SIMON FRASER UNIVERSITY

S.79-79

MEMORANDUM

To SENATE

From SENATE GRADUATE STUDIES COMMITTEE

Subject NEW COURSE PROPOSALS - CHEMISTRY

Date JUNE 18, 1979

MOTION 1: "That Senate approve, and recommend approval to the Board of Governors, as set forth in S.79-79, the following new courses:

CHEM 824-3 - Physical Biochemistry
CHEM 825-3 - Bioenergetics."

If Motion 1 is approved,

MOTION 2: "That the following courses be discontinued:

CHEM 821-3 - Advanced Biochemistry I
CHEM 822-3 - Advanced Biochemistry II."

SIMON FRASER UNIVERSITY

MEMORANDUM

To Senate

From Office of the Dean of Graduate Studies

Subject New Course Proposals

Date June 18, 1979

MOTION: That Senate approve the following new courses:

Chem 824-3 Physical Biochemistry
Chem 825-3 Bioenergetics

MOTION: That Senate delete the following existing courses if the above courses are approved:

Chem 821-3 Advanced Biochemistry I
Chem 822-3 Advanced Biochemistry II

Theses courses were approved by the Executive Committee, Senate Graduate Studies Committee, on June 4, 1979.

Jon Wheatley
Dean of Graduate Studies

mm/
attach.

SIMON FRASER UNIVERSITY

MEMORANDUM

To.....Dr. J. Wheatley.....	From.....N. Heath.....
.....Dean of Graduate Studies.....	.....Asst. to Dean of Science.....
Subject.....NEW COURSE PROPOSALS.....	Date.....1979 04 09.....

The following new graduate course proposals were approved by the Faculty of Sceince at the meeting of 1979 03 13 and are hereby submitted to the Senate Graduate Studies Committee for consideration and approval:

CHEM 824-3 Physical Biochemistry

CHEM 825-3 Bioenergetics.

If the above courses are approved, the following existing courses should be deleted:

CHEM 821-3 Advanced Biochemistry I

CHEM 822-3 Advanced Biochemistry II

Attached please find the approporiate documentation.

c.c. H.M. Evans, Registrar
M. McGinn, Asst. Registrar, Graduate Studies

nh

RECEIVED
APR 17 1979
REGISTRAR'S OFFICE
MAIL DESK

SIMON FRASER UNIVERSITY

MEMORANDUM

To: Dr. R. C. Brooke, Chairman, Faculty Graduate Program Committee

From: Dr. E. J. Wells, Chairman, Department of Chemistry

Subject: NEW COURSE PROPOSALS

Date: 14 November, 1978

I attach New Course Proposal forms for our proposed two new courses, Chemistry 824-3, "Physical Biochemistry", and Chemistry 825-3, "Bioenergetics". These titles and calendar entries better reflect current practice in our present offerings as they have developed over the last several years, and these courses will replace the existing entries, Chemistry 821-3, "Advanced Biochemistry I", and Chemistry 822-3, "Advanced Biochemistry II".

The existing course, Chemistry 823-3, "Selected Topics of Special Biochemical Interest", is proposed to be retained in the calendar but we see it as being offered less frequently tham the above two new courses.

These revisions to our graduate calendar entry have been discussed and approved by our Departmental representatives, by the faculty involved in biochemistry, and by the Departmental Graduate Program Committee. We hope that these amendments to the calendar can be in place for the 1979-80 edition.

EJW

/ae 30 Nov/78

These course proposals were approved by the Faculty Graduate Studies Committee by mail vote in November 1978 and are submitted to Faculty for consideration and approval.

N. Heath
Asst. to the Dean
of Science
79/03/02

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: Chemistry **Course Number:** 824

Title: Physical Biochemistry

Description: Modern physical methods applied to biomacromolecules; structure of nucleic acids, proteins and membranes.

Credit Hours: 3 **Vector:** Lecture **Prerequisite(s) if any:** none

ENROLLMENT AND SCHEDULING:

Estimated Enrollment: 5 **When will the course first be offered:** 79-3

How often will the course be offered: A minimum of once every two years.

JUSTIFICATION: To equip incoming biochemistry and bioorganic graduate students with the latest spectroscopic techniques in biochemistry. To broaden the interests of physical chemists and spectroscopists by applications of physical techniques to biological problems.

RESOURCES:

Which Faculty member will normally teach the course: R.J. Cushley

What are the budgetary implications of mounting the course: none - will replace Chem 821-3

Are there sufficient Library resources (append details): yes

Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course.
c) Library resources

Approved: **Departmental Graduate Studies Committee:** [signature] **Date:** 1979-04-09

Faculty Graduate Studies Committee: Robert C. Brooke **Date:** 9 Apr 79

Faculty: [signature] **Date:** 9/4/79

Senate Graduate Studies Committee: [signature] **Date:** 14 June 79

Senate: _____ **Date:** _____

Chemistry 824-3 Physical Biochemistry

I. Newer Applications of Physical Methods including:

1. Nuclear Magnetic Resonance (NMR) Spectroscopy
   a. Theory of Chemical Shifts.
   b. Theory of relaxation processes.
   c. The Nuclear Overhauser Effect and its applications in Biochemistry.
   d. Ligand-protein interactions.
   e. Structures of t-RNA.
   f. Proton relaxation enhancement.
   g. ^{13}C Fourier transform nmr and membrane fluidity.

2. Electron Spin Resonance (ESR) Spectroscopy
   a. Theory of ESR.
   b. Spin-labeling of proteins.
   c. Structures of membranes from intrinsic and extrinsic spin-labels.

3. Fluorescence Spectroscopy
   a. Fluorescent probes and protein and nucleic acid structure.
   b. Rotational correlation times of macromolecules.

