now know that endotoxin initiates the clotting reaction by activating a protease, which leads to the activation of the clotting enzyme and cleavage of coagulogen The insoluble cleavage products coalesce by ionic interaction to form the gel matrix of the clot.

Early Beginnings

The beginnings of Associates of Cape Cod can be traced back to the early 1970's when Dr. Watson, a scientist at the Woods Hole Oceanographic Institution, set out to separate membrane components of marine nitrifying bacteria from their cell walls. The LAL reagent appeared to be a convenient way of assessing the purity of these components, since lack of endotoxin would signify the absence of cell-wall material. Unfortunately, LAL was in short supply, and not sensitive enough to detect the very small amounts of endotoxin needed to assess the purity of membrane preparations. Dr. Watson decided to make his own LAL and in the process improved the sensitivity of the reagent. This effort soon became a major research project and in 1973 Watson's group was able to make stable, highly sensitive LAL. With the resulting LAL patent, Dr. Watson founded Associates of Cape Cod, Inc.

Those days were trying but fun. Crabs were bled on the lawn or in the garage while space was somehow made for laminar flow hoods, depyrogenating ovens, and an autoclave in the already cramped basement. Great progress was made in improving the sensitivity and stability of the reagent during those early years. Dr. Watson also worked with the Bureau of Biologics on the regulatory aspects of LAL and by 1977 the FDA granted ACC the first product and facility license for LAL. This same year ACC said farewell to Dr. Watson's basement and moved 4 miles to a leased facility in Falmouth proper.

A Young Company Grows Up

Starting with just seven customers in 1974, the company has continued to grow and the customer base now numbers in the thousands. One remarkable feature of this 25 year history is that the first product, the 5 ml 50 test vial of LAL that is still the key to the catalog, has not changed in price since the beginning. The widely used single test vials and I ml and 2 ml fill sizes were all approved by the FDA in 1978.

The 1980's were an exciting period of growth as pharmaceutical companies, encouraged by a number of far sighted individuals at the FDA, moved from the use of rabbits for pyrogen detection to LAL. It was not until the early 1990's that the USP monographs changed from specifying the Pyrogen (rabbit) Test to the Bacterial Endotoxins (LAL) Test. The 1980's also saw a dramatic growth of interest in the use of LAL abroad. While replacement of the pyrogen test by LAL has not proceeded as rapidly as in the USA, the use of LAL for in-process testing has increased dramatically.

The rapidly expanding company soon outgrew the facility occupied since 1977. In 1982, Dr. Watson purchased the current building on Main Street and, after extensive remodeling, began production. Even this much larger facility proved constricting and following acquisition of an adjacent lot, a new wing was added and commissioned in 1991.

Innovations

A major innovation by ACC was the introduction of a kinetic turbidimetric LAL assay system, in the early 1980's. The first commercial kinetic LAL assay consisted of a specially formulated LAL reagent, Pyrotell-GT®, which could be used for the gel-clot and turbidimetric assays. The kinetic assay also required an incubating optical reader in which to perform the test and software to collect and analyze data. The LAL-4000 was developed in conjunction with Benthos, a deep sea engineering company that also grew out of the oceanographic research activities in Woods Hole. The LAL-4000 was the first instrument specifically designed to perform LAL tests and, in conjunction with Pyrotell-T®, increased the sensitivity of the LAL test by a factor of ten with a detection limit of 0.001 EU/ml, a limit that still stands. In 1987 the LAL-4000 was replaced by the LAL-5000, an instrument that had increased capacity, reliability and ease of service. These features were further enhanced in 1990 by the LAL-5000 *Series 2*, which is now being redesigned to incorporate newer technologies both in optics and in the software package that analyzes the data

In 1985, ACC decided to pursue some non-LAL related research on the horseshoe crab. This resulted in the discovery of an endotoxin neutralizing protein (ENP). Because of its high tenacity for endotoxin, ENP formed the basis of a new line of endotoxin removal products, END-X™, and has also been the subject of preclinical studies to assess its potential as an anti-sepsis therapeutic drug. Studies of ENP continue with the hope that someday this compound will become an important product for ACC.

The single-step chromogenic reagent, Pyrochrome™, was introduced in 1993. This followed research and collaboration with our distributor in Japan, Seikagaku Corporation, the original patent holders for the chromogenic LAL test. In the new reagent, LAL and the chromogenic substrate are co-lyophilized in the same vial which increases the ease of use and flexibility. We now manufacture a number of chromogenic LAL reagents for use in plate readers.

Looking Forward

Our early associations with Seikagaku Corporation enabled us to become acquainted with their strong research orientation both in carbohydrate and LAL biochemistry. After Dr. Watson died in 1996, the company was managed by the Stanley Watson trust. This group sought a buyer to develop further the commercial and research aspects of the company. Seikagaku purchased ACC in November 1997 and made ACC an independent operating division. With the continued leadership of Dr. Thomas Novitsky as President and CEO, ACC is developing new LAL technology based on the research and products developed in Japan with the Japanese horseshoe crab, *Tachypleus.*

The story of Associates of Cape Cod and the development of LAL for the detection of endotoxin is an example of the unexpected result of basic research. Many of the senior staff, including Dr. Novitsky, received their advanced degrees in microbiology and are longtime members of the ASM: Marilyn Gould, Vice President Technical Affairs, Malcolm Finkelman, Vice President Regulatory and Clinical Affairs, Jack Sloyer, Director of Microbiology Applications, and Paul Ketchum, Director of Research and Development. We each follow in the footsteps of Dr. Bang and Dr. Watson in our efforts to create applications for the complex biochemistry of *Limulus* blood and apply it to benefit the medical and pharmaceutical industries.

Paul Ketchum

*Adapted from "The History of LAL and Associates of Cape Cod, Inc." by Thomas J. Novitsky, Editor, LAL Update, volume 12, No. 1, March 1994.

THE RISE OF BIOTECHNOLOGY IN BOSTON

The development of the biotechnology industry in the greater Boston area began to take shape in the early 1970's as companies such as Genzyme, Biogen, and Genetics Institute found that Boston, with its heavy concentration of academic research institutions, were prime locations for fostering the business of biology. Biotechnology is predicated on the development of products and services based on the outcome of controlled biological processes. Since microbiologists have been traditionally been trained in the art of aseptic bacteriological and tissue culture techniques, their training and experience became a highly sought after skill set. Additionally, the clinical training that many Boston based microbiologists received, and their discipline to comply with established written procedures was an intangible skill that industry found highly desirable especially as these first products reached a world highly regulated by the Food and Drug Administration.

One who made the transition to this new industry was Dr. Gary du Moulin who left the Anesthesia Department of Beth Israel Hospital in 1989 to join Cellcor Therapies, a small biotechnology start-up. Cellcor Therapies was established to develop and commercialize cellular therapies utilizing activated T-lymphocytes as a treatment modality for metastatic renal cell carcinoma and other life threatening diseases. Broadly grouped in an area termed adoptive immunotherapy these therapeutic modalities were based on the collection of an apheresis cell product from the patient. Lymphocytes extracted from this material are cultured in an environment of monoclonal antibodies, lymphokines and cytokines to activate the T-lymphocyte population. These would be returned to the patient. It was observed by the FDA that 25% of patients would receive contaminated infusions, some leading to devastating infections. Therefore, strict microbiology controls would need to be put in place to better control the process from the standpoint of sterility. Microbiologists, such as Gary du Moulin, set about to develop the first Quality Control programs for such therapies. Cellcor Therapies was able to complete its clinical development and evaluation after treating hundreds of patients without a single episode of sepsis due to the implementation of such quality control programs.

Because of the greater understanding that mammalian cells could be successfully cultured *ex vivo* and developed into products, the field of tissue engineering soon began to emerge in the 1980's. Companies such as Biosurface Technology of Cambridge pioneered the development of autologous grafts of keratinocytes to treat patient with devastating full thickness burns. These technologies required cells to be cultured for periods of time up to one month or longer. The ever-present risk of contamination required microbiologists to develop techniques and procedures to insure that cells would remain uncontaminated until they could be returned to the patient. Genzyme corporation acquired Biosurface Technology in 1994 and became Genzyme Tissue Repair. Dr. du Moulin joined Genzyme Tissue Repair shortly after the acquisition and participated in the development of Quality Assurance programs to position the company for the first FDA approval for a living cell product. This product was Carticel, autologous cultured chondrocytes for the repair of articular defects of the knee. The maintenance of sterility was so critical for these technologies since the treatment is dependent on the collection of biopsy material from skin or cartilage. If contaminated the patient could not receive the therapy or another invasive biopsy would have to be collected. These technologies were dependent on the development of high asepsis. Again, microbiologists would be needed to bring expertise in aseptic processing and microbial identification.

One unique problem in which the clinical field could have a major impact is that living cell or tissue engineered products are characterized by shelf-lives measured in terms of hours. The conventional determination of sterility from the FDA regulatory viewpoint has been the sterility test developed in accordance with the U.S. Pharmacopoeia. This sterility test is a fourteen day test in two bacteriologic media. The completion of this test in many cases is completed after the patient receives the implant, is administered cells, or is grafted. There has thus been the impetus to develop sterility testing protocols that have an increased sensitivity or shorten time to detection. The field of clinical microbiology has for a number of years developed the analytic tools needed to bring similar advances to the field of industrial microbiology. It will take time, however, to validate these advanced clinical techniques to supplant the traditional industry sterility test.

There will always be great change in the biotechnology community of Boston. Companies will downsize, upsize, merge or be acquired. As the millennium approaches these novel technologies and applications will continue to expand logarithmically. The gene therapies, many of which are in early developmental clinical trials, will also require the skills that Boston microbiologists will be able to fill.

Gary C. du Moulin, Ph.D.

CUBIST PHARMACEUTICALS

Cubist Pharmaceuticals was incorporated on May 1, 1992 and from its inception has been engaged in research, development and commercialization of novel anti-infective drugs to treat infectious diseases caused by bacteria and fungi. The Company has especially targeted organisms with increased resistance to existing antibiotics. Dr. Francis Tally, Executive Vice President, Scientific Affairs joined Cubist in 1995 having been previously at Lederle Laboratories division of American Cyanamid/American Home Products. Dr. Tally has been an integral part of the in-licensing of daptomycin (a novel lipopeptide antimicrobial agent). He has also been closely involved in the development of a newly patented technology called VITA (Validation in vivo of targets for anti-infectives) which enables researchers to validate whether a target will be useful for drug discovery early in the research process. In coming to Cubist, Dr. Tally has returned to New England having previously served in Tufts-New England Medical Center's department of Infectious Diseases from 1975-1987.

Jared Silverman, Ph.D. joined the company in 1997, as the first microbiologist on the research staff. Dr. Silverman did his graduate work at Harvard Medical School with John Collier. He undertook post-doctoral studies at Yale University with Dr. Keith Joiner working on *T. gondii*. At Cubist, Dr. Silverman is involved in drug discovery and in characterizing daptomycin's mechanism of action.

In December 1998, Grace Thorne, Ph.D. joined Cubist as the Director of Clinical Microbiology, just as Phase II and II of clinical trials of intravenous daptomycin were commencing. Previously Dr. Thorne had been Director of the Rapid Diagnostics Program at Children's Hospital and established a PCR laboratory there. Earlier in her career, Dr. Thorne was at Tuft-New England Medical Center's Infectious Diseases division pursuing studies of diarrheagenic *E. coli* .

Cubist Pharmaceuticals is now poised to apply its expertise in microbiology, genomics and medicinal chemistry to identify additional novel compounds with broad spectrum activity against life-threatening infectious organisms.

Grace Thorne

MICROBIOLOGY RESEARCH ASSOCIATES, INC.

Microbiology Research Associates, Inc. (MRA) is a contract testing Microbiology Laboratory servicing the Pharmaceutical, Medical Device, Cosmetic and Biotechnology Industries. MRA was started by James J. Barbato in 1993. Mr. Barbato is a former Professor at the Massachusetts College of Pharmacy where he taught Microbiology, Virology, Parasitology, Public Health and Pharmaceutical Microbiology for 20 years.

The transition to industry was made easier for Mr. Barbato because he acted as a consultant to the Pharmaceutical Industry for many years at the Massachusetts College of Pharmacy and the college has a small contract testing service for Professors to interact with Industry.

