

Collection Policy: MICROBIOLOGY

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(Several sections excerpted from Microbiology Web Page on April 15, 2002 <http://www.micro.cornell.edu/facultyOverview.html>)

1.0 TEACHING, RESEARCH AND EXTENSION PROGRAMS

1.1 *Mission and emphases of the department*

The mission of the Department of Microbiology is on general bacteriology, with emphasis on mechanisms of transcriptional control in bacteria, and environmental microbiology and ecology. The mission of the Section of Microbiology involves both teaching and research.

1.2 *Faculty research*

Faculty research represents a concentrated expertise in two areas: mechanisms of transcriptional control in bacteria, and environmental microbiology and ecology. All of the faculty in the department work predominantly, if not exclusively, on prokaryotes including both Bacteria and Archaea. Many other areas of Microbiology (including food microbiology, virology, biotechnology, and plant pathology) are represented in the larger Graduate Field of Microbiology that administers the PhD program in Microbiology.

Transcriptional Control Mechanisms in Bacteria

Researchers are interested in the mechanism by which bacteria monitor their environment and selectively activate or repress the appropriate sets of genes. Most often, these responses are controlled at the level of transcription by regulating the activity of RNA polymerase. Research in the Helmann laboratory includes studies of alternative sigma factors and their functions in *Bacillus subtilis* and the roles of metal-sensing proteins in controlling gene expression in response to changing metal ion levels and reactive oxygen species. The Shapleigh laboratory is investigating mechanisms of denitrification in *Rhodobacter sphaeroides* and, in particular, has identified an important role for nitric oxide in controlling transcription of denitrification genes. The Winans laboratory is exploring the complex exchange of chemical signals between host plants and *Agrobacterium tumefaciens*. These studies have revealed intersecting pathways that allow bacteria to respond to the presence of plant wounds and also to sense their own cellular density (quorum sensing). Work in the Zinder laboratory has begun to investigate the regulation of transcription in Archaea. Specifically, one project seeks to identify factors that respond to changing nitrogen availability to regulate nitrogen fixation in *Methanosarcina barkeri*.

Environmental Microbiology and Ecology

These researchers are interested in bacteria in relationship to their natural environment. Work in the Angert laboratory is investigating the biology of bacteria (*Epulopiscium spp.* and *Metabacterium polyspora*) that live as endosymbionts of vertebrates and reproduce by an unusual process related to sporulation. *Epulopiscium spp.* are also unusual in being among the largest known bacteria ever identified. The Ghiorse laboratory investigates the microbial ecology of sub-surface environments, including sites contaminated with aromatic hydrocarbons, and the roles of bacteria in metal ion cycling. Work in Dr. Hay's and Dr. Madsen's laboratories is focused on the ability of microorganisms to degrade pollutants in natural settings. Work in the Zinder laboratory has led to the first pure culture of a bacterium able to completely degrade the important pollutant, tetrachloroethene (TCE). The Russell laboratory focuses broadly on the microbial ecology of the cow rumen, one of the most densely populated microbial ecosystems known.

1.3 *Graduate program*

Graduate students in microbiology are organized based on research interest, rather than college or departmental affiliation. The graduate faculty in the Field of Microbiology consists of 31 members, representing 12 departments distributed among three Colleges and includes faculty from molecular biology and genetics, biotechnology, food science, natural resources, plant pathology among others.

1.4 *Undergraduate program*

Students in CALS can major in Biological Sciences and choose a concentration in one of the Sections before the close of their sophomore

year. Some BioSci students choose to concentrate their studies in Microbiology. Currently, there is no major in Microbiology.

1.5 Extension activity

The Section of Microbiology does not have a mandated extension function. However, they do participate in outreach programs in need of microbiological assistance.

1.6 Noteworthy facilities (e.g. unique classrooms, laboratories, farms, etc.)

Wing Hall has been fully renovated. In addition to their own facilities, there are labs in the Biotechnology building, the Veterinary building, and at the Geneva Experiment Station.

2.0 SUBJECT DESCRIPTION AND GUIDELINES

2.1 Subject definition

Microbiology is the study of the very small (i.e., microscopic) forms of life, often called the microorganisms. Traditionally, these include the fungi (yeasts and molds), the single-celled plants and animals (protozoa and algae), the various types of bacteria (eubacteria and archaeobacteria) and the viruses.

