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# HISTORY OF THE DEPARTMENT OF MICROBIOLOGY 1868 – 2009

University of Illinois at Urbana-Champaign

# A HISTORY OF THE DEPARTMENT OF MICROBIOLOGY

1868 – 2009

This 141 year history of the Department of Microbiology includes an article (Chapter 1), written and published in 1959 by the Department, which covers the period 1868 to 1959. I joined the Department in 1953, and my recounting of the Department's history includes personal observations as well as anecdotes told to me by H. O. Halvorson and others. Later I realized what a unique experience it had been to join a first-class department, and I resolved to play a role in maintaining its research stature.

Ralph Wolfe

# Department of Microbiology

## History of the Headship:

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1950 – 1959	Halvor Halvorson
1960 – 1963	Kim Atwood
1963 – 1972	Leon Campbell
1972 – 1982	Ralph DeMoss
1982 – 1987	Samuel Kaplan
1987 – 1990	Jordan Konisky
1990 – 1991	Ralph Wolfe (Acting Head)
1991 – 1997	Charles Miller
1997 – 2002	John Cronan
2003 – 2004	Jeffrey Gardner (Acting Head)
2005 – Present	John Cronan

# Organization of the History of the Department

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In Chapters 2 to 6 the data are divided into Academic Decades, each containing the following sections: Section I, an overview of the decade; Section II, some events for each year of the decade; Section III, a summary of the research interests, honors received, publications, and invited off-campus lectures or seminars for each faculty member. These data have been obtained from the annual reports of the faculty submitted to the departmental secretary.



# CHAPTER 1

## 1868 – 1959

During this time period the name of the Department was Department of Bacteriology

(Anecdotes by Ralph Wolfe)

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### **A SHORT HISTORY OF THE DEPARTMENT OF BACTERIOLOGY**

**H. O. Halvorson and F. M. Clark**

“A history of bacteriology on the Illinois campus begins essentially with the work of Professor Thomas J. Burrill who was appointed by the Board of Trustees as Assistant Professor of Natural History and Botany on November 18, 1868. A few years later the appointment was changed to Professor of Botany and Horticulture. During his academic career he held many administrative positions but throughout all this period maintained his active interest in research and teaching. In the Transactions of the Illinois State Horticulture Society (1877 and 1878), he reported observations on diseased conditions in plants which he suspected to be of bacterial origin. Two years later (1880) his work on fire blight of pears and twig blight of apples was reported in the Proceedings of the American Association for the Advancement of Science. In this report Professor Burrill indicated the cause to be a bacterium. This discovery proved a relationship between bacteria and certain types of plant disease.”

“The first complete course in bacteriology appeared in the first semester 1891 and could rightfully be considered the beginning of bacteriology at the University of Illinois campus and in the country.” (This course may have been the first non-medical bacteriological course, but bacteriology courses in medical schools were well

established in the late 1860s.) “The first graduate course offered in bacteriology was introduced by Professor Burrill in 1896. He described the work – “Investigation upon morphological and physiologic variation due to treatment: systematic studies upon the number, validity, and relationships of species; researches upon special saprophytic or parasitic kinds of bacteria and upon methods of favoring or combating their activities.” In 1903 Professor Burrill added to the botany curriculum a new course entitled “Lectures and Demonstrations upon Bacteria.” Dr. W. J. MacNeal, appointed specifically for the purpose of introducing work on pathogenic bacteriology, taught both courses.”

“Professor Burrill retired after the school term in 1911-12. Professor Otto Rahn then assumed responsibilities of teaching bacteriology. During Professor Rahn’s second year he introduced a course listed as “Applied Bacteriology,” which included a study of “decay of organic matter in nature, soil and sewage bacteriology, food bacteriology, water bacteriology, pathogenic bacteriology; identification of organisms.” During the summer of 1914, Professor Rahn returned to Germany. During his visit, World War I broke out and he was forced to remain in Germany until after the war. The same events required a visiting German, Professor Felix Lohnis, to remain at the University of Illinois, where at this time he did much of his work on bacterial life cycles.”

Anecdote: In Noyes Laboratory about 1954, an old storage closet was being cleaned out and a box made of fiberboard with dimensions of about 2 x 2 x 2 feet and with a fiberboard door was discovered. A light bulb was the heating element with a bimetallic thermocouple thermostat. This was the incubator used in the early 1900’s by Otto Rahn and Felix Lohnis. That German bacteriologists would come to study in the “frontier” of the Midwest is a tribute to the stature of Thomas Burrill.

“In 1914-15 Dr. Joel A. Sperry, II, who had been an instructor under Professor Rahn, was placed in charge of bacteriology. Dr. Sperry left the University during the summer of 1918, and was succeeded by Dr. F. W. Tanner. In 1921, bacteriology was given the status of a department headed by Dr. F. W. Tanner.”

“Dr. S. A. Koser was appointed as an assistant professor in 1923 and was the first appointment to the staff above the rank of assistant. Much of Professor Koser’s research on the nutritional requirements of bacteria began during this period. He left the department in 1928. A former graduate student in the department, Dr. G. I. Wallace, succeeded Professor Koser.”

“In addition to classwork and research Dr. Tanner and Dr. Wallace performed diagnostic bacteriological work in connection with the State Department of Public Health. A branch of the State Department of Public Health was subsequently established and was housed within the department. W. A. Miller, a graduate student in the department, was given the responsibility for the operation of the branch laboratory. After Mr. Miller’s graduation the branch facilities were enlarged but remained in the department until 1939, when new quarters were made available.”

“In the fall of 1934, Dr. F. M. Clark, a former graduate student in the department, was appointed instructor of bacteriology and in the following year Dr. O. F. Edwards was added to the staff. In the fall of 1938, Dr. Wickerham joined the staff. Professor Tanner had delegated the responsibility for the elementary course to Dr. F. M. Clark. In the summer of 1940, Dr. Wickerham accepted a position with the Northern Regional Research Laboratory in Peoria and was replaced by Dr. John Garey. During the year 1941-42, Dr. Doris Cook was appointed instructor in the department.”

Anecdote: The hiring of graduate students who received their Ph.D.’s from the department as faculty members led to an inbreeding effect that did not enhance the research stature of the department.

“During World War II, the department cooperated in the training of men for special services in the Armed Forces. This group was sent to the University as a part of the Army Specialized Training Program and was given refresher courses in several subjects in the Department of Bacteriology. Due to the wartime manpower deficiencies, the staff in 1943 consisted of five full-time members and one assistant. Dr. Severens

had been added to the staff after Dr. Garey and Dr. Edwards had left the University. After the war Dr. C. M. Wilson joined the department.”

“In the fall of 1948, Professor Tanner was forced to leave the University because of illness and in the following year, Professor G. I. Wallace was named Acting Head of the Department of Bacteriology. The departmental staff at this time consisted of four full-time staff members and eleven assistants. Professor H. O. Halvorson was appointed Head of the Bacteriology Department (Univ. of Illinois) in the fall of 1950. He brought into the department Professor Sol Spiegelman and Professor A. F. Borg. The following year Professor I. C. Gunsalus and Professor S. E. Luria were added to the staff.”

#### Anecdote: Wisconsin to the Rescue

Professor E. B. Fred was a bacterial physiologist in the Department of Bacteriology at the University of Wisconsin. His interests concerned bacterial physiology, especially nitrogen fixation. He allegedly ran a tight ship as his graduate students relate: every Sunday morning he would walk through the laboratory to make sure his graduate students were busy at research. He became department head, then dean, and finally president of the University 1945-1958. In the late 1940's at each meeting of the Big Ten presidents he would “attack” George Stoddard, president of the University of Illinois, about the terrible Department of Bacteriology at Illinois which lacked research stature and where research consisted of 1,000 thermal death tubes and oil baths. (George Stoddard had begun his presidency here in 1945, having been attracted to the Urbana campus to “wake up a sleeping giant.” He was “unceremoniously fired” in the summer of 1953 by the Board of Trustees who apparently disliked some of his methods. He was moving too fast in awakening the giant.) Finally in 1949, Stoddard had enough of Fred's needling; so he called in his provost, Henning Larsen, and told him to build the best department of bacteriology in the country. He would have four full professor lines and two assistant professor lines to do the job. Henning Larsen was of Norwegian descent and was aware of a fellow Norwegian, H. Orin Halvorson, and his work in Minnesota as the write up by Halvorson relates. This top-down effort by administrators was hugely successful, for a department that was incapable of directing its own future toward research excellence, and set high standards which 60 years later in 2014 are still apparent in the report of an outside peer evaluation committee.

## Orin assumes Head of the Department

“In 1949 Orin was invited to restructure the Department of Microbiology at the University of Illinois. Orin was born in a little town of River Falls, Wisconsin, where a Norwegian minister, named Peter Larsen had organized the first Lutheran parish. Half a century later Orin heard from the Rev. Larsen’s son, Dean Henning Larsen, that he was his choice for the new head of the Bacteriology Department. He recruited a team of young scientists to use microorganisms to study biochemistry, genetics and bioregulation: I. C. Gunsalus, Salvador Luria and Sol Spiegelman. In short order this was considered one of the best, if not the best, microbiology departments in the country. All three became members of the National Academy of Sciences, and one, S. Luria, went on to get a Nobel Prize. The next decade was a “golden era” in which many students were launched into the newly emerging fields of microbiology. He told his staff that he did not care if he published another paper, but he wanted the best damn department in the U.S.”

Anecdote: Within three years of becoming department head, H. O. Halverson had brought three full professors to his department: Sol Spiegelman, I. C. Gunsalus, and Salvador Luria. Each had a national research standing in his field, but there would be competition among the three for space, resources and students, as well as for setting departmental policy. The Department Head had a real challenge to meld these three into a team. One afternoon I felt the need for a cup of coffee so I went to the local diner across the street, found a stool at the counter, and started to sip my coffee when the person next to me said “hello.” It was our Department Head who was sipping on a bottle of beer in mid-afternoon. So I looked at the beer and said: “Rough day in the office?” With a sad smile, he nodded his head. Some years later he told me that one of his peers at another university had bet him \$100 that he could not hold the three together for 5 years. He then said, “I won the bet; he paid up.”

Anecdote: A new system of funding grants

Prior to the availability of federal grants in the late 1940’s and early 1950’s, most research funding for faculty research was available from

industry and was tied to the specific interests of the funding company. For example, Halvorson was a consultant for the Hormel Ham Company and his research funding was devoted to bacterial spores especially to ways that could lower their heat resistance in the canning process. That faculty members could now obtain significant grants of funding for a 3-year period from NIH or NSF caused Halvorson to remark, "This gravy train is going to stop someday." He would be amazed that after 60 years the train is still chugging along, although in recent years funding for basic research is showing signs of stress as there are increasingly more hungry research mouths than gravy. It should be noted that in the 1950's a principal investigator on a federally funded research grant was forbidden to use grant funds to pay a summer salary. At that time academic appointees were paid only on a nine month basis. Sol Spiegelman was especially vocal in saying: "We are the only highly trained specialists who are expected to work two months for nothing." In response to similar expressions on the national level granting agencies changed this policy.

#### Personal Anecdote: Mentoring

In the process of writing my first research grant to the National Science Foundation, I asked I. C. Gunsalus if he had any suggestions for me. He replied, "Don't ask for a 22 rifle to shoot sparrows at 6:00 tomorrow morning. Ask for money to investigate ways of getting rid of sparrows." So I entitled my grant: Metabolic Reactions in Bacteria. It was funded and served as a tent under which I could work on anything that interested me for many years.

"With the addition of these members to the staff new courses were introduced into both the undergraduate and graduate curricula, "Principles of Experimental Bacteriology and Viruses". From the birth of the department in 1921, the graduate offerings had been confined to physiology of bacteria, a current literature course, and research. With the increased staff it was possible to greatly enlarge the offerings at the graduate level. "Quantitative Analysis of Bacteriological Procedure--" was shared by Professor Halvorson and Professor Spiegelman. Lectures and laboratory in microbial genetics were given by Professor Spiegelman. Similarly, lectures and laboratory were

introduced by Professor Gunsalus on the “Chemistry of Microbic Processes.” After Gunsalus left the department to join the Biochemistry Department, responsibility for research and teaching in this area was assigned to Professor R. D. DeMoss in 1956. Work in the field of virology, originally introduced into the curriculum by Professor Luria, was continued by Dr. J. W. Drake.”

“Research in the various fields of bacteriology was greatly expanded with the introduction of the new staff, resulting in an increased demand for space. With the completion of the new East Chemistry Building in 1950 and the move of the Biochemistry Department to this building, the Bacteriology Department was given additional space on the fourth floor of Noyes Laboratory. This new space was used for a teaching laboratory, offices, and research laboratories. The space on the third floor was devoted to offices and research laboratories.”

“Professor Borg left the department in 1953 and his place was taken by Dr. Ralph Wolfe. Orin was especially fond of the pioneering work of Dr. Case van Niel in describing microorganisms in nature. Appointing Dr. Wolfe, a student of van Niel, introduced this field into the department. Dr. Wolfe taught the advanced bacteriology course and eventually assumed the duties attendant to the teaching of nutrition and cultivation of micro-organisms. Other changes in department personnel involved the appointments of Dr. Elliot Juni (1952) to teach the advanced bacteriology course and his successor, Professor J. T. Wachsman (1957).”

#### Personal Anecdote: Mentoring

One day about 6 weeks after I joined the Department, I was in my office sitting at my desk, when the Department Head, H. O. Halvorson, came in. He remained standing as he pointed his finger at me and said: “I just want to tell you one thing: you are paid to teach; you get promotions for doing research!” He departed. For 60 years the Department followed this line of thinking to maintain visible national and international research stature.

#### Personal Anecdote:

One day in my second year as an instructor the Department Head, Halvorson, came into my office, sat down, and in a serious tone said, "We have enough damn biochemists around here. The reason I hired you is that I thought you weren't one." (He was referring to biochemists Gunsalus and Juni.) It was clear to me that my future was on the line. So I replied, "Doc I am interested in all kinds of crazy bugs, but isolating and taking pictures of them is not enough; I want to know what makes them tick. If you're not interested in that, then you hired the wrong guy." He had the habit of sniffing when he was thinking. After sniffing for a while, he said, "Keep doing what you're doing" and departed. Phew!

"Despite the enlargement in quarters, sufficient classroom space was not available to accommodate all the courses listed in the department. After a request by Professor Halvorson for more space, the department was given laboratories on the second floor of the old Bevier Hall."

#### Anecdote: Air Conditioning

For many decades faculty members and students in the Department of Chemistry and Bacteriology worked throughout the hot-humid summers at their research in Noyes Laboratory building. Even though window air-conditioning units became available in the 1940's, these were forbidden by the University. This system was challenged by Professor Luria during one hot period in the early 1950's when the temperature in his laboratory was so high that the agar in overlays for assay of phage did not solidify. He demanded an air conditioner so that he could pursue his research. He won this battle and his air conditioner proved to be the "nose of the camel." Soon other investigators found good research reasons why they needed air conditioners. When Burrill Hall was being designed in 1955, this building was to be the first building on campus to have "central air." But there were limitations: animal quarters and laboratories could be air conditioned, but not offices. In the planning process, Professor Halvorson allowed each faculty member to exercise some original input in the design of individual laboratories; so for example, on the plans for my "office" I added a small table with a gas burner and labeled it "instrument room", so I had an air conditioned office.



“Late in 1955 ground was broken at the corner of Illinois Street and Mathews Avenue for the erection of one wing of a new building. The cornerstone of the building was laid on March 31, 1958, and the building sufficiently complete to permit the department to begin moving during March, the second semester of 1958-59. The department now occupies space on the first, second and third floors of this new building. During 1959 the name was changed from Department of Bacteriology to the Department of Microbiology.”

#### Anecdote: Naming of Burrill Hall

As copies of correspondence between H. O. Halvorson, Dean of LAS Lyle Lanier, President Henry, and the Board of Trustees in the spring of 1959 indicate, there was reluctance by the Board of Trustees to depart from the policy that buildings paid for by state funds could not be named after individuals. Finally, H. O. Halvorson prevailed and the building was named Burrill Hall rather than the cumbersome name of Microbiology-Physiology Building. On the bronze plaque which honors T. J. Burrill in the lobby of Burrill Hall is the statement of a colleague: “Dr. Burrill, biologically speaking, you are a monster of goodness.” Once the prohibition on naming buildings after individuals was abandoned, other buildings received new names.

# CHAPTER 2

## The 1960's Academic Decade

### 1959 – 1960 to 1968 - 1969

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#### I. OVERVIEW

The 1960 decade was to become a golden era for the expansion of microbiology. Enrollment in Microbiology courses per year increased from 1,100 to 2,400. External research funds received by faculty members per year increased from \$450,000 to \$941,500 (direct costs). During this decade faculty members delivered 353 external invited lectures and published 384 articles.

After engineering the rebirth of Microbiology at Illinois, launching the Department on a sustainable course, and obtaining funds for a new building, Burrill Hall, it became obvious to some of his associates that Halvorson was eager for a new challenge. One that attracted his attention was the overall state of Biology in the College of Liberal Arts and Science. There was a Division of Biological Sciences, but as a department head he, along with heads of Physiology, Botany, Zoology and Entomology, made an independent annual pilgrimage to the Dean of LAS to make the case for the next operating departmental budget. There was no coordination of these efforts among departments. In 1958, Halvorson began a serious approach to biology departments and higher administrators to show that everyone would benefit from a unified effort, and he proposed that a School of Life Sciences (SOLS) be established with a director who would make the case for biology to the Dean of LAS. One important factor was clear to Halvorson: at this time, NIH was providing money to universities for the construction of new buildings for biological research. To access this federal resource, Illinois would only become competitive with a coordinated program for the development of biology on this campus to complement the new facilities for Microbiology and Physiology. The School

of Life Sciences was established in 1959 with H. O. Halvorson as director and his executive committee consisted of the department heads. The original Morrill Hall building was the first fruit of this program. Halvorson then proceeded to obtain funds for his third building which was attached to Morrill Hall and provided space for Botany and additional space for Entomology and Zoology. He continued as a professor of Microbiology with an active research laboratory for graduate students.

Note from archives library at Illinois:

“Biographical Note for University of Illinois at Urbana-Champaign, School of Life Sciences:

Established in 1959 as a successor to the Division of Biological Sciences (1934-58) and the School of Natural History, the School of Life Sciences includes the Department of Botany, Entomology, Microbiology, Physiology and Zoology. The School coordinates activities of member departments within the College, promotes cooperation between those departments and biologists in other colleges of the University, and advances the interest of those departments in relations to agencies outside the University.”

Tribute to Halvorson from the Department of Entomology:

“One of the outstanding contributions of Dr. Halvorson was his untiring efforts in getting new buildings for the Biology Departments. Burrill Hall, Morrill Hall and the Zoology-Botany buildings are structures which cost over four and half million dollars each. Burrill Hall which houses Microbiology and Physiology and Biophysics was dedicated in 1959. Morrill Hall houses the research and graduate teaching of the Entomology Department and a few Zoology research laboratories. Morrill Hall was completed a year ago. The construction of the Zoology-Botany building has just started and will be completed in 1966. In conclusion we of the Entomology Department would like to say thanks to Dr. Halvorson for his unselfish, highly successful efforts as the initial Director of the School of Life Sciences.”

With the establishment of SOLS, a search was initiated for a new Department Head for Microbiology. The goal of the search was to recruit someone from outside the

Department. Dr. K. C. Atwood was recruited. He was interested in cutting edge concepts of biology and was strongly supported by Spiegelman. Some faculty members were concerned that his knowledge and interest in areas of Microbiology were limited, and these faculty members were not enthusiastic about his appointment. Halvorson himself had reservations.

The early 1960's was an exciting time for developing concepts of information transfer from nucleic acid polymers to the translation apparatus of the ribosome. Spiegelman's laboratory was highly active in this area and was recognized internationally as a leader in the new area of molecular biology. He opposed the term "messenger RNA" loudly proclaiming that this RNA was not a messenger but "*the message*" and should be called "message RNA". He lost this battle. He developed a system for investigating the *in vitro* activities by the viral induced RNA-dependent RNA polymerase (Q $\beta$  replicase). These experiments demonstrated the involvement of double stranded complexes as intermediates in the synthesis of single-stranded RNA. In addition he isolated a self-replicating mutant of Q $\beta$  RNA and extensively investigated its properties. He proclaimed this to be the first *in vitro* self-replicating system of biological origin to be reported. He also studied control mechanisms in eukaryotes using the DNA-RNA hybridization procedures. His research program was the most extensively funded in the Department. In the late 60's his annual research group consisted of 10 or more postdoctoral students and 7 graduate students.

Anecdote: Monod at the Pasteur Institute in Paris and Spiegelman were in close contact and exchanged scientific lectures. Using different experimental approaches, the results of their experiments were in remarkable agreement. On two occasions Monod visited this Department and presented lectures in the large lecture room in the Natural History Building to standing-room-only audiences from biology and biochemistry. On one occasion, Spiegelman invited Monod to join a few faculty members for lunch at Bud's Café on Goodwin Avenue. Bud served typical undistinguished American hamburgers and sandwiches. Monod showed no evidence of displeasure with the fare, but Postgate, a Visiting Professor from England in Campbell's laboratory, thought it was outrageous that Sol would invite Monod to the cuisine at Bud's Café.

Anecdote: When de Gaulle was the political leader in France in the 1960's, he was concerned that no French scientist had received the Nobel Prize in decades. He was advised that Monod's group was worthy but needed more visibility; so he invited members of the Swedish Academy to France where they met scientists and were wined and dined in French style. The next Nobel Prize in physiology and medicine was awarded to Monod and Jacob. Many scientists in the international community thought the invitation by de Gaulle and its acceptance by the Swedish Academy was unfortunate and set a dangerous precedent. However, there was general agreement that the recipients qualified for the Prize. In the Microbiology Department here, there was disappointment; Carl Woese was most vocal in crying "Foul"; he thoroughly believed that the prize should have included Spiegelman. Much later in Carl's career he would establish the Sol Spiegelman Memorial Lecture in the Microbiology Department.

## **II. SUMMARY OF EVENTS FOR EACH ACADEMIC YEAR OF THE 1960's DECADE**

### 1959-1960

The academic year 1959-1960 was the first year that the Department enjoyed an entire year in the new building, Burrill Hall. The Department received two 5-year training grants from NIH: one in Microbiology and Molecular Genetics and one in General Microbiology. Dr. Alfred Nisonoff, an immuno-chemist, was appointed to the staff in an area not previously emphasized by the Department and Dr. Sueoka, a physical chemist, who was interested in the structure of macro-molecules, was added as a new appointment under the training grant. The Department received equipment grants from NIH and NSF for the purchase of expensive equipment allowing the Department in new quarters to be a "state of the art" entity. The Microbiology faculty at this time consisted of 9 members.

Major changes were initiated in course offerings by the Department. The number of students admitted to the beginning course, Microbiology 104, was limited to available laboratory space. To solve this problem, the lecture and laboratory were separated as Microbiology 100, a 3-hour lecture course, and Microbiology 101, a 2-hour laboratory course. This strategy proved to be highly successful allowing more students to take Microbiology. Changes at the 300 level courses allowed students with a chemistry background to enroll and receive graduate credit for their first course in Microbiology.

### 1960-1961

During the 1960-1961 academic year, Professors Nisonoff, Sueoke, and Atwood initiated their research programs with new grants totaling \$196,500. Professor Josef De Ley of Ghent, Belgium, taught Wolfe's organisms' course in microbial diversity while Wolfe was on sabbatical leave in Sheffield, England. Dr. Joseph Wolfe of Leeds, England, joined Professor Halvorson's group October – March.

