

SIMON FRASER UNIVERSITY

S.75-180

MEMORANDUM

To..... SENATE

From..... SENATE COMMITTEE ON UNDERGRADUATE.....

..... STUDIES

Subject..... NEW COURSE PROPOSALS - PLANT
..... PHYSIOLOGY

Date..... NOVEMBER 13, 1975.....

MOTION 1:

"That Senate approve and recommend approval to the Board of Governors, as set forth in S.75-180, the following courses:

BISC 337-3 Comparative Morphology, Distribution
and Evolution of Vascular Plants
BISC 437-3 Plant Development and Morphogenesis
BISC 347-3 Physiology of Plant Nutrition and
Metabolism
BISC 447-3 Control and Regulation in Plants."

(Note: The approval of BISC 337-3 and 347-3 will result in the deletion of BISC 336-3 and BISC 315-3 respectively from the Biological Sciences curriculum.)

MOTION 2:

"That Senate approve that BISC 447-3 may be first offered in the Summer Semester 1976-2."

SIMON FRASER UNIVERSITY

S.75-180

MEMORANDUM

To..... SENATE

From..... SENATE COMMITTEE ON UNDERGRADUATE STUDIES

Subject New course proposal - Plant
Physiology

Date..... 13th November, 1975

Action taken by the Senate Committee on Undergraduate Studies at its meeting of November 12th, 1975 gives rise to the following motion:

MOTION

That Senate approve and recommend approval to the Board of Governors BISC.337-3 - Comparative morphology, distribution and evolution of vascular plants; BISC.437-3 - Plant development and morphogenesis; BISC.347-3 - Physiology of Plant Nutrition and Metabolism; and BISC.447-3 - Control and Regulation in Plants.

Note - The approval of BISC.337-3 and 347-3 will result in the deletion of BISC.336-3 and BISC.315-3 respectively from the BISC. curriculum.



Daniel R. Birch

:ams

att.

SIMON FRASER UNIVERSITY

SCUS 75-45

MEMORANDUM

To H. Evans
Secretary of SCUS
Subject NEW COURSE PROPOSALS - PLANT
PHYSIOLOGY

From S. Aronoff *S Aronoff*
Dean of Science
Date October 24, 1975

The Faculty of Science, at its meeting of October 16, 1975, approved the following new course proposals:

BISC 337-3	Comparative morphology, distribution and evolution of vascular plants.
BISC 437-3	Plant development and morphogenesis
BISC 347-3	Physiology of Plant Nutrition and Metabolism
BISC 447-3	Control and Regulation in Plants

The proposal forms and further documentation for these courses are forwarded herewith for consideration by SCUS.

/pel

Encl.

Secretary's Note:

*I/ BISC 337-3 is added drop BISC 336-3
BISC 347-3 " " BISC 315-3*

Waiver for 447-3

SIMON FRASER UNIVERSITY

MEMORANDUM

To DUCC - Department of Biological Sciences

From G. R. Lister, L. M. Srivastava,

W. E. Vidaver

Subject Plant Programme - Physiological;
Development and Anatomy Courses.

Date March 14, 1975

The field of Plant Science has undergone considerable change in recent times, both in extent and depth of insight into the complex phenomena involved in plant function, growth and development.

Two one semester courses, at the 300 level, were originally instituted in the areas of plant physiology, morphogenesis and anatomy. It was recognised at that time, that these areas would eventually have to be expanded when faculty, facilities and time were available.

It has become increasingly clear however, that if a viable programme in Plant science as an entity in itself and as an integral part of the discipline of Biological Sciences, is to be offered, expansion of these courses must take place now. The essential information and concepts content of these areas cannot be adequately taught in two one semester courses. The present physiological course is limited to an inadequate consideration of essentially only herbaceous angiosperms, other important plant groups such as marine macrophytes and conifers are barely dealt with at all.