MRA is known as a top contract testing laboratory, servicing large Pharmaceutical companies across the U.S. It is due to the knowledge and experience gained in microbiology that has allowed the entrepreneurial spirit such as that in MRA to be a success.

James Barbato

MORTON INTERNATIONAL, INC.

Morton International, Inc. is a salt and specialty chemical company. Products are sold to the pulp and paper, asphalt, adhesive, electronic, and plastic additive industries. A portion of the plastic additives business is devoted to the manufacture of biocides incorporated for the purpose of material preservation. The microbiologists in the Biocides Laboratory challenge the treated products with a variety of microorganisms, including bacteria, fungi,
and algae. In an attempt to simulate actual product exposures, many of the samples are subjected to dynamic water leaching, UV exposure (with lamps and outdoors in Florida), soil burial, and humidity, prior to and following microbial challenges.

The biocides portion of the business originated as Scientific Chemical in Chicago. Ventron, a chemical company in Beverly, MA, bought out Scientific in 1968. Woody Moy relocated from Chicago to Beverly in the early 1970s. In October of 1973 he was elected president of the new Northeast Section, Society for Industrial Microbiology (SIM).

As with many other organizations, several corporate takeovers and mergers have occurred. Thiokol Corporation purchased Ventron in 1976. In 1982, Morton Salt merged with Thiokol and became known as Morton Thiokol. Thiokol was divested from Morton in 1990; the subsequent company became known as Morton International, Inc.

Over the years, Woody has been active in both the SIM and ASM. He has also encouraged his coworkers to be active members in both societies. In addition to himself, Nan Hamilton was secretary for the SIM and Carol Mahoney has served as President, Vice-President, Secretary and Treasurer of the SIM. Currently, Carol is a local councilor for the Northeast ASM.

In February of 1999, an agreement was reached with the Philadelphia based specialty chemical company, Rohm and Haas to acquire a major portion of Morton International.

Carol Mahoney

MYCOBACTERIOLOGY 1971 TO 1985

It began on a hot summer afternoon in 1971 when Marion Holmes handed over several wire baskets of colorful mycobacterial culture slants indicating to the trained eye "various stages of viability". The brief encounter took place in the "historic" State Laboratory Building that vanished from the face of the earth a long time ago. The current one was in the planning stage. Marion's staff was partially hidden behind tall stacks of petri dishes in the non-air conditioned, open windowed lab coping with another of these enteric outbreaks occurring somewhere in the state. Mycobacteria were not on their minds. TB cases emerged mainly from Boston's South End. CDC, (NCDC at the time, prior to more name changes), predicted elimination of TB in the US early in the next century. Public Health measures had made great progress. The steady downward trend of newly diagnosed cases accelerated further due to effective chemotherapy prescribed and monitored by TB specialist physicians. We knew that TB was going the way of the virulent pox virus, at least in North America. Other mycobacteria? Well, they were just as important to Public Health

as other pox viruses. No man to man transmission had ever been shown to occur. *Mycobacterium avium* was as important to (human) medicine as the fowl pox virus. It was not even biochemically identifiable. One had to infect a chicken or rabbit.

Phyllis Edwards of CDC had shown that a so called "Battey" bacillus was lurking in the South. Later it was named *M. intracellulare* by Ernest Runyon, the "grand old man" who gave us the grouping of mycobacteria by pigmentation and rate of growth. Dr. Edwards had observed that Southern Navy recruits, presumably draftees in those days, gave significantly more false positive PPD skin tests upon entering the service than their Yankee compatriots. This was found to be due to exposure and sensitization of Southern children by this rather ubiquitous "Battey bacillus. The name was derived from a TB hospital in Rome, Georgia.

Without much further discussions, meetings, or task force deliberations, the State Lab turned the reference functions for mycobacteria over to the City run lab located at the former Mattapan Sanitarium on River Street, named now Mattapan Chronic Disease Hospital caring for a few hundred patients, among them about 120-150 TB in-patients. Several TB clinics had been organized, also, and were supervised by Dr. Clive Cohen. Dr. David Sherman, the superintendent of the hospital, had always been a strong advocate and supporter of laboratory medicine, mainly reliable and rapid diagnosis of so called AFBs (acid fast bacilli) - i.e. biochemical identification of *M. tuberculosis* and reliable, state-of-the-art drug susceptibility testing. In the early sixties he had secured Dr.Victor Lorian as lab director who had made great strides in this direction, but he left and the gains had to be consolidated and advanced by 1971.

Before Dr. Lorian left for New York City, he had attracted practically all laboratory mycobacteriology in Boston, including almost all major teaching hospitals that had given up this rather tedious and dangerous activity lured by a free and competent service provided at Mattapan. During the ensuing decade, the service expanded state-wide. Some cultures came from as far as Pennsylvania. The Mattapan Post Office provided daily, Monday through Saturday, a huge mail bag full of clinical specimens and cultures. In addition, couriers arrived constantly during the morning hours with purple labeled containers. The service peaked at slightly over 30,000 clinical specimens and about 1,000 reference cultures. About 5% of the clinical specimens were positive for mycobacteria, requiring full species identification and drug susceptibility tests to about ten drugs performed on meticulously "home made" Middlebrook7H1O agar using Canetti's agar dilution "proportion method". Smear positive specimens were tested "directly", however, yielding acceptable drug susceptibility results in most cases as early as 18 days after receipt of the specimens.

Today one should not generalize the constantly repeated assertion that 20 years ago all TB patients were confined for years and the lab diagnosis of TB took months. The crown jewel of the lab at Mattapan, and probably of the hospital, was the $3,000.00 fluorescent Zeiss microscope purchased in the sixties at a cost of a decent family car. Ever increasing numbers of sputum smears i.e. 100-200 per day, were competently screened six days/week, using proper quality control and adhering to a strict 24 hour turnaround time, even less for positive findings that were phoned in immediately. Throughout the seventies and early eighties this service expanded, but the highest standards were maintained, often requiring extraordinary efforts as during the storm of 1978.

ASM's Journal of Clinical Microbiology published recently the "re-discovery" of detecting mycobacteria microcolonies on agar using a dissecting microscope. The technique was practiced in the sixties and published by Dr. Lorian who had added Tween 80 to Middlebrook 7H-10 agar to discern "Cord factor" that is diagnostic for *M. tuberculosis*. Rapid TB diagnosis was practiced decades ago using the technology of the time and by providing full service six days/week. Admittedly, life was somewhat simpler. A positive AFB smear meant an active TB case, requiring immediate medical attention and often some hospitalization.

By publishing articles and even a book, Dr. Lorian had begun to put the lab at Mattapan "on the scientific map". This was to continue for more than a decade with the explicit blessings of city and state authorities, namely Dr. Sherman, Dr. Robinson and later Mr. Thomas Kearns.

Rhodococcus rhodochrous was separated by a new biochemical test from nocardia and mycobacteria, the isolation procedure for extrapulmonary sources by broth medium was improved, and six cases of true mycobacteriosis, i.e. pulmonary tuberculosis by mycobacteria, other than *M. tuberculosis* or *M. bovis*, were described in the American Review of Respiratory Disease.

There was time and resources to explore with Dr. Weller's department of Harvard Public Health the still mysterious etiology of Buruli ulcer in Central Africa by infecting Anole lizards with *M. ulcerans* and re-isolating this fastidious mycobacterium. The extraordinary genetic resilience of *M. tuberculosis* and resistance to gamma irradiation was demonstrated in cooperation with Dr. Michael Zack, pulmonary fellow at the Mass General at that time. Routine lab data collected over 10 years established, long before HIV was discovered, that cervical lymphadenitis in children is caused predominantly by *M. avium-intracellulare* (MAI) followed by *M. scrofulaceum*. Adults with this affliction, however, showed almost always *M. tuberculosis* as the infectious agent.

Dr. Gary du Moulin, at the time in Dr. Hedley-Whyte's lab at the Beth Israel Hospital, received cooperation and lab support by establishing the presence of MAI organisms in the Boston drinking water. The lab was discovering with Dr. Gerald Friedland, the Beth Israel Hospital epidemiologist, MAI as a source of contamination of clinical specimens. It was observed and reported, mostly to deaf ears, that the isolation of MAI from clinical specimens in Massachusetts was increasing every year, a trend that was to continue for more than ten years until the time when AIDS appeared and the isolation rates of MAI "skyrocketed". No skeptic doubted MAI's clinical significance, a controversy that was debated for decades.

Presentations and publications, but mainly the consistently reliable lab services, had established the reputation of the Mattapan Lab to the point that teaching and training became another task. Pathology residents were sent routinely from different Boston teaching hospitals to spend a week in the lab and other professionals were arriving for training and orientation from near and as far afield as Australia, Israel, and Pakistan. More often than not, the hospital agreed to provide room and board for foreign trainees.

Reference cultures were processed from other States, necessitating one of the first CLIA licenses in Boston for a lab participating in "Inter-State Commerce". Additional work for the staff was generated by the late Dr. Howard Gruft's request to act as one of the reference labs for NY State's mandatory Lab Improvement Program, one of the first and most stringent ones in the country. None of these activities were reimbursable, nor was any attempt made to recover expenses. Patients' care and research were important for the professional reputation of an institution.

This era came to an end sometime after 1985 with the appearance of gene probes by "Gen-Probe", the discovery of retro-viruses in human disease, lack of research funding accompanied by pressures to generate revenue, and eventually the return of the Mycobacteria Reference Lab to the current and ostensibly better equipped State Laboratory Institute under new management and with a different mission.

Kurt Stottmeier, 1996

ENVIRONMENTAL EPIDEMIOLOGY OF WATERBORNE MYCOBACTERIA

Disseminated disease due to mycobacteria other than *Mycobacterium tuberculosis* has been on the rise. Isolation of these organisms from normally sterile anatomic sites, namely blood, bone marrow, spleen, and liver, has led to a renewed interest in their ecology and in how humans acquire infections from environmental sources such as water. Moreover, the epidemic of acquired immunodeficiency syndrome (AIDS) as well as changing demographics which expose more and different human population groups to these organisms forced microbiologists and physicians to take a hard look at and give greater respect to these opportunistic pathogens, which traditionally were regarded as environmental contaminants or merely as transient colonizers in humans.

Meanwhile, during the past decade, we have isolated *M. avium* complex (MAC*), M. gordonae, M. flavescens, M. fortuitum*, and *M. chelonae* from the water distribution systems supplying Boston. Several factors contributed to waterborne dissemination of these organisms, including protracted time in the distribution systems, resistance to chlorination, optimal growth temperatures, nutrient availability and stagnant or interrupted water flow.

Our interest in mycobacteria dated to 1976 and the marked increase in isolation of MAC from clinical specimens at the Beth Israel Hospital. In one month 6.7% of all specimens submitted to the laboratory for culture grew this organism. Moreover, similar organisms were being isolated from specimens at other Boston area hospitals. Environmental sampling was instituted in patient care areas where clinical specimens had been positive for MAC and where there was water. Mycobacteria were isolated from a number of sites including heated nebulizers reservoirs, ice machines, and hot and cold drinking water faucets. Cultures from at least one of five service connections distributing municipal water to the hospital grew MAC. Environmental sampling on the greater Boston area revealed MAC in water from 5 of the 12 hospitals sampled. Serological tests confirmed that MAC isolates from the patient specimens and water sources were identical.

However, mycobacteria do more than simply contaminate water supplies and hospital specimens. In 1982, we reported infections on *M. intracellulare* serotype 10 in two rhesus monkeys residing in a closed primate colony in Worcester, Massachusetts. Abundant *M. gordonae, M. flavescens*, and *M. intracellulare* were subsequently isolated from water supplies obtained in the animal rooms.

A 12 year study of isolated of MAC organisms from patients was completed. Since 1972, 1953 patients have exhibited MAC as the only acid fast bacillus. During this period, a five-fold increase of MAC occurrence was documented in Massachusetts, with the statewide rate of isolation rising from 0.87 persons per 100,000 population in 1972 to 54.6 per 100,000 population in 1983.

We have studied the community incidence of MAC by monitoring 1454 patients during a ten year period. More densely populated communities appeared to have a high rate of MAC isolation. Forty-three strains of mycobacteria were isolated from drinking water supplies in seven coastal communities with groundwater supplies, two inland communities with surface supplies, two inland reservoirs, and hot and cold hospital taps, and revealed MAC, *M. gordonae,* and *M. scrofulaceum* in concentrations ranging from 10 to 500 Colony Forming Units/ml water.