### 1961-1962

In the 1961-1962 academic year, G. I. Wallace retired in October and was appointed an Emeritus professor. He taught pathogenic bacteriology during his career at Illinois. Dr. L. Leon Campbell from Western Reserve University School of Medicine was appointed Professor of Microbiology to begin in February 1962. Dr. Nisonoff and Dr. Wachsman were recipients of Research Career Development Awards from the National Institute of Health. Distinguished visitors who participated in research in laboratories were Dr. Helge Larson from Norway, Dr. Murrill Scott from Australia, Dr. Alex Keyman from Israel, and Dr. G. Krishnamurty from India.

### 1962-1963

For the academic year 1962-1963 Professor Ralph DeMoss was on sabbatical leave at the Laboratoire de Genetique Physiologique in Gif-sur-Yvette, France. Dr. Sueoka resigned to accept a position of Associate Professor of Biology at Princeton University. Dr. Joan McCamish joined the Department as Instructor, being in charge of teaching laboratories for the beginning courses. Dr. Spiegelman received the Pasteur Award from the Illinois Society of Microbiology for his work in molecular genetics. Because of faculty discontent, the Dean suggested that Dr. Atwood resign as Department Head, and Dr. Campbell replaced him as of September 1, 1963. Two distinguished visitors were Dr. Nygaard from the University of Oslo, Norway, who worked with Dr. Halvorson and Dr. B.D. Hall, chemistry. Dr. J.R. Postgate, England, worked with Dr. Campbell.

### 1963-1964

The academic year 1963-1964 was marked by the addition of Dr. C. R. Woese to the Department as Associate Professor in February. Spiegelman played a pivotal role in convincing departmental members that Carl was doing original work on DNA and the genetic code and was considering work on the ribosome. Spiegelman was convinced that Carl had great potential. Dr. Paul Sypherd joined the department as Assistant Professor in June. Spiegelman delivered the Jesup Lectures at Columbia University and

was elected to the Center of Advanced Study here. R. DeMoss served as president of the Illinois Society for Microbiology. Dr. F. J. Simpson of the Prairie Research Laboratory, Saskatoon, Canada, joined the research laboratory of DeMoss for the year.

#### 1964-1965

A significant event for the academic year 1964-1965 was the retirement of H. O. Halvorson as Professor of Microbiology and Director of the School of Life Sciences in June 1965. He was in the right place at the right time to recognize opportunities, and he effectively took advantage of these to set a new direction for Microbiology and for Biology. It is unlikely that new department heads or directors in the future will have equal opportunities.

Professor R. E. Kallio, University of Iowa, was appointed Director of the School of Life Sciences and Professor of Microbiology. Professor Spiegelman was elected to the National Academy of Sciences. Professor Campbell was appointed Editor-In-Chief of the Journal of Bacteriology and Chairman of the Publication Board, American Society for Microbiology. Dr. Alex Keynan, Israel, was a George A. Miller Visiting Professor of Biochemistry and Microbiology.

#### 1965-1966

In the 1965-1966 academic year, the Department of Microbiology was rated among the "Distinguished" departments by the American Council on Education in its report entitled, "An Assessment of Quality in Graduate Education". Professor Spiegelman was elected to the American Academy of Arts and Sciences. He received Honorary degrees D.Sc. from Rensselaer Polytechnic Institute and from Northwestern University.

#### 1966-1967

Dr. Samuel Kaplan was appointed Assistant Professor of Microbiology. Professor Nisonoff transferred to the University of Illinois Medical Center, Chicago. Dr. M. J. Wolin, Department of Dairy Science, received a joint appointment in the Department of Microbiology.

#### 1967-1968

Dr. Edward Voss, Jr. was appointed Assistant Professor of Microbiology in the area of immunochemistry as Dr. Nisonoff's replacement. Professors Atwood and Wolfe

were on sabbatical leave. Dr. Norbert Pfennig from Germany taught Microbiology 309, Wolfe's course in microbial diversity. Emeritus Professor, G. I. Wallace, died June 29 at Vero Beach, Florida.

### 1968-1969

Charles Hershberger accepted an appointment as Assistant Professor. His research interests involved use of eukaryotic microbes.

### **III. FACULTY RESEARCH INTERESTS, PUBLICATIONS, AND INVITED LECTURES AND SEMINARS OF THE 60's DECADE**

#### Kim C. Atwood: Genetics

(1.) Causes and consequences of genetic mosaicism in blood group antigens and the comparative study of automosaicism in twins; (2.) Effects of reactive polyamines to mutagenesis, mosaicism, and survival in *Neurospora crassa*; (3.) Blood group "A" substance (human) and *Dolichos biflorus* anti "A" lectin; (4.) Genetic mapping of operator translocations in mutant strains of *E. coli*; (5.) Location of the region in the genetic maps of *E. coli* that specifies ribosomal RNA. Role of small episomes in returning mutants in these genes to normal activity; (6.) Locus known as *bobbed* was identified as the locus of the RNA genes in *Drosophila melanogaster*, and the genetic basis of *bobbed* mutants is being studied.

In this decade Atwood delivered 25 invited lectures and published 14 articles.

#### Marvin Bryant: Microbes of the Rumen (Joint Appointment Dairy Science)

Marvin Bryant (Department of Dairy Science) was awarded a joint appointment in 1968. His research interests include: (1.) Methanogenic organisms, *Methanobacterium ruminantium* and *Methanobacillus omelianskii*; (2.) Interaction of sulfate reducing bacteria with methanogens.

In the 2 years of his appointment, Bryant delivered 5 invited lectures and published 4 papers.



Leon L. Campbell: Sulfate reduction; thermo-stable enzymes

(1.) Isolation, purification and study of enzymes in dissimilatory sulfate reduction by *Desulfovibrio desulfuricans*; (2.) Amino acid sequence in crystallized cytochrome C<sub>3</sub> from *D. desulfuricans*; (3.) Amino acid sequence of crystallized  $\alpha$ -amylase from *Bacillus stearothermophilus* and *Bacillus macerans*; (4.) Thermophilic bacteriophage; (5.) Genetic transformation in *Bacillus amyloliquefaciens*. He was appointed Editor-in-Chief of the Journal of Bacteriology & Chairman of Publications Board, ASM.

In this decade, Campbell delivered 32 invited lectures and published 35 articles.

Francis M. Clark: Microbial diversity

(1.) Inositol-containing phospholipids of *Schizosaccharomyces pombe*; (2.) Products produced in the degradation of inositol by *Torulopsis melibioseum*; (3.) Synthesis of excess capsular material produced by *T. melibioseum* when grown on glucose; (4.) Ascospore formation in yeast; (5.) Iron precipitation by heterotrophic bacteria in water; (6.) Enterococci in natural sources and survival of *Streptococcus faecalis* in stream waters; (7.) Extracellular polysaccharide formation by *Rhodotorula*.

In this decade, Clark delivered no invited lectures and published two articles.

Ralph D. DeMoss: Regulatory mechanisms in bacteria; tryptophanase

(1.) Regulatory mechanisms in *Pediococcus pentosaceus*; (2.) Hexosamine biosynthesis in *Leuconostoc mesenteroides* and catabolism of glucosamine; (3.) Mechanism of action of thioproline in *Escherichia coli*; (4.) Purification and characterization of tryptophanase from different organisms (5.) RNA synthesis during tryptophanase induction; (6.) Tryptophan permease in *Escherichia coli* and the intracellular distribution of tryptophanase; (7.) Glycolytic enzymes in *Zymomonas mobilis*.

In this decade, De Moss delivered 24 invited lectures and published 28 articles.

John W. Drake: Virology

(1.) Analysis of the mechanism of ultraviolet mutagenesis; (2.) Analysis of host-controlled variation in Newcastle disease virus; (3.) Mechanism of replication of Mengo virus RNA in mouse L-cells in tissue culture; (4.) Nature of deletion mutations in bacteriophage T4B by incorporation of such mutations into heterozygotes, on the mechanism which caused sign mutations, and on specificities of action of mutator genes.

In this decade, Drake delivered 24 invited lectures and published 18 articles.

Halvor O. Halvorson: Spores; halophiles

(1.) Study of sporogenesis by use of radioactive tracer techniques and specific inhibitors; (2.) Growth and physiology of halophylic bacteria; (3.) Pathway of synthesis of dipicolinic acid; (4.) A factor responsible for morphogenesis in spore-forming cells. He became an Emeritus Professor July 1, 1965.

In the six years of this decade before retiring, Halvorson delivered 7 invited lectures and published 15 articles.

Reino E. Kallio: Bacterial oxidation of aromatic compounds

(1.) Benzene hydroxylating system in cells of *Pseudomonas* grown at the expense of toluene; (2.) Methane-oxidizing organisms from surface waters are being screened for ability to co-oxidize other compounds; (3.) Incorporation of highly branched alkanes into fatty acids of *Mycobacterium*; (4.) Oxidation of benzene and halogen substituted benzenes to catechol.

In the six years after joining the Department in 1964-1965, Kallio delivered 19 invited lectures and published 8 articles.

Samuel Kaplan: Bacterial membrane synthesis (Joined the Department Feb. 1, 1967)

(1.) Biochemical and genetic control of macromolecule biosynthesis in *E. coli*: amino acid activating enzymes and ribosomes; (2.) Development of chromatophores in *Rhodospseudomonas spheroids*; (3.) Precursor-product relationship between stable RNA's and their precursors in chromatophore development.

In the 3 years after joining the Department, Kaplan delivered one invited lecture and published 5 articles.

Joan McCamish: Immunology (Joined the Department 1963-1964)

(1.) Kinetics of active cutaneous hypersensitive reactions; (2.) Correlation of kinetics with the classes of immune globulins in the serum of animals at time of the reaction; (3.) Reproduction of phases and reactions in animals passively sensitized with isolated immune globulins possessing several different characteristics.

In 6 years of this decade, McCamish was not invited to deliver lectures and published 3 articles.

Richard C. Meyer: Swine microbial diseases (Joint appointment Veterinary Medicine to teach the Microbiology course of pathogenic microbes)

(1.) Pathogenic strains of *E. coli*; (2.) Isolation and study of coliphage in enteropathogenic *E. coli* from non-human sources; (3.) Studies on swine pox viral agents.

In the year of his appointment (1968-1969), Meyer was not invited to deliver lectures and published 4 articles.

Alfred Nisonoff: Immunology

(1.) Structure of antibody molecules and nature of the active site antibodies; (2.) Chemical properties of the disulfide bonds in rabbit antibody molecules; (3.) Separation and recombination of the two subunits of the antibody molecule (half-molecules); (4.) Preparation and properties of hybrid antibodies.

In 1966 Nisonoff transferred to the University of Illinois Medical Center, Chicago. During the first 5 years of this decade, Nisonoff delivered 45 invited lectures and published 32 articles.

John Ordal: Spores (Joint appointment Food Technology)

Delivery of a laboratory course in food technology, cross listed with Microbiology. (1.) Sporulation in *Clostridium thermosaccharolyticum*; (2.) Bacterial cell injury and recovery by use of sublethal stress, for example sublethal heat treatment.

During the one year (1968-1969), Ordal delivered no invited lectures and published 5 articles.

Sol Spiegelman: Molecular biology

(1.) Synthesis of RNA and protein in the subcellular systems; (2.) Action of chemotherapeutic agents and substrate analogues; (3.) Synthesis and maintenance of intracellular enzymes; (4.) Study of bacterial cells infected with double-stranded and single-stranded DNA viruses and RNA viruses to elucidate central aspects of information transfer; (5.) Overall the thrust of the research program is to analyze central aspects of

information transfer; (6.) DNA-RNA hybridization techniques extended to *Drosophila* where the *bobbed* mutation is located on the sex chromosome; (7.) A new method for separation of nucleic acid molecules by electrophoresis on acrylamide gels yields a 10-fold increase in efficiency.

In this decade, Spiegelman was elected to the National Academy of Sciences, American Academy of Arts and Sciences, and the Center for Advanced Study.

During this decade, Spiegelman delivered 133 invited lectures and published 86 articles.

#### Noboru Sueoka: Molecular biology

(1.) Survey of variation and heterogeneity of DNA base composition in *Tetrahymena* and algae; (2.) Correlation between base composition of DNA and amino acid composition of protein; (3.) Fractionation of DNA on methylated albumin; (4.) Transformation in *Bacillus subtilis*.

During his 2 years at Illinois, Sueoka delivered 9 invited lectures and published 5 articles. He accepted an Associate Professorship at Princeton for the 1962-1963 year.

#### Paul Sypherd: Ribosomes

(1.) Biosynthesis of ribosomes; (2.) Physical chemical properties of ribosomal proteins; (3.) RNA metabolism in germinating wheat; (4.) Genetics of ribosomal proteins; (5.) Role of DNA in polysome assembly.

During the 5 years of his research here, Sypherd delivered 10 invited lectures and published 13 articles.

#### Edward Voss: Immunology (His appointment here began on September 1, 1967)

(1.) Valence and antigen binding of purified IgM antibodies; (2.) Purified chicken antibody requirement for high salt to precipitate with antigen; (3.) Covalent linkage of 2, 4, 6-trinitrophenyl groups to DNA as carriers; (4.) Isolation of specific antibody-producing cells from rabbit spleen and lymph nodes.

During his first 2 years here, Voss was not invited to deliver lectures and published 4 articles.

Joseph T. Wachsman: *Bacillus megaterium*

(1.) Use of 8-azaguanine to selectively kill wild type cells of *Bacillus megaterium* and enrich for auxotrophic mutants; (2.) Mechanism of thymineless death in *Bacillus megaterium* induction of lysogenic strains, and enrichment of auxotrophic mutants by thymine starvation. In 1962 he received a NIH career Development Award.

During this decade, Wachsman delivered 2 invited lectures and published 8 articles.

Carl Woese: The genetic code and protein synthesis

(1.) Molecular basis of the genetic code and its relationship to protein synthesis; (2.) Interrelationships among cellular macromolecular constituents during bacterial spore germination; (3.) Nature and evolution of the genetic code; (4.) Ribosome biosynthesis; (5.) Operon structure; (6.) Evolution of the ribosome with emphasis on the posttranscriptional modifications of RNAs that occur; (7.) Prebiotic systems that might give rise to the specificity manifested in the codon-amino acid relationship; (8.) Transfer RNA.

During 6 years here, Woese delivered 3 lectures, published 15 articles and published 1 book: The Genetic Code.

Ralph S. Wolfe: Microbial diversity

(1.) Pathway of allantoin degradation as a substrate for growth by *Streptococcus allantoicus*; (2.) Discovery of ferredoxin a new low-potential electron carrier and study of its biological role; (3.) Cellulose production in *Sarcina ventriculi*; (4.) Filamentous growth of *Sphaerotilus natans* and extracellular polysaccharide formation; (5.) Study of *Methanobacillus omelianskii* as a mixed culture in collaboration with M. Bryant, cell-free formation of methane in extracts of *Methanobacillus omelianskii* and transmethylations reactions involving methyl-cobamide in collaboration with M. Wolin; (6.) Morphogenesis in *Arthrobacter*.

During this decade, Wolfe delivered 40 invited lectures and published 40 articles.

Meyer J. Wolin: Microbial metabolism (Joint appointment Department of Dairy Science)

(1.) Hydrogenase of *Vibrio succinogenes* chemical and physical basis; the interaction of this enzyme and cell membrane; (2.) Collaborative studies of methane biosynthesis in collaboration with M. P. Bryant and R. S. Wolfe; (3.) Genetic and biochemical studies of teichoic acid function in *Staphylococcus aureus*; (4.) Microorganisms associated with the rumen.

During his 4 years as a joint appointee, Wolin presented 5 invited lectures and published 9 articles.

# CHAPTER 3

## The 1970's Academic Decade

### 1969 – 1970 to 1978 - 1979

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#### I. OVERVIEW

Over this academic decade research and training funds varied on an annual basis, but the trend was positive from \$838,000 in 1969-1970 to \$1,412,000 (direct costs) in 1978-1979. Total student enrollment in Microbiology courses was 2,570 in 1969-1970 and 3,019 in 1978-1979. Faculty members including joint appointees published 544 articles including book chapters and delivered 409 external invited lectures and seminars. When DeMoss, head of Microbiology, was notified that an alumnus of the University, named DeBoer, had bequeathed a farm in Germany to the University, and that funds from its sale were to be used to support research on viruses, he diligently made the case to administrators, in competition with other proposals for these funds, that the Department of Microbiology was the only department that had for 20 years pursued research and teaching of viruses and so should be the recipient of DeBoer funds. Administrators eventually agreed. Since 1976 funds generated from investment of the DeBoer gift by the University Foundation have greatly increased, and annually this Department increasingly benefits from DeMoss's foresight. Current faculty members may be unaware of the history behind the DeBoer funds.

During this decade an unofficial event was initiated. Any departmental faculty member who wished to have lunch with the seminar speaker on Thursdays would show up at noon in the office. This procedure was eventually changed so that the speaker met with graduate students at noon. Faculty members continued to meet for lunch on Thursdays, and this lunch meeting was given the name, "the fat cats' lunch" by Kaplan's

graduate students. Unknown to the students the fat cats' lunch consisted mostly of hamburgers and pizza with perhaps a beer.

Carolyn Corn was head secretary from 1973 to 1998. When the main office of this Department was located on the first floor of Burrill Hall, there were two secretaries on the third floor, one for Spiegelman and one for other faculty members. At this time manuscripts and research proposals were typed by typewriter. For manuscripts three carbon copies were made, one for the author, the original and two carbons being sent to the journal for the review process. The typist pool consisted of three to four individuals. Carolyn showed great dedication to her job; if one wanted to know something about the Department, just ask Carolyn. Sam Kaplan, as head, began the process of installing the first word processors in the secretarial space. Carolyn resisted these as a threat but eventually realized their value.

This academic decade was notable for Carl Woese's discovery of the Archaea. Woese decided that this discovery should receive publicity, and his granting agencies NSF and NASA agreed to sponsor a press release in the popular press. (NASA had a history of publishing "break-throughs" by their grantees.) This ensured serious coverage by newspapers. Woese had difficulty explaining to reporters in terms they could understand the significance of the discovery. They seized upon the term "a third form of life," and then, with limited knowledge of science, proceeded to write columns of pseudoscientific nonsense. For example, here are a few lines from the article on the front page of the Chicago Tribune.

#### Martianlike Bugs on Earth?

"No fossil traces of the bacteria *Methanobacteria thermoautotrophicus* can be found because by the time it evolved and went into hiding no rocks had yet formed."

The negative reaction of microbiologists and the scientific community to these newspaper articles was immediate and intense, even though the press release was



timed to coincide with publication of the data in PNAS. It would be more than 25 years before the concept was accepted by the scientific community and Carl would be awarded the Crafoord Prize by the Swedish Academy of Sciences. Let's look briefly at background events leading to these results.

In his early years here, Woese became increasingly interested in using the ribosome as a vehicle for studying ancient events in evolution. His reasoning was based on the fact that all living cells possess ribosomes, so this organelle is of very ancient origin. It was clear from world-wide research that the ribosome had only one function, translation of the genetic code and synthesis of amino acid polymers, proteins. A most important conclusion was that because it had only one function, the ribosome was "insulated" from the vast phenotypic variations in the microbial world. Therefore, it would be an ideal structure for studying ancient events in microbial evolution.

Sanger had developed a method for determining the sequence of amino acids in proteins and Zuckerkandl and Pauling opened the era of informational macromolecules by showing that variations in this sequence among the same protein in different organisms could be used to determine their relatedness. However, it soon became apparent that there were severe limitations to the use of amino acid sequence for the study of protein relatedness, one being that only small proteins such as cytochromes could be successfully used. The RNAs of the ribosome had been a popular area of research on ribosomes for many years, but analysis of nucleotide sequences was beyond reach until Sanger published a technique for doing this. Woese was immediately attracted to analysis of RNA nucleotide sequence for the study of organism relatedness. He modified the Sanger technique, and by adding  $P^{32}$  the cell synthesized radioactively labelled RNA. Woese chose the 16SRNA as an ideal "statistical ensemble" (his words), 5SRNA being too small and 23SRNA too large. By use of specific enzymes to degrade the 16SRNA, he produced oligonucleotides of different sizes which could be separated by 2-dimensional paper electrophoresis and located by exposure to x-ray film. Each oligonucleotide could then be isolated and sequenced, producing a unique "signature"

for the 16SRNA of the species. This was all proprietary information in Woese's laboratory.

One day at the beginning of the 1970's Woese came to Wolfe's office and said that he thought he had developed a reliable technique for identifying the relatedness of bacterial species; he would like to test his system on a group of bacteria, and could a group be recommended? Wolfe suggested the genus *Bacillus* because the spore would hold the group together, and eventually the relatedness of the genera *Bacillus* and *Clostridium* could be determined. A couple of years later, the results were in, and they were convincing, suggesting that Woese's system had great potential; Wolfe became the first convert outside of Woese's laboratory. By 1974 Woese had examined the 16SRNA of 60 bacterial species.

Because a graduate student, William Balch, in Wolfe's laboratory had developed a new technique for growing methanogens in a sealed tube with a pressurized atmosphere, it was now possible to inject  $P^{32}$  in perfect safety into a growing culture of a methanogen. A collaboration with Woese was initiated. Results of the first experiment were so unusual that Woese concluded: somehow the wrong RNA had been isolated. The experiment was repeated with the same results, and this time Woese exclaimed: "Wolfe, these cells are not even bacteria!" Wolfe replied: "Of course they are, Carl; they look like bacteria in the microscope." He replied: "Well, they are not related to anything I've seen." This was the pivotal statement that opened a new era in the study of evolution, one which would occupy Woese for the remainder of his career. The immediate concern, however, was to examine and compare all pure cultures of the 7 extant species of methanogens to see if this unusual finding would be repeated; it was, and the results were classical. H. A. Barker at Berkeley, the "father" of modern research on methanogenic organisms communicated the manuscript to PNAS. The methanogens also were found to be different from bacteria in many ways. Wolfe was interested in studying their unusual metabolism which required fractionation under strict anoxic condition.

Anecdote: This anecdote might well be entitled an explosive anecdote. On the third floor of Burrill an anoxic chamber had been installed in one of the cold rooms so that Wolfe's students could fractionate unstable enzymes in a cold oxygen-free environment. One student observed that an enzyme he was studying was more stable under a hydrogen atmosphere. Unknown to others, each time the gas in the airlock was replaced, he used 100% hydrogen. One day, by mistake, air was allowed to enter the chamber. The catalysts turned red hot, and the chamber exploded blowing the 200lb door off the cold room and into the hallway. Fortunately no one was nearby in the hallway and the student inside the cold room was not hurt. One wall of the cold room was buckled, and a few cinderblocks fell through a pipe raceway to the basement where a gas pipe was broken. At the smell of gas, the building engineer quickly turned off the gas supply to the building. In the teaching labs on the second floor, Professor C. Pratt improvised alcohol lamps from vials and cord so that students could continue to use aseptic techniques in inoculation procedures.

## **II. SUMMARY OF EVENTS FOR EACH ACADEMIC YEAR OF THE 1970'S DECADE**

### 1969-1970

The academic year 1969-1970 was marked by the departure of Sol Spiegelman and K. C. Atwood with a significant loss of research funding for the Department. Spiegelman's interest in using bacterial viruses to probe viral mechanisms which interacted with cell systems in the synthesis and expression of RNA and DNA led him to be attracted to mechanisms involved in human cancer. When Columbia University offered him a position with access to patients with cancer, he accepted. He arranged for Columbia to provide an appointment for K. C. Atwood. (It was a tragedy that 13 years later, he became a victim of *cancer*.) Francis Clark retired September 1, 1970, after 44 years of association with this Department. Dr. Paul Sypherd resigned during the academic year 1969-1970 to accept a position at the University of California, Irvine.

### 1970-1971

During the academic year 1970-1971, Daniel Burke joined the Department as an Assistant Professor in charge of teaching laboratories for beginning microbiology courses. Phillip Carl, Jordan Konisky, and Michael Weber joined the Department as Assistant Professors. M. Bryant was appointed Editor-in-Chief, Journal of Applied Microbiology. L. Campbell received the Pasteur Award, Illinois Society for Microbiology. J. Drake was appointed an Editor of the Environmental Mutagen Society Newsletter. C.

