

Collection Policy: PLANT BIOLOGY

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

1.0 TEACHING, RESEARCH AND EXTENSION PROGRAMS

1.1 Mission and emphases of the department

Research in the section covers the areas of plant physiology and biochemistry, cell biology, molecular genetics, biomechanics, paleobotany, anatomy and morphology. The Section is unusual in emphasizing vertical integration across disciplinary boundaries and collaboration with faculty from the applied plant sciences, chemistry and engineering. The section plays an important role in evolutionary studies. However, teaching and research in plant ecology is conducted by faculty in the Section of Ecology and Systematics, while plant systematics is primarily the responsibility of faculty in the Bailey Hortorium.

1.2 Faculty research

There are currently eleven faculty in the section, four adjunct members from the Boyce Thompson Institute and the U.S. Plant, Soil & Nutrition Laboratory, and a joint appointee with the Bailey Hortorium. The research interests of the individual faculty members are outlined on the World Wide Web in the location <http://www.bio.cornell.edu/plantbio/sofplantbio.html>. The section has particular strengths in the areas of photosynthesis, transport of ions and metabolites, biomechanics, developmental and reproductive plant biology, and plant molecular biology. A few of the faculty are also members of fields other than Plant Biology, such as Biochemistry and Applied Physics.

1.3 Graduate program

The section provides the administrative base for the Graduate Field of Plant Biology (formerly Botany). Approximately 30 graduate students are associated with faculty in the section. The graduate program within the Section covers the following areas of concentration: plant physiology; plant molecular biology; plant cell biology/cytology; plant morphology/anatomy/biomechanics; and paleobotany.

1.4 Undergraduate program

There are Plant Biology and Plant Biotechnology options in the Plant Biology "program of study" within the Biological Sciences major of the Division of Biological Sciences. There is also a Plant Biology specialization within the Plant Science major in the College of Agriculture and Life Sciences. While these programs have only a few students each, we anticipate growth in the plant biotechnology program. However, an important function of the undergraduate teaching program is in providing service courses to students in the Plant Science and Biological Science majors. New courses deal with plant molecular genetics, and plants and global issues, and it is anticipated that these new offerings represent areas of increasing interest to students in the near future.

1.5 Extension activity

The section has no formal extension responsibilities, but commonly serves to answer questions about plants received from the general public, and to direct inquiries requiring additional expertise to the appropriate resource centers on campus.

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

The laboratories and classrooms of the Section have modern facilities for instruction, and research, including plant growth chambers and greenhouses, that are maintained by the section or for which the maintenance and supervision are shared. These extend to all the subject areas of the Section.

In addition to the microscopy equipment in individual laboratories, an integrated microscopy facility for electron and optical microscopy, and image analysis, is administered by the section for the College of Agriculture and Life Sciences and the College of Veterinary Medicine under the supervision of Dr. Parthasarathy.

A number of specialized facilities are used by faculty of the Section to extend their research capabilities in areas like plant physiology and plant molecular biology, including picosecond fluorescence and femtosecond transient absorption facilities, and extensive facilities for the analysis and synthesis of nucleic acids.

2.0 SUBJECT DESCRIPTION AND GUIDELINES

2.1 Subject definition

Plant biology is the study of the structure and function of extant plants. However, plant biology as we practice it includes the study of evolution, and therefore the study of fossil plants.

2.2 Subject scope

The Section deals with the structure and function of all kinds of plants, including algae. Studies emphasizing systematics and ecology are dealt with principally by other sections in the Division of Biological Sciences, and fungi are dealt with by the Department of Plant Pathology and matters concerning fungi are described in their policy. Traditionally, plant biology has been divided into morphology and anatomy, physiology, taxonomy, paleobotany and ecology. However, in recent years there has been a trend in favor of recognizing functional disciplines with appropriate terminology. Hence, the areas of plant cell biology, plant molecular biology, plant biochemistry, plant biophysics and plant biomechanics are now recognized as identifiable subject areas of plant biology. There is, of course, considerable overlap both among these subjects and with the older subject groupings. The list below is organized around topics that reveal the subject matter within these areas that represent the specialties of our faculty.