4. Laser Raman Spectroscopy
   a. Structures and dynamics of macromolecules.
   b. Intensity fluctuation spectroscopy

5. Order - Disorder

   a. Introduction to irreversible thermodynamics.

   b. Helix-coil transitions.

   c. Melting of DNA.

The course also includes occasional guest lectures in the field (e.g., J. Seelig - deuterium magnetic resonance; E.D. Crozier - extended x-ray absorption fine structure, etc.).

Textbook: Reference texts are Dwek, "NMR in Biochemistry" and Berlmer (ed.) "Spin Labeling Theory and Practice". References, reviews and literature citations will be distributed throughout the course.

Instructor: R.J. Cushley, Chemistry Department

SIMON FRASER UNIVERSITY

New Graduate Course Proposal Form

CALENDAR INFORMATION:

Department: Chemistry **Course Number:** 825

Title: Bioenergetics

Description: A discussion of the most important processes for biological energy transduction. Structure-function relationships of membrane components and/or other interacting macromolecular systems.

Credit Hours: 3 **Vector:** lecture **Prerequisite(s) if any:** none

ENROLLMENT AND SCHEDULING:

Estimated Enrollment: 5 **When will the course first be offered:** 80-3

How often will the course be offered: A minimum of once every two years.

JUSTIFICATION: Most of the topics covered in this course are examples of membrane-associated biological energy transduction. Since many SFU faculty members are studying membrane associated phenomena, this course should be of interest to their graduate students. The course content also complements the content of other graduate courses (CHEM 824, PHYS 889, KIN. 850, BISC 821, 826, & 835) which deal with related topics or which emphasize other aspects of bioenergetic

RESOURCES:

Which Faculty member will normally teach the course: W.R. Richards

What are the budgetary implications of mounting the course: none - will replace Chem 822-3

Are there sufficient Library resources (append details): yes

Appended: a) Outline of the Course
b) An indication of the competence of the Faculty member to give the course.
c) Library resources

Approved: **Departmental Graduate Studies Committee:** [signature] **Date:** 1979 04 09

Faculty Graduate Studies Committee: [signature] **Date:** 9 Apr 79

Faculty: [signature] **Date:** 9/4/79

Senate Graduate Studies Committee: [signature] **Date:** 14 June 79

Senate: **Date:**

CHEMISTRY 825-3

(24 Lectures of 1-1/2 hours each)

1. Introduction and Review (2 Lectures)

   a. Definition of Bioenergetics and General Discussion.
   b. Review of cellular organization, membrane structure, "high energy" compounds, substrate level phosphorylation, and the dissociation of membrane proteins and electron transport components from biomembranes.

2. Nature of the "Energize State" of Biomembranes (2 Lectures)

   a. Membrane-dependant phosphorylatins.
   b. Phosphorylation Mechanisms:
      (i) Chemical Coupling hypothesis
      (ii) Conformational Coupling hypothesis
      (iii) Chemiosmotic Coupling hypothesis
   c. The structure of the "coupling factor" ATP ase.

3. The Proton-Pump of Halobacteria (1 Lecture)

   a. Nature of cytoplasmic membrane in halobacteria.
   b. Bacteriorhodopsis and the proton-pump.
   c. Reconstitution of the purple membrane.

4. Bacterial Photosynthesis (3 Lectures)

   a. Survey of the photosynthetic bacteria.
   b. Isolation of reaction centre and light-harvesting complexes from purple bacterial photosynthetic membranes.
   c. Study of primary light reactions in purple bacteria.
   d. Localization of thylakoid components.
   e. Reconstitution of active thylakoid membranes.
   f. Cyclic electron-transport and photophosphorylation.
   g. Reverse electron-transport and transhydrogenase.
   h. Green sulfur bacterial photosynthesis.

5. Green Plant Photosynthesis (3 Lectures)

   a. Summary of light and dark reactions in green plants.
   b. Photosystem II and the photoevolution of oxygen.
   c. Photosystem I and the photoreduction of NADP.
   d. Isolation of reaction centre and light-harvesting complexes from chloroplast thylakoids.

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6. Mitochondrial Oxidative Phosphorylation (2 Lectures)

   a. Isolation of electron-transport complexes from the mitochondrial inner membrane.
   b. Redox reactions carried out by Complexes I-IV.
   c. Asymmetry of the mitochondrial inner membrane.
   d. Reconstitution of ATP ase and electron-transport components into active membrane fractions.
   e. Demonstration of proton and potential gradients and proposed proton-pump in mitochondrial electron transport.

7. Mitochondrial Membrane Transport (1 Lecture)

   a. General discussion of transport systems.
   b. Mitochondrial active transport systems.
   c. Coupling of transport systems in mitochondria.

8. Bacterial Electron Transport Chains (2 Lectures)

   a. Aerobic respiration.
   b. Anaerobic respiration.
   c. Aerobic chemolithotrophic electron-transport.
   d. Anaerobic chemolithotrophic electron-transport.

9. Bacterial transport, Mobility, and Chemotaxis (2 Lectures

   a. Transport systems requiring "energized state".
   b. Transport systems requiring ATP (or other "high energy" compounds).
   c. The structure of bacterial flagella and mechanisms for mobility.
   d. Hypothesis for chemotaxis in bacteria.

10. Other Examples of Membrane Bioenergetics (6 Lectures)

   a. Eucaryotic cytoplasmic membrane transport systems.
   b. Sarcoplasmic reticulum Ca^{++} transport and muscle contraction.
   c. Axonic nerve impulse transmission; bioelectricity.
   d. Synapic nerve impulse transmission.
   e. Vision: rhodopsin and the rod cell dise membrane.
   f. Membrane receptors.