Woese was appointed Associated Member of the Center for Advanced Study. R. Wolfe received the 1971 Carski Foundation Distinguished Teacher Award, ASM. M. J. Wolin was elected Councilor of the Illinois Society for Microbiology. At the invitation of Holger Jannasch, R. Wolfe and E. R. Leadbetter joined Jannasch in initiating the Microbial Diversity Course at the Marine Biological Laboratory, Woods Hole, MA. This course attracted Wolfe for 13 summers.

Anecdote by R. Wolfe: During the early years of the 1970's, Wolfe began to explore the area around Woods Hole to locate a pond or swamp where sediment would release lots of gas when stirred with a stick. A nearby freshwater swamp was found to be ideal and was given the name, Cedar Swamp. After a number of exploratory experiments a large plastic funnel fitted with a rubber stopper and filled with swamp gas was found to produce the most dramatic burst of flame as a burning match was held close, when the stopper was removed. This procedure was named the "Volta experiment" after the Italian physicist who discovered "combustible air" in swamps. Students performed this experiment in pairs early in the course, and it became a ritual of the course, which 40 years later still serves as an introductory high-point to microbial diversity. In later years a replica of Volta's pistola was made by a glassblower. The pistola was fitted with a rubber stopper and filled with Volta's gas mixture of swamp gas and air. An internal spark from an attached battery caused the gas mixture to explode with a bang, propelling the stopper as a missile. The pistola was fired during a lecture prior to the students going to the cedar swamp.

### 1971-1972

During the academic year 1971-1972, L. Campbell accepted an administrative position at the University of Delaware and was elected Vice President of the ASM. S. Drake was awarded a USPHS Special Research Fellowship. A. Helm (instructor in Microbiology 100) and S. Kaplan were selected as members of the Incomplete List of Excellent Teachers Fall 1972. M. Wolin delivered the Hotpack Lecture, Canadian Society for Microbiology. J. Wachsman and R. Kallio were on sabbatical leave. Patricia Starr joined the Department as Assistant Professor as did Michael Gabridge as Assistant Professor in Basic Medical Sciences. Linda Birnbaum was Visiting Assistant Professor in Semester II as was Joan Gallagher. Professor G. D. Vogels was a visiting professor from the Netherlands.

### 1972-1973

During the academic year 1972-1973, P. L. Carl was awarded a European Molecular Biology Short Term Fellowship at the Institute de Biologie Moleculaire, Paris. R. D. DeMoss was awarded the 1973 Pasteur Award by Illinois Society for Microbiology. A. Helm, S. Kaplan, and E. Voss were cited on the list of Excellent Teachers. Z. J. Ordal was elected as Fellow of the Institute of Food Technologists. R. Wolfe joined an expedition to study the anaerobic Lake Kivu in African Rift Valley. R. Kallio and J. Wachsman were on sabbatical leave. R. DeMoss assumed duties of Microbiology Department Head.

### 1973-1974

During the academic year 1973-1974, the Department instituted the annual Microbiology Distinguished Lectureship to recognize outstanding researchers in other Departments and foster communication between departments. Professor Robert Metcalf from Entomology delivered this year's lecture. Procter and Gamble renewed their predoctoral fellowship award. Granite City Steel awards were made to support two graduate students. One Waksman Fellowship was awarded to the Department through ASM. S. Kaplan received the American Cancer Society Award to support his sabbatical leave in 1974-1975. J. Konisky was selected as a Fellow in the Center for Advanced Study. C. Woese transferred to the department of Genetics and Development as a result of a disagreement with our Department Head. Dwayne Savage began research and teaching. E. Voss and S. Kaplan were named to the list of Excellent Teachers. Dr. Savage received the "Golden Apple" award from medical students for excellent teaching.

### 1974-1975

During the academic year 1974-1975, Procter and Gamble Co. renewed a predoctoral fellowship award. U.S.P.H. 5-year Research Career Development Awards were given to J. Konisky and M. Weber. Granite City Steel Award to support graduate student research was received. A. Wachsman Fellowship was awarded to the Department. S. Kaplan was on special assignment to study mammalian cell culture and genetics. E. Voss and P. Starr were recognized on the list of Excellent Teachers. R. Wolfe received a Guggenheim Fellowship award and The Illinois Society for Microbiology Pasteur Award.

### 1975-1976

During the academic year 1975-1976, Paul Wong, virologist, joined the Department. S. Kaplan was on a one semester leave to study programming in PLATO. R. Wolfe was on sabbatical with a Guggenheim Fellowship to study in Roger Stanier's lab in Paris and in Norbert Pfennig's laboratory in Goettingen, Germany. M. Wolin (joint appointment from Dairy Science) accepted a position at New York State Department of Health, Albany. C. Hershberger accepted a position in industry.

### 1976-1977

During the Fall semester 1976, Dr. Ellen Simon was Visiting Assistant Professor who taught the Pathogenic Bacteriology course (326). Professor Savage transferred from the School of Basic Medical Sciences into the School of Life Sciences, filling the position responsible for pathogenic microbiology. Jeffrey Gardner has accepted an Assistant Professorship with responsibility for microbial genetics and will join the Department in 1977. R. Wolfe received the SOLS Distinguished Lectureship Award. S. Kaplan received the National Science Foundation Faculty Science Fellowship Award. D. Savage was elected Fellow of the American Academy of Microbiology. Two new courses Mcbio 491 and 492 were approved and will be the vehicle for introducing each first year graduate student to four areas of scholarly activity in the Department. This was the beginning of the "rotation system" which over the years has proved to be highly successful.

### 1977-1978

Abigail Salyers joined the Department as an Assistant Professor and began her duties as of January 1978. Her primary teaching duties would be in Medical Microbiology with guest lectures in Microbiology 326. Professor Gabridge was on sabbatical leave in England with a Fogarty International Fellowship studying mycoplasma attachment to human cells in culture. Professor Reichman was designated an American Cancer Society Scholar and studied tumor viruses during the year at the Imperial Cancer Research Fund, London. Professor DeMoss was on sabbatical leave at the Florida Medical Entomology Laboratory studying bacteria in the mosquito intestinal tract. The number of students enrolled in Microbiology undergraduate courses has decreased slightly due to a switch in LAS from declaration of a "Major" to an "Area of Concentration" in which certain Microbiology courses were no longer "required". P. Carl and J. Drake resigned from the Department. Drake was appointed Director of an NIH Virology Institute in North Carolina.

Anecdote: In 1977, due to the action of an inexperienced acting Dean of LAS, the budget of SOLS was made available to department heads. S.

Kaplan as Department head was dismayed at the treatment of Microbiology in the budget. Although Microbiology faculty delivered the highest specific activity in generating external research funds, in publications, in delivering invited external seminars, in instructional units, and in undergraduate majors, it was clear that Microbiology was not receiving a fair share of the SOLS budget. At a meeting hosted by the acting Dean, the Director of SOLS, J. Larson, was unable to present reasons for this policy. The Vice Chancellor for Academic Affairs was requested to conduct an external review of SOLS. The external reviewers recommended that the Director of SOLS and each Department Head be replaced. This occurred.

### 1978-1979

Pathogenic Microbiology (326) experienced a 40% increase in instructional unit load due to the efforts of Dwayne Savage to revise and modernize the course. Beginning undergraduate course enrollments decreased slightly as a result of LAS change from "Major" to "Area of Concentration". J. Konisky was on sabbatical leave studying recombinant DNA methodology with Herbert Boyer, U. of California Medical School, San Francisco. Joint appointee M. Bryant received the Borden Award of the American Dairy Science Association and the Paul A. Funk Award, College of Agriculture. Z. J. Ordal presented the Becton Dickison Award Lecture at the ASM meeting in Los Angeles. Abigail Salyers received the "Golden Apple" Award in the Medical School for excellent teaching. John Cronan joined the Department as Professor of Microbiology in July 1978. Department head, R. D. DeMoss wrote the following statement expressing frustration between department heads in SOLS and administrators of the medical school: "Probing steps continue to be made by department heads in SOLS who have faculty involved in the School of Basic Medical Sciences toward establishing a proper role between the SMBS administrators and the medical faculty housed in Departments. Progress is not apparent." D. Burke resigned from the Department.

### **III. FACULTY RESEARCH INTERESTS, PUBLICATIONS, AND INVITED LECTURERS AND SEMINARS IN THE 1970'S DECADE**

Marvin Bryant (Joint Appt. Dairy Science): Microbes of the rumen and dairy cattle waste

- (1.) Electron flow between formate and hydrogen in *Methanobacterium ruminantium*;
- (2.) Nutrition of *Methanobacterium* MOH; (3.) Fermentation of ethanol to acetate in the S organism; (4.) Bacteria responsible for the conversion of butyrate to methane in anaerobic sewage digesters; (5.) Predominant nonmethanogenic bacteria in anaerobic

sewage digesters; (6.) Predominant ureolytic bacteria of the rumen; (7.) Cellulolytic anaerobes from human feces; (8.) Thermophilic (60°C) biological degradation and methanogenesis of dairy cattle wastes; (9.) Ammonia assimilation in *Selenomonas*; (10.) A new anaerobe which metalolizes fatty acids, butyrate to octonate requires co-culture with a hydrogen-utilizing anaerobe; (11.) Co-culture of *Desulfovibrio* and *Methanosarcina* converts lactate to carbon dioxide and methane; (12.) Study of monensin.

In this decade, Bryant published 42 articles and presented 49 invited lectures.

#### Daniel Burke: Allomyces

Life cycle of *Allomyces macrogymus*. (1.) Type of RNA necessary for sporogenesis; (2.) Inhibition of synthesis of macromolecules during life cycle stages; (3.) Diverse components found in total DNA; (4.) Plasma membrane of the mitospore; (5.) Exoproteases during the life cycle; (6.) Genetic approaches: procedures for obtaining haploid spores, U.V. killing of spores, methods for induced fusion of spores.

In the years 1971-1972 to 1977-1978, Burke published 6 articles and presented 3 invited lectures before resigning.

#### Leon Campbell: Microbial sulfate reduction and heat stable enzymes

(1.) Heat stable protease from *Streptomyces rectus*; (2.) Enzyme complex in dissimilatory sulfate reduction continues; (3.) Amino acid sequence of cytochrome C<sub>3</sub>; (4.) Alkaline phosphatase of *Bacillus* species; (5.) Amylase of *Bacillus amyloliquefaciens* genetics of amylase synthesis, and transcription of its thermophylic phage.

In the first 3 years of this decade, Campbell published 13 articles and presented 13 invited lectures before resigning.

#### Phillip L. Carl: DNA synthesis and control

(1.) Use of biochemical and genetic tools to study mutants with temperature-sensitive synthesis of DNA; (2.) Purification of DNA polymerases I, II, and III; (3.) Mechanism of caffeine action in mutants; (4.) DNA synthesis in a DNA initiation defective strain; (5.) Development of an *in vitro* assay for initiation of DNA synthesis; (6.) A new direction of research into the intestinal microflora of the mosquito *Wyeomia mitchelli*.

In the 7 years of this decade before resigning, Carl published 7 articles and presented 5 invited lectures.



### John Cronan: Membrane lipids

(1.) Regulation of membrane lipid synthesis in *E. coli*; (2.) The acyl carrier protein has unusual properties, and mutants are being studied. Thermal control of membrane lipid synthesis is an area of interest.

One book chapter and 5 articles were published in Cronan's first academic year at Illinois. No invited lectures were presented.

### Ralph D. DeMoss: Tryptophanase

(1.) Catalytic and physical properties of tryptophanase; (2.) *In vivo* function of tryptophanase in cells from natural and germ-free animals; (3.) Purification of L-serine dehydratase and its comparison to tryptophanase; (4.) Anaerobic microflora of the mouse intestine; (5.) Continuous culture of mixed bacterial populations, and use of germ-free and gnotobiotic mice in study of intestinal microflora.

In this decade, DeMoss published 16 articles and presented 4 invited lectures.

### John Drake: Bacteriophage

(1.) Mechanisms of mutations in phage T4; (2.) DNA polymerase in setting base pair substitution mutation rates with development of a general theory to describe the role of polymerase in determining the accuracy of DNA synthesis; (3.) Transversion mutations; (4.) Effects of nearby base pair substitution upon site-specific mutation rates; (5.) Role of the Alberts protein in mutagenesis.

In the first 8 years of this decade, Drake published 40 articles and presented 34 invited lectures before resigning in 1977.

### Michael Gabridge: Mycoplasma

(1.) Mass cultivation of mycoplasma on glass surfaces to provide membrane fractions free of contaminating protein to evaluate their role in pathogenesis of *Mycoplasma pneumoniae*; (2.) Classification of mycoplasma species; (3.) Membranes from *M. fermentans* as related to induction of leukemia-like disease; (4.) Human lung fibroblast system as a model for mycoplasma attachment; sialoglycoprotein as a receptor site.

In the 8 years of this decade after arriving at Illinois, Gabridge published 30 articles and presented 11 lectures.

#### Jeffrey Gardner: Threonine operon

(1.) Mechanisms of genetic regulation especially the threonine operon of *E. coli* including isolation and cloning of the controlling elements, DNA sequencing, *in vitro* transcription studies, and isolation of novel endonucleases.

In the 2 years of this decade after arriving at Illinois, Gardner published 3 articles and presented no invited lectures.

#### Alice Helm:

Helm's role in the department included teaching Microbiology 100 and assisting in the laboratory section of pathogenic microbiology.

#### Charles Hershberger: Chloroplasts of *Euglena*

(1.) Genetic structure and replication of DNA in chloroplasts of *Euglena*; (2.) What is the quantity and distributing information in the DNA of chloroplasts? (3.) How is the number of copies of the chloroplast genome per cell regulated? (4.) How is duplication of chloroplasts coordinated with total dynamics of the cell? (5.) DNA specified synthesis of ribosomal RNA; (6.) Bleached mutants without functional chloroplasts.

In the 6 years of this decade before resigning in 1975, Hershberger published 10 articles and presented no invited lectures.

#### Reino Kallio: Hydrocarbon metabolism

(1.) Metabolism of highly-branched alkanes; (2.) Mechanisms by which hydrocarbons are oxidized by bacterial enzymes; (3.) Aromatic ring oxidation by purified enzymes which convert benzene to cisbenzene glycol then to catechol; (4.) Study of correlations between source rock crude and reservoirial oils to determine reasonable drilling locations; (5.) Identifications of microbial produced fragments of petroleum degradation. He presented the first Jackson W. Foster Memorial Lecture at the University of Texas.

In this decade, Kallio published 2 articles and presented 25 invited lectures.

#### Samuel Kaplan: Membrane synthesis

(1.) Control of macromolecule biosynthesis in *E. coli* especially control of stable RNA synthesis in *E. coli*; (2.) Control of chromatophore development in *Rhodospseudomonas*

*spheroides*; (3.) The 50S ribosome in *R. spheroids*; (4.) Screening program of photosynthetic bacteria for the absence of 23S RNA; (5.) Aerobic and anaerobic tRNA-specifications in *R. spheroides*; (6.) Proteins unique to chromatophores and also proteins found both in chromatophore and cell membranes; (7.) Phages of *R. spheroides*; (8.) Control of ribosomal RNA synthesis in *E. coli*, *Proteus mirabilis* hybrids; (9.) Membranes: *in vitro* formation, purification of proteins, membrane mutants, phospholipid metabolism, genetics, structure and function.

In this decade, Kaplan published 1 book chapter, 34 articles and presented 36 invited lectures.

#### Stephen Kaufman: Lymphocytes and myoblasts

(1.) Plant proteins, abrin, from *Arbus precatorius* and hurin, from *Hura crepitans* as potent lymphocyte mitogens; (2.) Actin in non-myogenic cells; (3.) Use of tritiated poly dT to detect poly A sequences in RNA; (4.) Variant of the (fu-1) of the Lg rat myoblast line which does not fuse; (5.) Development of muscle and muscle-specific proteins; (6.) Myogenesis and transformation in L<sub>8</sub> line of rat myoblasts; (7.) Expression of endogenous virus and sarcoma genes; (8.) Cell surface changes during development.

After arriving at Illinois in 1973-1974, Kaufman published 6 articles and presented 6 invited lectures in his first 6 years.

#### Jordan Konisky: Colicins

Mechanism of colicin action on *E. coli* (1.) With correlations between colicin structure and function; (2.) Characterization of the colicin receptor; (3.) Temperature conditional mutants of *E. coli* which are sensitive at 25C but not at 37C; (4.) Structure of colicins 1a and 1b; (5.) Colicin 1a resistant mutants (defective receptors) and tolerant (good receptors, yet cells not killed) mutants; (6.) Membrane biogenesis; (7.) Regulation of the 1a receptor synthesis and coupling between inner membrane function and the expression of outer membrane components.

In the 9 years of this decade, Konisky published 19 articles and presented 18 invited lectures.

#### Richard Meyer (Joint appt., Vet. Med.): Pig diseases

(1.) Enteric diseases of baby pigs – colibacillosis; (2.) Use of coliphage in typing enteropathogenic *E. coli* from nonhuman sources; (3.) Swine Pox; (4.) Can swine enterovirus (ECPO-1) survive passage through anaerobic sludge digesters; (5.) Atrophic rhinitis.

In this decade, Meyer published 34 articles and presented 11 invited lectures.

John Ordal (Joint appt., Food Tech.): Bacterial cell injury and recovery

(1.) Thermal lesions in *Salmonella typhimurium* and the difference in recovery of cells grown in simple synthetic medium and cells grown in complex medium; (2.) Spore activating effect of reducing agents such as sodium perborate; (3.) *Staphylococcus aureus* survival of stressed cells on storage; (4.) *Pseudomonas fluorescens* P<sub>7</sub> thermal stress survival; (5.) Thermal stress on conidia of *Aspergillus parasiticus*.

In this decade, Ordal published 33 articles and presented 5 invited lectures.

Manfred Reichman: Vesicular stomatitis viruses

(1.) Multiplication of defective particles in infections with vesicular stomatitis virus; (2.) Functional expression of the RNA in defective particles; (3.) In vivo RNA synthesis; (4.) TS mutants of VSV; (5.) Relationships between the origin of RNA Defective Interfering (DI) particles of VSV on the viral genome and its ability to interfere homo- and heterotypically.

In the 8 years of this decade after transferring to Microbiology, Reichman published 24 articles and presented 14 invited lectures.

Abigail Salyers: Human intestine microbes

(1.) Utilization of polysaccharides by *Bacteriodes*, the predominant genus of bacteria in the human intestine. Degradation of xylan, a branched polymer of xylose and arabinose, is the substrate being studied by use of whole cells and of the fractionated enzymes xylanase and  $\beta$ -xylosidase. In collaboration with Jeff Gardner experiments to develop a genetic system for *Bacteriodes* have been initiated; (2.) Use of the breakdown of chondroitin sulfate as a model system for studying *Bacteriodes* metabolism in continuous cultures.

In the 2 years of this decade after joining the Department, Salyers published 11 articles and delivered 2 invited lectures.

Dwayne Savage: Microbes of the murine intestine

(1.) Definition of the gastrointestinal ecosystem of murine animals; (2.) Attachment of microbes to epithelia; (3.) Influence of indigenous microbes on their murine hosts

including immunological responses and intestinal physiology; (4.) Mechanisms by which certain microbes depress the activity levels of alkaline phosphatase in the intestinal epithelium in mice.

In the 6 years after joining the Department in 1973, Savage published 27 articles including 3 book chapters and delivered 31 invited lectures.

Patricia Starr: *Saccharomyces*

(1.) Amino acid transport in *Saccharomyces cerevisiae*; (2.) Ethionine resistant mutants; (3.) Analysis of membrane protein fractions; (4.) Methionine transport mutants.

In the 4 years before resigning, Starr published 3 articles and presented no invited lectures.

Paul Sypherd: Ribosomes

(1.) Ribosomal proteins and structure of ribosomal RNA; (2.) Proteins of the 30S ribosomes; (3.) DNA-RNA hybrids between *Salmonella/E. coli* and *Salmonella/Salmonella*; (4.) Chromosome map location of ribosomal proteins.

In his one year of this decade, Sypherd published 5 articles and delivered 5 invited lectures before resigning.

Edward Voss: Antibodies

(1.) Methods for induction of IgM antihapten antibody; (2.) Carbohydrate content of IgM; (3.) Study of a natural antibody in normal sera of nurse sharks; (4.) Study of IgM antibody-producing cells and their purification; (5.) Antibodies to detect LSD in blood; (6.) Antibodies in serum from patients with the autoimmune disease systemic lupus erythematosus; (7.) Antigen-binding receptors on rabbit antibody producing cells; (8.) Founded the fluorescein hapten system and its use in a variety of systems.

In this decade, Voss published 53 articles and delivered 26 invited lectures.

Joseph Wachsman: Thymineless death

(1.) Role of deoxyribonucleoside kinases and ribonucleotide reductase in thymineless death in *Bacillus megaterium*; (2.) Similar studies in *Lactobacillus leichmannii* in mammalian cells; (3.) Role of B<sub>12</sub> in ribonucleotide reductase in *B. megaterium*; (4.) Fast-

growing strains of mouse fibroblasts (L929) infected with reovirus type 3; (5.) Deoxycytidine kinase in *B. megaterium*.

In this decade, Wachsman published 14 articles and delivered no invited lectures.

#### Michael Weber: Rous Sarcoma Virus Research

(1.) Use of Rous Sarcoma virus to cause malignant transformation; (2.) Control of glucose transport in normal and malignant cells; (3.) Role of cyclic AMP in control of membrane permeability and cell morphology; (4.) Intra cellular transport as a regulatory mechanism; (5.) Carbohydrate containing moieties of Rous Sarcoma viruses; (6.) Control of RNA synthesis in growing and contact-inhibited cells.

In this decade, Weber published 29 articles and presented 22 invited lectures.

#### Carl Woese: The ribosome and evolution

(1.) Evolution of the cell by study of the biosynthesis of the ribosome and of various RNA components of the translation apparatus to reveal functional, structural, and evolutionary relationships among components; (2.) Attempts to prove the “reciprocating ratchet” model for translation; (3.) Use of ribosomal 16S RNA to study bacterial relationships.

Before transferring temporarily to the department of Genetics & Development, Woese published 13 articles and delivered 2 invited lectures.

#### Ralph Wolfe: Microbial Diversity

(1.) New coenzymes in methanogens. Structure and functional of coenzyme M and the deazaflavin coenzyme F-420; (2.) Activation of carbon dioxide in *Methanobacterium*; (3.) Proteolytic and cellulolytic enzymes in *Myxobacterium* AL-1.4; (4.) Anaerobic dark growth of purple nonsulfur bacteria; (5.) Morphogenesis in *Geodermatophilus*; (6.) A new thermophilic methanogen; (7.) Assay for CoM in *M. ruminantium* grown in a pressurized atmosphere of hydrogen and carbon dioxide. This technique would be of critical importance in future collaborative experiments with Carl Woese.

In this decade, Wolfe published 39 articles including 1 book chapter, and delivered 71 invited lectures.

Meyer Wolin (Joint Appt. Dairy Science): Microbial Metabolism

(1.) NADH oxidase of *Bacillus megaterium* KM separation into two fractions; (2.) Phage-binding sites in *Lactobacillus plantarum*; (3.) Conversion of ethanol to acetate and hydrogen by the S. organism; (4.) Study of fermentation interactions between anaerobes in a continuous culture of *Ruminococcus albus* and *Vibrio succinogenes* where ethanol formation is shifted to acetate formation in a 2-culture system; (5.) Aspartase of *Vibrio succinogenes*.

Before leaving the University in 1974, Wolin published 15 articles and delivered 9 invited lectures.