At most institutions, these areas are 'Year' courses, taught either as one integrated unit or as is increasingly been set up, divided almost precisely along the lines proposed here, i.e. two one semester (term) courses in each area with a varying degree of inter-dependance. The Botany Department at U.B.C. is attempting at the present time to achieve a similar system while also liaising with the Departments of Agr. Science and Plant Science. The University of Windsor for example, already has such a system in operation.

It is also desirable that there be increased co-ordination between the physiological and the development-anatomy courses. The form that this should take initially is to offer courses 347 and 337 in the same semester, the laboratory sessions to be held in the same lab. Courses 447 and 437 would follow, also in the same lab. The advantages of this scheduling lie in the areas of subject matter co-ordination and correlation and would ease considerably Departmental facility and logistics problems.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: BIOLOGICAL SCIENCES

Abbreviation Code: BISC Course Number: 337 Credit Hours: 3 Vector: 3-0-4

Title of Course: Comparative morphology, distribution and evolution of vascular plants.

Calendar Description of Course:

Change to "Geologic history, distribution, comparative morphology and evolution of vascular plants".

Nature of Course

Prerequisites (or special instructions):

BISC 101, 102
Students with credit for BISC 336-3 may not take this course for further credit
What course (courses), if any, is being dropped from the calendar if this course is approved: 336-3

2. Scheduling

How frequently will the course be offered? Alternate semesters.

Semester in which the course will first be offered? 76-3

Which of your present faculty would be available to make the proposed offering possible? Srivastava, Fisher.

3. Objectives of the Course

To provide an appropriate base of information comparable to the first half of a year course in botany.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty - No additional due to a reassignment of teaching commitments due to reductions in the frequency of offering of other courses.

Staff - None

Library - None

Audio Visual - None

Space - No additional since it is planned to interdigitate the teaching of Plant Physiology and Plant Anatomy. See Preamble memorandum.

Equipment - None

5. Approval

Date: 3/6/75

27/0/75

[Signature]
Department Chairman

[Signature]
Dean

3
Chairman, SCUS

SCUS 73-34b:- (When completing this form, for instructions see Memorandum SCUS 73-34a. Attach course outline).

Simon Fraser University

BIOLOGICAL SCIENCES 337-3

Dr. L.M. Srivastava

Biology of vascular plants - Geologic history, distribution, comparative morphology and evolution of vascular plants. Plant communities and plants of economic importance. 3-0-4

Course Outline

<u>Lecture #</u>	<u>Topic</u>
1	Introduction; features associated with transition from an aquatic to a land habitat. Primitive land plants - their morphology, anatomy and reproduction:
2, 3	psilophytes
4 - 6	lycopods
7, 8	horsetails
9 - 12	Ferns - growth habit, megaphylls, - stem anatomy and concept of stele - reproduction in homosporous and heterosporous forms
13 - 17	Gymnosperms - characteristic features, geological history and distribution - morphology and anatomy - reproduction in pines - variations in other gymnosperms
18	MIDTERM
19 - 37	Angiosperms - characteristic features, distribution, dominance - growth and basic anatomy of roots, stems and leaves - reproduction - flower and inflorescence, - ♂ and ♀ organs, embryo and endosperm, seed, fruit and seedling. - pollination and pollinators - seed and fruit dispersal - evolution within angiosperms - herbaceous habit, nodal anatomy, vessel elements, floral evolution - evolution and origin of angiosperms - primitive angiosperms

