

Collection Policy: BIOCHEMISTRY, MOLECULAR AND CELL BIOLOGY

[Subject Scope](#) | [Priority Tables](#) | [Other policies . . .](#)

1.0 TEACHING, RESEARCH AND EXTENSION PROGRAMS

1.1 Mission and emphases of the department

The Section teaches courses on the following subjects: general biochemistry, bimolecular structure, recombinant DNA and its applications, metabolism, molecular biology, computer graphics in molecular biology, general cell biology, biotechnology, oncogenes and cancer viruses, yeast genetics and molecular biology of yeast, protein structure and function, membranes and bioenergetics, biosynthesis of macromolecules, structure and function of the cell nucleus, structure and function of the cell cytoplasm, macromolecular crystallography, ethical issues and professional responsibilities, and laboratory courses in biochemistry, recombinant DNA, enzymology, and cell biology, and also seminar courses on special topics from this list.

1.2 Faculty research

The section has 21 faculty members and 17 research associates who carry out research in the areas of biochemistry, molecular and cell biology. A list of research interests of individual faculty members are grouped by the three libraries which would provide the main support for the program:

MANN LIBRARY

- Rapid reaction methods applied to ligand-receptor interactions
- Effect of extracellular ATP and adenosine on early and late events in DNA synthesis
- Structure and function of membrane transporters in the cell
- Microfilament organization and the functions of actin in animal and yeast cells
- Microtubule-based motility in yeast and functioning of the mitotic spindle
- Membrane trafficking in the cell, biogenesis and functioning of Golgi and lysosomes
- Signal transduction by oncoprotein kinases like src, and functions of src in the cell cycle
- Factors needed for the regulation of the initiation of DNA replication in yeast
- Gene regulation and chromatin structure in eukaryotes
- Regulation of the heat shock genes
- Control of gene expression in bacteria, especially *E. coli* and *Bacillus subtilis*
- Multiple functions of the leucine-response regulatory protein in bacteria
- Bacterial transcription mechanisms, especially termination, and control of DNA repair functions
- Mobile introns in genes for ribosomal RNA in acellular slime mold
- Genetic engineering of cellulases from thermophiles using recombinant DNA technology
- Production of agronomically important transgenic rice plants by introducing resistance genes, etc.
- Structure and function of neurotransmitter receptors

PHYSICAL SCIENCE LIBRARY

- Structure and assembly of retroviruses
- X-ray crystallography of proteins
- NMR spectroscopy of proteins and domains of proteins, and ligand binding to proteins
- Protein structure, structure-function relationships, and protein dynamics
- Structure-based drug design based on analysis of molecular structure of ligand-protein complexes
- Biological applications of synchrotron radiation (needs further review)

ENGINEERING LIBRARY

- Computational analysis of protein-ligand interactions

1.3 Graduate program

Almost all the 70 or so graduate students in the department work towards a Ph.D. degree in the four different areas listed in 2.1. Very few students choose to study for an MS degree alone. About 15 students are selected to start the program each year.

1.4 Undergraduate program

There are about 136 concentrators all of whom are majors in Biological Sciences. Some specialize in Biochemistry, some in Cell Biology, and a few in Biophysics. Many are premedical students. Perhaps one fifth are interested in careers in science, often in research. At any one time about 40 undergraduates do independent research projects in the laboratories of professors in the Section.

The majority of the courses listed in the course catalog are directed to undergraduates or can be taken by undergraduates. Introductory general biochemistry is taught in a number of different formats for a large number of students. In the past these students were all Juniors, but now more and more Sophomores are taking introductory biochemistry.

1.5 Extension activity

The Section contributes to the training program of the Cornell Institute of Biology Teachers run by the Division of Biological Sciences.

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

The Biotechnology Building provides exceptionally fine laboratories for research and has up-to-date equipment. The Biotechnology Center in the same building provides support facilities for the sequencing and synthesis of DNA and protein, for computer graphics, and for video imaging and confocal microscopy, etc. There is also a Plant Science Center in the building with a gene gun for transfecting cells with DNA, etc.