Gary C. du Moulin, Kurt D. Stottmeier, and Irene George

MYCOPLASMA RESEARCH IN BOSTON

Boston was the first mecca for mycoplasma research following the report in 1937 by Drs. Louis Dienes and Geoffrey Edsall of the isolation of mycoplasma from a Bartholin's gland abscess in a young woman. Early investigators came here to visit Dr. Louis Dienes and Sarabelle Madoff in their laboratory at the Massachusetts General Hospital to learn their techniques for the isolation and identification of these unusual microorganisms. From Dr. Dienes and Sarabelle they not only obtained the state of the art information, but even more important, they were encouraged and inspired to continue the work.

An important milestone occurred in 1962 when Dr. Monroe Eaton's so-called "Eaton agent", long thought to be a virus, was proven to be a mycoplasma, and called *Mycoplasma pneumoniae*. This microorganism was later demonstrated to be a common cause of primary atypical pneumonia in young adults.

Subsequently, a group of us, investigators in the Boston area, started meeting regularly with Drs. Dienes and Eaton to discuss ongoing research. We met for many years with a lively interchange of ideas and discussions

which were extraordinary in the wealth of information that was shared and disseminated during those paper bag lunches in the conference room.

After Dr. Eaton left Harvard, and after the loss of Dr. Dienes, these meetings were continued by Sarabelle Madoff until her retirement in 1998. She was able to organize meetings and symposiums with many exciting internationally known speakers. One such meeting featuring Dr. Luc Montagnier attracted a very large audience because his subject was a possible association of mycoplasmas with AIDS.

We were a profoundly dedicated group throughout all these years. Many publications resulted from all these events. It is due to the original work of Drs. Dienes and Sarabelle, and many of the researchers trained by them, that the mycoplasmas and the ureaplasmas have become familiar words in the vocabulary of microbiologists, doctors, and nurses. These microorganisms have been implicated in serious infections in humans, other mammals, birds, and reptiles. Recent work has associated other mycoplasma related species with plant pathology. Carriage of these microorganisms by insects has also been demonstrated.

In the future we will have more surprises. The mycoplasmas and ureaplasmas are versatile microorganisms and we have just begun to explore their potential for causing diverse human infections. And to think that it all started here, in Boston!

Ruth B. Kundsin,
May 10, 1999

PROFILE OF A VIRUS HUNTER – Dr. Thomas Peebles

Excerpts from Virus Hunters (1) and personal interviews

In 1953, a young pediatric resident from Massachusetts General Hospital wanted to do research in the field of infectious diseases of children. He had served during four years of war as a Navy pilot, had returned to study medicine and in 1951 graduated from Harvard Medical School. His name is Thomas C. Peebles.

As a medical student, intern and resident, he worked with Dr. Louis Weinstein at Haynes Memorial. Dr. Weinstein was a very influential figure for the young man and the reason he became interested in infectious disease. So interested, that he went to Dr. Charles A. Janeway, of Children's Hospital, seeking work in the field of infectious disease. Dr. Janeway referred Peebles to Dr. John F. Enders at Children's Hospital to learn about Enders' new virus isolation techniques (tissue culture) which he had used to isolate the polio virus in 1949 with Drs. Thomas Weller and Frederick Robbins. When Enders asked Peebles if he'd like to work on the measles virus, Peebes eagerly joined this fabulous team to work with Weller in attempts to isolate German measles and with Enders to isolate measles. "It was a "really exciting time", says Peebles. (2) Other viruses had been isolated with this tissue culture technique and now it was time to try isolating the agent of the highly infectious disease of measles. Weller did eventually isolate the viruses of German measles and chicken pox.

Enders had been interested in the measles virus long before he got side tracked with polio. Measles was known to cause brain damage, other complications and even death, particularly among malnourished children in underdeveloped countries. It ranks, along with smallpox as one of the oldest known viral diseases. Until 1953, measles had only been produced in monkeys with filtered blood from a measles patient (Goldberger 1911). Measles had also been cultivated in tissue cultures of chick embryo cells (Plotz 1938) and had then been grown in hatching eggs with signs of attenuation (Rake & Shaffer 1939). However, none of these works was reproducible at that time.

Now Peebles had his work cut out for him. Since he had no measles virus to work with, he had to find some. There were no specimens from measles patients in deep storage at Children's Hospital Laboratory, so he

followed the reports of local health departments looking for an outbreak. It was six months later, January 1954, when Dr. Theodore H. Ingalls, a Harvard epidemiologist and school physician at the Fay School in Southboro, MA (a private boarding school for boys) called Peebles to tell him the school was having an outbreak of measles. Peebles immediately went to the school and was able to collect specimens (blood, stool and throat washings) from some of the boys after explaining his purpose of trying to grow the virus reproducibly for the first time. He collected these specimens within 24 hours of the appearance of the rash.

Back at the laboratory, which Peebles had inherited from Dr. Sidney Kibrick (who went to Parke-Davis to help with the polio vaccine) along with his technician Yinette Chang, culture tubes had already been prepared by Peebles and Chang to be inoculated. The first set of specimens from these two cases were injected within three and a half hours of collection into roller-tube tissue cultures of human infant kidney and other human and monkey tissues. Nothing was expected to happen for several days. Meanwhile on day four, Peebles was able to collect specimens from a third case at the Fay School.

On day seven, the cultures from throat washings on Patient #1 showed some large swollen cells which after lengthy investigation turned out to be Herpes simplex. This patient must have had cold sores or fever blisters in addition to his measles.

On day seventeen, Peebles got another call from the school and he collected his fourth set of specimens and inoculated the culture tubes.

On day twenty two, he saw something unusual in the roller tube inoculated with blood of the fourth patient. On microscopic examination of the human-kidney cells, he saw giant cells, not so strange by themselves, but there were spotty areas of spongy ballooning of tissue which seemed eaten away, as well as apparent coalescence containing multiple fragments. Peebles was uncertain of what the tissue change might represent but thought it might be a cytopathogenic effect. Was it caused by the measles virus replicating in human kidney cells? He showed the roller tube to Enders and Weller who thought it might be simple degeneration of tissue as well as possible fragments of red cells. They didn't think there was anything to get excited about, so Peebles set about to reproduce the effect by passing fluid from this blood culture to a fresh roller tube.

The very next day, he notices the same giant-cell effect that he had seen before and a week later, he makes a second passage with the same results. He was sure now he was looking at cell nuclei in the giant cells and not red blood cells which he wanted to rule out. Peebles was very excited. "I knew I had something". "Your heart sings. It is a foolhardy feeling. You need a man like Enders to prick the bubble".

Enders played the role of skeptic, and made Peebles feel possessive about his discovery. Enders "was loath to accept this", but with much intellectual give-and-take between Peebles and Enders, strong proof of the discovery was being built; so much so, that when a month later Enders was "going to Washington to report on the discovery to the Armed Forces Epidemiological Board and the Army, which was supporting this measles research, Enders asked: "Now, Thomas, are you sure about all this?" and Peebles replied emphatically "Yes, sir".

In order to demonstrate the virus clearly, they had ether fixed and hematoxylin and eosin stained (2) preparations from tissue cultures of the "Edmonston" (the last name of Patient #4) strain in order to clearly photograph what they saw under the microscope. Dr. William J. Cheatham had found the way of removing the virus laden cells from the roller tube with collodium..Within the giant cells the many nuclei could be seen and within them inclusion bodies, conglomerates of viruses, thousands of them. It surely looked like they had the means of reproducing and detecting the growth of measles virus in tissue cultures. Pathologists had been noting these same cells in tissue preparations from the appendix of children and been known to predict that the child would soon be getting the measles. The first observation of these stained cells took place on a Saturday morning. Enders had invited several friends to observe the findings.

Still they could not absolutely prove that the inclusion body was a package of measles viral particles, but what else could it be? Their first report, co-authored, on May 16, 1954 to "ProcSoc", called it an "agent from patients with measles" and no fault could be found with their conclusions.

By the end of 1954, Koch's Postulates were substantially fulfilled. They had been able to isolate and cultivate the measles virus from blood and the throat washing of three of the four initial patients and others were added. But, it was the Edmonston strain that they continued to work with.

Peebles and his co-workers took immune serum from twelve measles convalescents and showed that it neutralized the virus in the tissue cultures which left even less doubt that this was the measles virus. But to produce the infection in a human or monkey was the final step. Enders decided they should try monkeys, but the first batch of monkeys were from India all immune, probably having contracted measles from humans as they often ran wild in the streets where they were captured. So the next batch of monkeys from the South Pacific and living more in the jungle were tested for antibodies within a day of capture, found to be susceptible and then air shipped to the lab as soon as they landed in the U.S. Peebles remembers un-loading the monkeys. They were unruly and care needed to be taken not to be bitten. With these "fresh" from the jungle monkeys, Peebles and co-worker, Kevin McCarthy (now in Edinboro) were able to show that the disease could be passed onto monkeys from the human virus. This was evidenced by rash and/or ability to isolate the virus from the monkey's blood. "The circle of evidence was quite complete. John Enders, whose ingrained reaction to a will to believe is to disbelieve, now believed his laboratory could grow measles virus."(2)

Enders immediately set out to produce a vaccine. Since human kidney cells were scarce in any tissue-culture laboratory this would not be a suitable medium for mass production of virus for a vaccine and one could not expect to bring about an attenuation of a human virus while continuing to maintain it in human tissue. Enders believed that attenuating rather than killing the virus would be the only possible way of preserving its antibody-stimulating power. (This is an ongoing argument and today we may be seeing the effects of killing off organisms with antibiotics rather than learning to live with them in harmony). Monkey kidneys, the source of the Salk polio vaccine, had a wild type virus in it, but it didn't matter since the virus was killed by formaldehyde.

Peebles was generally "out of funds" during this time with a family to support. At one point, Weller had told Enders, a multimillionaire, "This guy is broke and he's eating eggs out of the incubator. He needs support." and Enders responded with a stipend of $1500 for a year, a good part of the grant at the time.

In December 1954, the microbiologist John Franklin Enders, virologist Thomas H. Weller, and physician Frederick Chapman Robbins received the Nobel Prize in Medicine for developing the technique to grow poliovirus in the test tube cultures of human tissues and gave virologists a practical tool for the isolation and study of viruses.

It was time that Peebles moved on, to become chief resident at Massachusetts General Hospital. He received a stipend as a Milton fellow and became Chief of the new Tissue Culture Laboratory there (1954-1959.) He worked with Dr. Lawrence Kunz, then Director of Clinical Laboratories, to set up the lab and then moved it to the Vincent Memorial Laboratories at MGH.

It was during this time that he studied 133 patients to see if tetanus booster could be given less frequently. Dr. Geoffrey Edsall, at the State Biologic Laboratories, Massachusetts Department of Public Health, was at the time promoting a program of a tetanus booster every six months. Peebles, after studying these patients and their antibody titers after four or more injections, concluded that the antibody titers lasted for at least 12 years from the last injection, was instrumental in establishing our present protocol of 10 years, avoiding many necessary emergency boosters and unnecessary reactions from the injections. His paper was published in JAMA co-authored with Edsall (4).

He also continued his studies with the measles virus at Children's Hospital where he went on to demonstrate the predominant role of leukocytes in the carriage of measles virus in the blood. Measles virus was isolated from washed white blood cells, but not from red cells or plasma, sometime after it had been inactivated by serum antibodies in whole blood specimens from patients with measles (3). Some of the other clinical investigations Peebles did concerned treatment of streptococcal disease and fluoride supplementation in the prevention of dental caries.

Several investigators continued the work with Enders to develop a vaccine. Meanwhile, from 1955 to 1958, a great deal had been accomplished but no vaccine had been tried on a human. By late 1958, eleven institutionalized children in Massachusetts received the vaccine with consent of their parents. Tests before vaccination showed they were susceptible and tests after 2 weeks to 6 months showed they had antibodies. Other field studies were done with parallel results. Eventually some of these vaccinated children were to be deliberately exposed to measles which is highly infectious. More recently, Samuel L. Katz, M.D. worked with Enders to attenuate the virus and then moved on to the Beth Israel Hospital as Chief of Pediatrics.