Laboratory

- Lab 1 - Frittschiella, mosses, Psilophyta - plants and sectioned material
 stem
 rhizome
 sporangia
 gametophyte
 fossils
- Lab 2 - Lycopodium, Selaginella, Isoetes plants and sectioned material
 e.g. root, stem, corn (Isoetes), gametophyte, Fossil lycopods
- Lab 3 - Equisetum - plant and sectioned material
 spores and elators
 gametophyte
 fossil horsetails
- Lab 4 - Ferns - plants and sectioned material - emphasis on st le types
 Soral and indusial types
 homosporous forms → gametophyte
 heterosporous forms → gametophyte
- Labs 5 & 6 - Gymnosperms
 pine - x.s. & L.S. young and old stems and roots
 x.s. leaves of 1, 3, 5 needle pins, fir
 ♂ and ♀ cones of different ages (collect)
 (cones embedded in branches)
 x.s. & L.S. and cones
 sporangia and pollens
 ovule and archegonia
 embryo and seedlings
- Plants of cycads, Ginkgo, Ephedra and Gnetum
 leaves of Ginko
 vessels in Ephedra and Gnetum xylem
 ovules in Ginkgo, cone in Ginkgo
 berries in Taxus
 flowers in Gnetum, Welwitschia and Ephedra
- Lab 7 - Angiosperms - appropriate plant and sectioned material with emphasis
 on root, stem and leaf
- Lab 8 - Angiosperms - Flower and inflorescence, ♂ and ♀ structure; embryo
 and endosperm
- Lab 9 - Angiosperms - Seed, fruit, seedling.
- Lab 10 - Life Forms 1)
)
) xerophytes, mesophytes, hydrophytes,
) epiphytes
)
 - Life Forms 2)

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: BIOLOGICAL SCIENCES

Abbreviation Code: BISC Course Number: 437 Credit Hours: 3 Vector: 3-0-4

Title of Course: Plant development and morphogenesis

Calendar Description of Course:

Anatomy and development of vegetative and reproductive organs. Special features of plant morphogenesis, embryo and organ culture, totipotency of cells, differentiation at the cell, tissue and organ levels.

Nature of Course Lecture - Laboratory

Prerequisites (or special instructions):

BISC 337 (or BISC 336)

What course (courses), if any, is being dropped from the calendar if this course is approved: NONE

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? 77-1

Which of your present faculty would be available to make the proposed offering possible? L. M. Srivastava

3. Objectives of the Course

To bring the students to a level of comprehension of plant anatomy, development and morphogenesis comparable in conjunction with BISC 337 (or 336) to a year's programme in botany.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty - No additional due to a reassignment of teaching commitments due to reductions in the frequency of offering of other courses.

Staff - None

Library - None

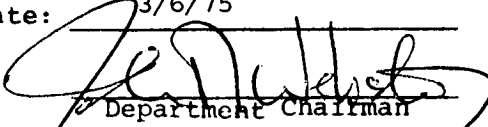
Audio Visual - None

- No additional since it is planned to interdigitate the teaching of Plant Physiology and Plant Anatomy. See Preamble memorandum.

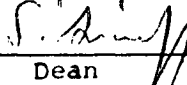
Equipment - None

5. Approval

Date: 3/6/75


Department Chairman

27/10/75


Dean

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Chairman, SCUS

SCUS 73-34b:- (When completing this form, for instructions see Memorandum SCUS 73-34a. Attach course outline).

437-3 Plant development and morphogenesis - Anatomy and development of vegetative and reproductive organs. Special features of plant morphogenesis, embryo and organ culture, totipotency of cells, differentiation at the cell, tissue and organ levels. 3-0-4

Course Outline

Lecture #	Topic
1	The plant cell - protoplast
2	- cell wall
3, 4	Simple and complex tissues, vascular tissues
5 - 7	Roots - apical organization, quiescent centre - tissue differentiation - origin of lateral roots, secondary growth in roots
8 - 10	Primary growth in stems - apical organization, phyllotaxy and origin of leaves - internodal elongation - tissue differentiation
11 - 15	Secondary growth in stems - cambium - wood - bark - periderm - Abnormal cambia and 2° growth in monocots
16 - 18	Leaf - initiation, development and maturation - structure and environment - control of form, leaf abscission
19, 20	Flowering, seed and fruit
21, 22	Embryo development
23	MIDTERM
24 - 27	Embryo culture - age and nutrition requirements; organ culture - shoot apex and leaf, root, pollen, single cell cultures Plant protoplasts and somatic cell hybridization.
28 - 31	Morphogenesis at the cell level - control of frequency and planes of cell division - differential cell enlargement and growth - selected examples of cell differentiation 1 " " " " " " 2
32 - 35	Morphogenesis at the tissue and organ level - studies on shoot apex - stem, leaf determination - root apex - vegetative vs. floral shoot apex - control of cambial activity and xylem and phloem formation
36, 37	Role of teratology in morphogenetic studies.

