

SIMON FRASER UNIVERSITY

S86-107

MEMORANDUM

As amended and approved by SCUS to Aug. 5/80 and by ECSGC to Jul. 7/80

To..... SENATE

From..... SENATE COMMITTEE ON UNDERGRADUATE
STUDIES AND EXECUTIVE COMMITTEE, SENATE
GRADUATE STUDIES COMMITTEE

..... PROPOSED NEW PROGRAMS:

Subject..... A. MINOR IN ENVIRONMENTAL
TOXICOLOGY
B. EXTENDED STUDIES DIPLOMA IN
ENVIRONMENTAL TOXICOLOGY

Date..... AUGUST 8, 1980

Action taken by the Senate Committee on Undergraduate Studies at its meeting of August 5, 1980 and by the Executive Committee, Senate Graduate Studies Committee on July 7, 1980 gives rise to the following motion:

MOTION:

That Senate approve, and recommend approval to the Board of Governors, the proposed Minor in Environmental Toxicology, the requirements for an Extended Studies Diploma in Environmental Toxicology, the proposed new undergraduate courses, and the proposed new graduate courses, as set forth in S.80-107, specifically:

- a) Proposed Minor in Environmental Toxicology, including
 - i) Lower division courses as prerequisites for the Minor
 - ii) Upper division course requirements - including the usual requirements for completion of degree
- b) Requirements for the Extended Studies Diploma in Environmental Toxicology
- c) Proposed new undergraduate courses:
 - i) BISC 311-3 - Introduction to Environmental Toxicology
 - ii) CHEM 371-3 - Chemistry of the Environment I
 - iii) GEOG 319-3 - Physical Interactions in the Environment
- d) Proposed new graduate courses
 - i) BISC 650-3 - Industrial Toxicology
 - ii) BISC 651-3 - Food and Drug Toxicology
 - iii) BISC 652-3 - Problem Analysis in Environmental Toxicology

Note: It is intended that the programs be operated through the Department of Biological Sciences with the cooperation of the Departments of Chemistry and of Geography.

There is request for a new Minor in Environmental Toxicology offered within the Bachelor of Science degree. There is also request for an Extended Studies Diploma in Environmental Toxicology.

SIMON FRASER UNIVERSITY

As amended and approved
by SCUS to Aug. 5/80

MEMORANDUM

SCUS 80-41

To.....	H. EVANS, SECRETARY	From.....	JOHN CHASE, SECRETARY
	SENATE COMMITTEE ON UNDERGRADUATE STUDIES		SENATE COMMITTEE ON ACADEMIC PLANNING
Subject.....	PROPOSED ENVIRONMENTAL TOXICOLOGY PROGRAMS:	Date.....	JULY 11, 1980

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- A. MINOR IN ENVIRONMENTAL TOXICOLOGY
 - B. EXTENDED STUDIES DIPLOMA IN ENVIRONMENTAL TOXICOLOGY

Action taken by the Senate Committee on Academic Planning at its meeting on July 9, 1980 gave rise to the following motion:

That the Minor and Extended Studies Diploma programs in Environmental Toxicology as described in SCAP 80-10 be approved and forwarded to SCUS and Senate for consideration and approval.

Since the two proposed programs contain two new courses (BISC 311-3, Introduction to Environmental Toxicology and CHEM 371-3, Chemistry of Environment i) would you please see that the SCAP motion and accompanying papers are placed on the agenda of a subsequent meeting of the Senate Committee on Undergraduate Studies.

Registrar's Note: The proposal includes a new course in Geography:
GEOG 319-3 - Physical Interactions in the Environment.

SIMON FRASER UNIVERSITY

MEMORANDUM

To SENATE

From OFFICE OF THE DEAN OF GRADUATE STUDIES

Subject GRADUATE CURRICULUM CHANGES - NEW
COURSE PROPOSALS, BISC 650-3, 651-3,
AND 652-3

Date JULY 14, 1980

These courses were approved by the Executive Committee,
Senate Graduate Studies Committee, on July 7, 1980.