Paul Wong: Murine viruses

Moloney murine leukemia viruses Mo-(MuLV) and murine sarcoma viruses (MuSV). Determination of the number of genes involved in viral replication and their interactions by characterization of temperature sensitive mutants. Relatedness of these viruses and their possible involvement in carcinogenesis. (1.) Genetic analysis; (2.) Relatedness of the murine sarcoma and murine leukemia virus (MuLV); (3.) Virus and host interaction; (4.) MuLV events in virus penetration of host cell, assembly of virus, virion maturation, and packaging of virion RNA and DNA.

In the 5 years of this decade at Illinois, Wong published 13 articles and delivered 7 invited lectures.

# CHAPTER 4

## The 1980's Academic Decade

### 1979 – 1980 to 1988 - 1989

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#### I. OVERVIEW

In the first year of this academic decade, faculty members numbered 22 and in the last year 29. Annual research funding generated by the faculty increased dramatically from \$1,340,000 (direct costs) in 1979-1980 to \$3,363,000 in 1988-1989. This reflects in part the increased budgets of federal funding agencies. Faculty members including joint appointees published 718 articles including book chapters and delivered 571 external invited seminars and lectures, a significant increase over the previous decade. Student enrollment in Microbiology courses decreased from 2,630 in 1979-1980 to 2,580 in 1988-1989. Graduate students numbered 69 in the first year of the decade and 63 in the last year.

When DeMoss retired in 1982, Sam Kaplan accepted the position of Department Head. In 1987 he resigned to become Director of the School of Life Science (SOLS) replacing Joseph Larson. Kaplan moved quickly to innovated changes in SOLS. He believed that the Department of Genetics and Development was a dysfunctional unit and proceeded to dissolve it, a possibly illegal move, and one that generated much hostility within SOLS. In Microbiology, he continued his teaching duties and running of his outstanding research program. He conceived the idea for a new building for biology. He carefully documented the need for such a building, drawing on comparisons with the status of biology at our peer institutions in the Big Ten. The administration became interested and then convinced to pursue this idea. At about this point, Kaplan was dismayed to discover that Chemistry had convinced the administration that Chemistry should have “a piece of the action”. New space was badly needed for Inorganic and



Physical Chemistry. Eventually in the 90's decade a compromise would be worked out. Unfortunately, Kaplan became dissatisfied with the pace of steps toward bringing the concept of this building to fruition; he made plans to leave the University. Kaplan's building, CLSL, was built later in the 1990's.

## **II. SUMMARY OF EVENTS FOR EACH ACADEMIC YEAR OF THE 1980'S DECADE**

### 1979-1980

For the first year of this academic decade, the faculty included 2 joint members from Genetics and Development, one from Dairy Science, one from Veterinary Pathology, and 5 from the School of Basic Medical Sciences, as well as 69 graduate students, and 23 postdoctoral students and associates.

### 1980-1981

The Mcbio 326, pathogenic microbiology, enrollment increased 53%. The course had been upgraded, modernized, and divided into lecture (Mcbio 326) and laboratory (Mcbio 328) in 1979-1980. The department instituted a Departmental Research Conference in November 1980 held at Allerton Conference Center. Faculty members presented brief discussions of their research programs to graduate and postdoctoral students as well as faculty. Seven representatives of industry responded to invitations to attend the conference as observers. The two-day conference was an overwhelming success judging from comments from all groups, noting the informality of research discussions, the location away from campus, and the opportunity to discuss leisurely problems of interest to industry. John Scott was recruited as an Assistant Professor in Basic Medical Sciences. R. Wolfe was elected to the National Academy of Sciences, the American Academy of Arts and Sciences, and the Center for Advanced Study. S. Kaplan received the Pasteur Award of the Illinois Society for Microbiology. A. Salyers received the "Golden Apple" award for excellent teaching of medical students. M. Weber and A. Helm were included in the Daily Illini "Incomplete List of Excellent Teachers". Total student enrollment in courses was 2,559.

### 1981-1982

The second annual Allerton Microbiology Research Conference was held in November 1981. Again, the two-day conference was considered a resounding success. A. Helm was cited in the Daily Illini list of outstanding teachers. A. Salyers received the

“Golden Apple” award for excellent teaching of medical students. P. Wong was on sabbatical leave studying DNA manipulation techniques at Oregon State University. D. Savage was on sabbatical leave in New Zealand. Dr. Carol Muster joined the Department as Visiting Research Assistant Professor. Total student enrollment in courses was 2,554.

### 1982-1983

S. Kaplan assumed duties as Department Head. Professor Emeritus F. M. Clark set up an endowment of funds to be used in encouraging research and teaching excellence by both undergraduate and graduate students. This year, two awards of \$400 each were made to two undergraduates for best senior research theses. Two awards of \$150 each were awarded to two undergraduates for attaining the highest overall grade point average. Two \$150 awards were made to junior Microbiology majors for their high grade point average. R. DeMoss retired from the departmental headship in August 1982. This Department was rated among the top 10 in Microbiology by most measures, and was the only life science department so ranked in the state of Illinois by the Conference Board of Associated Research Councils in their “Assessment of Research Doctorate Programs in the United States.” Again, A. Helm was in the list of Outstanding Teachers. R. Wolfe received a von Humbolt fellowship to study with Rolf Thauer in Marburg and N. Pfennig in Konstanz. Total student enrollment in courses was 2,882.

### 1983-1984

This was S. Kaplan’s first full year as Department Head. J. Wachsman resigned to take a position in industry. M. Weber moved to the University of Virginia. Total student enrollment in courses was 3,002. Carl Woese received the MacArthur “genius” award.

### 1984-1985

R. E. Kallio retired as Professor of Microbiology. A. Salyers and E. Voss were on sabbatical leave. S. Maloy joined the Department as Assistant Professor after completing a postdoctoral with John Roth. Total student enrollment in courses was 2,667.

### 1985-1986

S. Kaplan was awarded the Carski Distinguished Teacher Award by the American Society for Microbiology. R. Tuveson joined the Department as Professor of

Microbiology. J. Gardner, M. Reichman, S. Kaufman, and J. Cronan were on sabbatical. Joint appointee M. Bryant died. J. Scott resigned. A. Helm was again listed as an Outstanding Teacher. Total student enrollment in courses was 2,558. Stan Maloy suggested that the Volta experiment should become an event at the annual Allerton scientific retreat. In certain areas of the pond, adjacent to the conference building, microbial activity in the sediment was found to produce sufficient amounts of gas. The Volta experiment evolved into a 'rite of passage' as each new faculty member was encouraged to participate, and with few exceptions each one did so, sometimes with memorable results.

Two anecdotes from later years:

Anecdote by Peter Orlean: "While assisting with the Volta experiment Orlean got a foot stuck under a submerged branch and couldn't extricate himself from the pond. His unappealing option was to leave a wader behind and swim for shore. Heroically, his partner, Fouke, came to the rescue and dragged him out. Fouke, who had prepared for the Volta by changing into a swim suit and divers booties beforehand had trouble finding his pile of clothes after the experiment."

Anecdote by Joanna Shisler: "From what I remember, Richard Tapping and I did the experiment together. We had an excellent flame at least 2 feet high; well worth the leaky boots that both of us had!"

### 1986-1987

Vytas Bankaitis joined the Department as Assistant Professor. His research interests concern the Golgi apparatus in yeast. Michael Plewa (Professor of Genetics) received a joint appointment as did David Stahl (Assistant Professor, Veterinary Science). P. Wong resigned. S. Maloy was listed as an Excellent Teacher by the D. I. Total student enrollment in courses was 2,413.

### 1987-1988

S. Kaplan became Editor in Chief, Journal of Bacteriology, and Director of the School of Life Sciences. J. Konisky became Head, Department of Microbiology. C. Pratt, in addition to his teaching duties, became Assistant Department Head. S. Maloy and A. Helm again were listed as Excellent Teachers by the D.I. Total student enrollment in courses was 2,392.

### 1988-1989

Gary Olsen joined the Department as Assistant Professor. His research interests concern sequence analysis of microbial genomes. Sondra Lazarowitz joined the Department as Assistant Professor. Her teaching duties included presenting virology to medical students. S. Maloy and A. Helm were again listed as Excellent Teachers by the D.I. D. Savage became department head at the University of Kentucky. C. Woese was elected to the National Academy of Science. He delivered the Roger Stanier Memorial Lecture at Berkeley. Total student enrollment in courses was 2,158.

### **III. FACULTY RESEARCH INTERESTS, PUBLICATIONS, AND INVITED LECTURERS AND SEMINARS IN THE 1980'S DECADE**

#### Carolyn Bergholz (Visiting Assistant Professor): Simian Sarcoma Virus (SSV)

Gene expression of the transforming virus (SSV) and gibbon ape leukemia virus (GALV) components in clonal marmoset cell lines and analysis by proteins synthesized.

In the 2 years as Visiting Assistant Professor, Bergholz delivered 3 invited lectures and published 4 articles.

#### Vytas Bankaitis: Genes and products mediating protein traffic through the Golgi apparatus in *S. cerevisiae*

(1.) Mutants that affect normal Golgi function; (2.) Mutant alleles of yeast SEC14; (3.) GLG1 gene location.

In the 3 years after joining the Department, Bankaitis published 9 articles and delivered 14 invited lectures.

#### Marvin Bryant (Joint Appointment Dairy Science): Anaerobes

(1.) Ammonium assimilation, urease formation and glutamate synthase; (2.) New group of syntrophic anaerobes: *Syntrophobacter* and *Syntrophomonas*; (3.) Action of monensin on methanogens in the rumen; (4.) *Eubacterium limosum* growth on one-carbon compounds producing acetate and butyrate; (5.) *Bacteriodes rumenicola* and the effect of monensin; (6.) *Succinivibrio dextrinosolvens*; (7.) *Peptostreptococcus productus*, a most effective metabolic, mesophilic anaerobe, is one of the most numerous bacteria

in the human GI tract; (8.) *Syntrophococcus*, a new species that uses benzoid compounds.

Before his death, Bryant published 38 articles and delivered 24 invited lectures in this academic decade.

John Cronan: Regulation of fatty acid synthesis and protein-lipid interactions in *E. coli*

(A.) Fatty acid synthesis: (1.)  $\beta$ -ketoacyl-acyl carrier protein (ACP) synthetase II; (2.) Regulation of fatty acid composition at a given temperature; (3.) Methods to purify native acyl-ACP substrates. (B.) Protein lipid interaction: (1.) Biochemical and genetic study of the lipid-containing bacteriophage PR4; (2.) Cyclopropane fatty acid synthase; (3.) Mutants of pyruvate oxidase; (4.) Penetration of proteins into the lipid bilayer.

In this academic decade, Cronan published 86 articles and delivered 40 invited lectures.

Ralph DeMoss: Intestinal microflora of the mosquito

(1.) Bacteria are being isolated from the mosquito, *Wyeomia mitchelli*, crop, intestinal tract, and larval intestine tract. So far no strict anaerobes or gram positive bacteria have been detected.

In this academic decade, DeMoss published 1 article and delivered no invited lectures before retiring in 1982.

Jeffrey Gardner: Threonine operon and restriction endonucleases

(A.) Regulation of the threonine operon (*thr*) of *E. coli*: (1.) DNA sequencing of the controlling elements and isolation of regulatory mutations; (2.) Use of an *in vitro* transcription system with purified RNA-P and restriction fragment DNA templates. (B.) Restriction endonuclease. Type II restriction endonucleases from strains of *R. sphaeroides* (collaboration with Kaplan's laboratory). (C.) Mutations in phage  $\lambda$  to understand regions of phage DNA involved in recognition and recombination by phage enzymes. (D.) Development of a genetic system in *Bacteriodes* (collaboration with A. Salyers). (E.) Phage encoded protein (Int). (F.) New method for increasing the average yield of mutants from 0.1% to 5-50%.

Gardner published 28 articles and delivered 20 invited lectures in this academic decade.

### Alice Helm:

Helm is in charge of teaching Microbiology 100 in each semester and is in charge of Mcbio 328 Labs A and B in the Fall Semester and Mcbio Labs 312 A and B in the Spring Semester.

### Reino Kallio: Microbial action on petroleum

(1.) Isolation, identification, and mode of formation of high molecular weight (C<sub>40</sub>- C<sub>65</sub>+) compounds produced during biodegradation; (2.) Techniques for assessing potential drill sites for petroleum.

Kallio published no articles and delivered 5 invited lectures before retiring in 1985.

### Samuel Kaplan: Cell membranes

(1.) *In vivo* formation of cell membrane; (2.) Fractionation of alternative cellular membranes; (3.) Purification of membrane proteins; (4.) Analysis of membrane mutants; (5.) Phospholipid metabolism and membrane synthesis; (6.) Structure and function of cell membranes; (7.) Genetics of membrane development, particularly the inducible photosynthetic membrane in *Rhodospseudomonas sphaeroides*; (8.) *In vitro* synthesis of RNA and DNA of membrane polypeptides; (9.) *R. sphaeroides* specific promoters; (10.) Physical and genetic mapping of *R. sphaeroides* chromosome; (11.) RNA polymerase: comparison of *in vivo* and *in vitro* transcripts.

Kaplan published 74 articles and delivered 66 invited lectures during this academic decade.

### Stephen Kaufman: Differentiation of developing skeletal muscle

(1.) Development of skeletal muscle especially the control of replication during differentiation and cell-cell interaction; (2.) Development changes in myoblast membranes that are important in interaction with the environment of the cell; (3.) Stage-specific developmental on the cell surface; (4.) Use of immunofluorescence on single cells to explore dynamic remodeling of myoblast membrane in biochemical and morphologic differentiation in skeletal muscle; (5.) Membrane antigen, H36 in skeletal and cardiac muscle.

Kaufman published 17 articles and delivered 21 invited lectures in this academic decade.

Jordan Konisky: Colicins; *E. coli* outer membrane

(1.) Cloning of colicin Ia and V by use of recombinant DNA techniques, the ultimate goal being to determine the complete DNA sequence and the derived amino acid sequence; (2.) Use of [<sup>3</sup>H]-1-Azidopyrene to probe the interaction of small hydrophobic molecules with *E. coli* outer membrane under conditions of stress; (3.) Role of outer membrane proteins in active transport of iron; (4.) Use of recombinant DNA to identify genes involved in colicin production and resistance; (5.) Development of a genetic system for *Methanococcus voltae*: genes his A and arg G; (6.) Primary sequence of each colicin; (7.) Exclusive focus on methanogenic organisms (a.) ATP formation, (b.) Transport system for HSCoM, (c.) Development of methanogen gene vectors.

In this academic decade, Konisky published 39 articles and delivered 24 invited lectures.

Stanley Maloy: The *put* genes in *Salmonella*

(1.) Mutants with altered levels of expression of the *put* genes; (2.) *PutA* gene as a DNA binding protein; (3.) Structure and function of the *putP* gene; (4.) Regulation of the *put* operon; (5.) Regulation of the glyoxylate shunt; (6.) Proline transport.

In the 5 years after joining the Department, Maloy published 11 articles and delivered 16 invited lectures.

Carol Muster (Visiting Research Assistant Professor): Tn1 and Tn3 replicons

(1.) Replication requirements for the first step of transposition; (2.) Transposition immunity; (3.) Behavior of direct repeats of a Tn1 derivative; (4.) Transposon Tn1/Tn3 mediated recombination and transposition immunity. C. Muster is Director of the Biology Honors Program and Director of the P3 Facility.

In this academic decade, Muster published 1 article and delivered no invited lectures.

Gary Olsen: Comparative Sequence Analysis of Microbial Genomes

(1.) Multiplex automatic sequencing of DNA; (2.) Computation facilities now moved to the Beckman Institute.

Olsen joined the Department in the last year of this academic decade, publishing 6 articles and delivering 3 invited lectures.

Michael Plewa (Professor of Genetics, joint appointment): Plant-activated promutagens

(1.) Use of plant cells grown in suspension to serve as a metabolic activation system and to detect specific genetic end points; (2.) Use of yeast shuttle vector pMP4 to isolate information from mutated region of HIS4A of the yeast chromosome; (3.) Microbial and plant genetic assay system for use in genetic toxicology.

After receiving a joint appointment in this Department in 1986, Plewa published 16 articles and delivered 3 invited lectures in the last 3 years of this decade.

Charles Pratt: Control of alkaline phosphatase synthesis

Prof. Pratt is responsible for courses McBio 101, 200, 201

(A.) Research not initiated in 1979-1980. (B.) In charge of teaching Microbiology 101, 102, and associated laboratory sections. (C.) Maturation process of converting nascent polypeptides to active enzymes: (1.) *E. coli* alkaline phosphatase disulfide bond formation, folding and incorporation of Zn and Mg; (2.) Rous sarcoma virus envelop protein precursor. (D.) Formate dehydrogenase of *Methanococcus voltae*.

In this academic decade, Pratt published 1 article and delivered no invited lectures.

Manfred Reichman: Vesicular stomatitis virus (VSV)

(1.) Use of defective interfering (DI) particles to inhibit VSV *in vitro* and *in vivo* RNA transcription; (2.) The shut-off of host RNA and protein synthesis following infection by VSV and polio virus; (3.) Use of VSV mutants which inhibit DNA synthesis but not protein synthesis; (4.) Molecular characterization of unique animal papillomaviruses; (5.) VSV from an epidemic in 1982 of horses in Colorado; (6.) Rabbit oral papillomavirus (ROPV); (7.) Inhibition of adenovirus DNA by VSV; (8.) Analysis of DNA from a monkey wart and comparison to human papilloma virus (HPV).

Reichmann published 31 articles and delivered 6 invited lectures in this academic decade.

Abigail Salyers: Interaction of members of the normal bacterial flora of the human colon with each other and with the human host

(1.) Location of enzymes for polysaccharide breakdown; (2.) Efficiency of *Bacteroides* utilization of polysaccharides at slow growth rates; (3.) The unused components of polysaccharides which result from growth of *Bacteroides*; (4.) Induction of polysaccharide-degrading enzymes; (5.) Development of a genetic system for



*Bacteroides* (collaboration with J. Gardner); (6.) DNA coding for inducible chondroitin-degrading enzymes; (7.) *Bacteroides* transposon Tn4351; (8.) Use of species-specific DNA probes to estimate population numbers in human feces; (9.) Conjugal elements in *Bacteroides*.

Salyers published 57 articles and delivered 29 invited lectures in this academic decade.

Dwayne Savage: Interaction of microorganisms indigenous to the gastrointestinal tract with their mammalian host

(1.) Use of laboratory mice as model organisms; (2.) Mechanisms by which certain microbes remain and proliferate in their habitats in the tract; (3.) Mechanisms by which microbes influence absorptive enzymes in the epithelial cells of the intestine; (4.) Use of germ-free mice to study rates of epithelial cell multiplication and transit; (5.) Use of the motility apparatus of *Roseburia cecicola* to colonize the mucous gel of the columnar epithelium in the cecum.

In the 9 years of this academic decade before resigning to become Head of a Microbiology Department at another university, Savage published 55 articles and 27 book chapters. He delivered 60 invited lectures.

John Scott: DNA replication in eukaryotic cells of *Saccharomyces cerevisiae*

(1.) Use of small circular DNA plasmids which replicate under nuclear control to study DNA binding, DNA dependent nucleoside triphosphatases, DNA polymerase, RNA polymerase, RNAase, DNAase, DNA ligase, and DNA twisting; (2.) Specifically understanding of the chromosomal replicator ARS1.

In the 5 years in this Department before resigning, Scott published 6 articles and delivered 9 invited lectures.

David Stahl (Assistant Professor of Veterinary Medicine, joint appointment): Use of 5S, 16S and 23S ribosomal RNAs as historical documents

(1.) Use of RNAs to characterize natural microbial communities; (2.) Microbial ecology of the rumen as a model system; (3.) The complex microbial etiology in disease; (4.) Natural microbial biofilms.

In the 3 years of his joint appointment with this Department, he published 10 articles and delivered 13 invited lectures.

Robert Tuveson (Professor of Microbiology): Near-UV inactivation and mutagenesis

(1.) Fundamental photodynamic effects of near-UV; (2.) Phototoxicity of plant-derived photo toxins; (3.) Phototoxicity of non-carcinogenic polycyclic aromatic hydrocarbons; (4.) Use of mammalian cells carrying *E. coli* gene (gpt) to induce mutants resistant to 6 thioguanine.

In the final 3 years of this academic decade, Tuveson published 14 articles and delivered 1 invited lecture.

Edward Voss: Autoimmune antibodies; anti-fluorescein antibodies; antigen-binding receptors

(1.) Antigen determinants recognized by autoimmune antibodies; (2.) Creation of hybridomas; (3.) High affinity rabbit IgM antibodies specific for a hapten determinant; (4.) Autoimmune monoclonal antibodies which represent the major categories of systemic lupus erythematosus disease; (5.) Cloning of the 4-4-20 (prototype) gene.

Voss published 71 articles and delivered 77 invited lectures in this academic decade.

Joseph Wachsman: Plasminogen activator (PA) liberated by human neuroblastoma cells

(1.) PA is a serine protease; (2.) PA and urokinase affinities for fibrin and Km's for plasminogen are being studied; (3.) Rat myoblast line L8E63.

Before resigning in 1984, Wachsman published 2 articles and delivered no invited lectures.

Michael Weber: Malignant transformations by Rous sarcoma virus (RSV)

(1.) Molecular analysis of primary membrane events in Rous transformation; (2.) Primary targets of the src gene product; (3.) Protease-activated prodrugs for cancer chemotherapy; (4.) Increased glucose transport and metabolism caused by malignant transformation; (5.) Plasmin-activated anti-cancer drugs; (6.) Use of monoclonal antibodies to study proteins which become phosphorylated on tyrosine during RSV-transformation.

Before moving to the University of Virginia in 1983, Weber published 28 articles and delivered 26 invited lectures.

Carl Woese (Joint appointment Genetics and Development during the first 7 years of this academic decade): 16S ribosomal RNA

(1.) Use of 16S rRNA to study phylogeny of eubacteria and archaeobacteria; (2.) sequence of the 16S rRNA gene of *Halobacterium volcanii* and *Sulfolobus solfatarius*; (3.) Archaeobacterial genes have introns; (4.) 23S rRNA sequences of archaeobacteria to study 23S rRNA of higher order structure; (5.) Cloning and sequencing of 7S rRNA genes for archaeobacteria.

In the 4 years of this academic decade in which Woese submitted an annual report, he published 16 articles and delivered 2 invited lectures.

Ralph Wolfe: Microbial diversity

(1.) Study of 7 new water-soluble coenzymes found in methanogens; (2.) An unidentified growth factor for *Methanobacterium mobile*; (3.) Differences between methanogens and typical prokaryotes; (4.) Magnetotactic bacteria; (5.) New genera of acetogenic bacteria; (6.) New methanogen *Methanococcus jannaschii* from a hydrothermal vent.

Wolfe published 75 articles and delivered 98 invited lectures in this academic decade.

Paul Wong: Moloney strain and murine leukemia (Mo-MuLV) and sarcoma (MuSV) viruses

(1.) MuLV gene products in replication and virus-cell interactions by use of temperature-sensitive mutants; (2.) Interaction between xenotropic and ecotropic MuLV; (3.) Viral protein-nucleic acid interaction and maturation of the virus; (4.) Use of clonal dog cell lines (a.) to isolate DNA provirus, (b.) construction of hybrid genomes between mutants and wild type virus, (c.) molecular cloning of integrated viral DNA with flanking sequences; (5.) Use of MoMuLV to determine molecular and genetic basis of uncontrolled T-cell proliferation.

Wong published 20 articles and delivered 9 invited lectures in this academic decade before resigning in 1986.