The chapter in "Virus Hunters" published 1959 is entitled "Is the End of Measles Now in Sight?" At this writing an article in the Boston Globe (9/3/99) reports "Measles in US at record low point". In the article CDC reported "that measles has joined the ranks of smallpox, polio, diphtheria, and other diseases that have been effectively wiped out in the United States". The measles vaccine became available in 1963 as a result of the work of Dr. Enders and Dr. Peebles who isolated the Edmonston strain of the measles virus in 1954.

Dr. Peebles opened his pediatric practice in Weston in 1961 and he is now retired and living in Florida.

Addendum: Dr. Peebles passed away July 8, 2010

References:

1. Williams, Greer; "Virus Hunters", Alfred A. Knopf, Inc. 1959.
2. Interviews; August 15, 1999, September 12, 1999, October 6, 1999
3. Peebles. TC; Distribution of Virus in Blood Components during the Viremia of Measles, Archive Fur Die Gesamte Virusforschung. Vol. 22, No.1-2, 1967, p.43-47
4. Peebles, TC; Levine, L;Eldred, M; Edsall,G, Tetanus-Toxoid Emergency Boosters – A Reappraisal NEJM 280;575-581, March 13,1969.

A FUNNY THING HAPPENED ON THE WAY TO WORK ONE DAY

It was July 1974. I had just graduated from college with my long-awaited Bachelor of Science degree in Microbiology. I had pretty much worked my way through high school and then through college. I was working for a local bank performing general janitorial services, (sweeping floors, washing windows, etc...). I thought I would soon be rich making my $ 2.50/hr. Heck, all I needed was money for gas and Schlitz beer and both were real cheap then.

I had sent out a bunch of resumes figuring I might even get lucky enough to work somewhere in the field that I had studied. Well -- I did get lucky, I thought anyway.

Before I go any further, let it be clear that this company is no longer in business, and that I did work for them for 6 good years. (No lawsuits please !!)

Anyway, I got a job in the Quality Control Lab performing QC on freshly-made culture media. I was to make a whopping $ 2.25 /hr. This was $.25 less than I was making sweeping floors. But I wanted to be a microbiologist !!

I showed up for my first day on the job happy as can be and dressed to kill with a new suit, new shoes, new haircut, and great new attitude. I went in, filled out all the necessary paper-work, met my new boss and was ready to settle in on my new lab bench. I looked around and saw all this equipment. I saw autoclaves; I saw this big "walk-in" incubator; I even saw these old candle jars. It smelled really ripe in this place. One of my cohorts had just 'transferred" the stock cultures. WOW !! I had finally made the " Big Time".

So "where do I start", I asked? Well------ ," we need someone representing QC to take a ride and sign off as witnessing something". "Sounds easy enough, I thought". Now I get into this big old smelly dump truck (in my new suit), and I'm on my way to the local dump. The truck driver was most friendly. He worked for us also. He was making the $2.50/hr that I was making sweeping floors. "What's going on?", I asked him. "You just have to watch and sign off on the fact that you witnessed the contents of this truck as being discarded". "Well", I said, "what's the problem?" "Don't worry about it, everything is OK."

Now I'm thinking! Aren't we supposed to be selling the stuff that we're dumping? Why are we dumping it? Is there more of this? I stood and watched as this stuff got trashed. I couldn't help but think about my new job. I had wished I was still sweeping floors for the extra $0.25/hr. I wished I never studied Microbiology. I wished I never bought this, now dirty, new suit.

The bottom line is that the then mild-mannered FDA found out about a couple of lot numbers of 150 x 15 Mueller Hinton plates that had "slipped" out. They were contaminated. They had to be recalled and subsequently discarded. It was, as it turned out, an isolated incident. The next day, I did get to sit at my QC station and start doing some microbiology (in jeans, loafers and a short-sleeve sport shirt).

Jim Koczat

U.S. ARMY SOLDIER AND BIOLOGICAL CHEMICAL COMMAND NATICK SOLDIER CENTER

The U. S. Army Quartermaster Research and Development Command at Natick was established in 1954 by combining the textile laboratories of Philadelphia with the food laboratories in Chicago and smaller Quartermaster laboratories in New England. The facility is located about 20 miles west of Boston. For many years work was carried out at the basic and applied levels which included research on spore and fungal physiology, fungal enzymes, food microbiology, experimental pathology, and applied microbiology with regard to deterioration of military materiel.

The laboratories are now called **U. S. Army Soldier and Biological Chemical Command (Natick Soldier Center).** In the mid 1970's studies were conducted on the microbial degradation of munitions, which have since led to modifications in the treatment of waste waters during the manufacture of munitions. During the energy crisis a major research effort was devoted to studying the feasibility of the microbial production of ethanol from waste materials (newspapers). In the 1980's studies were undertaken on the genetically engineered microbial production of fibrous polymers with the potential for use in biodegradable packaging or for protection against biohazardous materials. Since the 1980's the thrust of the microbiology program has changed so that the main focus is on applied microbiological research and development in support of sanitation and safety of food and equipment and in response to emerging microbiological problems in the field.

Projects under study at Natick include both the extension of shelf life of fresh produce and the exploration of novel sterilization and pasteurization methods for foods packaged in lightweight metal or in flexible, disposable material. All packaged food items must meet the storage criterion of maintaining quality when stored for 3 years at 80 degrees Fahrenheit. Efforts include investigation of various hurdles imposed upon bacteria in a food system that must be overcome by the bacteria in order to grow and perhaps produce toxin. These hurdles include pH, water activity, bacteriocins, chemicals and synergistic effects of any of these

hurdles. There are investigations into non-thermal processing procedures such as pulsed electric field, pulsed high intensity light pasteurization of low acid foods and high pressure cold pasteurization. Commercial or civilian versions of these products can be made and used by anyone needing a lightweight, nutritious meal or snack.

Other projects include evaluation of new packaging systems containing oxygen scavengers and anti-bacterial compounds, evaluation of new water purification systems, development of rapid methods for detection of bacteria in food systems, and production of bacteriocins. Furthermore, the quality control laboratory provides services for products under development at Natick as well as for monitoring commercial products used by the military.

Some work is also accomplished through cooperative research agreements with industry, such as determination of bacterial growth kinetics with a view to establishing a data base from which predictive models can be generated.

Florence E. Feeherry
Neil G. McCormick

NACMID HISTORY
(Northeast Association for Clinical Microbiology and Infectious Disease)

1983 was a banner year for clinical microbiologists in the Northeast. Richard Clark, a clinical microbiologist transplanted from Texas arrived in New England to work at Togus VA Hospital in Maine. Richard had been active in a regional clinical microbiology organization in Texas and immediately set out to ascertain whether such an organization would be feasible in New England. With the assistance of a vendor (Marion Scientific) Richard Clark, Dr. Bill Martin (New England Medical Center) and Dr. Gary Doern (U-Mass Medical Center) sent questionnaires to clinical microbiologists in six New England states and New York to determine the interest and needs of the group. The results of the mailing were positive (over 200 people responded), and on June 4, 1983 an organizational meeting of microbiologists from 7 states was held in Worcester, MA. Much of the discussion at this meeting centered on whether this proposed new organization would be in conflict with the Northeast Branch of ASM. However, those present decided that it would not be competitive, but complementary. A motion to formally incorporate as a non-profit corporation was voted on and accepted. The name of the new organization was the Northeast Association for Clinical Microbiology and Infectious Disease (NACMID). The Charter Officers were Richard Clark, President; Caron Lyman, Secretary; and Mary Keville, Treasurer. The Board of Directors also included: Normand Martell (Maine), Nancy McLeod Benda (Maine), Tom Northey (New Hampshire), Washington Winn, Jr. (Vermont), Gary Hollick (New York), Gary Doern (Massachusetts), Linda Ferraresso (Massachusetts), Steve Edberg (Connecticut), George Carrington (Connecticut), Tommy Shikashio (Rhode Island), and Ron Gonthier (Industry, Gibco).

The mission was and still is to promote scientific knowledge of clinical microbiology and infectious diseases. The goal was to be attained through scientific meetings and workshops to be held in all geographical regions covered by the organization and an annual meeting held in central locations. The organization was designed to serve those who are mainly hospital based and sought to bring quality nationally recognized experts to the local level as speakers and workshop faculty.

The directors of the fledgling association worked quickly and by September 1983, NACMID has 142 members and had scheduled seven Tuesday evening meetings and a three-day Annual Meeting to be held in May 1984. The evening meeting topics centered on current issues of the hospital laboratories such as Chlamydia and Mycoplasma, Coagulase Negative Staphlyococci and Opportunistic Mycoses. Evening

meeting speakers were local experts, and vendors funded meetings. These evening meetings, utilizing local experts and laboratorians continue to be offered in each state by the State Directors. The various state directors also offer half day and full day workshops throughout the year.

Corporate sponsors provided critical financial support to the new organization. Charter Sustaining Members were Analytab, Difco, E. I. DuPont de Nemours, Gibco, Hynson Wescott and Dunning, Johnston Laboratories, Marion Scientific and Pharmacia Diagnostics. Other early Sustaining Members were Bellco Glass, Oxoid USA, REMEL, Meridian Diagnostics, Miles Pharmaceuticals, Scott Laboratories and Trend Scientific. Local representatives of these companies provided much needed assistance in planning meetings, getting speakers and providing mailing lists. Corporate sponsors continue to allow NACMID to offer high quality programming by providing financial support, speakers and/or supplies. Becton Dickinson Microbiology Systems, Meridian Diagnostics, Dade Microscan, Inc., Organon Teknica, Biostar, Inc., Glaxo-Wellcome, bioMeriuex, Inc., BBI Clinical Laboratories, Gen-Probe Incorporated, Medical Chemical Corporation, REMEL, Olympus America, Inc., Scientific Device Laboratory, Inc., Abbott Diagnostics, Pfizer U.S. Pharmaceuticals, Merck & Co. and Immuno-Mycologics are some of the companies that have been sustaining members.

The First Annual Meeting was held at the Marriott Hotel in Worcester, MA May 3-5, 1984 and was highly successful. Over 200 microbiologists attended the meeting. The themes at that original meeting were "Emerging Problems in Infectious Disease", "Cost Containment in Clinical Microbiology" and "Rapid Identification of Microorganisms." Sidney Finegold, MD of Wadsworth VAMC and UCLA was the banquet speaker that first year. Two workshops were offered: one on Cost Effective Clinical Microbiology presented by Dennis Wegner and the other on Systemic Mycoses presented by David Bauman. Since that first meeting in 1984, NACMID has held their Annual Meeting in a wide variety of locations, from the Albany, NY to Danvers, MA; Portland, ME to Cromwell, CT. Attendance at these meetings averages about 200 people with an all-time high attendance of 336 people at the 10th anniversary meeting in Sturbridge, MA. Workshops about parasitology, mycology, antimicrobial agents, anaerobes and other assorted topics continue to draw large groups of interested technologists. Lynne Garcia, MS, Roberta Carey, Ph.D., Davise Larone, Ph.D., Janet Hindler, MS, Evelyne Kokoskin, M.Sc., and Richard Hodinka, Ph.D., all presented workshops for NACMID Annual Meetings. The two-day General Sessions offer a variety of topics that directly impact the clinical microbiologist. Favorite topics are panel discussions of case studies (a.k.a. Stump the Expert) and open forums that allow those present to ask questions from the floor about particular problems facing them in their laboratories. Over the years, Peter Gilligan, Ph.D., A. Mark Fendrick, MD, Mary York, Ph.D., Joseph Campos, Ph.D., Stephen Brecher, Ph. D., Richard Tilton, Ph.D., Linda Binns, Ph.D., Leona Ayers, MD, Karin McGowan, Ph.D., Frank Koontz, Ph.D., Stuart Levy, MD, Ellen Jo Baron, Ph.D. (to name just a few) have traveled to the New England area to present at NACMID's Annual Meetings

The organization in 1999 continues to support the needs of hospital based microbiologists from Boston to Syracuse, Burlington to Providence and Hartford to Bangor through the on-going efforts of such dedicated people as Patricia Urbanowski, Jim Koczat, Cynthia Astolfi, Richard Koss, Michele Goodwin, Kerry Zeller, Judy Heelan, Barbara Servetnick, Wendy Gillespie (current President), Tommy Shikashio and Shoolah Escott. Membership has grown steadily from those original 142 members to around 450 members. NACMID continues to collaborate with the local ASM branches, State Departments of Public Health and the National Laboratory Training Network to provide affordable continuing education and networking opportunities to those involved in clinical microbiology.