The teaching effort of our faculty overlaps with their research specialties. However, course content is much broader than would be represented by the research specialties alone.

Specific research interests of the faculty include, but are not limited to the following:

PLANT PHYSIOLOGY BIOCHEMISTRY AND BIOPHYSICS

Photosynthesis and chloroplast biology

- Physiology and biophysics of photosynthesis in higher plants, algae and bacteria

- Mechanism of photophosphorylation

- Chloroplast DNA repair enzymes

- Amino acid and protein biosynthesis and turnover

- Carbohydrate metabolism

 - Photosynthetic carbon dioxide fixation

 - Carbohydrate synthesis

Plant Growth Regulators

- Biosynthetic pathways of growth substances (particularly gibberellic acid, auxin and cytokinin).

Nitrogen fixation

Water relations of plants

- Mechanism of water permeation across membranes

Plant nutrition

Ion transport in plants

- The mechanisms of ion transport across membranes, including membrane ATPases, secondary transport systems and ion channels.

- Identification and purification of membrane transport proteins

Electrophysiology

Phloem transport

- Mechanisms of phloem loading in leaves and unloading in developing embryos (seed loading)

Developmental physiology

- Molecular mechanisms of hormone action

- Signal transduction

- Physiology and developmental regulation of plant senescence, stem and root elongation, and fruit ripening

- Developmental physiology of nodulation

- The import-export transition in developing leaves

Stress physiology

- Mechanisms of aluminum tolerance

PLANT MOLECULAR BIOLOGY

Molecular genetics of hormone action
Molecular genetics of virus resistance
Molecular basis of self-incompatibility
Regulation of plant organelle gene expression
Chloroplast DNA repair and recombination enzymes

PLANT CELL BIOLOGY

The cytoskeleton.
Cell motility (actin- and tubulin-based motility)
Structure and function of plasmodesmata
Cellular responses to gravity and light
Cellular bioenergetics

PLANT ANATOMY AND MORPHOLOGY

Plant structure/function
Phloem structure and function
Morphological adaptations and evolution
Paleobotany
Developmental morphology and anatomy, vegetative and reproductive
Plant biomechanics
Application of engineering principles to the study of plant branching, photosynthetic tissue display, and hydraulics.

OTHER NOTES

General laboratory techniques (fluorescence, gel electrophoresis, HPLC) are collected selectively, and only as applied to plants.

The use of plants as indicators (e.g., tree ring analysis, pollution indicators) is collected according to the department of the application.
Botanical illustration (paintings, plates, techniques) is collected by the Bailey Hortorium.

2.3 Emerging trends in the subject area

It may be anticipated that the tools of molecular biology will become of increasing importance over the next several years. Ion channels and the associated "patch clamp technique" are topical. Other expanding areas include: the "membrane skeleton" (a lattice on the inner surface of the cell membrane made up of several different proteins); the extracellular matrix; integrins (transmembrane proteins involved in signal transduction); chaperone proteins (molecules that facilitate the folding of other proteins); enzyme phosphorylation; signal transduction; phytopharmacology; cell-cell interactions; chemical ecology; phytoremediation.

3.0 SPECIAL INFORMATION NEEDS AND RESOURCES

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

Access to DNA/RNA/protein sequence and structure analysis software and sequence databases.

Databases on structure of smaller organic and inorganic compounds.

3.2 Special collections or noteworthy resources in the field

- [Bailey Hortorium](#)

3.3 Endowment funds or special funding arrangements

- Mann Endowment -- General biology
- Ferguson -- Botany
- Burnham -- Botany
- Clausen -- Treatises

4.0 TYPES OF MATERIALS

4.1 Priorities for types of materials

See [Priorities Table](#).