2.2 Subject scope

Because of tradition, the small number of faculty, the lack of specialized facilities and equipment, and its mission in the CALS, the Dept. of Microbiology has concentrated its studies upon the bacteria. Materials on fungi are collected according to the Plant Pathology policy, and on algae according to the Plant Biology policy. Research involving such topics as immunology and virology is not being done in the Dept. of Microbiology but is concentrated in the College of Veterinary Medicine in the Department of Microbiology and Immunology. Most medically related microbiological research is either being done in the College of Veterinary Medicine or the Department of Microbiology of the Cornell Medical College in New York City.

Instructional areas covered by the Section of Microbiology include:

- Evolution of microorganisms.
- Bacterial cell structure and function: cellular components, life cycles and ultrastructure.
- Bacterial physiology, metabolism, and ecology.
- Bacterial genetics, especially enterobacteria and their viruses: mutagenesis, isolation of mutants; genetic exchange, recombination and mapping; complementation, epistasis and suppression; transposons; gene expression, regulation and pathogenesis.
- Bacterial diversity, including molecular methods for determining bacterial phylogeny and taxonomy, the evolution of diverse mechanisms of energy conservation, fixation of carbon and nitrogen, adaptation to extreme environments, interactions between bacteria and plants and animals, prokaryotic development, biodegradation of xenobiotics.
- Molecular plant-microbe interactions, with a focus on *Agrobacterium*-plant interactions (plant-microbe recognition mechanisms, T-DNA transfer process, oncogenesis and production of transgenic plants) and *Rhizobium*-plant interactions (regulation of nitrogenase activity and expression, organization and function of the *sym* plasmid, nodule development and plant genetics.)
- Protein-nucleic acid interactions within bacteria, involving DNA and RNA binding proteins, nucleic acid polymerases, recombinases, topoisomerases, DNA repair enzymes and nucleases.
- Microbiological applications in biotechnology and environmental processes. Microbiological applications in immunology and medicine are collected on a basic level.
- Bacterial and fungal agents of infectious diseases: the basic biological mechanisms, including virulence mechanisms and host-parasite interaction. Does not include clinical and therapeutic aspects.
- Normal flora, antibiotic synthesis and therapy, drug resistance and vaccine development.
- Techniques for isolation, culture and identification of infectious agents.
- Environmental microbiology: the role of microorganisms in elemental cycling, nutrient cycling, compost, transformation of pollutants, bioremediation, waste (solid and liquid) treatment and environmental biotechnology.
- Bacterial systematics (to be covered by a separate Systematics policy).
- Viruses and disease (all but introductory materials are collected by the Veterinary Library).

- Basic holdings in light, video and electron microscopy.

2.3 Emerging trends in the subject area

The department expects to retain its emphases on the ecology, physiology, structure, and genetics of the bacteria. As is true for most areas of biology, the future will bring more reliance upon the use of molecular genetics (i.e. RNA sequencing) and phylogeny in such studies and the use of computer analysis of the results of these studies. The two model organisms: E-coli and Bacillus subtilis are used to help researchers understand their own organism under investigation. Another field of growing interest is in Extremophiles, that is microorganisms that are able to tolerate extreme physical or chemical environments.

3.0 SPECIAL INFORMATION NEEDS AND RESOURCES

3.1 Special information needs of those working in this subject area.

BIOSIS

NCBI (National Center for Biotechnology Information) and related tools (PubMed, Entrez, BLAST (sequencing tools), Structure, Nucleotide)

TIGR (The Institute for Genomic Research) database, available through the Internet

MEDLINE

3.2 Special collections or noteworthy resources in the field

3.3 Endowment funds or special funding arrangements

Mann Endowment -- general biology

Biomedical -- biomedical

Sherman -- general biology and microbiology

4.0 TYPES OF MATERIALS

4.1 Priorities for types of materials

See Priorities Table.

Proceedings of conferences, except for Symposia published by the Society for General Microbiology (UK), should not be collected except by request. Most are out-of-date and not peer-reviewed. For publishers on the Yankee approval plan, slips should be received and submitted to faculty for advice.

Monographs containing state-of-the-art reviews are often useful.

Materials published by Springer Verlag, Academic Press, CRC and NATO are of uneven quality and should be purchased with caution. On the other hand, everything published by the American Society of Microbiology should be obtained.

4.2 Format

Electronic journals are the desired format of most researchers in the department. Print archives of older articles are still necessary from

Mann or from their own reading room. Electronic version of protocols (i.e. Current Protocols) is desirable over print. Mann Library will continue to purchase journals in printed form whenever possible (technically or financially), and will take care to archive older print material. Printed books are desirable over electronic ones.

4.3 Geographical guidelines

United States, Great Britain, Germany and France.

4.4 Language guidelines

Mostly English.