Mary Keville
Linda Ferraresso

HISTORY OF THE N.E.S.I.M.

The **New England Section of the Society for Industrial Microbiology** was founded in October 1973 and was the only local section of the Society for many years. F.S. "Woody" Moy of the Ventron Corp., Beverly, MA, organized the local section, which had 33 active members. Most of its meetings were held at the Holiday Inn, Waltham, MA. At the second meeting, held in November 1973, the first election of Officers was held. The following officers were elected by unanimous vote:

President - F.S. Moy, Ventron Corp
Vice President - W. Fitzgerald, BioQuest, Inc.
Secy-Treasurer - D. Small, Stop & Shop, Inc.

The membership was quite diverse at that time. Membership represented companies with interest in the following areas:

- Personal Health Products
- Disposable Medical Devices
- Food Science
- Ethylene Oxide Sterilization
- Cosmetic Manufacturing/Testing
- Biological Media Manufacturing
- Industrial Biocides
- Dairies
- Breweries
- Aquaculture
- U.S. Government Biological/Food Testing
- Academic Institutions
- Pharmaceuticals

The Section grew attaining an active membership of approximately 100 and a mailing list of over 200 companies. In 1995, the New England Section had dwindled to a small group of about 25 active members. At that time, Dr. Arnold L. Demain of M.I.T., a strong supporter of the New England Section organized an effort to revitalize the New England Section of the Society for Industrial Microbiology. Calling upon his friends in the Boston area Biotechnology industry and using staff and facilities at M.I.T, he brought new life to the New England Section.

Today, we have a viable organization which has an active membership of approximately 125 and a mailing list of approximately 400 members, made up of Biotechnology companies, Academia, and other diverse Industrial companies.

F.S. Moy
Joe Mello

ASM OFFICERS and CHAIRPERSONS FROM NORTHEAST BRANCH

PRESIDENTS

Stuart Levy	Tufts Medical School, Boston	1998-99
Alice Huang	Children's Hospital, Boston	1988-89
Moselio Schaechter	Tufts Medical School, Boston	1985-86
Harlyn Halvorson	Brandeis University, Waltham, MA	1976-77

SECRETARY

Cynthia Needham	Lahey Clinic, Burlington, MA	1987-1996

MEMBERSHIP CHAIRPERSON

Paul Ketchum	Associates of Cape Cod, Falmouth, MA	1995

BOARD OF GOVERNORS

Abraham L. Sonenshein	Tufts University, Boston, MA	1999

COUNCILORS

See NEB Officer List

ASM HONORARY MEMBERS

1987 Harlyn O(dell) Halvorson, 17 May 1925 -
Brandeis University, Waltham, Massachusetts

1981 Salvador E(dward) Luria, 13 August 1912 - 6 February 1991
Massachusetts Institute of Technology, Boston, Massachusetts

1977 George W(illiam) Kidder, 29 December 1902 -
Amherst College, Amherst Massachusetts

1972 Louis L(adislaus) Dienes, 4 September 1885 - 31 January 1974
Massachusetts General Hospital, Boston, Massachusetts

1967 John F(ranklin) Enders, 10 February 1897 - 9 September 1985
Children's Hospital and Harvard Medical School, Boston, Massachusetts

1911 William T(hompson) Sedgwick, 29 December 1855 - 25 January 1921
Massachusetts Institute of Technology, Boston, Massachusetts

1911 Theobald Smith, 13 July 1859 - 10 December 1934
Harvard Medical School; Massachusetts State Board

ASM AWARDS – NEB-ASM

Alice C. Evans Award

Recognizes an individual who has made major contributions toward the full participation of women in microbiology. The award is given in memory of Alice C. Evans who was the first woman to be elected president (in 1928) of the Society of American Bacteriologists.

1998 Arnold L. Demain, Massachusetts Institute of Technology, Cambridge, MA

ASM Fisher Scientific Award in Applied and Environmental Microbiology

Rewards and stimulates research and development in applied microbiology (excluding clinical fields) and environmental microbiology.

1982 Holger W. Jannasch, Woods Hole Oceanographic Institute, Woods Hole, MA

ASM Founders Distinguished Service Award

Recognizes a member of the American Society for Microbiology for outstanding contributions to ASM in a volunteer capacity at the national level. Selection is based on commitment to furthering the goals of the Society, ability to inspire commitment from others, and significance of contributions to the membership of ASM and its various audiences.

1994 Arnold L. Demain, Massachusetts Institute of Technology, Cambridge, MA

The Becton Dickinson and Company Award in Clinical Microbiology

Honors a distinguished clinical microbiologist for outstanding research accomplishments, clinical or nonclinical, leading to/or forming the foundation for important applications in clinical microbiology.

1995 Gary V. Doern, University of Massachusetts Medical Center, Worcester, MA

Bristol Myers Squibb Award for Distinguished Achievement in Infectious Disease Research

1992 Bernard N. Fields, Harvard Medical School, Boston, MA

Carski Foundation Distinguished Teaching Award, ASM

Recognizes a mature individual for distinguished teaching of microbiology to undergraduate (prebaclaureate) students and for encouraging them to subsequent achievements.

1980 Warren Litsky, School of Public Health, University of Massachusetts, Amherst, MA

1995 Mary Mennes Allen, Wellesley College, Wellesley, MA

Eli Lilly and Company Research Award

Recognizes fundamental research in microbiology and immunology of unusual merit by an individual on the threshold of his or her career.

1999 John A. T. Young, Harvard Medical School, Boston, MA

1993 Ralph Isberg, Tufts Medical School, Boston, MA

1991 John J. Mekalanos, Harvard Medical School, Boston, MA

1977 Alice S. Huang, Harvard Medical School, Boston

1971 David Baltimore, Massachusetts Institute of Technology, Cambridge, MA

1941 Alwin M. Pappenheimer, Harvard University, Cambridge, MA

Hoechst Marion-Roussel Award in Antibiotic Chemotherapy

Recognizes outstanding accomplishment in basic research or development of new agents, investigating antimicrobial action or resistance to antimicrobial agents, or research relating to the pharmacology, toxicology, or clinical use of those agents.

1994 Robert C. Moellering Jr., New England Deaconess Hospital, Boston, MA

1995 Stuart B. Levy, Tufts University School of Medicine, Boston, MA

1989 Bernard Davis, Harvard Medical School, Cambridge, MA

ICAAC Young Investigator Award

Recognizes and rewards up to two young investigators annually for excellence in research in the broad areas of microbiology and infectious diseases and supports travel to ASM's Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC).

1994 Celia M. Alpuche-Aranda, Massachusetts General Hospital,
Harvard Medical School, Boston, MA

Scherago-Rubin Award

Recognizes an outstanding clinical microbiologist at the bachelor's or master's level. This award was established by the late Dr. Sally Jo Rubin, an active member of the ASM Clinical Microbiology Division, in honor of her grandfather, Professor Morris Scherago.

1989 Pamela Hulme, Beth Israel Hospital, Boston, MA

FOUNDATION FOR MICROBIOLOGY LECTURE PROGRAM

The Foundation for Microbiology Lecture Program is jointly sponsored by the American Society for Microbiology and the Foundation for Microbiology. The Foundation for Microbiology was founded in 1951 by Nobel Laureate Selman A. Waksman, a former ASM president. The Foundation is funded with royalties from his streptomycin and neomycin discoveries and supports lectureships, courses, unusual projects, prizes and publication of monographs in the microbiological sciences. There is a special interest in innovative educational programs using contemporary communication techniques. The Foundation is also concerned with enhancing public awareness of science including K-12 teaching programs that involve microorganisms.

The Foundation for Microbiology has supported the lecture program since 1963 and is designed to strengthen the relations between the American Society for Microbiology and its local branches by providing distinguished speakers for their meetings. The program annually selects a scientifically diverse group of outstanding speakers who are available to participate in ASM Branch meetings at the local and regional level.

Foundation for Microbiology Lecturers from Northeast Branch

1999-2001

Stephen M. Brecher, Director, Microbiology Laboratory, VA Medical Center, Boston, MA
ASM Division - Clinical Microbiology, Antimicrobial Chemotherapy

- The bacterial revolution: The bugs fight back
- The role of the clinical microbiology laboratory in outbreak investigations and infection control

Angela M. Caliendo, Microbiology Laboratory, Massachusetts General Hospital
ASM Division - Genetics and Molecular Biology

- HIV-1 Viral Load - Testing Methods and Interpretation
- Molecular Diagnostics for Infectious Diseases
- Clinical Virology

Joseph Cooney, Environmental Coastal and Ocean Sciences Department
University of Massachusetts Boston
ASM Division - Microbiology Education, Environmental & Applied Microbiology

- Organotin compounds and aquatic bacteria
- Indicator phages in Boston Harbor, USA
- Bacterial biofilms on water-immersed surfaces

Honorine Ward, Division of Geographic Medicine and Infectious Diseases
New England Medical Center, Tufts University School of Medicine, Boston

Susan Leschine, Department of Microbiology, Morrill Science Center North
University of Massachusetts, Amherst

- Cellulosomes and the microbial attack on insoluble natural polymers: a complex story
- Cellulolytic anaerobes and the carbon cycle: a global role for the little guys
- Prospects for employing ellulolytic clostridia in bioass fuel processes

1998-2000

Paula Fives-Taylor, Department of Microbiology and Molecular Genetics
University of Vermont, College of Medicine, Burlington, VT
ASM Division - Genetics and Molecular Biology

- The war begins: invasion of epithelial cells by the periodontopathogen, *Actinobacillus actinomycetemcomitans*
- Oral pathogens: from dental plaque to cardiac heart disease

1997-1999 **(**None)

1996-1998

Linda Nolan, The Honors Program, University of Massachusetts, Amherst, MA
ASM Division - Antimicrobial Chemotherapy, Microbiology Education

- Unconquered diseases of humans - malaria and leishmaniasis - who's winning the battle?
- The need to go extremes in hunting new antimicrobials: from rain forests to the sea
- Women - the most underutilized resource in science: Why?

Kathryn L. Ruoff, Microbiology Laboratory, Massachusetts General Hospital, Boston, MA
ASM Division - Clinical Microbiology

- Beyond the streptococci: New catalase-negative gram-positive cocci of clinical interest
- Vancomycin resistance in gram-positive clinical isolates: A cause for concern
- Bartonella: A century of microbiological mystery

1995-1997

Robert I. Krasner, Biology Department, Providence College, Providence, RI
ASM Division - Microbiology Education

- Pasteur and rabies: The making of a hero
- Partnerships in science education

1994-1996 **(**None)

1993-1995

Mary Jane Ferraro, Director, Microbiology Laboratory, Massachusetts General Hospital, Boston, MA
ASM Division - Clinical Microbiology

- Special considerations in susceptibility testing for gram positive organisms
- Update on new susceptibility testing methods and information from NCCLS
- Potential and pitfalls of automated susceptibility testing
- The role of the clinical laboratory in the diagnosis of gastroenteritis
  (with special emphasis on C. difficile associated diarrhea)

Ruth B. Kundsin, Brigham & Women's Hospital, Boston, MA
ASM Division - Mycoplasmology

- *Ureaplasma urealyticum* and perinatal morbidity and mortality
- *Ureaplasma urealyticum*: Does it play a role in systemic lupus erythematosus (SLE)
- *Mycoplasma hominis* and *Ureaplasma urealyticum*, their role in human disease

Graham C. Walker, Department of Biology, Massachusetts Institute of Technology, Cambridge, MA
ASM Division - Genetics and Molecular Biology

- Role of Exopolysaccharides in nodule invasion by *Rhizobium meliloti*
- Intertwining of regulation and function in UV and chemical mutagenesis
- DnaK as a cellular thermometer and a molecular chaperone for higher temperature

1992-1994

Andrew Wright, Department of Molecular Biology, Tufts Medical School, Boston, MA
ASM Division - Genetics and Molecular Biology

- Regulation of gene expression in *E. coli* by protein phosphorylation
- Timing of chromosome replication in bacteria
-