Conference proceedings are sometimes useful, because authors can take more risks and be more innovative than would be possible in more permanent publications. Flyers describing proceedings should be sent to the liaison for advice. For slips which describe proceedings, the descriptions should be sent via email.

4.2 Format

It is quite possible that a number of texts and monographs may soon be available in electronic form. This may require provision of extra facilities so that they can be read.

Computer models, of plant growth for example, are very difficult to evaluate from printed descriptions. It seems likely that direct interaction with the programs on a microcomputer will be desirable as a means of evaluation in the future. At present the microcomputer center has available only the corn growth model "CERES-maize". As graphical interfaces improve, it is probable that the provision of models on disk will be useful both for research and as an interactive instruction medium.

4.3 Geographical guidelines

For basic biology, geographical restrictions are not meaningful. For systematics literature, see separate Systematics policy.

4.4 Language guidelines

Most work in the fields of interest to this section is published in English. Some systematics work may be collected in French, Spanish or German. Chinese material is of growing importance; such material in non Roman alphabets will be collected by Wason.

4.5 Chronological guidelines

5.0 OTHER RELATED LIBRARY COLLECTIONS

The Physical Sciences Library is used for critical journals in biophysics and biochemistry. The Veterinary College Library has some journals not available in Mann, particularly techniques journals. The Engineering Library may be consulted occasionally in such areas as mechanics, fluid dynamics, system dynamics, NASA publications, etc.

6.0 POLICY QUESTIONS, COLLECTION NEEDS, FUNDING PROBLEMS OR OPPORTUNITIES

The collection needs more materials on mineral nutrition, specifically the modification of mineral nutrients in plants to improve nutritional status in populations consuming them.

7.0 PRINCIPAL LC CLASSES

QK 641-899
 QH368.5
 QH423
 QE 901-996

8.0 RELATED COLLECTION POLICIES

- [ECOL](#) -- studies on the population level
- [BIOC](#) -- genetic engineering of plants
- [PLPA](#) -- physiology of fungi
- Systematics
- [GENE](#)
- [PLBR](#)
- [AGRO](#)
- [Horticultural Sciences](#)

Priorities Table for Plant 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	-
5	Journals, technical	-

-	Journals, other (describe)	-
5	Annual reviews, advances in...	-
4	Scientific and technical reports and research bulletins of major academies, learned societies, professional research and educational organizations and government agencies	-
4	Proceedings, of international congresses and symposia	-
3	Proceedings, national or local	-
NA	Statistical series	-
NA	Trade journals and periodicals	-
NA	Popular periodicals, hobby	-
3	Popular periodicals, semi-technical	-
NA	Popular periodicals, farm press	-
2	Newsletters/newspapers	-
NA	Proceedings of legislative bodies	-
NA	Student publications	-
1	Administrative publications of major academies, learned societies, professional, research and educational organizations and government agencies	-
NA	Corporate annual reports	-
NA	Yearbooks	-
0	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	-
3	Biographies	-
3	Popular monographs	-
3	Technical reports	-
2	Government reports	-
4	Proceedings, international	-
3	Proceedings, other	-
2	Theses and dissertations (outside CU)	-
2	Festschrift	-
0	Patents	-
NA	Corporate histories	-
NA	How-to books & lab manuals	-
NA	Pamphlets	-
NA	Ephemera (describe)	-
NA	Maps	-
-	Mathematical computer models	physiological process, crop growth, etc.
3	Technical bulletins/handbooks/compendia	should be available on campus, not necessarily Mann
Code	ELECTRONIC INFORMATION	Notes
2	Applications programs	-
5	Bibliographic databases	-
2	Bulletin boards	local? internet?
3	Fulltext files	-

NA	Geographic information systems	-
NA	Numeric/statistical files	-
-	Other (describe, taking as much space a necessary)	-

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[Top of Page](#)