Bryan P. Beirne
Dean of Graduate Studies

MEMORANDUM

Dr. J. Chase, Secretary

From N. Heath
Assistant to the Dean
Faculty of Science

Senate Committee on Academic Planning

Date 1980 06 12

Subject PROPOSED ENVIRONMENTAL
TOXICOLOGY PROGRAMS

At the meeting of 1980 06 05, the Faculty of Science approved the following motions:

"That the new course proposals BISC 311-3, Introduction to Environmental Toxicology, and CHEM 371-3, Chemistry of Environment I, as described in F-80-13, be approved and forwarded to SCUS and Senate for consideration and approval."


"That the Minor and Extended Studies Diploma programs in Environmental Toxicology as described in F-80-13, be approved and forwarded to SCUS and Senate for consideration and approval."

A third motion was also passed, approving the graduate course proposals BISC 650-3, Industrial Toxicology, BISC 651-3, Food and Drug Toxicology and BISC 652-3, Problem Analysis in Environmental Toxicology. These proposals have been forwarded to the Senate Graduate Studies Committee.

The following documentation is attached:

- Part 1. Proposal for a Minor and Extended Studies Diploma Program in Environmental Toxicology (F-80-13) including:
- Descriptions of the proposed new programs.
 - New course proposal forms for BISC 311-3 and CHEM 371-3.
 - A copy of the course proposal form for GEOG 319-3, Physical Interactions in the Environment (previously submitted to SCUS by the Faculty of Arts).
 - Copies of the course proposal forms for BISC 650-3, 651-3, 652-3, as submitted to SGSC.
- Part 2. Course overlap information for the proposed new undergraduate courses.
- Part 3. Memorandum from M. Mackauer to J.M. Webster concerning additional resources needed to mount the Programs.
- Part 4. Statement from E. Weinstein on Library resources for new course CHEM 371-3.

Part 4. Report by M. Deutsch on Library resources
(Continued) for the new courses in the Minor and ESD Programs.



N. Heath

NH/mgj
Attachments

SIMON FRASER UNIVERSITY

MEMORANDUM

To M. McGinn
Secretary
Senate Graduate Studies Committee

Subject NEW COURSE PROPOSALS BISC 650-3,
651-3, 652-3

From N. Heath, Administrative Assistant
to the Dean of Science

Date 1980 06 12

At the meeting of 1980 06 05, the Faculty of Science approved the following motion:

"That the new course proposals BISC 650-3, Industrial Toxicology, BISC 651-3, Food and Drug Toxicology and BISC 652-3, Problem Analysis in Environmental Toxicology, as described in F-80-13, be approved and forwarded to Senate Graduate Studies Committee for consideration and approval."

The document referred to in the motion contains the respective course proposal forms and proposals for a Minor Program and an Extended Studies Diploma Program in Environmental Toxicology. Neither of these programs is at the graduate level, but in order to explain the context of the course proposals submitted, I have included an edited version of document F-80-13.

I attach also a memorandum from Dr. Mackauer to Dean Webster concerning the need for additional resources (faculty, equipment, etc.) if these courses are approved.


N. Heath

NH/mgj

Encls./

PROPOSALS FOR

- A. MINOR PROGRAM IN ENVIRONMENTAL TOXICOLOGY
(within a B.Sc. Degree)
- B. AN EXTENDED STUDIES DIPLOMA PROGRAM IN
ENVIRONMENTAL TOXICOLOGY

Prepared by

DR. C. VAN NETTEN

and submitted by

THE DEPARTMENT OF BIOLOGICAL SCIENCES

Environmental toxicology is the science that deals with the adverse effects of chemical and physical agents on living organisms in the environment. Although the significance of environmental toxicology as an area of national concern is widely recognized, no Canadian university currently offers a program in the area. As a result, many Canadian students now go to the United States of America where 6 such programs are available.

Information obtained from students enrolled in pilot courses offered in 1978 and 1979 at Simon Fraser University indicates that there are two types of students with an interest in environmental toxicology: undergraduate students who wish to specialize in environmental toxicology and graduate students who are already employed in areas related to environmental toxicology and wish to upgrade their training. To satisfy these needs we propose to offer a Minor program and an Extended Studies Diploma program in Environmental Toxicology. The Minor will require 3 new undergraduate courses, one each to be offered through the Departments of Biological Sciences, Chemistry, and Geography. The proposed Extended Studies Diploma program includes the courses required for the Minor, several existing graduate courses and 3 new graduate courses.