Marie Chow, Department of Biology, Massachusetts Institute of Technology, Cambridge, MA
ASM Division - RNA Viruses

- Relationships of the poliovirus structure to function in disease pathogenesis
- Functional roles of acyl modification during polio virus replication
- The humoral and cell-mediated immune responses induced upon exposure or vaccination with poliovirus

1991-1992 (None)

1990-1991

Mary Mennes Allen, Jean Glasscock Professor of Biological Sciences
Department of Biological Sciences, Wellesley College, Wellesley, MA
ASM Division - General Microbiology

- Whatever happened to blue-green algae
- Frontiers in cyanobacterial research
- Research in biology at predominantly undergraduate institutions

Priscilla A. Schaffer, Laboratory of Tumor Virus Genetics,
Dana-Farber Cancer Institute, Harvard Medical School, Boston, MA
ASM Division - Genetics and Molecular Biology, DNA Viruses

- Molecular biology of herpes simplex virus latency
- Regulation of herpes simplex virus gene expression in productive infection and latency
- Factors Involved in initiation of herpes simplex virus DNA replication

Carol S. Reiss, Associate Professor, Division of Pediatric Oncology
Dana Farber Cancer Institute, Boston, MA
ASM Division - Immunology

- Are Class II-MHC restricted immune responses Important?
- Recovery or Pathology: The immune response to viruses and vaccination
- Analysis of T Cell Epitomes on the secreted glycoprotein of vesticular stomatitus virus

Paula Fives-Taylor, Department of Microbiology and Molecular Genetics
University of Vermont, College of Medicine, Burlington, VT
ASM Division - Genetics and Molecular Biology

- A molecular genetic analysis of the adhesion of *Streptococcus sanguis* and its role in dental caries
- The invasion of epithelial cells by *Actinobacillus actinomycetemcomitans* and the role it plays in peridontitis
- Microbiological problems associated with intrauterine devices
- How molecular biology can be used to solve problems in microbial virulence

1989-1990

Grace M. Thorne, Director, Rapid Diagnostics Program, Children's Hospital, Boston, MA
ASM Division - Genetics and Molecular Biology

- Application of DNA probe tests to the diagnosis of infectious diseases
- *Escherichia coli* mediated diarrheal diseases: 6 mechanisms and still counting…

Stuart B. Levy, Molecular Biology and Microbiology, Tufts Medical School, Boston, MA
ASM Division -

- The emergence and spread of multiple antibiotic resistance
- Genetics, mechanisms and spread of tetracyline resistance determinants
- Cryptic chromosomal genes for multiple antibiotic resistance

Harlee S. Strauss, President, H. Strauss Associates, Inc., Natick, MA
ASM Division -

- On the road towards risk assessment of releasing genetically altered microorganisms into the environment
- Microbes in landfills: Do they increase or decrease the health risks associated with the chemicals placed there?

Bernard N. Fields, Microbiology and Molecular Genetics, Harvard Medical School
Boston, MA
ASM Division -

- Early events in the life cycle of an enteric virus
- Molecular basis of viral virulence: Lessons from the reoviruses
- How viral hemagglutinin localizes viral infection to specific sites in the host

1988-1989

John M. Coffin, Department of Molecular Biology, Tufts University Medical School
Boston, MA
ASM Division - Virology

- Molecular biology of retroviruses
- Integration of retrovirus DNA
- Genetics of endogenous murine retroviruses

Eva Kashet, Department of Microbiology, Boston University School of Medicine
Boston, MA
ASM Division - Bacterial Physiology

- Bioenergetics of clostridia and lactic acid bacteria
- The proton motive force in bacteria
- Bioenergetics of *Bradyrhizobium*

1987-1988

Peter R. Shank, Division of Biology and Medicine, Brown University, Providence, RI
ASM Division - Virology

- Avian osteopetrosis: a novel retrovirus induced disease
- Proto-oncogene expression in regenerating and neoplastic rat liver

1987-1988 (continued)

Abraham L. Sonenshein, Department of Molecular Biology, Tufts Medical School, Boston, MA
ASM Division - Genetics and Molecular Biology

- Initiation of transcription in *Bacillus subtilis*
- Initiation of spore formation in *Bacillus subtilis*
- Control of carbon and nitrogen metabolism in *Bacillus subtilis*

Graham C. Walker, Department of Biology, Massachusetts Institute of Technology, Cambridge, MA
ASM Division - Genetics and Molecular Biology

- Mutagenesis and cellular responses to DNA damage
- Xoexopolysaccharides and nodulation by *Rhizobium*

Mary Jane Ferraro, Director, Bacteriology Laboratory, Massachusetts General Hospital, Boston, MA
ASM Division - Medical and Clinical Microbiology

- The role of the clinical microbiologist in reporting of antimicrobial susceptibility results
- *Campylobacter pyloridis*, a new pathogen? What role should the laboratory play?

Donald A. Goldmann, Infectious Disease Division, Children's Hospital, Boston, MA
ASM Division - Medical and Clinical Microbiology

- The microbiology of hospital infection control
- Pseudomonas infections in cystic fibrosis
- Antibiotic resistance: Epidemiology and the role of the new antimicrobials

Robert I. Krasner, Department of Biology, Providence College, Providence, RI
ASM Division - Education/Public Services

- The case for an ASM Division for microbiology education
- Opportunities for educators in microbiology
- Insights into Pasteur: Based on a visit to the Pasteur Institute, France

1986-1987

Moselio Schaechter, Department of Molecular Biology and Microbiology
Tufts University, Boston MA
ASM Division - General Microbiology, Genetics, Molecular Biology

- The bacterial chromosome and the cell membrane
- A case in structure-function relationships
- Cellular regulation in bacteria: A personal view

1985-1986

Myron Essex, Department of Cancer Biology, Harvard University, Boston, MA
ASM Division - Virology

- The etiology of AIDS
- Retroviruses as immunosuppresive agents
- Human T lymphotropic retroviruses

1984-1985

Cynthia Needham, Department Laboratory Medicine, University Hospital
Boston, MA
ASM Division - Clinical Microbiology

- Coagulase negative *Staphylococcus* species as human pathogens
- Current problems in the diagnosis of bacterial gastroenteritis

1980-1984 (Unknown)

1979-1980 (None)

1978-1979 Dr. Botstein, Cambridge, MA

1977-1978 Alice S. Huang, Children's Hospital, Boston, MA - Virology

1976-1977 Richard C. Tilton
Edward R. Leadbetter

1975-1976 Alice S. Huang

1974-1975 Ruth Kundsin
John H. Hanks

1973-1974 Arnold L. Demain
Moselio Schaechter

1972-1973 John Collier
Holger W. Jannasch

1971-1972 David Baltimore
Edward H. Kass

1970-1971 (Unknown)

1967-1970 (None)

1967-1968 Harlyn Odell Halvorson

1966-1967 John H. Hanks
Salvador E. Luria
Frederick C. Neidhardt

1965-1966 Salvador E. Luria

1963-1965 (None)

NEB AWARDS

Service Awards

1997	Hollis	Bodman
	Edward	Carney
	Emy	Thomas
1994	Irene	George
	Margaret	Johns
	Neil	McCormick

NEB HONORARY MEMBERS

1999	Arnold	Demain
	Thomas	O'Brien
1998	Ruth	Kundsin
	Sarabelle	Madoff
1993	Lawrence	Kunz
1969-1978	Margaret L.	Anderson
	Catherine	Atwood
	Edgar E.	Baker
	Clara H.	Bartley
	Mary I.	Bunting '69
	John E.	Cornish
	Joan B.	Daniels
	Lewis	Diones
	Mary A.	Donoghue '69
	Cecil G.	Dunn
	Monroe D.	Eaton
	Goeffrey	Edsall
	Maxwell	Finland
	Edna M.	Follensby '69
	Martin	Frobisher '69
	Helen	Gillette
	Malcolm	Hinchcliffe
	Robert A.	McCready '69
	Alice T.	Marston '69
	James	McComb
	Leon S.	Medalia '69
	Randolph	Philbrook
	Elenor V.	Smith
	Edgar J.	Staff
	Ralph E.	Wheeler '69
	Delaphine G.	Wyckoff

Awards

(L-R) Kate Ruoff presents Lawrence Kunz with Lifetime Achievement Award 1993

Paulette Howarth (President), left confers service awards to (top) Irene George, Secretary, (center) Margaret Johns, Treasurer-1994 And (bottom) Neil McCormick, Membership Chair, Past President & Treasurer

Awards

(L-R) Edward Carney and Holly Bodman
Receive Service Awards 1997

(L-R) Emy Thomas presents Sarabelle Madoff
with Honorary Membership Award 1998

(L-R) Gail Cassell, Sarabelle Madoff,
Mary Jane Ferraro and Morton Schwartz attend
The Centennial of Mycoplasma Discovery 1998

HONORABLE MENTION

IN MEMORIAM

Holger W. Jannasch, marine microbiologist, September 8, 1998, 71 years old.
Dr. Jannasch ("Holger") was a Senior Scientist at the Woods Hole Oceanographic Institution, widely known for his research. He participated in many dives of the submersible Alvin and organized many local and international research trips. He lectured on "The Alvin Lunch" that was so well preserved in seawater for 10 months and the deep sea hydrothermal vents with associated microbes, one of which has been named after him, Methanococcus jannaschii.

Charles Seymour III, Epidemiologist, December 11, 1997, 53 years old.
Dr. Seymour was a professor of microbiology at the University of Rhode Island and Boston University School of Medicine. He is noted for his lectures and participation in Northeast Branch activities.

Phillip A. Hanff, Virologist, December 9, 1996.
Dr. Hanff ("Phil") was Technical Director of Microbiology Laboratories at the Beth Israel Deaconess Medical Center. He was well known for his talks on Chlamydia, his participation in Northeast Branch activities and his interest in Virology.

Alvin M. Pappenheimer, Immunologist, March 21, 1995, 86 years old.
Dr. Pappenheimer was Chairman of the Board of Tutors in Biochemical Sciences at Harvard University. His is noted for his work on the diphtheria toxin which he began isolating in 1935 at the Antitoxin and Vaccine Laboratory in Jamaica Plain. He continued his work at Harvard in1958 where he worked with many students and abroad at the Institut Pasteur in Paris.

Bernard N. Fields, Virologist, January 31, 1995, 56 years old.
Dr. Fields was Chairman of the Department of Microbiology and Molecular Genetics at Harvard Medical School from 1984 to 1994. He is noted for his work on the genetics of viruses and as editor and principal author of the textbook "Virology".

Albert Kelner, Bacteriologist, July 29, 1994, 81 years old.
Dr. Kelner was a bacteriologist and retired professor of biology at Brandeis University.
Dr. Kelner was known for his work in the field of DNA repair using a process known as photoreactivation. He was a member of the American Society for Photobiology, Genetics, and Bacteriology as well as the Northeast Branch of the American Society of Bacteriologists where he served as Local Councilor, Vice President and then President.

Bernard D. Davis, Microbiologist, January 14, 1994, 78 years old.
Dr. Davis was Chairman of Bacteriology and Immunology at Harvard Medical School from 1957 to 1984 where he was known for his research on antibiotics and protein synthesis in vitro. He wrote with 3 other authors the well known textbook, Davis et al, "Microbiology" and lastly ran the Laboratory of Bacterial Physiology

Charlotte C. Campbell, Medical Mycologist, October 13, 1993, 78 years old.
Ms. Campbell was professor of medical mycology at Harvard University School of Public Health from 1962 to 1973. She was well known for her lectures and activities in the Northeast Branch. After retirement in 1977, she continued to serve on the Bacteriology and Mycology Study Sections of the National Institute of Allergy and Infectious Diseases.

IN MEMORIAM

Warren Litsky, Environmental Microbiologist, August 12, 1993, 69 years old.
Dr. Litsky was Professor at the School of Public Health at the University of Massachusetts for 40 years. He was a consultant in the field of applied and environmental microbiology and he was one of the founding faculty of the Environmental Sciences Program at the University.

Lawrence M. Corwin, Microbiologist, February 19, 1983, 53 years old.
Dr. Corwin was Professor of Microbiology at Boston University and BU Medical School.
He is known for his research in microbiology, nutrition (vitamin E) and biochemistry.
He was a member of the Northeast Branch.