The Biophysics group uses MacChess, the Macromolecular Diffraction Facility of the Cornell High Energy Synchrotron Source and also the supercomputing facility of the Cornell Theory Center. And the Biophysics group now has the use of the very fine new Keck 3D Stereo Viewing Theater in the Biotechnology Building. Also a Biomolecular NMR Center is being developed in the Biotechnology Building.

2.0 SUBJECT DESCRIPTION AND GUIDELINES

2.1 Subject definition

Within the Division of Biological Sciences, the section is responsible to both the Arts College and CALS for teaching the fundamentals of four fields of biology and doing research in these areas.

Biochemistry:

The basic biochemical mechanisms used by all living organisms including microorganisms, viruses, plants, and animals. This includes the structure and function of proteins, nucleic acids (DNA and RNA), carbohydrates, lipids, steroids, hormones, vitamins, etc., and the pathways of metabolism of all of these substances. It includes enzymology, and the specific biochemistry of the different types of tissues of an organism.

Molecular Biology:

The techniques for working with recombinant DNA, construction of plasmids, vectors, cloning, transfection, site specific mutagenesis, etc., and the basic mechanisms of DNA replication, transcription of DNA into RNAs, and protein synthesis.

Cell Biology:

The cell structures present in all types of animal cells and the way in which these structures function in the growth and functioning of these cells. The emphasis in this Section is on animal cell biology, as plant cell biology is dealt with by the Section of Plant Science, microbial and viral cell biology by the Section of Microbiology and the Vet College.

Biophysics:

General biophysics covers the physics of all biological processes, but the Section focuses on methods for studying the structure of proteins such as X-ray analysis, synchrotron radiation, nuclear magnetic resonance (NMR), and computational analysis. In structure-based drug design the new methods for determining molecular structures of protein-ligand complexes are used to find inhibitors which could become novel drugs.

2.2 Subject scope

The materials needed by Biochemistry, Molecular Biology and Cell Biology fall generally into the definition above. A more detailed description for each area is provided below.

Biochemistry:

Amino acids, peptides, the sequence and structure of proteins, enzymes and their mechanism of action and kinetics, sugars and polysaccharides, lipids, sterols, nucleotides, the sequence and structure of RNA and DNA, genes, chromatin, chromosomes, gene expression, transcription, protein synthesis, the synthesis and metabolism of all sugars, amino acids, lipids, nucleotides, glycolysis, citric acid cycle, oxidative phosphorylation, photophosphorylation, bioenergetics, vitamins, membranes.

Molecular Biology:

The techniques for working with recombinant DNA, construction of plasmids, vectors, cloning, transfection, site specific mutagenesis, etc., and the basic mechanisms of DNA replication, transcription of DNA into RNAs, and protein synthesis.

Cell Biology:

Electron microscopy, immunofluorescence, and other methods for studying cells, the cytoskeleton, actin and microfilaments, tubulin and microtubules, intermediate filaments, the structure of the nucleus, chromosomes and gene expression, protein synthesis and the endoplasmic reticulum, the Golgi and Trans Golgi Network, lysosomes, endocytosis, exocytosis, vesicular transport, secretion, structures and functioning of cellular organelles, mitochondria and chloroplasts, cell division cycle, mitosis, meiosis, growth factors and signal transduction, cell junctions and cell adhesion, extracellular matrix, specialized tissues, oncogenes and cancer.

Biophysics:

Methods for studying the structure of proteins such as X-ray analysis, synchrotron radiation, nuclear magnetic resonance (NMR), and computational analysis, also structure-based drug design which uses new methods for determining molecular structure to find new inhibitors which could become novel drugs.

Note: Biophysics is collected at the Physical Sciences Library per an agreement between the two libraries reached in 1995. Mann Library will only collect in Biophysics at an introductory and overview level (e.g. textbooks and annual review titles).