The proposed programs in Environmental Toxicology will be offered through the Department of Biological Sciences with the co-operation of the Department of Chemistry and the Department of Geography. Depending on enrolment growth, the Minor program may be expanded into a Major program and/or a graduate program leading to a M.Sc. degree in Environmental Toxicology.

Introduction.

Environmental toxicology, defined as the science that deals with the adverse effects of chemical or physical agents on living things in the environment¹, is rapidly expanding. The public and private concern about environmental problems such as mercury pollution, food additives, pesticides and herbicides, demands more information before these problems are dealt with. In order to prevent accidents it is essential to know when, where and how a hazardous substance, released into the environment by accident or design, is most likely to exert its toxic actions. Only once this information is known can appropriate counter measures be taken. At present, dangerous situations often develop because the toxic action of a particular substance has not been properly assessed resulting in faulty predictions, often followed by serious damage to the environment and the organisms living in it.

Until recently the predictions of potential hazard were largely based on data obtained from experiments which subjected a test organism to various concentrations of a given chemical agent. Although this approach provides valuable information regarding toxicity, it is a poor indicator of the actual hazard a substance might pose when it is released into the environment.

In order to estimate a potential hazard the interaction of the chemical agent and the environment should be studied. These interactions may include parameters such as wind dispersal, soil binding, microbial breakdown and conversion, bioconcentration, as well as possible synergistic and antagonistic effects with other substances present.

As an illustration of these concepts consider the interaction of mercury with the environment. Mercury in its metallic form has a certain toxicity which is modified by the presence or absence of other substances. For instance, the toxicity of mercury is greatly enhanced when it interacts with copper. This element acts synergistically with mercury, i.e. the combination of these two elements produces a hazard which is much greater than the sum of their individual effects. Similarly, the presence of selenium will have an antagonistic effect, protecting the organism to a large extent against the harmful effects of mercury. Microorganisms may convert elemental mercury to methyl mercury, a compound with an entirely new set of chemical, physical and biological properties. This compound is one hundred times more toxic than elemental mercury, is selectively stored in muscle tissue, has synergistic effects with nitrites and, as some recent reports suggest, has antagonistic effects with vitamin E, vitamin B1, and vitamin C.

If, for example, one were to assess the hazard of mercury toxicity among the Inuit, one would have to consider if these people use nitrites to cure fish and meat which might be contaminated with methyl mercury.

It is clear therefore that, in order to estimate the hazard produced by mercury or any other substance, one must be aware of, consider, and investigate often superficially unrelated factors. The study of the field of environmental toxicology attempts to identify these factors and evaluate their importance.

Many aspects of environmental toxicology are presently dealt with in courses given in the biological and other sciences. Often a particular example from environmental toxicology is used to illustrate an academic principle. Although this approach often appears adequate, severe deficiencies have become apparent. For instance, the interaction of a particular substance with the whole environment, and how its toxic effects integrate with the effects produced by other substances present, is not adequately dealt with.

Demand for courses in environmental toxicology and for toxicologists.

Information gathered from students that were enrolled in pilot courses in environmental toxicology as well as from potential students presently employed by government and industry (appendix 1), indicates that there are two categories of interest for enrolling in courses in environmental toxicology.

- A. Student working towards a bachelors degree in the sciences who would like to supplement their degree with practical information in environmental toxicology which will aid them in finding employment in areas of their interest.
- B. Students who are already employed in areas concerned with environmental problems who have come to the realization that their training is lacking in certain areas essential to the understanding and assessment of the problems they are dealing with.

These students as well as their employers, are looking for universities that offer courses in environmental toxicology which:

- a. Provide a detailed and integrated view of the field of environmental toxicology.
- b. Provide information regarding the latest sampling and assay techniques as well as the evaluation of data generated by these techniques.
- c. Provide experience with laboratory equipment that is presently used to monitor toxic agents in the environment.
- d. Are designed and coordinated in such a fashion that they can serve as a guide to the prediction of the environmental impact of toxic agents when they are released, in a given location.