Lab #	Topic
1	Plant cell - protoplast and cell wall - 1° & 2° walls
2, 3	Tissues
4	Root
5	Stem
6, 7	2° structure of wood and bark
8	Leaf
9	Flower, fruit
10	Embryo and seedling
11, 12	Projects - One of
	(1) Culture of root and/or shoot tips
	(2) Culture of embryos
	(3) Preparation of protoplasts
	(4) Sections of different woods and cambia (technique #1)
	(5) Floral induction in <u>Pharbitis</u> or <u>Xanthium</u> and study of changes in shoot apex by staining (technique #2)
	(6) Cambial reactivation in a woody plant.
Techniques	1. Use of sledge microtome.
	2. Wax or glycol methacrylate embedding and sectioning on rotary microtome.
	3. Tissue culture.

Books:

Cutter, E. G. "Plant Anatomy, Experiment and interpretation"
Part 2, organs, Edward Arnold (Publishers) Ltd. London, 1971.

Sinnott, E. W. "The Problem of Organic Form" Yale University Press,
New Haven, Conn., 1963.

Steeves, T.A. and Sussex, I. M. "Patterns in Plant Development"
Prentice-Hall Inc., Englewood Cliffs, N.J. 1972.

Wardlaw, C. W. "Morphogenesis in Plants", Methuen, London, 1968.

_____ "Organization and Evolution in Plants", Longmans, London 1965.

_____ "Embryogenesis in Plants", Methuen, London, 1955.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: Biological Sciences

Abbreviation Code: Bisc. Course Number: 347 Credit Hours: 3 Vector: 2-0-4

Title of Course: Physiology of Plant Nutrition and Metabolism.

Calendar Description of Course:

Water relations and transport phenomena; photosynthesis, respiration, mineral nutrition and nitrogen metabolism; function and metabolism of plant polymers and large molecules, : lipids, aromatics and carbohydrates.

Nature of Course Lecture, Tutorial-laboratory.

Prerequisites (or special instructions):

Bisc. 201, Chem. 251, 256.

Students with credit for BISC 315-3 may not take this course for further credit

What course (courses), if any, is being dropped from the calendar if this course is approved: 315-3

2. Scheduling

How frequently will the course be offered? Once per year.

Semester in which the course will first be offered? 76-3

Which of your present faculty would be available to make the proposed offering possible? G. R. Lister, W. Vidaver. (H. Speer)

3. Objectives of the Course

To enable the student to attain an adequate level of comprehension of the structural and functional physiology of plants, comparable to that of students completing the first half of a year plant physiology programme at other Universities.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty - No additional due to a reassignment of teaching commitments due to reductions in the frequency of offering of other courses.

Staff - None

Library - None

Audio Visual - None

- No additional since it is planned to interdigitate the teaching of Plant Space Physiology and Plant Anatomy. See Preamble memorandum.

Equipment - None (above "normal" updating and course improvement considerations)

5. Approval

Date: 6/6/75

27/10/75

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[Signature]
Department Chairman

[Signature]
Dean

Chairman, SCUS

SCUS 73-34b:- (When completing this form, for instructions see Memorandum SCUS 73-34a. Attach course outline).