2.3 Emerging trends in the subject area

With the earlier addition of three professors of Cell Biology, Professors Bretscher, Brown, and Huffaker, the Section expanded into the then rapidly growing field of Cell Biology. Then with the more recent arrival of Professors Ealick and Karplus, the Section expanded into the currently rapidly growing area of Biophysics. This area is especially strong here at Cornell because of the availability of the synchrotron radiation. Both Cell Biology and Biophysics are areas which are expanding more rapidly than classical Biochemistry at present. With the addition of Professor Shalloway to the faculty, the developing area of oncogenes (genes which when mutated cause cancer) is now strongly represented. Within Cell Biology, there is now a growing interest in what is called signal transduction, the way in which a substance acting on the surface of a cell can exert an effect on the expression of DNA in the nucleus through a series of stepwise protein-protein interactions. The Section hopes to recruit a new faculty member working in this rapidly developing area.

3.0 SPECIAL INFORMATION NEEDS AND RESOURCES

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

The most important single source of databases for this Section is **Entrez** on the WWW available to anyone, updated frequently and provided by the National Center for Biotechnology Information. The NCBI WWW Entrez PubMed Browser, at <http://www3.ncbi.nlm.nih.gov/Entrez/> lists the following databases which contain sequences for all kinds of organisms, including viruses, microorganisms and eukaryotes, animals and plants:

- NCBI protein database
- NCBI nucleotide database
- NCBI 3-D structure database
- NCBI genome database
- NCBI taxonomy

In addition, the faculty use a WWW accessible database, called **Tigr**, which contains the sequences of all the genomes which have been completely sequenced. It is found at <http://www.tigr.org/tdb/>.

Also, many faculty use **PubMed** at <http://www3.ncbi.nlm.nih.gov/PubMed>. The database contains over 9 million citations from Medline as well as pre-Medline citations. Because PubMed is as timely or more timely as Current Contents, the department will discontinue its the subscription to Current Contents, Biological Sciences in 1998.

Finally, the Biotechnology Center provides a program, **DNA Star**, for operating on DNA sequences. Users must pay for the use of this program. (The Center has discontinued the use of a VAX to provide the sequences of the GeneBank and EMBL since they are available on WWW.)

This Section together with the Section of Genetics and Development and Biotechnology maintains a collection of the most frequently used journals in the reading room of the Biotechnology Building. Many of these journals are contributed by individual faculty members. For journals too expensive for individual faculty to subscribe to, or journals used less frequently, the department is entirely dependent upon the Mann and Clark Libraries and the Library of the Veterinary College.

3.2 Special collections or noteworthy resources in the field

3.3 Endowment funds or special funding arrangements

- Biomedical Fund -- Biological applications in Physiology, Anatomy, Nutrition, Genetics, and Microbiology
- Mann Fund -- General Biology
- Sarna Fund -- Genetics, Molecular Biology, and Cell Biology

4.0 TYPES OF MATERIALS

4.1 Priorities for types of materials

See [Priorities Table](#).

4.2 Format

N/A

4.3 Geographical guidelines

The subject is not geographically determined.

4.4 Language guidelines

English Language only.

The major literature in our four fields is all published in English in the USA, England and Europe. Most of the first rate Japanese research is also published in these English language journals.

4.5 Chronological guidelines

N/A

5.0 OTHER RELATED LIBRARY COLLECTIONS

Physical Science Library

Collects information on all areas of chemistry including bioorganic chemistry, bioinorganic chemistry and biophysics. Special emphasis is placed on the design, synthesis, isolation and chemical communications of biologically active compounds; structure and chemical interaction of peptides, nucleic acids, proteins, carbohydrates, alkaloids, and terpenes; use of instrumentation for analysis of biologically active compounds; drug design at the compound level; and the chemical basis for the origins of life. Generally the Physical Sciences Library does not collect materials in the area of gums, resins, biological activity of drugs, or clinical trials.

Veterinary College Library

Medical books and journals

Biotechnology Building Reading Room

The key journals used by the two Sections and the Biotechnology Center. These are personal subscriptions of faculty members and some subscriptions purchased by the three units through Mann Library Acquisitions.