Theresa Emery, Medical Technologist,
Ms. Emery ("Terry") was a clinical microbiologist who was supervisor of microbiology at the Boston Hospital for Women, Lying-In Division until the merger with the Robert Breck Brigham and Peter Bent Brigham Hospitals. Most recently she was assistant supervisor of microbiology, Children's Hospital, Boston. She was an active member of the Northeast Branch.

Lois Hamilton, Medical Technologist,
Ms. Hamilton ("Lois") was a clinical microbiologist who was supervisor of microbiology at the Waltham Hospital. She was an active member of the Northeast Branch.

Northeast Branch - American Society for Microbiology
Officers for terms beginning July 1
1949-1999

Year	President	President-elect	Secretary	Treasurer	Nat'l Councilor Alt. Councilor	Local Councilors
1999	William Thiemke	Jaclynne Laxon	Irene George	Jo-Ann Rosol-Donoghue	Paulette Howarth Grace Thorne	John Metcalfe, Dina Caloggero Carol Mahoney
1998	William Thiemke	Jaclynne Laxon	Irene George	Jo-Ann Rosol-Donoghue	Paulette Howarth Donald Schwartz	Deborah Shea, Sonia Wallman Carol Mahoney
1997	Harvey George	William Thiemke	Irene George	Margaret Johns	Paulette Howarth Donald Schwartz	Deborah Shea, Jaclynne Laxon Sonia Wallman
1996	Harvey George	William Thiemke	Irene George	Margaret Johns	Edward Carney Paulette Howarth	Donna Leombruno, Jaclynne Laxon Sonia Wallman
1995	Emy Thomas	Harvey George	Irene George	Margaret Johns	Edward Carney Paulette Howarth	Donna Leombruno, Jaclynne Laxon Annette Durbin
1994	Emy Thomas	Harvey George	Irene George	Margaret Johns	Edward Carney Grace Thorne	Annette Durbin, Donna Leombruno Michael Shiaris
1993	Paulette Howarth	Emy Thomas	Irene George	Margaret Johns	Edward Carney Grace Thorne	Annette Durbin, Michael Shiaris James Barbato
1992	Mary Nicholson	Paulette Howarth	Irene George	Margaret Johns	Emy Thomas Grace Thorne	Annette Durbin, Michael Shiaris James Barbato
1991	Joseph Cooney	Mary Nicholson	Irene George	Margaret Johns	Emy Thomas Grace Thorne	Annette Durbin, James Barbato Paulette Howarth
1990	Edward Carney	Joseph Cooney	Irene George	Margaret Johns	Emy Thomas Grace Thorne	Mary Nicholson, Paulette Howarth
1989	Nadine Solomon	Frank Rogers	Irene Sherman	Margaret Johns	Emy Thomas Grace Thorne	Jacqueline Piret, Joan Haaf
1988	Nadine Solomon	Frank Rogers	Irene Sherman	Margaret Johns	Emy Thomas Arline Eckman	Jacqueline Piret, Joan Haaf
1987	Gary duMoulin	Nadine Solomon	Irene Sherman	Margaret Johns	Emy Thomas Arline Eckman	Jacqueline Piret, Judith Heelan Robert Krasner
1986	Gary duMoulin	Nadine Solomon	Gail Thomas	Margaret Johns	Emy Thomas Richard Levy	Judith Heelan, Robert Krasner Monique Morimoto
1985	Neil McCormick	Gary duMoulin	Arline Ekman	Gail Thomas	Emy Thomas Richard Levy	Alfred DeMaria, Margaret Johns Judith Heelan

Northeast Branch - American Society for Microbiology
Officers for terms beginning July 1
1949-1999

Year	President	President-elect	Secretary	Treasurer	Nat'l Councilor Alt. Councilor	Local Councilors
1984	Neil McCormick	Gary duMoulin	Arline Ekman	Gail Thomas	Thomas Pistole Cynthia Needham	Alfred DeMaria, Margaret Johns Julia Blazek
1983	Andrew Onderdonk	Neil McCormick	Hollis Bodman	Arline Ekman	Thomas Pistole Cynthia Needham	Alfred DeMaria, Margaret Johns Julia Blazek
1982	Andrew Onderdonk	Neil McCormick	Hollis Bodman	Arline Ekman	William Corbett Cynthia Needham	Julia Blazek, Nadine Solomon Gary duMoulin
1981	Kurt Stottmeier	Andrew Onderdonk	Hollis Bodman	Arline Ekman	William Corbett Martha Mulks	Julia Blazek, Nadine Solomon Gary duMoulin
1980	Kurt Stottmeier	Andrew Onderdonk	Hollis Bodman	Arline Ekman	Arnold Demain William Corbett	Julia Blazek, Nadine Solomon Janet Verna
1979	Anthony Sbarra	Kurt Stottmeier	Hollis Bodman	Chester Roskey	William Chesbro Arnold Demain	Janet Verna, Neil McCormick Julia Blazek
1978	Anthony Sbarra	Kurt Stottmeier	Hollis Bodman	Chester Roskey	William Chesbro Arnold Demain	Janet Verna, Neil McCormick Irene Girard
1977	William Corbett	Anthony Sbarra	Hollis Bodman	Chester Roskey	Martha Berliner Fred Rosenberg	Sarabelle Madoff, Irene Girard Neil McCormick
1976	Joseph Previte	Anthony Sbarra	William Corbett	Hollis Bodman	Martha Berliner Fred Rosenberg	Sarabelle Madoff, Irene Girard Hillel Levinson
1975	William Chesbro	Iolanda Low	William Corbett	Hollis Bodman	Martha Berliner Fred Rosenberg	Warren Graff, Hillel Levinson Sara belle Madoff
1974	Sr. Frances Donahue	William Chesbro	Mary Meyerserian	Hollis Bodman	Martha Berliner Fred Rosenberg	Barbara Carlson, Warren Graff Hillel Levinson
1973	Arnold Demain	Sr. Frances Donahue	Mary Meyerserian	William Corbett	Lawrence Kunz Charles Bump	Barbara Carlson, William Chesbro Warren Graff
1972	Anne Coghlan	Arnold Demain	Mary Meyerserian	William Corbett	Lawrence Kunz Charles Bump	Martha Berliner, Barbara Chase William Chesbro
1971	Fred Rosenberg	Arnold Demain	Mary Meyerserian	William Corbett	Lawrence Kunz Charles Bump	Martha Berliner, Barbara Chase William Chesbro
1970	Kenneth Girard	Mary Meyerserian	Anne Coghlan	Charles Bump	Fred Rosenberg David Feingold	Galen Jones, Malcolm Hinchlitte Martha Berliner

Northeast Branch - American Society for Microbiology
Officers for terms beginning July 1
1949-1999

Year	President	President-elect	Secretary	Treasurer	Nat'l Councilor Alt. Councilor	Local Councilors
1969	Sigmund Socransky	Kenneth Girard	Anne Coghlan	Charles Bump	Fred Rosenberg, David Feingold	Mary Meyerserian, Galen Jones Malcolm Hinchlitte
1968	Ruth Kundsin	Sigmund Socransky	Anne Coghlan	Charles Bump	Fred Rosenberg David Feingold	Mary Meyerserian, Galen Jones Lawrence Kunz
1967	Charlotte Campbell	Harold Amos	Ruth Kundsin	G. Raymond Shaffer	Charles Okey Kenneth Girard	Mary Meyerserian, Lawrence Kunz Edward Kass
1966	Alice Marston	Charlotte Campbell	Ruth Kundsin	G. Raymond Shaffer	Charles Okey Keneth Girard	Edward Kass, Ernest Blaustein Lawrence Kunz
1965	Howard Lind	Alice Marston	Ruth Kundsin		Charles Okey Kenneth Girard	Clarence Elstrom, Raymond Shaffer Edward Kass
1964	George Foley	Howard Lind	Alice Marston		Ruth Kundsin Helen Gillette	Raymond Shafer, Clarence Elstrom Kenneth Girard
1963	Geoffrey Edsall	George Foley	Alice Marston		Ruth Kundsin Helen Gillette	Clarnece Elstrom, Kenneth Girard R. Philbrook
1962	Delaphine Wyckoff	Geoffrey Edsall	Alice Marston		Howard Lind Joan Daniels	Kenneth Girard, R. Philbrook Louise Wyman
1961	Catherine Atwood	Delaphine Wyckoff	Alice Marston		Howard Lind, Joan Daniels	.Philbrook, Louise Wyman Sister Margaret
1960	Albert Kelner	Catherine Atwood	Alice Marston		Howard Lind Joan Daniels	Norman Hunt, Sister Margaret Delaphine Wyckoff
1959	Philip Carpenter	Albert Kelner	Alice Marston		Howard Lind Joan Daniels	Sister Margaret, Delaphine Wycoff E. M. Follensby
1958	Ralph Wheeler	Philip Carpenter	Alice Marston		Howard Lind John Hanks	Delaphine Wyckoff, E. M. Follensby Albert Kellner
1957	Robert MacCready	Howard Lind	Alice Marston		John Hanks Ralph Wheeler	E.M. Follensby, Albert Kelner L. Wetterlow
1956	L. W. Slanetz	Robert MacCready	Alice Marston		John Hanks Ralph Wheeler	Albert Kelner, L. Wetterlow Bryce Prindle
1955	Genevieve Young	L. W. Slanetz	Alice Marston		G. I. Staff Raymond Young	Robert MacCready, L. Wetterlow Bryce Prindle

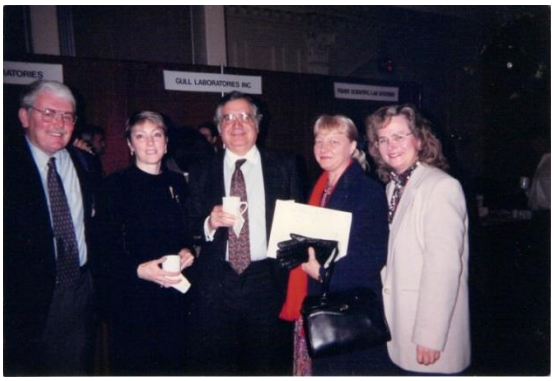
Lecture Series and Meetings

Harbor Cruise 1994, Antibiotic Resistance
Stuart Levy (Speaker)

Dinner-Lecture, 1995, Mycoplasma: (L-R)
Ruth Kundsin (Speaker) and Sarabelle Madoff

Harbor Cruise, 1995
(L-R) Dr. Kenneth Mayer (Speaker), Linda Simon,
Emty Thomas-Pres., Harvey George, Pres-Elect

Region I Meeting, 1996, Boxboro, MA
Regional Branch Officers Meeting



Region I Meeting, 1995
Hosted by the-Eastern New York Branch
(L-R) Edward Carney, NEB; Nellie Dumas, ENY;
Karim Hechamy, Pres. ENY; Cynthia Brinkman,
Pres. CT Valley; Emy Thomas, Pres. NEB

Region I Meeting, 1996, Boxboro, MA
Alfred DeMaria (speaker)

Lecture Series and Meetings

Region I Meeting, 1996, Boxboro, MA
Host NEB: (L-R) Garry Greer and Harvey George

Branch Officers Meeting, 1997, ASM Miami
(L-R) Harvey George, Emy Thomas, Nellie Dumas

Dinner-Lecture, Biotoxins, 1996 Legal Seafood
(L-R Linda Simon, Paulette Howarth,
Emy Thomas, Pres., and Gregory Reppucci

NEB sponsored workshop at the CT Valley Branch Meeting, Mystic, CT, 1997. (L-R) Stacey Kinney, Roger Lee, Bela Matyas, Joseph Peppe, and Robert Arbeit

Region I Meeting, 1996, Boxboro, MA
(L-R) Garry Starzinski, Paulette, Howarth, Emy Thomas and Gregory Reppucci

Dinner-Lecture NEB and Connecticut Valley Branch, 1999. (L-R) Suzanne Haskell, Arthur Bruce, Irene George, Anne Simon (Speaker), William Thiemke, Pres. and Stephen Brecher

Student Initiatives

Professor Arnold Demain (Left) and students from Massachusetts Institute of Technology

Professor Edward Carney (Right) and students from Norwich University

Professor Gregory Reppucci (right) and students from Essex Agricultural and Technical School

Students from Worcester State College
Professor Ellen Fynan (not pictured)

Students from Bristol Community College
Professor Paulette Howarth (not pictured)

Deborah Shea, Local Councilor (3rd from right)
and students from Univ. of Massachusetts, Boston

NORTHEAST BRANCH ACTIVITIES, 1991-1999

1999-2000 ACTIVITIES

10/26-28/99 Region I Meeting: Worcester Centrum Center, Worcester, MA

1998-1999 ACTIVITIES

1998 Education: Support of Massachusetts and Vermont State Science Fairs
Support of five regional fairs, Massachusetts

11/17/98 Dinner-Lecture: Hepatitis C: Between a Rock and a Hard Place.
Angela Caliendo, M.D., Mass General Hospital & Raymond S. Koff, M.D., MetroWest Medical Center at the Hard Rock Café, Boston, MA

3/2/99 Full-day Symposium: New Developments in Cystic Fibrosis
Cosponsored with NACMID and NLTN

3/2/99 Education (for students): Student audience and honor society at
Worcester State College, PFGE and Food-Borne Illness, Harvey George, PhD.