# CHAPTER 5

## The 1990's Academic Decade

### 1989 – 1990 to 1998 - 1999

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Data presented for this decade do not fully represent the activities of the faculty as the annual reports for several years are missing or incomplete

#### I. OVERVIEW

Early in this decade the microbial community began to show signs of accepting Carl Woese's tree of species based on 16S rRNA analysis. The beginning was slow until editors Madigan, Martinko, and Parker of the textbook, *Biology of Microorganisms*, decided to present a full treatment of Woese's phylogenetic tree. Other textbooks soon followed, and at the end of the decade editors of biology textbooks began a serious consideration of Woese's phylogenetic tree of life, a subject treated with disdain for 25 years.

At the beginning of this Decade, Jordan Konisky resigned as Department Head to assume duties as Director of SOLS. He was replaced by Charles Miller as the new head, Department of Microbiology. One of Miller's first priorities was to hire a new microbial physiologist to replace R. Wolfe. James Imlay was recruited and joined the Department in 1992.

Anecdote by Imlay: "When I was being recruited by the Department, I came for a second visit with my wife, Kari, and our infant son. Because we were dealing with a young one, Charles and Judy hosted us for a small dinner at their new house, whose construction had just finished; they invited Stan and Lisa Maloy and John and Betsey Cronan to join us. When we arrived, the Maloy's were there but the Cronan's were not. Suddenly Charles turned to Judy and asked whether she had told them where the house was. No, she had thought he would do that. The address was not

yet listed in either the departmental list or the phone book. Well, announced Charles, John will figure it out from first principles. And a moment later the doorbell rang". Today, "John will figure it out" is still used with admiration.

The new building continued to be a major project, and a compromise over its mission was worked out: the building would be named Chemical and Life Sciences Laboratory (CLSL) and would provide space for the Departments of Microbiology and Cellular and Structural Biology. Although doubters existed, the building was "sold" on the concept that Biology in the 21<sup>st</sup> Century would increasingly involve chemistry. This was a safe bet. A major event of this decade involved reorganization of the School of Life Sciences (SOLS). After Jordon Konisky resigned as Director of SOLS in 1997, the Dean of LAS asked Charles Miller to become Director. With considerable reluctance, Miller finally agreed to accept this position. John Cronan accepted the position as Head of the Department of Microbiology.

Miller was heavily involved along with Paul Mortenson in working out the many details of space in CLSL for MCB including the seminar room on the fourth floor bridge. One of Miller's major accomplishments was to negotiate with the Dean and Department Heads of SOLS a solution to a problem which had plagued SOLS and its executive committee (which consisted of Department Heads) since the founding of SOLS in the 1960's. The executive committee was a dysfunctional entity on many issues where each Department Head defended a perceived "turf". For example, departments which had a major focus in areas of behavior and ecology felt threatened by the growing areas of molecular genetics, molecular biology, and biochemistry. They resisted any efforts in SOLS to join national trends in emphasizing these disciplines.

The solution which Miller engineered was to divide Biology in LAS into the School of Integrative Biology (IB) and the School of Molecular and Cellular Biology (MCB). Each Department would choose which school to join. (Biochemistry later moved from the School of Chemical Sciences to MCB.) This solution has proven to be highly successful.

MCB has set high standards for undergraduate course work. Each Department defines its own requirements for the PhD degree. For example, Microbiology requires that each PhD candidate, prior to receiving a PhD degree, must have published, or have in press, two articles in a first class, peer reviewed journal. Although data are incomplete for certain years, in this academic decade, faculty members published 561 articles including book chapters and delivered 503 invited seminars or lectures.

## **II. SUMMARY OF EVENTS FOR EACH ACADEMIC YEAR OF THE 1990'S DECADE**

### 1989-1990

During this first year of the academic decade, J. Konisky resigned as Department Head to assume duties as the Director of SOLS. He replaced S. Kaplan who resigned to become Head of Microbiology at the University of Texas Health Sciences Center at Houston after 23 years as a member of this Department.

Anecdote by Jeff Gardner: Several years after leaving the Department Kaplan had a pacemaker installed causing his friend, Jeff, to quip, "So he really does have a heart."

A search was initiated for a new Department Head, and R. Wolfe became Acting Department Head for one year. The search was successful; Charles Miller was recruited from Case-Western University. S. Farrand, College of Agriculture, accepted an Adjunct Appointment in this Department and was invited to teach J. Konisky's course in microbial physiology.

### 1990-1991

Charles Miller assumed duties as Department Head. R. Wolfe became Professor of Microbiology Emeritus. David Stahl, a former student of C. Woese and Assistant Professor of Veterinary Medicine, received an Affiliate appointment and taught McBio 309.

### 1991-1992

C. Woese received the Leeuwenhoek Gold Medal from the Dutch Society for Microbiology. This prestigious Medal is awarded every 10 years for outstanding contributions to the field, and its recipients constitute a long list of elite microbiologists including Louis Pasteur. He also received the Twenty-third Brown-Hagen Award. V. Bankaitis resigned to become Associate Professor at the University of Alabama Medical School in Birmingham. D. Celandier joined the Department as an Assistant Professor. S. Maloy was on sabbatical during the Fall semester at the California Institute of Biological Research in San Diego in the laboratory of Phil Youderian.

### 1992-1993

James Imlay joined the Department as Assistant Professor in the area of microbial physiology. David Nunn also joined the Department as an Assistant Professor. Affiliate Appointee, D. Stahl, leaves the University. E. Vimr of the College of Veterinary Medicine received a joint appointment. D. Rivier received a joint appointment. A. Salyers was on sabbatical leave at Princeton. J. Cronan was on sabbatical leave in Adelaide, Australia.

### 1993-1994

E. Reichman retired from the Department. A. Salyers and D. Whitt publish their book, Bacterial Pathogenesis, which received good reviews and became a popular textbook. J. Slauch joins the Department as a faculty member in the Medical School. Charles Miller was listed as a DI Excellent Teacher.

### 1994-1995

J. Konisky was on sabbatical. A. Salyers received the Pasteur Award from the Illinois Society of Microbiology.

### 1995-1996

A. Salyers was named a University Scholar 1995-1996 and was named an ASM Foundation Lecturer. She began a 5-year commitment as co-director of the 8-week summer course in Microbiology Diversity at the Marine Biological Laboratory, Woods Hole, MA. R. Wolfe received the ASM Abbott Lifetime Achievement Award. The new building, CLSL, came on line in 1996.

#### 1996-1997

J. Konisky resigned as Director of SOLS and Professor of Microbiology to assume an administrative position at Rice University. James Slauch was on the “list of teachers ranked as excellent”, an event that would be repeated 29 times in the next 21 years.

#### 1997-1998

C. Miller became Director of SOLS and played a key role in dividing SOLS into two schools, the School of Molecular and Cellular Biology of which he was the founding Director, and the School of Integrative Biology. J. Slauch began a 4-year commitment as an Instructor in the Cold Spring Harbor summer Genetics Course. R. Wolfe received the ASM Proctor and Gamble Award in Environmental Microbiology.

#### 1998-1999

John Cronan became Head, Department of Microbiology. E. Voss retired.

### **III. FACULTY RESEARCH INTERESTS, PUBLICATIONS AND INVITED SEMINARS AND LECTURES IN THE 1990'S DECADE**

#### Vytas Bankaitis: The Golgi Apparatus in *Saccharomyces*

(1.) Action of the SEC14p protein at a late Golgi compartment; (2.) Regulatory pathway through which SEC14p activates Golgi secretory function; (3.) The Golgi compartment that is defective in *sec14<sup>ts</sup>* mutants. Bankaitis resigned May 20, 1992. No Annual Report submitted 1991-1992.

In the two years before departing, Bankaitis published 7 articles and presented 19 invited seminar and lectures.

#### Daniel Celander: RNA structure and function

(1.) Understanding of catalytic RNA and regulatory RNA structural biology. Group I intron structure in relation to the kinetic timing of splicing; (2.) Yeast in RNA transport pathways; (3.) Bacteriophage genetic system to detect for RNA-binding *in vivo*; (4.) RNAase P in ciliated protozoa; (5.) Conformational changes of the RNA-protein complex.



In the 6 years before resigning, Celander published 7 articles and presented 12 invited seminars and lectures.

Antony Crofts: Structure/function relationships in photosynthetic energy conversion

- (1.) Use of molecular engineering to change the protein catalytic site in photocatalysis;
- (2.) Biophysical aspects of electron transfer and coupling to ATP synthesis.

In the 2 years that Crofts was an affiliate member of this Department, he published 16 articles and delivered 2 invited seminars and lectures.

John Cronan: Phospholipids, structure and function in biological membranes

- (1.) Order-disorder phase transition of phospholipids;
- (2.) Regulatory mechanisms determining the acyl group composition;
- (3.) Use of genetic manipulation *in vivo* and *in vitro* in *E. coli*, enzymology, physiological and physical studies as tools to study specific protein-lipid interaction in membranes.

In this decade, Cronan published 86 articles and delivered 39 invited lectures and seminars.

Stephen Farrand: Conjugal transfer of Ti plasmids

- (1.) Cloning and characterization of the region of pTiC58 which encodes a repressor activity that negatively regulates expression of conjugal transfer and catabolism of the Tra-inducing opines;
- (2.) Region of the octopine-type Ti plasmid, pTi15955 which encodes catabolism of mannopine and agropine;
- (3.) Root colonization by rhizosphere bacteria;
- (4.) Production of the antibiotic, agrocin.

In this decade, Farrand published 49 articles, 9 book chapters, and delivered 26 invited lectures. One of these papers was selected for inclusion in a compendium of the 35 most important papers published in *Agrobacterium* biology. In: E. W. Nester, M. P. Gordon, and A. Kerr, (eds.) *Agrobacterium tumefaciens*. From Plant Pathology to Biotechnology. APS Press, 2004. Two of these papers were selected for inclusion in Journal Highlights, ASM News, 1997.

Jeffrey Gardner: Site-specific recombination by bacteriophage lambda, DNA binding proteins

(1.) Study of the requirement of Integrase (Int) protein encoded by lambda and the Integration Host Factor (IHF) encoded by *E. coli* to integrate the lambda chromosome into *E. coli* chromosome; (2.) Mechanism of transcription termination and pausing by the *E. coli* RNA polymerase; (3.) Recombination protein Xis, and proteins Ece RI restriction endonuclease and methylase.

In 8 years of this decade, Gardner published 35 articles and delivered 26 invited seminars and lectures. Data for lectures delivered are incomplete.

Alice Helm: Instruction

McBio 100 each semester; McBio 312 A & B Spring Semester; McBio 328 A & B Fall Semester.

In 1989-1990, 1993-1994 and 1994-1995, Helm received the DI Outstanding Teacher Award. In 1994-1995, she was on the Panhellenic Council Outstanding Teacher List.

James Imlay: Oxidative Stress

(1.) Fumarate reductase as a suspected succinate-reducible respiratory component that evolves superoxide; (2.) Anaerobic synthesis of iron SOD and forestalling of oxidative toxicity on re-aeration; (3.) Reduced-sulfur auxotrophy of SOD mutants; (4.) Mechanism of oxidative DNS damage; (5.) Flavin as the reactive site common to enzymes that inadvertently react with oxygen.

Imlay joined the Department in the year 1992-1993 and in 6 years published 11 articles and presented 14 invited seminars and lectures. Data for lectures delivered are incomplete.

Jordan Konisky: *Methanococcus voltae*

(1.) Characterize the molecular biology and life cycle a virus-like particle which contains covalently circular DNA and protein; (2.) Characterization of the molecular biology and function of the membrane-associated P-type ATPase which he discovered; (3.) Gene expression in methanogenic archaeobacteria; (4.) Evolution of proteins, the adenylate kinases of marine methanogens. 1989-1997 Director, School of Life Sciences; 1994-1995 sabbatical.

In the first 6 years of this decade, Konisky published 18 articles and delivered 21 invited seminars and lectures.

Sondra Lazarowitz: Plant pathogenic geminiviruses squash leaf curl (SqLCV) and maize streak (MSV)

(1.) Molecular analysis of viral replications, viral movement in the plant and disease development; (2.) Mutant B component of SqLCV-R and its host-dependent movement; (3.) Interaction of the viral replication protein AL1 with the 200 bp common region in these viruses.

In the first 6 years of this decade, Lazarowitz published 9 articles and delivered 19 invited seminars and lectures. She resigned in 1996 to accept a position at Cornell.

Stanley Maloy: The put operon

(1.) Determination of the role of the long untranslated leader sequence preceding the putP gene; (2.) How the putA protein binds to the cytoplasmic membrane; (3.) Cloning and characterization of the put operon from *Klebsiella aerogenes*; (4.) Proline permease; (5.) Mutants of *S. typhimurium* that prevent uptake of phage DNA; (6.) Peptidyl prolyl-cis-trans-isomerase (rotamase).

In the first 6 years of this decade, Maloy published 30 articles and delivered 42 invited seminars and lectures.

Charles Miller: *Salmonella* pepT genes and bacterial proteases

(1.) Mutations that effect the anaerobic regulation of the pepT gene; (2.) Processing of a phage P22 protein by the host OpdA protease; (3.) Transposon-mediated recombination using *E. coli* transposable elements.

In the 6 years for which data are available, Miller published 17 articles and presented 9 invited seminars and lectures.

Carol Muster: Lecturer – School of Life Sciences; Director – Honors Biology Program SOLS

Muster taught Biology 151, 390M and in 1991-1992 Biology 151 The Cell; In 1993-1994 she received DI Excellent Teacher recognition which has recurred several times.

David Nunn: Molecular pathogenesis and microbial physiology

(1.) Description of specialized secretion machinery required for export of toxins and hydrolytic enzymes from the human pathogen *Pseudomonas aeruginosa*; (2.) Exotoxin A; (3.) Elastase; (4.) Phospholipase C; (5.) Lipase; (6.) Stapholytic enzyme; (7.) Alkaline phosphatase.

Nunn joined the Department in 1992-1993 and in the next 5 years, published 10 articles and delivered 4 invited seminars.

Michael Plewa: Plant activation of aromatic amines – environmental mutagenesis

(1.) Isolate, purify, and characterize plant activated products of m-phenylenediamine, benzidine, 4-aminobiphenyl and 2-aminofluorens; (2.) Molecular dosimetry of these agents and definition of their DNA adduct; (3.) Mutant spectra analysis of these agents in bacteria and hamster ovary cells; (4.) Affinity of the agents as substrates for human and bacterial O/N-acetyltransferases.

When the Department of Genetics and Development was discontinued, Plewa joined Microbiology. Data are unavailable for only 2 years of this decade. He published 10 articles and delivered 7 invited seminars and lectures. He retired in 1993.

Gary Olsen: Microbial genome sequencing

(1.) Technique development and testing; (2.) Automation of sequence analyses to detect potential nucleotide interactions concerning the three-dimensional structure of RNA (collaboration with Overbeek); (3.) Critical analysis of available phylogenetic analytic techniques.

For 6 years of this decade, Olsen published 25 articles and delivered 30 invited seminars and lectures. Data are incomplete for the last 4 years of this decade.

Charles Pratt: Teaching, McBio 200, 201; Oxidation of formate by *Methananoecoccus voltae*

(1.) Formate dehydrogenase; (2.) Hydrogenase. For each semester of the decade, Pratt taught McBio 201 laboratory and delivered 18 lectures in McBio 200.

In 1993-1994, he was listed in the DI as an Excellent Teacher. He published 1 article and delivered 1 invited lecture.

Manfred Reichman: DNA of a monkey papillomavirus (CgPV1)

(1.) Characterization CgPV1 cloned into the ECOR1 site of the pUC18 vector; (2.) Cross hybridization with human papillomavirus HPV-16; (3.) Integration and partial deletion of CgPV1 viral DNA transformed cells.

In the first 4 years of this decade, Reichman published 3 articles and delivered 1 invited lecture. He retired in 1993.

Abigail Salyers: *Bacteroides*

(1.) Genetic and biochemical analysis of polysaccharide utilization in *Bacteroides*; (2.) Cloning of DNA around mutations that affect utilization of chondroitin sulfate and glactomannans; (3.) Large (70kb) self-transmissible elements located in the chromosome of certain *Bacteroides* strains; (4.) Use of the *E. coli*  $\beta$ -glucuronidase (CUS) gene as a reporter group in *Bacteroides*; (5.) Genetic tools for *Prevotella ruminicola* (*Bacteroides*) found in high numbers in the rumen of cattle; (6.) Chromosomal gene transfer elements (Tc<sup>r</sup> elements); (7.) Transfer of antibiotic resistant genes among strains of *Bacteroides*. In 1994 the textbook, *Bacterial Pathogenesis*, was published authored by Salyers and Whitt. Salyers was on sabbatical leave at Princeton in 1994. She received the Pasteur Award from the Illinois Society for Microbiology in the year 1994-1995.

In this decade, Salyers published 74 articles and delivered 86 invited lectures. Data on lectures for 1997-1998 and 1998-1999 were incomplete.

James Slauch: Mechanisms by which *Salmonella typhimurium* circumvents the host immune system

(1.) Use of IVET system to identify novel genes required for the infection process; (2.) Effects of acetylation of lipopolysaccharides (LPS) on interaction of bacteria and the host immune system. Prior to Slauch's arrival, he was a co-author who received the 1992-1993 AAAS Newcombe-Cleveland Prize for best paper published in *Science*. Slauch was appointed as Assistant Professor in the Department in the 1993-1994 academic year, with teaching duties in the Medical School.

In the 6 years for which data are available, Slauch published 11 articles and delivered 4 invited seminars and lectures. Data for lectures delivered are incomplete.

David Stahl (Affiliate Appointment, Veterinary Science): Natural Microbial Communities

(1.) Use of molecular systematics of 16SrRNA to analyze evolutionary, functional, and ecology of natural communities; (2.) Fiber digestion by ruminal microbiota; (3.) Relationship between methanogens and sulfate reducing bacteria in anoxic environments in fixed-bed bioreactor systems.

In the 4 years before leaving the University in 1993-1994, Stahl published 33 articles and delivered 32 seminars and invited lectures.

Robert Tuveson: Toxicity of light-activated polycyclic aromatic hydrocarbons (PAH's)

(1.) This research effort on (PAH's) may not continue as research funding is not likely; (2.) Studies on the effects of ozone depletion on fungal pathogens attacking citrus; (3.) Iron and copper as photosensitizers; (4.) Synthesis of carotenoids in response to light. In 1989-1990 Tuveson was on sabbatical leave. Tuveson (Deceased 1993).

In the 3 years 1989-1990 to 1991-1992, he published 10 articles and delivered 2 seminars and invited lectures.

Eric Vimr (Affiliate Appointment, College of Veterinary Medicine): Biological functions of the sialic acids

(1.) The multigenic *kps* cluster for polysialic acid (PSA) synthesis in *E. coli* K1, a pathogen for meningitis in humans and a pathogen for several animal diseases.

After 1992-1993, Vimr became inactive in the Department. In this year, he published 10 articles and delivered 5 seminars and lectures.

Edward Voss: Antibody structure-function and systemic lupus erythematosus (SLE) syndrome

(1.) Use of the model fluorescein system to understand the structural basis of antibody molecules differing by several orders of magnitude; (2.) Study of the SLE system as a model for autoimmune etiology and immune complex diseases. In 1994-1995, Voss was named a Martin University Scholar, received a Panhellenic Council Outstanding Faculty Award, and an award from the Lupus Foundation of America.

In 8 years of this decade, he published 67 articles and delivered 79 invited seminars and lectures. Voss retired in 1998.

Dixie Whitt (Affiliate, Teaching):

In 1993-1994 and 1994-1995 she was named an Excellent Teacher in Medical Science. In 1994-1995, the text book, Bacterial Pathogenesis, co-authored with Salyers, was honored by the Library of Science Book Club.

Carl Woese: 16SrRNAs

(1.) Study of 16SrRNAs to detail the phylogenetic structure of various eubacterial and archaeobacterial groups; (2.) Generation of a restriction map of *Thermococcus celer*; (3.) Collaboration with Olsen on developing an RNA database. In 1992, Woese received the Leeuwenhoek Gold Medal for the most notable contributions to science in the last 10 years, the 23<sup>rd</sup> Brown-Hazen Award, and was elected to the Center for Advanced Study.

In this decade, Woese published 29 articles and delivered 4 invited lectures. Data for 6 years of this decade are incomplete.

Ralph Wolfe: Biochemistry of methanogenesis

(1.) Structure and function of the new coenzymes in the enzymology of methane formation; (2.) Special focus on the reactions involved in the activation of CO<sub>2</sub> and the methylreductase reactions, the RPG effect; (3.) Genetic analysis of *Methanosarcina*. In 1989-1990 Wolfe was Acting Head of the Department. In 1991 he was named Professor of Microbiology Emeritus. In 1995-1999, he received the Abbott Lifetime Achievement Award from ASM.

In the 6 years of this decade for which data are available, Wolfe published 25 articles and delivered 19 invited seminars and lectures.

# CHAPTER 6

## The 2000's Academic Decade

### 1999 – 2000 to 2008 - 2009

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#### I. OVERVIEW

At the beginning of this Academic Decade, faculty members in the Department numbered 20. Faculty members published 505 articles and delivered 542 invited seminars or lectures. This was the first full decade in which faculty and students could enjoy modern facilities in Wing B of the new CLSL building. The third floor of Burrill Hall was completely remodeled, providing space for immunologists. The new MCB course curriculum for undergraduates is regarded as highly successful, due largely to the dedicated teaching by full professors from Microbiology, John Cronan, Stephen Farrand, Charles Miller, Peter Orlean and James Slauch. Stephen Farrand was awarded the 2002 Outstanding Senior Research Award in the College of Agriculture, Consumer, and Environmental Sciences.

In this decade there were two significant changes to the Department. First, in 2005 Deb LeBaugh was finally convinced, after considerable resistance, to move into B103 CLSL as head secretary, bringing a calm and competent sense of stability to the office. Secondly, in 2006 Diane Tsevelekos began working as a highly organized and competent secretary in the Microbiology Office. Thus began one of the most effective teams in the history of the Department.

A most important event of this decade occurred in 2003, when Carl Woese received the Crafoord Prize from the Royal Swedish Academy of Sciences. This prize was established in 1980 by Holger Crafoord, a Swedish industrialist, and his wife, Anna-



Greta, to recognize significant discoveries in areas other than the limited disciplines listed by Alfred Nobel, when he established the Nobel Prizes. So in the fall of 2003, the University of Illinois celebrated not only the Crafoord Prize to Carl Woese but also two Nobel Prizes, one in Physics to Anthony Leggett, and one in Physiology or Medicine to Paul Lauterbur. In 2007 a symposium to celebrate the 30<sup>th</sup> anniversary of the publication of the discovery of the archaea was organized by Nigel Goldenfeld and others. This celebration brought together a distinguished group of international scholars to the UIUC campus to honor Carl Woese.

## **II. SUMMARY OF EVENTS FOR EACH ACADEMIC YEAR OF THE 2000'S DECADE**

### 1999-2000

Stanley Maloy received the Alpha Delta Pi Outstanding Faculty Award. He was on the DI list of Excellent Teachers. Deanna Raineri was placed in charge of developing bioinformatics, tools for interactive simulators and laboratories, for molecular biology and biochemistry. She received the Phi Epsilon Professor of the Year award and was on the list of DI Excellent Teachers. Abigail Salyers and Dixie Whitt in 2000 published their textbook, *Microbial Diversity, Disease and Environment*. William Metcalf joined the Department as an Assistant Professor in the area of microbial physiology. Brenda Wilson joined the Department in August 1999.

Anecdote by James Slauch: "In 1999 the Department interviewed Bill Metcalf for a faculty position. To hire Metcalf, we had to break one of our unwritten rules to not hire our own students/postdocs. Ralph Wolfe, Metcalf's postdoctoral advisor, was a staunch defender of this rule as he noted what 'inbreeding' had done to the stature of this Department in the late 30's and 40's, and at other departments and institutions. There was much debate on this subject, but given Metcalf's record, his scientific fit with the Department, and the fact that Wolfe had technically retired in 1991, we offered him the job. It was a great hire as evidenced throughout this document."