6.0 POLICY QUESTIONS, COLLECTION NEEDS, FUNDING PROBLEMS OR OPPORTUNITIES

6.1 Policy Questions

1. Physical Sciences library has a special interest in proteins. The division between Mann and PSL in this area should be delineated
2. Mann Library doesn't generally collect information on drug design. This collection guideline warrants review considering faculty research in the area 1.2 (specifically: Structure-based drug design based on analysis of molecular structure of ligand-protein complexes.)

6.2 Ongoing Collection Needs

1. A number of publishers are each putting out a complete line of monographs on biochemical or cell biology topics or practical techniques books in competition with each other. This creates a problem in trying to find among all these new books any which will have a lasting value. Mann Library selectors should send the book information to the faculty liaison in Biochemistry who will have the faculty member most knowledgeable in the area evaluate the book before purchasing.
2. In a general way, protocol books are valuable in a laboratory but not in the library. (Some departments make an exception for Oxford's Practical Approach Series, which gives a background on techniques.)
3. Conference and symposium proceedings are usually not worth adding to the collection. There are a few well know exceptions, for example The Cold Spring Harbor Symposia on Quantitative Biology. If some professor knows of a volume like this which is really valuable and finds Mann has not acquired

it, the professor can ask Mann to get it.

4. Mann Library is not a medical sciences library and is not funded to have a strong collection in oncogenesis. Given faculty interest in oncogenes and cancer viruses (see Section 2.2 and 2.3), there is a clear need for further funding, possibly from independent sources.

7.0 PRINCIPAL LC CLASSES

- QD 8-9 Communication of Chemical Information (Mann)
- QD 40-49 Study and Teaching, Research, Primary and Secondary (Mann)
- QD 415-436** Biochemistry (Physical Sciences)
- QD 416** Terpenes, Camphors, etc. Essential Oils (Physical Sciences)
- QD 419** Gums and Resins (Physical Sciences)
- QD 421** Alkaloids (Physical Sciences)
- QD 426** Steroids (Physical Sciences)
- QD 431** Proteins, Peptides, Amino Acids, etc. (Physical Sciences)
- QD 433-436** Nucleic Acids (Physical Sciences)
- QH 426-531 Genetics (Mann)
- QH 573-671 Cytology (Mann)
- QP 501-801 Animal Biochemistry (Mann)

** The QD class for Biochemistry emphasizes the physical chemistry aspect of biochemistry: atomic composition, structure (steriochemistry), energy changes, and the phenomena of atoms and compounds associated with biochemical substances. Many items in this class will naturally go to Physical Sciences Library. A rough rule to follow: if a selection approaches the topic as a discussion concerning chemical structure or composition, direct it to Physical Sciences Library; if a selection involves biological systems or cellular processes, direct it to Mann Library.

8.0 RELATED COLLECTION POLICIES

- GENE
- MICR
- PHYS
- PLBI

Priorities Table for Biochemistry, Molecular & Cell Biology

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	-

3	Journals, technical	-
-	Journals, other (describe)	-
4	Annual reviews, advances in...	-
2	Scientific and technical reports and research bulletins of major academies, learned societies, professional research and educational organizations and government agencies	-
0	Proceedings, of international congresses and symposia	-
0	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	-
NA	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
4	Major scholarly monographs	-
3	Professional and technical	-
2	Subject histories	-
2	Textbooks, upper division, graduate	-
NA	Biographies	-

Code	ELECTRONIC INFORMATION	Notes
2	Applications programs	-
5	Bibliographic databases	BIOSIS
NA	Bulletin boards	-
NA	Fulltext files	-
NA	Geographic information systems	-

NA	Popular monographs	-
NA	Technical reports	-
NA	Government reports	-
1	Proceedings, international	-
1	Proceedings, other	-
0	Theses and dissertations (outside CU)	-
2	Festschrift	-
NA	Patents	-
NA	Corporate histories	-
NA	How-to books & lab manuals	-
NA	Pamphlets	-
NA	Ephemera (describe)	-
NA	Maps	-
2	Technical bulletins/handbooks/compendia	-

NA	Numeric/statistical files	-
5	Other (describe, taking as much space as necessary)	-

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 June, 1997

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