4/6/99 Round Table for Students: Salem State College, Careers in Microbiology.

4/14/99 Joint Meeting NEB and CT Valley Branch: The Real Science Behind the X-Files
Dr. Anne Simon, University of MA, Amherst, Publick House, Sturbridge

1997-1998 ACTIVITIES

10/14/97 Dinner Lecture. Rapid Methods and Future Systems in Microbiology,
Judith Daly, Ph.D., Hampshire House, Boston, MA
Cosponsored with M.D.PH, State Lab Training Program

10/30-1/97 Half-day Molecular Biology Symposium at CT-Valley hosted 32nd Tri-Branch Meeting, Mystic, CT.

11/18/97 Dinner-Lecture: Infections in the Elderly, William F. Vincent, PhD.
Siro's Restaurant, Quincy, MA
Cosponsored with MDPH, State Lab Training Program

1998 Education: Support of Massachusetts and Vermont State Science Fairs
Support five regional fairs, Massachusetts

2/26/98 Dinner-Lecture: The Challenge of Emerging Infectious Diseases.
William R. Jarvis, M.D, Hospital Infections Program, National Center for Infectious Diseases, CDC, Atlanta, GA. ASM Foundation Speaker, Doubletree Guest Suites Hotel, Waltham, MA

3/25/98 Dinner-Lecture: Microbial Aspects of Helicobacteri pylori Clinical Trial Design: What is the FDA Looking For? Linda Utrup, PhD, ASM Foundation Speaker, Siros Restaurant, Quincy, MA

4/8-9/98	Workshop: Laboratory Approach to Clinical Mycology, Two-day workshop including hands-on, interactive laboratory experience Cosponsored with MDPH and NLTN
4/15/98	Dinner-Lecture: The Need To Go To Extremes In Hunting New Antimicrobials From Rain Forests to the Sea, Linda Nolan, PhD, University of Massachusetts, ASM Foundation Lecturer, Publick House, Sturbridge, Joint Meeting with the CT Valley Branch
5/13/98	One-day Seminar: OSHA and Safety in the Laboratory. Norwich University, Northfield, VT Cosponsored with Vermont Public Health Lab, Sigma Xi and the NLTN
6/2/98	One-day Seminar: Drug Discovery for the 21st Century. Egan Center, Northeastern University, MA Cosponsored with the Northeastern University Biotechnology Program

1996-1997 ACTIVITIES

9/25/96	Dinner-Lecture Meeting: Tour of Cytotherapeutics, Inc., Lincoln, R.I.
10/22-24/96	TriBranch Regional Meeting Host: 31st Regional Meeting, Workshops and General Sessions
3/97	Education: Support of MA and VT State Science Fairs Support five regional fairs
3/11/97	Dinner-lecture: Shiga toxin producing E. coli-Current Issues and New Technologies, David Acheson NEMC, Jocelyn Isadore, Joe Peppe, SLI Siro's, Quincy Cosponsored with MDPH and NLTN
4/15/97	Dinner-Lecture. Biotechnology in Clinical Medicine-Expect the Unexpected. Joseph Cosponsored with MDPH and NLTN
5/13/97	Dinner-Lecture. Streptococci and Drug Resistance: What's Important, What's Not, Dr. Kathryn Ruoff, MGH, Siro's, Quincy Cosponsored with MDPH and NLTN
6/24/97	Dinner-Lecture-Cruise: The History and Changing Ecology of the Charles River Basin, MDC Park Ranger Russell Geer. Cosponsored with MDPH and NLTN

1995-1996 ACTIVITIES

11/8/95	Dinner-Lecture: Key Issues on Carrying Out Concurrent Multi-Product Manufacturing, Tour of NHC-Tech Biotech Training Facility, Gordon Pugh
11/13-15/95	Support of NY-hosted Tri-Branch Meeting
3/96	Education: Support of MA and VT State Science Fairs Support five regional fairs

3/15/96	Education: Student Colloquium at Volpe Transportation Building
4/96	Education: Half-day Microcosmos program for elementary school teachers, Framingham, MA
6/5/96	Dinner-Lecture: Marine Biotoxins, Christopher Martin, Legal Seafoods, Chestnut Hill

1994-1995 ACTIVITIES

9/29/94	Dinner-Lecture-Tour: Large Scale Animal Cells Culture for Production of Pharmaceuticals (and tour of Genzyme). Debra Barngrover, Guest Quarters Hotel, Cambridge Cosponsored with SIM
10/94	Presented Hantavirus Symposium at the CT-hosted Tri-Branch Meeting
3/95	Education Support of MA and VT State Science Fairs Support six regional fairs Support 1 person to Microcosmos I (6/25-7/1/95)
3/29/95	Dinner-Lecture: Ureaplasma urealyticum; What the Microbiologist Should Know, Ruth Kundsin, Guest Quarters Suites Hotel, Waltham Cosponsored with MDPH
4/13-14/95	2 Workshops: Anaerobic Bacteriology for the Clinical Laboratory, Brigham & Women's Hospital, Cosponsored with MDPH
4/25/95	1-day Symposium: The Evolving Threat of Antibiotic Resistance Global, National and Local Perspectives Cosponsored with MDPH and NLTN
4/28/95	Education: Student Colloquium, Diversity of Microbiology, Volpe Transportation Building, Cambridge, MA, 5 oral and 17 posters Cosponsored with SIM
6/20/95	Dinner-Lecture-Cruise: Women & Aids, Setting a New Agenda. Ken Mayer, M.D. Cosponsored with MDPH
6/27/95	Biotech Workshop: 21st Century Technologies for the Clinical and Biotechnology Laboratory. Cosponsored with NLTN and VT DPH

1993-1994 ACTIVITIES

11/93	NEB-ASM hosted the 28th Regional Meeting, Cambridge, MA
1/21-22/94	Wet Workshop: Diagnostic Medical Parasitology Review, Lynne Garcia Bristol Community College, Dartmouth, MA
3/94	Education: Support of six science fairs
5/12-13/94	Exhibit: 27th Annual Meeting of the Association of Science Supervisors

6/94	Dinner-Lecture-Cruise: The Global Impact of Antimicrobial Resistance, Stuart Levy Cosponsored with MDPH

1992-1993 ACTIVITIES

2/25/93	Dinner-Lecture Microbes of the Deep Sea Hydrothermal Vents. By Holger Jannasch, Woods Hole at Philips Old Colony House, Dorchester
4/1-2/93	Mycology workshop: Vermont, Cosponsored with NLTN
4/17-18/93	Mycology workshop: Lahey Clinic, Cosponsored with NLTN
4/92	Education: Support of six science fairs

1991-1992 ACTIVITIES

10/25-26/91,	Participated in the 1991 Regional Meeting Regional Meeting hosted by CT
11/21/91	Wet Workshop Parasitology: UMASS, Dartmouth James Griffith, Paulette Howarth, Ronald Trudel Cosponsored with MAMT and NACMID.
1/23/92	Student Research Colloquium: Countway Library, Boston, MA Sponsored by Becton-Dickinson
3/24/92	Dinner-Lecture: Emerging Microbial and Enzyme Technology for Renewable Resource Utilization, J. Gregory Zeicus, Cosponsored with SIM
4/92	Education: Support of MA State Science Fair
4/1-2/92	Workshop: Laboratory Identification of Intestinal Parasites Cosponsored with NLTN, NACMID, VT DPH
5/6/92	Dinner-Lecture: Health Care for the Homeless, James O'Connell, M.D., Pine St. Inn, Boston, Massachusetts

NORTHEAST BRANCH ASM, 1999 MEMBERSHIP LIST

Alachi, Peter
Alam, Akhtari M.
Allen, Mary M.
Astolfi, Cynthia A.
Babiak, Loraine
Babick, Suzanne
Baillargeon, Lisa M.
Balkovic, Edward S.
Balsamo, Kathleen M.
Barbato, James J.
Bard, Linda F.
Barsoom, FayekM.
Bauer, David B.
Bazylinski, Dennis A.
Benjamin, John B.
Benner, Carolyn M.
Bertolino, Janet M.
Berube, Erin L.
Bicchieri, Rex
Blaustein, Ernest H.
Blazek-D'Arezzo, Julia E.
Bodman, Hollis A.
Boger, Edwin A.
Borbone, Christopher J.
Bradley, Peter M.
Brecher, Stephen M.
Bresciano, Karen R.
Brickman, Edith R.
Brooks, Patricia E.
Browne, Kathleen F.
Butt, K. M.
Byers, Karen B.
Calia, Mary E.
Caloggero, Dina A.
Camarda, Amy A.
Campbell, Eric N.
Carlson, Barbara L.
Carney, Edward M.
Case, Susan M.
Cavanaugh, Colleen M.
Ceballos, John M.
Celotti, Mary J.
Choate, Edith J.
Coakley, John M.
Coffey, Donna M.
Conley,Caryn P.
Cooney, Joseph J.
Corbett, Sandra L.
Cosgrove, Edward V.
Cotter, Paul F.
Crane, Lynn
Croteau, Zvjezdana M.
Daniels, Joan B.
Darois, Lisa
Decker, Karen L.
Defronzo, Elizabeth A.
Degon, Steven C.
Demain, Arnold L.
DeMaria, Jr., Alfred
Demers, Jennifer E
Dickinson, Beverly L.
DiLeone, Gilbert R.
DiLibero, Justin H.
Donatelli, Janice E.
Downey, Richard T.
DuMoulin, Gary C.
Duncanson, Robert A.
Dupuis, Julie A.
Durbin, Annette J.
Dylingowski, Peter J.
Ebrecht, Sally A.
Edwin, Chitra
Ekman, Arline V.
Escott, Shoolah H.
Faro, Susan J.
Ferrante, Anthony A.
Ferraro, Mary Jane
Ferrier, David C.
Fesmire, Bonnie K.
Fink, Richard
Firth, Crystaline A.
Fletcher, Ronald D.
Fletcher, Gail
Folan, Marianne
Foley, Albert E.
Frankel, Richard M.
Fuller, Jennifer M.
Fynan, Ellen F.
Gabliks, Janis
Gage II, Donald R.
George, Irene H.
George, Harvey
Gifford, Susan M.
Gilman, Elizabeth A.
Gittle, Marcy M.
Gonzales, Raisa E.
Goodale, Ellen J.
Goodwin, Doris M.
Gorton, Patricia M.
Grace,Thomas F.
Green, Barbara L.
Greene, Richard A.
Greer, Garry R.
Griffith, Bernadette M.
Gronros, Donna L.
Gu, Ji-Dong
Hajema, Ellen M.
Hanser, Anne N.
Harrison, Gail I.
Hearn, Michael J.
Heelan, Judith S.
Henderson,Shelly
Hendry Jr.,William J.
Herrera, Shabnam H.
Hinckley, Lynn S.
Hodlin, Linda J.
Holden, Judy
Holt, Virginia L.
Howarth, Paulette M.
Jenkins, Cecil C.
Johns, Margaret A.
Johnson, Doris L.
Kaynor, G. Campbell
Ketchum, Paul A.
Kim, Agnes
Klietmann, Wolfgang F.
Klinger, Jeffrey D.
Knudsen-Fowler, Cybelle A.
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