5.0 OTHER RELATED LIBRARY COLLECTIONS

The section has a small library containing journals purchased by the Section or donated by faculty members. Most of these publications have been discontinued, as campus-wide electronic access is available. Other libraries that may be used, in addition to Mann Library, are the Engineering Library (microbiology for environmental engineering), and the library of the College of Veterinary Medicine, which collects materials on virology, immunology and medical microbiology at a research level. (By contrast, virology and immunology are collected by Mann Library at a basic level. Medical microbiology is not collected.) The College of Medicine Library in New York City makes its collection available through FAX and Interlibrary Loan.

6.0 POLICY QUESTIONS, COLLECTION NEEDS, FUNDING PROBLEMS OR OPPORTUNITIES

Bioremediation (the cleanup of organic and non-organic wastes using microbes) is studied by several labs in the department. Water quality is not a priority for Microbiology, but may be of interest to Engineering researchers.

Due to budgetary constraints, the Veterinary Library is currently purchasing few monographs. This may cause campus-wide gaps in materials on animal disease, virology, parasitology and immunology.

7.0 PRINCIPAL LC CLASSES

QR1-647

8.0 RELATED COLLECTION POLICIES

Ecology and Systematics -- microbiology of various biomes

Genetics

Plant Pathology -- fungi, bacterial plant disease, plant virology

Plant Biology -- algae

Agronomy -- soil microbiology

Biotechnology

Agricultural Engineering -- bioprocessing applications, soil microbiology

Food -- food microbiology

Statistics – epidemiology

Toxicology -- cellular and molecular toxicology

food and nutritional toxicology

ecotoxicology and environmental chemistry

Priorities Table for Microbiology

Code	IMPORTANCE/INTENSITY CODES DEFINITIONS
NA	Not applicable to the discipline.
0	Ephemeral; of insufficient value to be provided by library.
1	Of short term interest, but with little or no enduring value; very selectively acquired; retained, uncataloged, for limited duration only, e.g. newsletters in newly emerging, poorly documented areas, and manuals or pamphlets for reserve reading.
2	Limited scholarly interest or utility; collected very selectively, but not of high priority.
3	Important for research and/or instruction; should be well represented, but collected selectively rather than intensively.
4	Very important for faculty and/or students; intensively collected, i.e. every effort is made to provide as deep coverage of this literature as possible.
5	Essential to work in the discipline; the most important type of material for research or instruction purposes. Ensuring the highest possible coverage should be the library's top priority in this discipline.

Code	SERIALS	Notes
5	Journals, scholarly	-
4	Journals, technical	-
-	Journals, other (describe)	-
5	Annual reviews, advances in...	-
3	Scientific and technical reports and research bulletins of major academies, learned societies, professional research and educational organizations and government agencies	-

1	Proceedings, of international congresses and symposia	-
1	Proceedings, national or local	-
NA	Statistical series	-
NA	Trade journals and periodicals	-
NA	Popular periodicals, hobby	-
NA	Popular periodicals, semi-technical	-
NA	Popular periodicals, farm press	-
NA	Newsletters/newspapers	-
NA	Proceedings of legislative bodies	-
NA	Student publications	-
2	Administrative publications of major academies, learned societies, professional, research and educational organizations and government agencies	-
NA	Corporate annual reports	-
NA	Yearbooks	-
NA	Press releases	-
NA	Lists	-
NA	Working papers	-
Code	MONOGRAPHS	Notes
5	Major scholarly monographs	-
5	Professional and technical	-
3	Subject histories	-
5	Textbooks, upper division, graduate	-
2	Biographies. Be very selective.	-

3	Popular monographs. Selective purchases.	-
2	Technical reports	-
NA	Government reports	-
2	Proceedings, international	-
2	Proceedings, other	-
0	Theses and dissertations (outside CU)	-
2	Festschrift: purchase only by request.	-
1	Patents	-
NA	Corporate histories	-
3	How-to books & lab manuals. Selective purchases (Cold Spring Harbor and Current Protocols, etc.)	-
NA	Pamphlets	-
NA	Ephemera (describe)	-
NA	Maps	-
NA	Technical bulletins/handbooks/compendia	-
Code	ELECTRONIC INFORMATION	Notes
2	Applications programs	i.e. Current Contents, BIOSIS
5	Bibliographic databases	-
NA	Bulletin boards	-
NA	Fulltext files	-
NA	Geographic information systems	-
NA	Numeric/statistical files	-
-	Other (describe, taking as much space a necessary)	-

Last updated by Philip Davis with help by Esther Angert, departmental liaison, March 2003.