### 2000-2001

Gary Olsen was elected to the American Academy of Microbiology. Andrei Kuzminov joined the Department in August 2000. Stanley Maloy resigned to accept a position in California after 17 years at Urbana. David Nunn resigned. Abigail Salyers was President of the ASM in 2000-2001. Marvin Bryant died.

### 2001-2002

Deanna Raineri resigned to accept a position in the University Administration. In 2002, Abigail Salyers received an Honorary Doctorate from the Eidgenossische Technische Hochschule, Zurich, Switzerland, one of the best “tech” universities in the world. William Metcalf was instructor in the Cold Spring Harbor genetics course in summer of 2002. Bruce Fouke joined this Department as an affiliate. Joanna Shisler joined the Department in November 2001, with a research program focused on the role of viral immune evasion mechanisms of poxviruses. Her teaching role is to present virology to the first and second year students in the College of Medicine.

In 2002, following the reorganization of Life Sciences into two schools, Miller and Cronan asked Slauch and Farrand to organize and teach a new course, MCB 250—Molecular Genetics, designed to be the gateway course in the Molecular and Cellular Biology major. Slauch and Farrand taught this course first in the Fall semester, and then in both Spring and Fall semesters until 2008 when Miller took over for Slauch. The course, taught mostly to first-semester sophomores, generated close to 1000 IU’s per year for the Department.

### 2002-2003

Stephen Farrand was elected to the American Academy of Microbiology. Peter Orlean moved from Biochemistry to Microbiology. Richard Tapping joined the Department with a research program focused on the role of Toll-like receptors in innate immune defense. His teaching role is to present immunology to students in the College of Medicine. Brenda Wilson was cited in the DI list of Excellent Teachers in 2003.

### 2003-2004

John Cronan was on sabbatical leave in England. Dixie Whitt was cited on the DI list of Excellent Teachers. In 2004, she received a Special Tribute Award from the graduating class, College of Medicine. William Metcalf was on the DI list of Excellent Teachers.

### 2004-2005

In May 2005, Steven Blanke joined the Department and moved his research group from the University of Houston. Jeffrey Gardner was on sabbatical with Phoebe Rice at the University of Chicago. James Imlay was on sabbatical on this campus. William Metcalf began a 5-year commitment as co-director of the 8-week summer course in Microbial Diversity at the Marine Biological Laboratory, Woods Hole, MA. He was elected ASM chairman of the Metabolism and Physiology Division and was listed on the DI list of excellent teachers.

### 2005-2006

Alice Helm retired after being a dedicated teacher in charge of MCB 100 and the laboratories of MCB 101 and MCB 312 for 40 years. She was continually cited on the DI list of Excellent Teachers. Brenda Wilson was recognized on the DI list of Excellent Teachers in 2006. Kenneth Chapman began full-time teaching duties of MCB 100 and 101 each semester in addition to MCB 312. Isaac Cann joined this Department as an affiliate.

### 2006-2007

Carin Vanderpool joined the Department with a research program on small RNAs and the teaching of microbial physiology. Rachel Whitaker joined the Department with a research program involved with a genome-based study of the microbial ecology of hot springs and freshwater lakes. Her teaching involves the area of Microbial Ecology and Evolution. John Xu departed the University. S. Farrand joined this Department as Professor and moved his laboratory to CLSL.

### 2007-2008

Peter Orlean was on sabbatical in The Netherlands.

### 2008-2009

Stephen Farrand received recognition as a member of the Faculty of 1000 Biology. Carl Woese received the ASM-Abbott Lifetime Achievement Award.

### III. FACULTY RESEARCH INTERESTS, PUBLICATIONS AND INVITED SEMINARS AND LECTURES IN THE 2000'S DECADE

#### Steven Blanke: Molecular and cellular basis of bacterial pathogenesis

In May 2005, Blanke moved his laboratory, 8 graduate students, and one technician from the University of Houston to Illinois. This report covers his research activity 2005 to the academic year 2008-2009.

(1.) Study of the molecular basis of cellular intoxication by the *Helicobacter pylori* vacuolating cytotoxin (Vac A), an important factor in *H. pylori* mediated pathogenesis; (2.) Study of the mechanism by which Vac A interacts with mammalian cells; (3.) Study of generation of a factor by *H. pylori* that promotes ADP-ribosylation of a mammalian protein; (4.) Study of early *Bacillus anthracis* infection during inhalation of anthrax; (5.) Study of the molecular basis of cellular recognition of the cytolethal distending toxins (CDTs); (6.) Human vaginal ecosystems and women's health; (7.) Human inflammatory bowel disease.

In 5 years of this decade after joining the Department, Blanke published 22 articles including 1 book chapter and 1 article which was spotlighted in Microbe and delivered 31 invited seminars and lectures.

#### Kenneth Chapman: Lecturer

In 2005-2006, Chapman ceased his research program and began full-time teaching of MCB 100 Fall and Spring semesters, as well as MCB 312 (laboratory).

#### John Cronan: Role of lipids in bacterial cell fatty acid synthesis, membrane phospholipid modification, lipoic acid metabolism, biotin synthesis

(1.) Acyl carrier proteins; (2.) Mechanism of a prototypical synthetic membrane-active antimicrobial: efficient hole-punching via interaction with negative intrinsic curvature lipids; (3.) The *Lactobacillus lactis* Fab F fatty acid synthetic enzyme can functionally replace both the Fab B and Fab F proteins of *E. coli* and Fab H protein of *L. lactis*; (4.) Functions of the *Clostridium acetobutylicum* Fab F and Fab 2 proteins in unsaturated fatty acid biosynthesis. In 2003-2004, Cronan was on sabbatical leave in England.

In this decade, Cronan published 70 articles including 2 book chapters and delivered 41 invited seminars and lectures.

### Stephen Farrand: *Agrobacterium*

How extracellular signals regulate the conjugative transfer system of *Agrobacterium* plasmids; Ti plasmid study focuses on four aspects of its regulation: (1.) Tra R, the quorum-sensing transcriptional activator; (2.) degradation of the acyl-homoserine lactone signal; (3.) induction by mannopine of the quorum-sensing system controlling conjugation; (4.) *lon* mutant: (a.) attenuation for virulence, (b.) specificity to the VirB virulence to T4SS; (5.) Genome sequence: this is a multigroup effort with four academic units and Monsanto -- two strains of *Agrobacterium* S4 and K84 represent two of the three characterized biovars of the genus; (6.) Collaborations: with Paul Shimmel's group at Scripps on the tRNA synthases and with Dr. Ingyu Hwang (U of Seoul) on sequence and function of pAg K84; (7.) Role of cyclic-di-GMP synthase in the biology of *Agrobacterium* control of cellulose synthase activity. In 2003, Farrand was elected to the American Academy of Microbiology. In 2009, he was cited in the Faculty of 1000, Biology.

In this decade, Farrand published 39 articles, 2 book chapters, and presented 11 invited seminars and lectures.

### Jeffrey Gardner: Bacterial Genetics: DNA binding proteins

(1.) Site-specific recombination of the *Bacteroides* conjugative transposon CTnDOT assay for the CTnDOT integrase (DOTInt); DNA sequence requirements for the CTnDOT excision reaction in vitro; (2.) Synthetic peptides that inhibit the reaction catalyzed lambda Int and force the accumulation of Holliday junction intermediates; (3.) The excisionase (Xis) protein encoded by bacteriophage P22; (4.) The recombination reaction catalyzed by the NBU2 element of *Bacteriodes*; (5.) IntDOT mutants. In 2004-2005 he was on sabbatical leave with Phoebe Rice at the University of Chicago.

In this decade, Gardner published 24 articles and delivered 16 invited seminars and lectures.

### Alice Helm: Teaching MCB 100, MCB 312, MCB 101

For this decade, Helm has been listed routinely on the DI List of Excellent Teachers. She retired in 2005-2006.

### James Imlay: Formation and activities of reactive oxygen species

(1.) Study of the formation of periplasmic superoxide by the autoxidation of menaquinone, direct or indirect and scavenging of superoxide by SOD; Search for other routes of H<sub>2</sub>O<sub>2</sub> formation; (2.) Study of enzyme damage by hydrogen peroxide, search

for mechanism of inhibition of enzyme activity, and role of the Suf operon in repair; (3.) Study of oxidative DNA damage by submicromolar amounts of H<sub>2</sub>O<sub>2</sub>; (4.) Sources of H<sub>2</sub>O<sub>2</sub> synthesis (NadB and fumarate reductase as sources of H<sub>2</sub>O<sub>2</sub> and cellular defenses against hydrogen peroxide; (5.) Peroxide sensitivity of the pentose phosphate pathway: ribulose-phosphate epimerase; (6.) Destruction of Fe/S dehydratase by copper; some clusters degrade during oxidative stress. In 2004-2005, he was on sabbatical leave on this campus.

In this decade, Imlay published 35 articles including 1 book chapter and delivered 55 invited seminars and lectures.

Andrei Kuzminov: DNA Lesions: How does DNA damage kill the organism?

(1.) Use of *E. coli* to study chromosomal lesions (DNA lesions that kill the cell unless repaired) such as the double-strand DNA break repair; (2.) Mechanisms of chromosomal fragmentation; another major type of lesion is the unfillable single-strand gap that forms during replication opposite a non-coding lesion in DNA; how are such gaps formed? (3.) Uracil-DNA incorporation; (4.) DuT-dependent mutants; (5.) Rec-dependent mutants; (6.) Recombinant repair in *Deinococcus radiodurans*.

In this decade, Kuzminov published 18 articles and delivered 16 invited seminars and lectures.

Stanley Maloy: *Salmonella*

(1.) Proline utilization, the (put) operon, putA gene, DNA protein interactions; (2.) Host specificity of *S. enterica*, *Salmonella* serovars that infect farm animals; (3.) *Salmonella* genome sequencing (with Olsen and Edwards). In 1999-2000, he was on the DI list of Excellent Teachers. He received the Alpha Delta Pi Outstanding Faculty Award. He resigned in 2001.

In the first 2 years of this decade, Maloy published 9 articles and delivered 17 invited seminars and lectures prior to leaving the University.

William Metcalf: Archaeal methanogenesis, bacterial metabolism of reduced phosphorus compounds, synthesis of antibiotics which contain reduced phosphorus

(1.) Development of genetic methods for *Methanosarcina* for the study of the metabolism of the substrates: methanol, hydrogen and carbon monoxide; study of non-methanogenic growth of *M. acetivorans* on CO as well as its inability to grow on H<sub>2</sub> though it possesses genes for hydrogenases; study of regulation of the genes required for methanol assimilation; (2.) Study of CoM methyltransferases; hydrogen cycling in

*Methanosarcina*; (3.) Study of metabolic pathways for reduced phosphorus compounds in various bacteria; especially synthesis of phosphonate antibiotics in *Streptomyces*; which are now a core theme at the Institute of Genomic Biology at the University. In 2004, he was placed on the DI list of Excellent Teachers. For 5 years (2004-2009), he was co-director of the Microbial Diversity Course at Woods Hole.

In this decade, Metcalf published 44 articles and delivered 39 invited seminars and lectures.

Charles Miller: Director of MCB

MCB 250 Fall enrollment approximately 550; MCB 250 Spring enrollment approximately 250; 21 lectures each term (Miller) 19 lectures (Farrand); MCB Honors Discussion 2 sections; both Miller and Farrand attend all meetings of both sections each term.

In the year 1999-2000, Miller published 5 articles and delivered 1 seminar.

Carol Muster: Teaching

Teaching in MCB 290 DAB and MCB 253 H, MCB 253, MCB 251 Honors sections; Developed Power Point presentations for MCB 290 and 253 websites; Director, Biology Honors Program; Developed an honors track for MCB undergraduate curriculum; Developed materials for pilot honors course MCB 290 DAB.

In 2000-2003, she was on the DI list of excellent teachers and received the outstanding advisor award.

David Nunn: Molecular pathogenesis and microbial physiology

Expression and secretion of bacterial virulence factors; specialized secretion machinery for export of toxins and hydrolytic enzymes (exotoxin A, elastase, phospholipase C, lipase, stapholytic enzymes, alkaline phosphatase) from *Pseudomonas aeruginosa*. At least 13 gene products are required for the excretion machinery. Both conditioned and “knock out” mutations are being generated to study this system.

In the first year of this decade, Nunn published 2 articles and delivered 4 invited seminars and lectures prior to resigning.

Gary Olsen: Genome sequence analysis and an analysis of transcription in Archaea and Eukaryotes

(1.) Comparative analyses of genome data in collaborations: *Giardia lamblia*, *Salmonella enteritidis*, *Methanococcus maripaludis*, *Methanococcus thermolithotrophicus*, and *Methanococcus voltae*; Horizontal gene transfer in *Agrobacterium*; (2.) Location of DNA sequences in the *Methanococcus jannaschii* genome that bind TBP and TFB and study of the tightness of binding to transcription factors; (3.) Analysis of transcription in Archaea and Eukaryotes; (4.) Host microbe systems and biocomplexity, IGB themes. In 2001, he was elected to the American Academy of Microbiology.

In this decade, Olsen published 29 articles and delivered 52 seminars and lectures.

Peter Orlean: Carbohydrates

(1.) Search for a new gene required for addition of the second mannose during GPI precursor assembly, a member of a new glycosyltransferase family; (2.) Cloning, disruption, and conditional expression of the GABI gene from the human pathogenic fungus *Candida albicans*; (3.) Structure-function studies of chitin synthases: cloning and expression of the Rhizobium Nod C protein; (4.) Genetic analysis of the function of the essential yeast Gpi11 protein; (5.) Biochemical function of the putative GPI anchored endomannase DFg5p; (6.) Epitope tagging and expression of yeast GPI mannosyltransferases; (7.) Expression of a soluble, secreted chitin oligosaccharide synthase. In 2003, he transferred from Biochemistry to Microbiology. In 2007-2008 he was on sabbatical in The Netherlands.

In this decade after joining Microbiology, Orlean published 8 articles and delivered 15 seminars and lectures.

Deanna Raineri: Biology, an information-driven science

Creation of a new discipline: bioinformatics; Development of educational technologies (interactive simulations and laboratories) for teaching molecular biology and biochemistry. Her mission was teaching. In 1999-2000, she received the Sigma Phi Epsilon Professor of the year award. In the Spring of 2000, was on the Top 5 Professors List and in the Spring and Fall of 2000 was on the DI List of Excellent Teachers.

Prior to resigning in 2002, Raineri published 2 articles and delivered 14 seminars and lectures.



### Abigail Salyers: Bacteroides

Conjugative and mobilizable transposons; a major research effort concerns the conjugative transposon CTnDOT, operon control of excision genes, requirements for the excision reaction in vitro, tetracycline resistance and sequence requirements for the excision reaction. A second major effort concerns human intestinal bacteria as reservoirs for antibiotic resistance genes, the ecology of antibiotic resistance genes, and safety concerns about agricultural use of antibiotics. Study of antibiotic resistant in the vaginal microbiota of primates not exposed to antibiotics. Work with Bruce Fouke on Yellowstone hot springs. In 2000, her textbook, *Microbiology, Diversity, Disease and Environment*, was published by Fitzgerald Science Press. In 2001-2002, she was president of the American Society for Microbiology. In 2002 she received an Honorary Doctorate from Eidgenossische Technische Hochschule, Zurich, Switzerland.

In this decade, Salyers published 68 articles including 2 book chapters and delivered 83 invited seminars and lectures.

### Joanna Shisler: Poxviruses

Mechanisms used by poxviruses to evade the immune response. Study of the canonical NF- $\kappa$ B activation pathway, which is well documented, to find out how various poxviruses proteins affect this pathway. Use of two poxviruses, MCV and vaccinia in experiments. Her teaching role is to present virology to students in the College of Medicine.

In the 9 years of this decade after joining the Department, Shisler published 13 articles and presented 32 seminars and lectures.

### James Slauch: *Salmonella*

The molecular mechanisms by which *Salmonella* circumvents the host immune system to cause disease; Use of the well-defined genetics of this organism to manipulate and characterize mutations that affect virulence, especially the most serious *Salmonella* disease which results from extraintestinal infection and bacteremia; Superoxide dismutases; The pathogenicity island; The ability of *Salmonella* to survive in macrophages, the role of copper/zinc SOD C, and genes that affect resistance to superoxide.

Slauch has maintained teaching responsibilities in the Medical School where he team teaches BMS 300 – M1 & M2 in Fall and Spring Terms with D. Whitt, A. Salyers, and J. Shisler. In the Fall term, he teaches MCB 250 with S. Farrand. In 2000, he developed a lab manual for the Cold Spring Harbor Advanced Bacterial Genetics Course. In 2001 and 2003 he was on the DI list of excellent teachers. In 2002 he received an Arnold Beckman Award.

In this decade, Slauch published 30 articles and delivered 20 invited seminars and lectures.

Richard Tapping: Role of Toll-like receptors (TLRs) in innate immune defense

Definition of bacterial lipoprotein structures that have a preference for the human (TLR 2/1) receptor pairs versus the human TLR 2/6 receptor pairs; Definition of the trafficking and physical interaction between the receptors themselves and their proximal cytoplasmic adaptor molecules in response to agonist engagement; Mechanisms by which pathogens evade TLR recognition; His teaching role is to present immunology to Medical students.

In the 7 years after joining this Department, Tapping published 26 articles and delivered 24 invited seminars and lectures.

Carin Vanderpool: Metabolic stress response required when *E. coli* cells experience disruptions in glycolytic flux; The role of small RNAs

May 2006 – July 2006 Vanderpool set up her new laboratory at Illinois. (1.) Study of the regulation and function of the transcription factor SgrR; (2.) Study of the physiological function of a small RNA, Sgr S and another SgrS, man XYZ; (3.) Identification of paralogs of the regulators, SgrR, in a wider range of gamma protobacteria and bacilli; (4.) Study of a putative sugar efflux transporter, Set A.

In the 3 years after joining the Department, Vanderpool published 3 articles and delivered 8 invited seminars and lectures.

Rachel Whitaker: Microbes in thermal environments

(1.) Comparative genomics of *Sulfolobus islandicus*, a thermophilic crenarchaeon that lives in geographically isolated geothermal environments; (2.) Hot spring community structure; Analysis of PCR amplified 16S rRNA gene from DNA (directly extracted from hot spring samples) designed to conserve specific regions in the Bacteria and Archaea (27F Bacteria, 23F Archaea 1492R); (3.) Metagenomics; Extraction of high-quality, high-molecular weight DNA for fosmid library construction from hot spring samples; (4.) Proviruses and CRISPR immunity; (5.) Population dynamics in northern Wisconsin lakes.

In the 3 years after joining the Department, Whitaker published 3 articles and delivered 10 invited seminars and lectures.

### Dixie Whitt: Teaching, Medical Students

Courses taught: Medical Sciences 300 Basic Medical Microbiology (shared with 2 faculty members); Medical Sciences 300 Immunology Laboratory; Medical Sciences 301 Pathology, Clinical Microbiology; Book with Salyers, Microbiology: Diversity, Diseases, Environment; Another book with Salyers in 2002 Bacterial Pathogenesis; In 2003-2004, Dixie Whitt was cited on the DI list of Excellent Teachers; In 2004, Whitt received a Special Tribute Award by the graduating class of College of Medicine.

In this decade, Whitt was co-author on 4 publications including textbooks with Salyers.

### Brenda Wilson: Bacterial protein toxins

(1.) Interaction of bacterial protein toxins with host cells, their effects on intracellular signal transduction, and development of novel alternative anti-toxin therapeutics; One project concerns the structure, function and pathogenic mechanisms of the potent dermonecrotic toxins produced by *Pasteurella multocida*, *Bordetella sp*, and *E. coli*; Of particular interest is development of post-exposure anti-toxin therapeutics; (2.) Another project concerns botulism, development of improved recombinant vaccines and anti-toxin therapeutics as well as development of sensitive detection devices to distinguish between botulinum neurotoxins; (3.) Another focus is study of the dynamic interactions between the host and its commensal and pathogenic microbes to elucidate basic processes of disease and commensalism.

In this decade Wilson published 43 articles including 1 book chapter and book reviews and delivered 40 invited lectures.

### Carl Woese: The archaeal concepts to domains of life, the emergence of life

Microbial phylogeny and evolution based on 16SRNA analysis of bacterial and archaeal cells and of 23SRNA in protozoa, fungi, plants, and animals; Collaboration with Nigel Goldenfeld and Zan Schulten on the role of horizontal gene transfer as a control on the coevolution of ribosomal proteins and the genetic code, and the emergence of life from geochemistry to the genetic code.

In this decade, Woese published 13 articles and delivered 1 invited lecture.

### John Xu: *Yersinia pestis* (plague)

Study of B cell-deficient mice and their response to *Y. pestis* infection as well as the response of wild type mice; Study *Y. pestis* infection in inbred strains of mice to

determine host factors that are important in resistance to plague; Search for new vaccines for human plague.

In the 4 years associated with this Department, Xu published 0 articles and delivered 5 invited lectures.

# ADDENDUM

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## SOME CONTRIBUTIONS TO SCIENCE BY FORMER FACULTY

(Elected to the National Academy of Science)

### I. C. Gunsalus

As a member of the faculty in the 1950's Gunsalus purified the pyruvate oxidation factor to homogeneity. This factor from yeast extract was required by cells of *Streptococcus faecalis* to oxidize pyruvate. In collaboration with chemists at the DuPont company the structure was determined and named lipoic acid. At Dupont a method of organic synthesis of lipoic acid was developed.

### Sol Spiegelman

Spiegelman joined the Department in 1959. His research interests were at the forefront of a new era which became known as molecular biology, especially the conversion of information from DNA to cellular components. He opposed the term "messenger RNA", arguing forcefully that this RNA was the message and should be called "message RNA". He lost this battle. His research became widely known, when in 1961 he began to study a new phage MS2 which lacked DNA and contained only RNA. He studied how this phage replicated, eventually finding an RNA-polymerase which was specific for MS2 RNA. The scientific community was not convinced because at that time no nucleic acid polymerase was known to be specific. However, study of the RNA-polymerase from a newly discovered RNA phage, Q-beta, was shown to be specific only for Q-beta. This was Spiegelman's finest hour.

He was able to synthesize this RNA in the test tube, and when it was injected into protoplasts of *E. coli*, virus particles were synthesized at a rate equal to that of natural Q-beta. These experiments resulted in wide spread acclaim by the scientific community. Newspapers exclaimed "life is synthesized in a test tube".

### S. E. Luria

Luria joined the Department in 1950. His research involved the genetics of phage. Prior to his arrival at Illinois Luria and Delbruck had performed an experiment which has been called the Fluctuation Test. They showed that mutations in bacteria which gave rise to resistance to a virulent phage occur in the absence of a selection pressure (the phage) and not in response to the presence of the phage. At Illinois during the 1950's Luria continued research into the growth of phage, especially how the growth of phage from one strain of *E. coli* was inhibited when transferred to another strain of *E. coli* but eventually recovered the ability to grow normally.

### Carl Woese

Woese joined this Department in 1963. He developed an interest in the nature of the genetic code, publishing his book, *The Genetic Code*. He was attracted to the study of ribosome biosynthesis for he realized that here was an organelle of ancient origin, one possessed by all living cells, and one that had a single mission: translation of the genetic code. Therefore, it was "insulated" from phenotypic variations of bacterial cells and could serve as a vehicle for studying the ancient evolution of bacteria. He chose the 16S-ribosomal RNA as the molecule of choice, for it had a "statistical ensemble" of 1540 monomers. This polymer has become "the unit" international study of taxonomy. He received the Crafoord Prize in 2003.