Simon Fraser University

BIOLOGICAL SCIENCES 347-3

Physiology of Plant Nutrition and Metabolism (2-0-4)

Dr. G. R. Lister

February 1975

Course Outline

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|--|--|
| I. <u>Water relations.</u> | Properties of water, Water requirements of plants, Water loss - transpiration and the ascent of sap. Physiology of stomata, water uptake. |
| II. <u>Mineral nutrition.</u> | Chemical composition of plants, function and physiology of macro and micro nutrients, trace elements, and Toxic elements. Plants as geological indicators. Conservation. |
| III. <u>Nitrogen Metabolism.</u> | Nitrogen fixation - Symbiosis. Absorption of Nitrogen by plants - Mycorrhizae. Nitrate reduction and Metabolism. Cycling and conservation. |
| IV. <u>Photosynthesis.</u> | Light reactions, dark reactions - alternate pathways. Factors affecting. |
| V. <u>Photorespiration: Respiration.</u> | Control mechanisms, non-mitochondrial oxidations. |
| VI. <u>Translocation of organic solutes.</u> | Pathways. Form, amount and velocity of translocate. Mechanisms. |
| VII. <u>Plant polymers.</u> | Large molecules and 'secondary' plant products. |
| VIII. <u>Competition, Parasites and Disease.</u> | Responses, interactions. |
| IX. <u>Physiology of plants under stress.</u> | Tolerance, avoidance; water, heat, radiation. |
| X. <u>Plants and Man.</u> | Productivity and agriculture, plant breeding and modification; environment and plant response; modification of environment. |

Laboratory

- A. P/S and R - I.
 - i) Corn (C_4) and bean (C_3). APS.v. light intensity. ft.c.v. energy units, Saturation intensity, LCP.
 - ii) Light Quality. APS action spectrum. Equal energy v. equal quanta, equal ft.-c.
 - B. P/S and R - II
 - i) Photorespiration. Effect of O_2 conc.
 - ii) PlB. (Post Illumination Burst and other transients).
- (A and B involve the use of: IRGA, O_2 Electrode, Luxmeter, YSI radiometer).
- C. Transpiration.
 - i) Modified Thoday. Volume of water uptake, wt. of water loss.
 - ii) Rates of transpiration under controlled conditions. RH and temperature effects. Vapour flux measurements.
 - D. Translocation I
 - ¹⁴CO₂ incorporation and ¹⁴C distribution.
 - i) Time sequence.
 - ii) Effect of differing light regimes.
 - E. Translocation II. Analysis of Section D. expts. Distribution patterns, profile, velocity, effect of light.
 - F. Mineral Nutrition I.i) Corn. Uptake, distribution, velocity of ³²P. Effect of metabolic inhibitors.
 - G. Mineral Nutrition II. Bean. Distribution with respect to anatomy and phylotaxy. Organ physiological age and status. Circulation.
 - H. Bio-potentials. Occurence, magnitude and factors affecting.
 - I. Stress Physiology.

General Comments. Both material type and areas investigated in the lab are restricted in order to achieve greater depth and insight. Students work in groups of no more than or less than 24.

No formal laboratory write-ups. Lab units are organised in groups of three. Each student group presents data to TA at 3 week intervals. Presentation - tables and/or graphs → Blackboard or overhead projector and written; followed by discussion,

review, extension, and relationship of work to other subject areas.

Wherever possible - individual group tours of appropriate research lab areas.

Texts.

Introduction to Plant Physiology. Meyer and Anderson. 2nd Ed.
van Nastrand, N.Y. 1973.

Introduction to Plant Physiology. Levitt. 2nd Ed.
C. Y. Mosby Co. St. Louis. 1974.

Plant Physiology. Salisbury and Ross.
Wadsworth Publishing Co. Inc. California 1970.

Plant Physiology. Bidwell. Macmillan Publishing Co. N.Y. 1974.

Lab-manual.

Experiments in Plant Physiology - G. R. Lister.

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar Information

Department: BIOLOGICAL SCIENCES

Abbreviation Code: BISC Course Number: 447 Credit Hours: 3 Vector: 2-0-4

Title of Course: Control and Regulation in Plants

Calendar Description of Course:

Physiology of hormonal and other regulatory systems.