### R. S. Wolfe

Study of pyruvate oxidation by extracts of *Clostridium butyricum* led to the discovery of ferredoxin, and later by mass culture of methanogens in kilogram quantities to the discovery of six new coenzymes; the structure of four of these was determined. Development of a technique for growing methanogens in a pressurized atmosphere of hydrogen and carbon dioxide allowed Carle Woese to label and isolate the 16S-RNA from a methogen. This methogen was the first archaeon to be discovered.

# ADDENDUM

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Subject: History of Microbiology at Illinois  
Date: Thu, 13 Nov 2014 18:55:15 +0000  
From: Karr, Jeff <JKARR@asmusa.org>  
To: rwolfe@life.uiuc.edu <rwolfe@life.uiuc.edu>  
CC: Donohue, Timothy <tdonohue@bact.wisc.edu>, DiRita, Victor <VDIRITA@UMICH.EDU>, Meyers, John <jmeyers@asmusa.org>

Hello, Dr. Wolfe:

My name is Jeff Karr, and I'm the archivist for ASM. Tim Donohue recently informed me that you're working on a history of Microbiology at Illinois, which I think is an excellent idea. I'm sure you have access to extensive resources, but just to make sure nothing falls through the cracks I thought I'd let you know some of the materials here in the ASM collections.

1. Chronology titled "Hygiene and Bacteriology" which (apparently) lists all Ph. D. recipients in those fields from 1900-1927. Dr. McClung annotated this with "Chronology compiled by P. F. Clark" but I wonder if it was actually prepared by F. M. Clark. 2 pp.
2. The Alumni News XXXVIII #6, Edition B October 1959 has coverage of the opening of Burrill Hall.
3. A Short History of the Department by F. M. Clark, 1959. 8 pp.
4. Outline and explanation of H. H. Thornberry's "History of Plant Pathology in Illinois," 1958. The full document appears to be in the ACES Library, call number 632.6 T39h. There may be helpful material on Burrill there.
5. Letter, Maynard Brichford, Archivist, to McClung detailing some bacteriology-related items which had been displayed in the Illinois library during the 1964 AIBS meeting. The letter goes on to describe archives bacteriology-related holdings more generally. 2 pp.
6. Letter, Thornberry to McClung, 1/31/64, which mentions in passing that Marguerite Pease of the Illinois Historical Survey and Dr. Elmer Roberts were preparing a history of the Illinois College of Agriculture.
7. There's a section on H. O. Halvorson's Illinois period in "Halvor and Selma Halvorson," (2006), a family history shepherded into print by Harlyn.

8. The finding aid to our collection of the papers of Halvorson pere is here:  
<http://www.asm.org/index.php/choma2/71-membership/archives/8167-h-orin-halvorson-papers>.

9. Transcript of minutes of the Bacteriology Club of the University of Illinois, 1913-1924. Prepared in 1973 by R. D. DeMoss. 40 pp.

10. The 1915 SAB meeting was held in Urbana. We have the program; a schedule of "Visits to Buildings and Grounds;" and a 9" x 17" two-sided map: "University of Illinois Campus, 1915-1916" and "Environs of the Campus, University of Illinois, 1915-1916." The meeting abstracts, which heretofore had been published in Science, were apparently not published, which may be in part why it was at this meeting that the Society decided to establish a journal (JB.).

We also have pretty substantial biographical and photo files if you need additional info on, or images of, any of the players.

I'm not sure of what value any of this may be to your project, but we're happy to help in any way we can. And of course we'd be very grateful for a copy of the finished product.

Best,

Jeff Karr, Archivist



# ADDENDUM

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**DATE:** January 29, 2015

**TO:** Milestones in Microbiology Committee (MiMC)  
c/o Center for the History of Microbiology/ASM Archives  
American Society for Microbiology  
1752 N Street, NW  
Washington, DC 20036  
[jkarr@asmusa.org](mailto:jkarr@asmusa.org) or [archives@asmusa.org](mailto:archives@asmusa.org)  
Phone Number: (410) 455-3601

**FROM:** Brenda A. Wilson, PhD  
ASM Chapter – University of Illinois at Urbana-Champaign,  
Department of Microbiology  
601 South Goodwin Avenue, B103 CLSL, MC-110  
Urbana, IL 61801  
(217) 244-9631  
(217) 244-6697  
[bawilson@life.illinois.edu](mailto:bawilson@life.illinois.edu)

**RE:** **This nomination is submitted to the MiM Committee of ASM for evaluation as a potential Milestone in Microbiology Site.**

## **DESCRIPTION:**

### **1. Site**

University of Illinois at Urbana-Champaign

### **2. Location**

#### **a. Address, City or County, State**

601 South Goodwin Avenue, Urbana, Illinois

#### **b. Proposed plaque location**

We propose to mount the plaque on the west wall of the north atrium of the main entrance into the Chemical and Life Sciences Laboratory (CLSL) at 601 South Goodwin Avenue, Urbana, Illinois. This site is adjacent to the main auditorium (the Charles G. Miller Auditorium) used for seminars by Microbiology and several other departments. The auditorium is named in honor of Charles G. Miller, former Head of the Department of Microbiology and founding Director of the School of Molecular and Cellular Biology at the University of Illinois.

### 3. Nominators (address and contacts)

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### 4. Significance

The University of Illinois at Urbana-Champaign has a rich history of major microbiological research achievements and has been the home of a number of outstanding microbiologists, who have made seminal discoveries that have significantly advanced the field of microbiology.

### 5. Unique features

- a. **Marvin P. Bryant** (July 4, 1925 – October 16, 2000)

#### Period at UIUC in the Departments of Dairy Science and Microbiology (Joint Appointment): 1964-1994

He was a pioneer of the study of methanogenic rumen microbes. He is recognized as the most prominent rumen bacteriologist in the world for his seminal contributions to rumen microbiology, in particular cellulose-utilizing bacteria and fermentation processes. His work included the first demonstration of anaerobic degradation of aromatic heterocyclic ring structured compounds of plant flavonoids in pure cultures of rumen bacteria.

b. **Thomas J. Burrill** (April 25, 1839 – April 14, 1916)

Period at UIUC in the Department of Botany and Horticulture: 1868-1912, 1912-1916 (Emeritus)

He was the first to discover the bacterial causes of plant diseases (plant pathogens), and thus founded the science of bacterial plant pathology. Papers in *Transactions of the Illinois State Horticulture Society* (1877, 1878) and *PNAS* (1880) reported the first discovery that fire blight of pears and twig blight of apples was caused by a bacterial pathogen. He determined that *Erwinia amylovora* (formerly *Micrococcus amylovorus*) was the causal agent of pear fire blight. He established the first non-medical microbiology course in bacteriology in this country in 1891, which is considered the beginning of bacteriology. He served as President of UIUC from 1891-1894 and acting-President in 1904). One of our research laboratory buildings (Thomas J. Burrill Hall, 407 South Goodwin Avenue, Urbana, IL) was named in honor of him in 1959.

c. **Irwin C. "Gunny" Gunsalus** (June 29, 1912 – October 25, 2008)

Early work prior to UIUC:

While at Indiana University (1947-1950) he studied microbial intermediary metabolism, in particular studies of vitamin B6.

Period at UIUC in the Department of Microbiology: 1950-1955; Biochemistry: 1955-1982 (Department Head 1955-1966), 1982-2008 (Emeritus)

He pioneered studies in microbial biochemistry. While studying *Enterococcus* metabolism, he discovered lipoic acid; and pyridoxal phosphate (the active form of vitamin B6). He served as Head of Biochemistry at UIUC 1955-1966. During 1960-1970, he developed a genetic system for the study of *Pseudomonas*, dissected the 11-step pathway of terpenoid catabolism, discovered the first 3-component microbial cytochrome P450 system, and purified and crystalized the hemoprotein component of cytochrome P450. After retiring from UIUC in 1982, he was named founding director of the United Nations International Center for Genetic Engineering and Biotechnology, and he worked for the United States Environmental Protection Agency on bioremediation from 1993-2003.

d. **Salvador E. Luria** (August 13, 1912 – February 6, 1991)

Early work prior to UIUC:

He pioneered the study of bacteriophage transduction mechanisms. In 1943 while at Indiana University, Luria (with Max Delbrück) showed that bacterial resistance to viruses (phages) is genetically inherited. For this work, he later received the Nobel Prize in 1969.

Period at UIUC in the Department of Microbiology (formerly Bacteriology): 1950-1959

While at UIUC, Luria first observed genetically the phenomenon of microbial restriction and modification system (first reported in 1952), although they referred to it as host-induced variation. They observed that several different bacteriophages varied in their ability to grow on different host strains (*E. coli* versus *Shigella*), but once growth was established on one strain, the phage could propagate in this strain, but were now restricted in their ability to grow on other bacterial strains.

- e. **Abigail A. Salyers** (December 24, 1942 – November 6, 2013)

Period at UIUC in the Department of Microbiology: 1979-2012, 2012-2013 (Emerita)

She pioneered the study of polysaccharide utilization by *Bacteroides* and revolutionized how we think about human gut microbes, and she was a major driving force in the study of horizontal gene transfer mechanisms of antibiotic resistance in the gut. She was the first to develop genetic tools for studying metabolism, mobilizable elements and novel antibiotic resistance genes in *Bacteroides*. She wrote the first groundbreaking undergraduate-level textbook on bacterial pathogenesis (first edition published in 1994, now in its third edition). Salyers became the first female tenured professor in Microbiology at UIUC in 1983 and full professor in 1988.

- f. **Sol Spiegelman** (December 14, 1914 – January 20, 1983)

Period at UIUC in the Department of Microbiology (formerly Bacteriology): 1949-1969

He pioneered the study of RNA, mechanisms of viral replication, and the separation of viral RNA by acrylamide gel electrophoresis of nucleic acids. In a series of elegant experiments over a 10-year period in the 1950s, he solved the problem of how RNA phages exploit cellular information to survive and replicate in a host cell. He solved the mystery of where ribosomal RNA originates, demonstrating that a phage-specific short-lived RNA message is synthesized during DNA-phage infection. In 1962 he developed an improved technique of nucleic acid hybridization (DNA-RNA hybridization) that helped to lay the groundwork for advances in recombinant DNA technology. In 1965 he was the first to carry out the test-tube synthesis of a self-replicating, infectious viral RNA. He also showed that only one DNA strand is transcribed at any particular location. He also showed that polycistronic mRNAs were made. He was the discoverer of self-reproducing RNA structures, called Spiegelman's Monster, which is an RNA of 218 nucleotides that is able to reproduce by RNA replication enzyme from bacteriophage Q $\beta$ .

- g. **Carl R. Woese** (July 15, 1928 – December 30, 2012)

Period at UIUC in the Department of Microbiology: 1964-2012

He pioneered the technique of using the 16S rRNA gene as a basis for phylogenetic taxonomy to study microbial evolution, which revolutionized the discipline of microbiology. In 1977, he and George Fox reported the discovery of a new domain of life that was distinct from Bacteria and Eukarya, the Archaea. This work led to several awards, including the Leeuwenhoek Medal in 1992. This medal was initiated about 130 years ago and has been awarded less than 20 times since then. Carl later also received the Crafoord Prize by Swedish Academy of Sciences in 2003. Also in 1977, he and Fox first described the concept of cellular evolution. Woese's work on horizontal gene transfer as a primary evolutionary process has tremendously advanced the field of microbiology. An upcoming symposium in honor of him, entitled "Looking in the right direction: Carl Woese and the New Biology", to be held September 19-20, 2015, will mark the renaming of one of our research institutes, of which he was a faculty member, as The Carl R. Woese Institute for Genomic Biology.

- h. **Ralph S. Wolfe** (July 18, 1921 – )

Period at UIUC in the Department of Microbiology (formerly Bacteriology): 1953-1991, 1991-now (Emeritus)

He is a pioneer of the microbial biochemistry of methanogenesis. He was the first to isolate,

culture and demonstrate methane production in cell extracts from methanogenic microbes, developed new technique to grow methanogens in culture, identified new coenzymes in methanogens, and identified hydrogen and carbon dioxide as substrates for methane production in methanogens. Richard P. Blakemore, while working in the laboratory of Wolfe, first isolated and with Richard B. Frankel characterized the first magnetic bacteria from aqueous environments.

i. **Association with ASM Landmark events**

The first ASM journal, *Journal of Bacteriology* and establishment of local branches of ASM (formerly SAB, Society for American Bacteriologists) were first proposed at the 1915 ASM (formerly SAB) Meeting held in Urbana, Illinois. The first application to establish a local branch was from the Bacteriology Club at Urbana, Illinois.

The first volume of *J Bacteriology* was subsequently issued in 1916.

The first application to establish a local branch was from the Bacteriology Club at Urbana, Illinois.

j. **Home of 5 past presidents of ASM**

Thomas J. Burrill (1916), H. Orin Halvorson (1955), and Abigail A. Salyers (2002) served as ASM Presidents while they were at UIUC.

Salvador E. Luria (1968) and Stanley R. Maloy (2006) served as ASM Presidents after they left UIUC.

## **6. National (and international) aspects**

All eight individuals mentioned above have been recognized at the national and international levels for their achievements.

### Notable Awards and Honors:

- a. **Marvin P. Bryant** – National Academy of Science member in 1987, Honorary Member of ASM
- b. **Thomas J. Burrill** – Past President of American Microscopical Society (1885-1886), Past President of ASM (1916), Past President of the American Association for the Advancement of Science (1916)
- c. **Irwin C. "Gunny" Gunsalus** – Guggenheim Fellow 1949, Member of American Academy of Arts and Sciences in 1965, National Academy of Science Member in 1965, American Academy of Microbiology, Selman A. Waksman Award in 1982, Past President of American Society of Biological Chemists in 1974, Past President of the Federation of American Societies for Experimental Biology
- d. **Salvador E. Luria** – National Academy of Science Member in 1960, Nobel Laureate in 1969, Past President of ASM in 1968, National Medal of Science Laureate in 1991
- e. **Abigail A. Salyers** – Past President of ASM (2002), American Academy for Microbiology Member 2001

- f. **Sol Spiegelman** – National Academy of Science Member in 1965, American Academy of Arts and Sciences in 1966, Laskar Award in 1974, Antonio Feltrinelli International Prize in Biology in 1981
- g. **Carl R. Woese** – MacArthur Fellow in 1984, National Academy of Science member in 1988, Leeuwenhoek Medal in 1992, Selman A. Waksman Award in Microbiology in 1995, National Medal of Science in 2000, Crafoord Prize in 2003, foreign member of Royal Society in 2006
- h. **Ralph S. Wolfe** – National Academy of Science member in 1981, American Academy of Arts and Science in 1981, Abbott Lifetime Achievement Award in 1996, Selman A. Waksman Award in 1995, Pasteur Award in 1974, Alexander von Humboldt Senior Award in 1984

## 7. Supporting evidence (documents, photos, etc.)

- a. ***History of the Department of Microbiology (1868-2009) by Ralph S. Wolfe*** – Attached is a draft of a monograph prepared by Ralph S. Wolfe that details the history of the Department of Microbiology (formerly Bacteriology) from 1986 to 2009. A final published version of the manuscript will be provided for ASM archives at a later date.
- b. **Supporting Documents**

Many supporting documents are housed in the Archives Research Center at the Main Library at UIUC located at: 1707 S. Orchard Street, Urbana, IL.

A map with location and hours for the Archives Research Center can be found at URL:  
<http://archives.library.illinois.edu/wp-content/uploads/2012/03/HFLmap1.pdf>

- i. **Marvin P. Bryant** –

Demain AL, Wolfe RS "Marvin P. Bryant, 1925 – 2000" *Biogr Mem Natl Acad Sci* (2002) 81:66-98

<http://www.nasonline.org/publications/biographical-memoirs/memoir-pdfs/bryant-marvin-p.pdf>

UIUC Archives Research Center:

Faculty Portraits, record series 8/1/18

box 3, folder: Bi-Bu: Bryant, Marvin (Animal Sciences, retired), Studio 1995 (University Archives, UA)

Irwin C. Gunsalus Papers, record series 15/5/40

box 32, folder: M. P. Bryant, 1963-64 (Archives Research Center, ARC)

Chancellor's Office Subject File, record series 24/1/1

box 222, folder: Marvin P Bryant funding-Fatty & aromatic acid catabolizing bacteria in methanogenic ecosystems (ARC)

Graduate College Campus Research Board File, record series 7/12/5

box 4, folder: Bryant, Marvin P. -- Dairy Science 1973-74 (ARC)

ii. **Thomas J. Burrill** –

- "Thomas Jonathan Burrill. April 25, 1839 – April 14, 1916" *Transactions of the American Microscopical Society* (1916) **35** (4): pp. 269–270  
[http://www.jstor.org/stable/3221912?seq=1#page\\_scan\\_tab\\_contents](http://www.jstor.org/stable/3221912?seq=1#page_scan_tab_contents)
- Smith EF "In Memoriam: Thomas Jonathan Burrill" *J Bacteriol* (1916) **1**(3):269.b2-271  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC378653/>
- Burrill TJ "The so-called fire-blight of the pear and twig-blight of the apple tree" *Transactions of the Meeting of American Society of Microscopists at Detroit, in Science* (1880) **1**(14):160-163, Comment on "The 'yellows' of the peach tree" *Science* (1880) **1**(16):191-192  
<http://www.sciencemag.org/content/os-1/14/160.full.pdf>
- Burrill Papers – Archive List – Attached  
The Burrill Papers are now open to the public and available through the UIUC Archives  
<http://archives.library.illinois.edu/archon/index.php?p=collections/controlcard&id=3720&q=burrill>
- Illinois Digital Newspaper Collections:  
<http://idnc.library.illinois.edu/cgi-bin/illinois?a=q&hs=1&r=1&results=1&txq=Burrill&txf=txIN&ssnip=txt&o=20&dafdq=&dafmq=&dafyq=&datdq=&datmq=&datyq=&puq=&e=>

iii. **Irwin C. "Gunny" Gunsalus** –

- Umbreit WW, O'Kane DJ, Gunsalus IC "Function of the vitamin B6 group: mechanism of transamination" *J Biol Chem* (1946) **176**(2):629-637  
<http://www.jbc.org/content/176/2/629.citation>
- Gunsalus IC "The chemistry and function of the pyruvate oxidation factor (lipoic acid)" *J Cell Physiol Suppl* (1953) **41**(supp 1):113-136  
<http://onlinelibrary.wiley.com/doi/10.1002/jcp.1030410409/abstract>
- Katagiri M, Ganguli BN, Gunsalus IC "A soluble cytochrome P-450 functional in methylene hydroxylation" *J Biol Chem* (1968) **243**:3543-3546  
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- Yu CA, Gunsalus IC, Katagiri M, Suhara K, Takemori S "Cytochrome P-450cam. I. Crystallization and Properties" *J Biol Chem* (1974) **249**:94-101  
<http://www.jbc.org/content/249/1/94.long>
- Kresge N, Simoni RD, Hill RL "The bacterial cytochrome P450 and Irwin C. Gunsalus" *J Biol Chem* (2007) **282**:e4  
<http://www.jbc.org/content/243/12/3543.abstract>
- Illinois Digital Newspaper Collections:  
<http://idnc.library.illinois.edu/cgi-bin/illinois?a=q&hs=1&r=1&results=1&txq=Gunsalus&txf=txIN&ssnip=txt&o=20&dafdq=&dafmq=&dafyq=&datdq=&datmq=&datyq=&puq=&e=>

iv. **Salvador E. Luria** –

- Luria SE, Human ML "A nonhereditary, host-induced variation of bacterial viruses" *J Bacteriol* (1952) **64**, 557-569.  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC169391/>
- The Luria Papers – Profiles in Science: National Library of Medicine Collection  
<http://profiles.nlm.nih.gov/ps/retrieve/Collection/CID/QL>

UIUC Archives Research Center:

Press Releases (Public Affairs Office), record series 39/1/10

box 6, folder: Luria, S. E. (off-site, requires 48 hrs. advance notice)

Lindsay M. Black Papers, record series 15/4/29

box 4, folder: Luria, Salvador E. (UA)

Irwin C. Gunsalus Papers, record series 15/5/40

box 5, folder: Research Discussion with Luria, 1963 (ARC)

Illinois Digital Newspaper Collections:

[http://idnc.library.illinois.edu/cgi-](http://idnc.library.illinois.edu/cgi-bin/illinois?a=q&hs=1&r=1&results=1&txq=Luria&txf=txIN&ssnip=tst&o=20&dafdq=&dafmq)

[bin/illinois?a=q&hs=1&r=1&results=1&txq=Luria&txf=txIN&ssnip=tst&o=20&dafdq=&dafmq](http://idnc.library.illinois.edu/cgi-bin/illinois?a=q&hs=1&r=1&results=1&txq=Luria&txf=txIN&ssnip=tst&o=20&dafdq=&dafmq)  
[=&dafmq=&datdq=&datmq=&datyq=&puq=&e=](http://idnc.library.illinois.edu/cgi-bin/illinois?a=q&hs=1&r=1&results=1&txq=Luria&txf=txIN&ssnip=tst&o=20&dafdq=&dafmq)

v. **Abigail A. Salyers** –

Salyers AA, Whitt DD *Bacterial Pathogenesis: A Molecular Approach*, ASM Press, 1994

<http://www.amazon.com/Bacterial-Pathogenesis-A-Molecular-Approach/dp/1555810705>

Salyers AA, Vercellotti JR, West SEH, Wilkins TD "Fermentation of mucin and plant polysaccharides by strains of *Bacteroides* from the human colon" *Appl Environ Microbiol* (1977) 33:319-322

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC170684/>

Salyers AA, Kuritza AP "Digestion of proteoglycan by *Bacteroides thetaiotaomicron*" *J Bacteriol* (1983) 153(3):1180-1186

<http://jb.asm.org/content/153/3/1180.long>

Shoemaker NB, Wang GR, Salyers AA "Evidence for natural transfer of a tetracycline resistance gene between bacteria from the human colon and bacteria from the bovine rumen" *Appl Environ Microbiol* (1992) 58:1313-1320

<http://aem.asm.org/content/58/4/1313.full.pdf>

vi. **Sol Spiegelman** –

Gillespie D, Spiegelman S "A quantitative assay for DNA-RNA hybrids with DNA immobilized on a membrane" *J Mol Biol* (1965) 12(3):829-842

<http://www.sciencedirect.com/science/article/pii/S002228366580331X>

Bishop DH, Claybrook JR, Spiegelman S "Electrophoretic separation of viral nucleic acids on polyacrylamide gels" *J Mol Biol* (1967) 26(3):373-387

<http://www.sciencedirect.com/science/article/pii/0022283667903105>

Spiegelman S, Haruna I, Holland IB, Beaudreau G, Mills DR "The synthesis of a self-propagating and infectious nucleic acid with a purified enzyme" *Proc Natl Acad Sci* (1965) 54(3):919-927

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC219765/>

Mills DR, Peterson RL, Spiegelman S "An extracellular Darwinian experiment with a self-duplicating nucleic acid molecule" *Proc Natl Acad Sci* (1967) 58(1):217-224

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC335620/>

The Spiegelman Papers – Profiles in Science: National Library of Medicine Collection

<http://profiles.nlm.nih.gov/ps/retrieve/Collection/CID/PX>

UIUC Archives Research Center:

Chancellor's Office Subject File, record series 24/1/1



box 238, folder: Chancellor's Office "Allerton Conference - Sol Spiegelman: Frontiers in Biology in the Next Several Decades"

box 140, folder: Honorary Degrees - Sol Spiegelman (ARC)

Roger Adams Papers, record series 15/5/23

box 50, folder: S. Spiegelman et al., "The Synthesis of a Self-Propagating and Infectious Nucleic Acid with a Purified Enzyme," September 1965

box 50, folder: I. Haruna and S. Spiegelman, "Recognition of Size and Sequence by an RNA Replicase," October 1965 (UA)

Irwin C. Gunsalus Papers, record series 15/5/40

box 34, folder: S. Spiegelman, 1961

box 49, folder: Sol Spiegelman, 1972, 1975, 1983

Daily Illini, record series 41/8/801, articles about "Sol Spiegelman" - May 28, 1966 and Jan. 22, 1966 (UA)

Illinois Digital Newspaper Collections:  
<http://idnc.library.illinois.edu/cgi-bin/illinois?a=q&hs=1&r=1&results=1&txq=spiegelman&txf=txIN&ssnip=txt&o=20&dafdq=&dafmq=&dafyq=&datdq=&datmq=&datyq=&puq=&e=-----en-20--1--txt-txIN-spiegelmann>

vii. **Carl R. Woese** –

Woese CR, Fox GE "Phylogenetic structure of the prokaryotic domain: The primary kingdoms" *Proc Natl Acad Sci USA* (1977) 74 (11): 5088–5090  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC432104/>

Woese CR, Kandler O, Wheelis M "Towards a natural system of organisms: proposal for the domains Archaea, Bacteria, and Eucarya" *Proc Natl Acad Sci USA* (1990) 87 (12): 4576–9  
<http://www.ncbi.nlm.nih.gov/pubmed/2112744>

Woese CR, Fox GE "The concept of cellular evolution" *J Mol Evolution* (1977) 10(1):1-6  
<http://link.springer.com/article/10.1007%2FBF01796132>

Woese CR, Olsen GJ, Ibba M, Söll D "Aminoacyl-tRNA synthetases, the genetic code, and the evolutionary process" *Microbiology and Molecular Biology Reviews* (2000) 64(1):202-236  
<http://mmbr.asm.org/content/64/1/202.full>

Woese Papers – Archive List – Attached

The Woese Papers are now open to the public and can be inspected at the Archives Research Center, located at: 1707 S. Orchard Street, Urbana, IL  
<http://archives.library.illinois.edu/archon/index.php?p=collections/controlcard&id=11138&q=woese>

Illinois Digital Newspaper Collections:  
<http://idnc.library.illinois.edu/cgi-bin/illinois?a=q&hs=1&r=1&results=1&txq=Woese&txf=txIN&ssnip=txt&o=20&dafdq=&dafmq=&dafyq=&datdq=&datmq=&datyq=&puq=&e=>

viii. **Ralph S. Wolfe** –

Chung KT, Varel V "Ralph S. Wolfe (1921 - ) Pioneer of Biochemistry of Methanogenesis" *Anaerobe* (1998) 4:205-208  
<http://www.sciencedirect.com/science/article/pii/S107599649890169X>

Wolin MJ, Wolin EA and Wolfe RS "Formation of methane by bacterial extracts" *J Biol Chem*

(1963) 238:2882-2886  
<http://www.jbc.org/content/238/8/2882.full.pdf>  
Bryant MP, McBride BC, Wolfe RS "Hydrogen-oxidizing methane bacteria: I. Cultivation and Methanogenesis" *J Biol Chem* (1968) 95(3):1118-1123  
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC252139/>  
McBride BC, Wolfe RS "A new coenzyme of methyl transfer, coenzyme M" *Biochemistry* (1971) 10(12):2317-2324  
<http://pubs.acs.org/doi/pdf/10.1021/bi00788a022>  
Frankel RB, Blakemore RP, Wolfe RS "Magnetite in freshwater magnetotactic bacteria" *Science* (1979) 203(4387):1355-1356  
<http://www.sciencemag.org/content/203/4387/1355>  
Wolfe RS "My kind of biology" *Ann Rev Microbiol* (1991) 45:1-35  
<http://www.annualreviews.org/doi/pdf/10.1146/annurev.mi.45.100191.000245>

**c. Home of 5 past presidents of ASM**

Thomas J. Burrill (1916), H. Orin Halvorson (1955), and Abigail A. Salyers (2002) served as ASM Presidents while they were at UIUC. Salvador E. Luria (1968) and Stanley R. Maloy (2006) served as ASM Presidents after they left UIUC.  
<http://www.asm.org/index.php/choma3/71-membership/archives/913-presidents-of-the-society>

**d. Association with ASM Landmark events**

The first ASM journal, *J Bacteriology*, and establishment of local ASM branches were first proposed at the 1915 ASM (formerly SAB) Meeting held in Urbana, Illinois. The first volume of *J Bacteriology* was subsequently issued in 1916. The first application to establish a local branch was from the Bacteriology Club at Urbana, Illinois.

Attached is a copy of the Reports to Members of SAB, by A. Parker Hitchens, SAB Secretary-Treasurer, from January 17, 1917, detailing the process of establishing the new *J Bacteriology*, the possibility of establishing local branches of the Society, and the resulting votes.

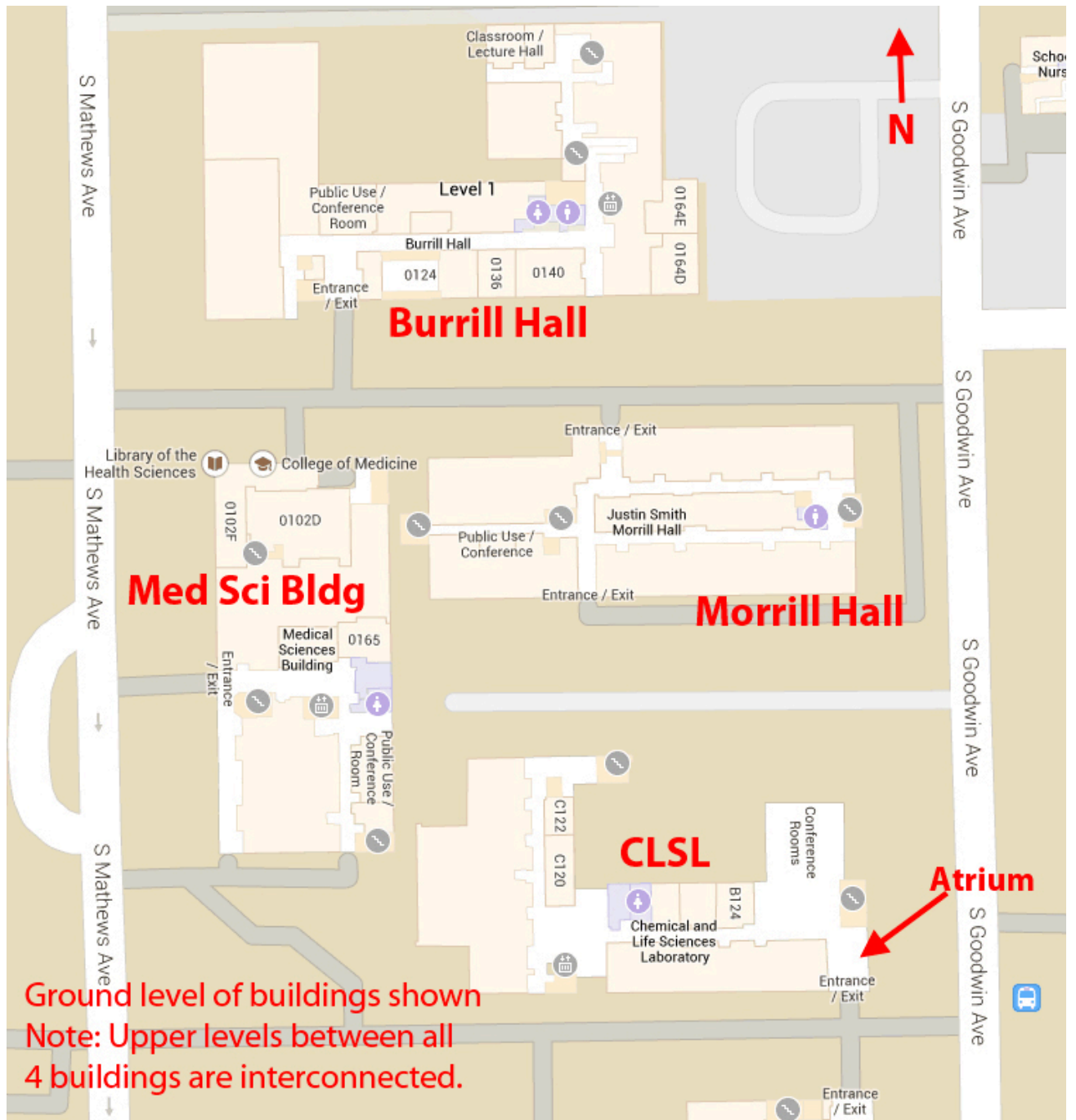
Attached is a copy of a portion of the typescript document of minutes (1913-1924) of the Bacteriology Club of Urbana, Illinois, found in an old record book and prepared by R. D. DeMoss in 1973, which details the plans of the Club to serve as host for the 1915 meeting of the Society in Urbana, Illinois, and the intent to propose the Bacteriology Club of the University of Illinois to serve as a local branch of the SAB.

**8. Present condition, past restorations, and availability to the public**

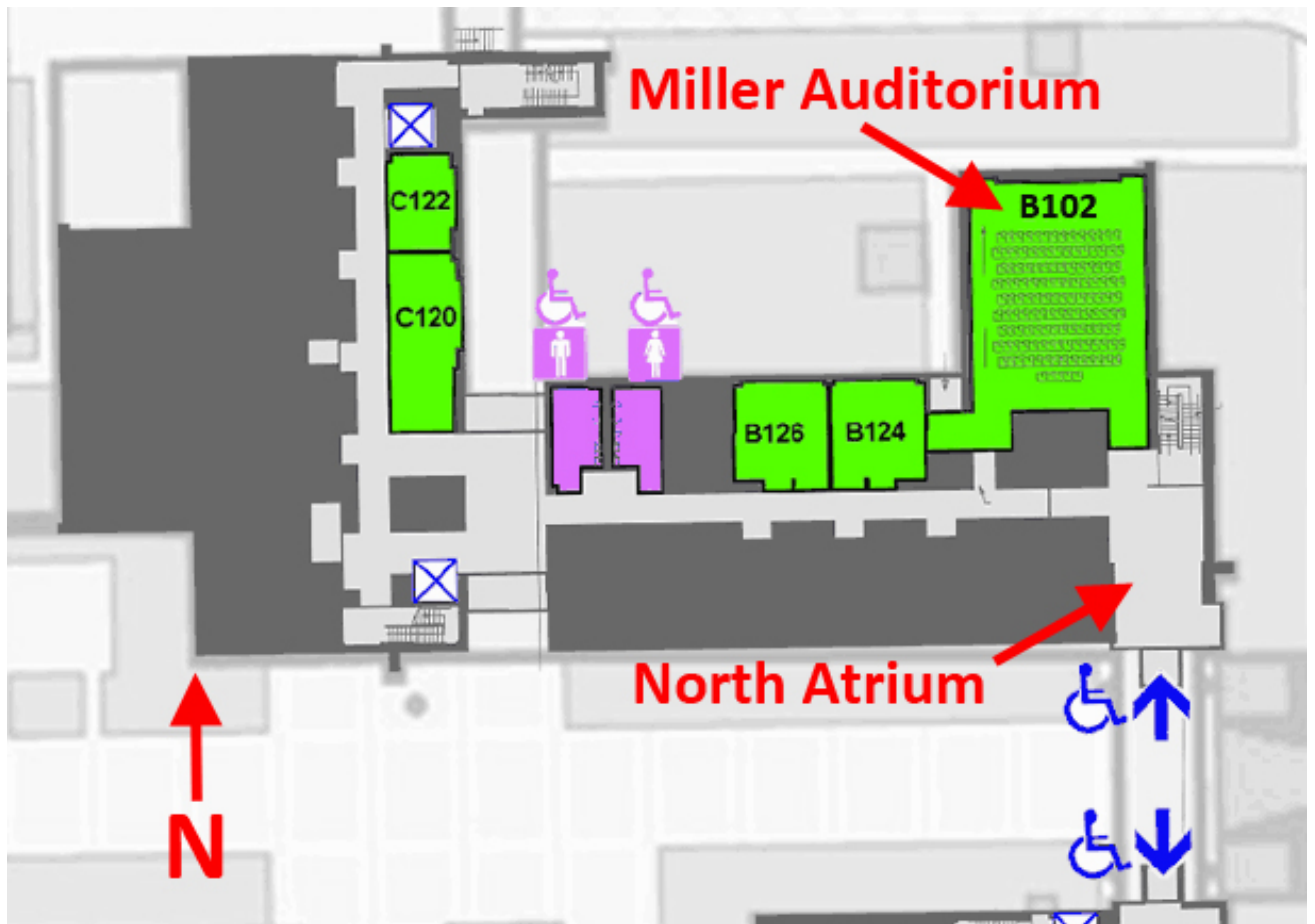
We plan to display in the plaque in the north atrium of the Chemical and Life Sciences Laboratory (CLSL), a building opened in 1997. We plan to include next to the plaque in the atrium a monitor with slides rotating through that feature each of the notable scientific contributions of the honored individuals, and to include a display case featuring pictures with descriptions of the notable contributions.

Shown below are maps and pictures of the proposed site, detailing the location of the buildings (CLSL, Morrill Hall, and Burrill Hall) and north atrium of CLSL (red arrow), where

the ASM plaque would be mounted on the west wall of the atrium adjacent to a monitor screen, with a display case below them where the public can view items associated with the scientific achievements.



Map of the Chemical and Life Sciences Laboratory (CLSL), Morrill Hall, Medical Sciences Building, and Burrill Hall. The North Atrium of CLSL is indicated.

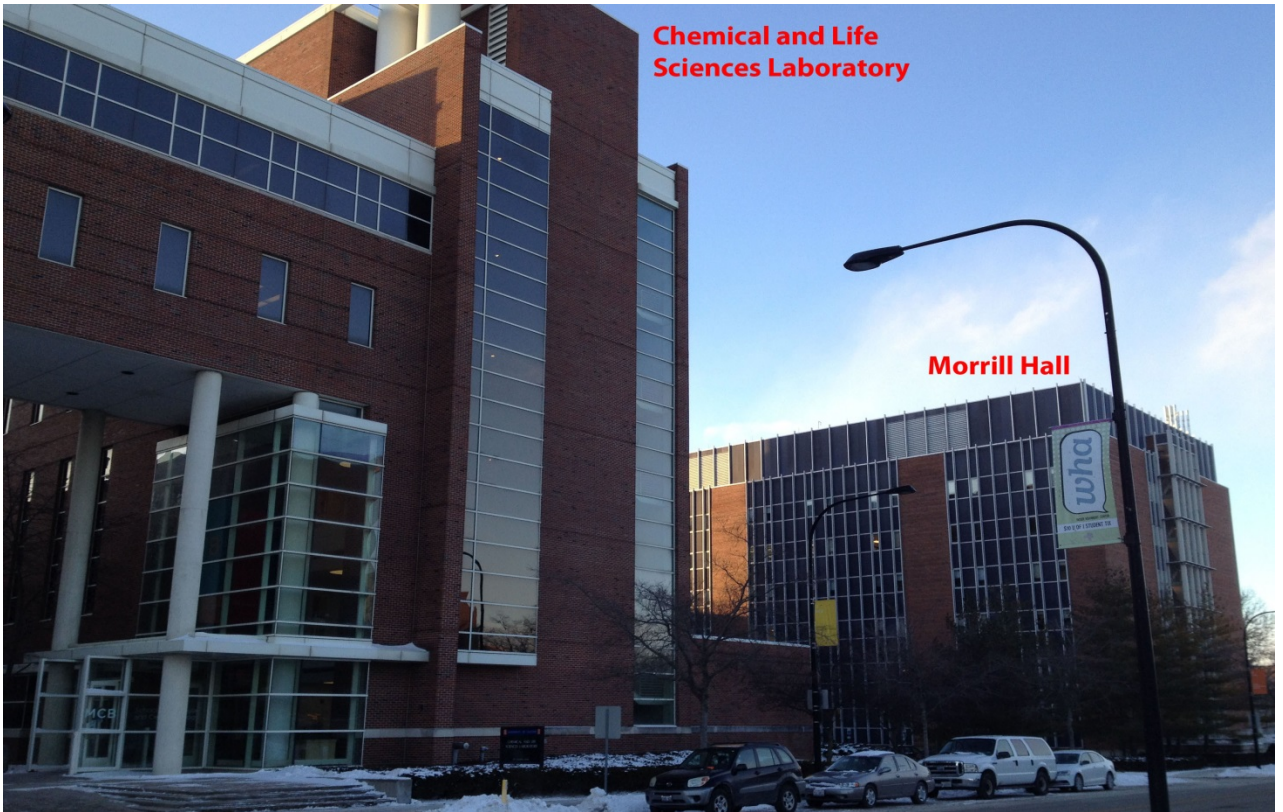


North atrium (indicated above), which is the main entrance to CLSL (see below), is the proposed location, where the plaque will be mounted.



West view of the north building of the Chemical and Life Sciences Laboratory (CLSL), the main entrance for the School of Molecular and Cellular Biology (MCB), including the Department of Microbiology.





Morrill Hall is located directly north of CLSL.



Burrill Hall is located directly north of Morrill Hall.





Entrance to the North Atrium of CLSL.



The North and East Walls of the CLSL North Atrium, opposite the proposed display wall, showing the entrance to the Charles G. Miller Auditorium.





The West Wall of the CLSL North Atrium, the proposed site for where the ASM plaque will be mounted. A monitor similar to the one shown and displaying slides with information

about the plaque honorees would be mounted next to the plaque. A display case showing pictures of notable scientific contributions, such as awards, medallions commemorating achievements, and other items, will be placed below the ASM plaque and monitor.

#### **9. Current owner**

University of Illinois at Urbana-Champaign

#### **10. Tentative plans for a commemoration ceremony**

The commemoration ceremony will be coupled with the Annual Microbiology Conference, which is a 1-day meeting held on a Saturday each fall at a conference center near campus. The next scheduled Conference will be held at the local Hilton Garden Inn on October 17, 2015. Alternatively, the ceremony could be held in early Fall of 2016. Attached is an example of a conference brochure from Fall 2014. For the commemorative ceremony we plan to include researchers from affiliated units on campus with interests in microbiology. We anticipate 100-150 attendees.

**NOTE: This application for a Milestone in Microbiology Award from the American Society for Microbiology is included because it presents the accomplishments of the faculty prior to 2009. As of May 2015, this application has been approved, and the plaque will be installed at a ceremony in the Fall of 2015.**





AMERICAN  
SOCIETY FOR  
MICROBIOLOGY

# MILESTONES IN MICROBIOLOGY SITE

## University of Illinois at Urbana-Champaign



The University of Illinois at Urbana-Champaign (UIUC) has a rich history of major microbiological achievements. It has been home to many outstanding microbiologists who made seminal discoveries that significantly increased biological understanding and advanced the field of microbiology.

As of 2015, UIUC is the home of six past presidents of the American Society for Microbiology (ASM), formerly SAB, Society for American Bacteriologists (SAB): Thomas J. Burrill (1916), H. Orin Halvorson (1955), and Abigail A. Salyers (2002) who all served as president of the Society while at UIUC; Salvador E. Luria (1968), L. Leon Campbell (1974), and Stanley R. Maloy (2006) who served after they left UIUC.

UIUC is associated with landmark events of the ASM (or SAB). Notably, in December 1915 the University hosted the SAB meeting where the Society decided to publish its first journal and to establish local Branches. *Journal of Bacteriology* appeared in the spring of 1916, and the Bacteriology Club at Urbana was recognized as the first local Branch in 1917.

### Thomas J. Burrill (1839 – 1916)



- Discovered bacterial causes of plant diseases, helping found the science of bacterial plant pathology
- Identified *Erwinia amylovora* as the causal agent of fire blight in pear and apple trees
- In 1891, established one of the earliest bacteriology courses in the United States

### Sol Spiegelman (1914 – 1983)



- Pioneered the study of RNA and mechanisms of viral replication
- Pioneered the separation of RNA by polyacrylamide gel electrophoresis
- Developed nucleic acid hybridization technology to detect specific sequences, a basic tool of molecular biology
- Solved the mystery of the origin of ribosomal RNA
- Discovered self-reproducing RNA structures

### Salvador E. Luria (1912 – 1991)



- Pioneered the study of bacterial virus-mediated transfer of DNA
- First observed genetically the phenomenon of microbial DNA restriction and modification
- Awarded Nobel Prize with Max Delbrück and Alfred Hershey in 1969 for their discoveries concerning the replication mechanism and genetic structure of viruses

### Marvin P. Bryant (1925 – 2000)



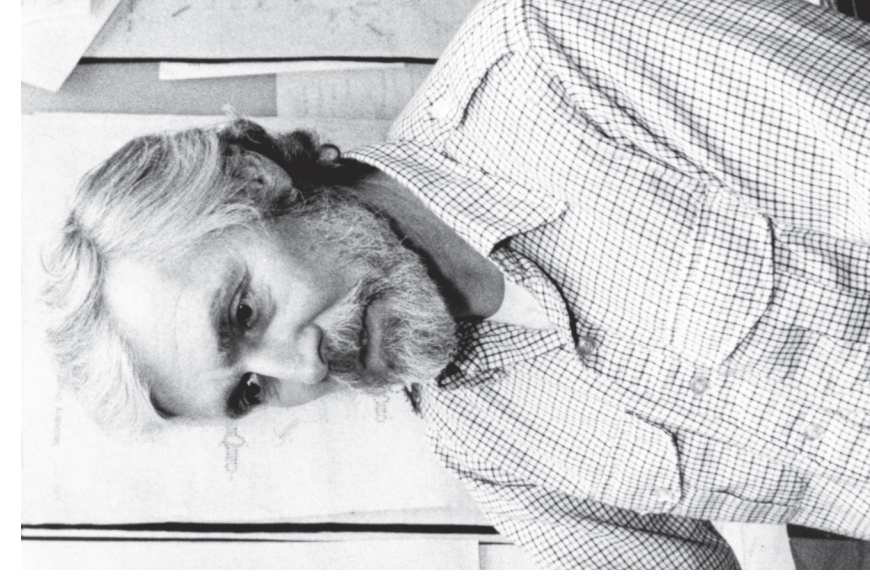
- Pioneered the study of rumen microbes and their roles in cellulose fermentation
- Isolated methanogens from the rumen and defined media for their cultivation
- Pioneered the study of microbial anaerobic degradation of ligno aromatic ring structures

### Irwin C. "Gunny" Gunsalus (1912 – 2008)



- Pioneered studies in microbial biochemistry
- Discovered lipoic acid and worked out its role as a coenzyme
- Defined the structure of vitamin B6
- Developed a genetic system to study *Pseudomonas*
- Charted the microbial metabolic breakdown of steroid-like terpenes
- Discovered the first microbial cytochrome P450 system

### Carl R. Woese (1928 – 2012)



- Revolutionized understanding of life on Earth by pioneering the use of 16S ribosomal RNA sequences as a basis for studying microbial evolution and ecology
- In 1977, discovered the Archaea a new Domain of Life distinct from Bacteria and Eukarya
- Awarded the Leeuwenhoek Medal in 1992, the National Medal of Science in 2000, and the Crafoord Prize in 2003

### Abigail A. Salyers (1942 – 2013)



- Pioneered studies of *Bacteroides* polysaccharide utilization and its role in colonic fermentation
- Developed genetic tools for studying *Bacteroides*, including metabolism, mobilizable elements, and antibiotic resistance
- First female tenured professor in Microbiology at UIUC in 1983 and full professor in 1988

### Ralph S. Wolfe (1921 – )



- Pioneered studies of the microbial biochemistry of methanogenesis
- Developed the first archaeal cell-free extract for methane formation
- Identified ferredoxin and six new coenzymes of methanogenesis
- Isolated and characterized the first *Acetobacterium*
- Leading role in establishing and developing the Woods Hole Microbial Ecology Course

In recognition of these and other achievements, the American Society for Microbiology is pleased to designate the University of Illinois at Urbana-Champaign as a Milestones in Microbiology site.