Nature of Course Lecture-Lab

Prerequisites (or special instructions):

BISC 347 (or BISC 315)

What course (courses), if any, is being dropped from the calendar if this course is approved: NONE

2. Scheduling

How frequently will the course be offered? Once per year

Semester in which the course will first be offered? 76-2

Which of your present faculty would be available to make the proposed offering possible? W. Vidaver, G.R. Lister. (H. Speer)

3. Objectives of the Course To enable the student to achieve a level of comprehension of plant regulatory and control mechanisms comparable to students completing the second half of a year plant physiology programme at other universities.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty - No additional due to a reassignment of teaching commitments due to reductions in the frequency of offering of other courses.

Staff - None

Library - None

Audio Visual - None

Space - No additional since it is planned to interdigitate the teaching of Plant Physiology and Plant Anatomy. See Preamble memorandum.

Equipment - None

5. Approval

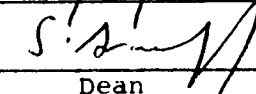
Date: 3/6/75

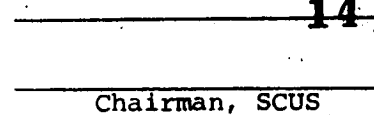
27/0/75

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Department Chairman


Dean


Chairman, SCUS

SCUS 73-34b:- (When completing this form, for instructions see Memorandum SCUS 73-34a. Attach course outline).

Simon Fraser University

Biological Sciences 447-3

February 21, 1975

Control and Regulation in Plants

Physiology of hormonal and other regulatory systems in plants.

2-0-4

Lecture Topics

I Agents of control and regulation

1. Hormones

- a. auxin
- b. gibberellins
- c. abscissic acid
- d. ethylene
- e. cytokinins

2. Growth substances

3. Light

II Physiological and molecular aspects of growth regulation.

1. Cell elongation

2. Differentiation

3. Leaf expansion

4. Apical dominance

5. Root induction

6. Floral induction

7. Fruit set and development

III Mechanisms of plant movements

1. Phototropism

2. Geotropism

3. Stomatal opening

4. Nastic activity

IV Germination, dormancy, abscission, and senescence controls

1. Seed dormancy
2. Bud dormancy
3. Germination
4. Senescence
5. Leaf, flower, and fruit abscission

Labs

1. The effects of auxins
 - a. elongation
 - b. directional growth
 - c. root initiation
 - d. abscission
 - e. apical dominance
2. The effects of gibberellins
 - a. elongation
 - b. amylase activity
 - c. germination
3. The effects of cytokinins
 - a. callus tissue shoot formation
 - b. kinetin and chlorophyll retention
4. Interactions between hormones
 - a. kinetin and auxin on callus shoot formation
5. Effects of light
 - a. photoperiod and flowering
 - b. influence of light on germination
 - c. extraction of phytochrome
6. Interactions of light and hormones
 - a. seed germination and dormancy
7. Abscissic acid
 - a. dormancy
 - b. senescence and inhibition of growth

Labs - Continued

8. Chemical growth regulators

- a. AMO 18
- b. CCC
- c. 2-4-d

N.B. These laboratory topics do not represent individual lab periods. Most of the experiments are ongoing and will cover several periods. The workload is to be distributed in such a way as to maintain reasonable coincidence with designated laboratory periods.

Books: Introduction to Plant Physiology

Meyer and Anderson, van Nostrand, N.Y., 1973.

Introduction to Plant Physiology, 2nd ed.

Levitt, Mosby, St. Louis, 1974,

Introduction to the Biochemistry and Physiology
of Plant Growth Hormones

Phillips, McGraw-Hill, N.Y., 1971

Control Mechanisms in Plant Development

Galston & Davies, Prentice-Hall, N.J., 1970

Lab Manuals: Experiments in Plant Physiology

Witham, Blaydes, & Devlin, van Nostrand, 1971

Experimental Plant Physiology, Arditti & Dunn,

Holt, Rinehart & Winston, N.Y., 1969