Presently, there is no Canadian university or college which offers a program in environmental toxicology.² A few institutions, however, are offering individual courses in this area. Simon Fraser University has offered such a course since 1976 on a regular basis. The University of Toronto has recently become involved, September 1979, and is offering a course in Interdisciplinary Toxicology. At various institutions, however, there are related programs such as Environmental Studies, Industrial Hygiene and Occupational Health. Environmental Studies tend to centre around urban planning and development, whereas Industrial Hygiene and Occupation Health are concerned primarily with monitoring and control of exposure to toxic substances around the work place.^{3, 6}

None of these programs address environmental issues directly and are not concerned with the fundamental basis of these problems; that damage to a particular environment is caused by the physiological and biochemical effects of toxic agents on the organisms living in it. A thorough knowledge of these effects and of the environment is therefore essential to the proper assessment of a particular problem and consequently to the design of possible answers.

Because of the lack of such program in Canada, many employers have sent their employees for retraining and upgrading, at great investment of time and money, to universities in the United States where six programs specifically addressing the field of environmental toxicology are available. (Appendix 2).

The demand for formal training in environmental toxicology and for toxicologists has recently been emphasized^{4,5} and is perhaps best demonstrated with the following quotation taken from a recent issue of the Journal, Science.⁴

"Toxicologists are in great demand - but short supply - in both the regulatory establishment and the private sector. In the government alone, more than 2000 toxicologists are expected to be employed by 1985, up from a relative handful now working in each of the large agencies, such as the Food and Drug Administration, Environmental Protection Agency, Occupational Safety and Health Administration, and Consumer Product Safety Commission."

The Canadian government is presently assessing the extent of the demand for trained personnel in toxicology but has, to date, not come up with any definite figures.²

List of References

1. Draft proposal for a "Subcommittee on Toxicology of the Associate Committee on Scientific Criteria for Environmental Quality." Attachment I, Page 2, October 31, 1979. National Research Council.
2. Personal communication with I. Hoffman, Head, Environmental Secretariat, National Research Council of Canada.
3. J. B. Olishifski and F. E. McElroy editors, Fundamentals of Industrial Hygiene, National Safety Council, Chicago, Ill. 60611.
4. "Toxicologists Struggling for Federal Identity." Science, Vol. 203, January 12, 1979.
5. "Wanted: More Toxicologists," EPS Journal, Vol. 4, No. 8, September 1978.
6. Personal communication with Paul B. Hammond, Professor of Environmental Health, Kettering Laboratory, University of Cincinnati Medical Center.

Program proposal and requirements.

In order to satisfy the demand for meaningful, integrated and applicable information in environmental toxicology which is relevant to Canadian environmental problems, a minor program (for the category A students) and an extended studies diploma program (for the category B students) in this field is proposed.

Because of the dynamic nature of the field of environmental toxicology, with issues and problems changing from time to time, it is important for any successful program to have direct feedback from the public, the government and the industry. This feedback will be provided by the extended studies diploma students who have been working in the field, have identified information gaps, and have come to the university for additional training. The combination of these two, although independent, programs will ensure that students working towards a B.Sc. with a minor in Environmental Toxicology will be trained in areas where they are most useful to government and industry.

The proposed programs are ideally suited for integration with many of the already existing programs such as pest management, resource management, criminology (forensic science), kinesiology, marine science, computing sciences and biochemistry. In addition integration with non-academic programs such as the cooperative education program is highly desirable and a realistic possibility.

The proposed program may be viewed as a natural evolution of material dealt with in many areas of biological sciences but which has been integrated, and supplemented in order to provide a comprehensive view and understanding of current concepts of environmental toxicology.

Objectives of the Two Programs

A. Minor Program in Environmental Toxicology

1. To give undergraduates who are working towards a degree in the sciences an opportunity to obtain a thorough overview of the field of environmental toxicology.
2. To make these students better qualified, and consequently eligible for employment with various industrial and government agencies engaged in environmental monitoring and research and where, in the past, a large proportion of the science graduates have found employment.

B. Extended Studies Diploma Program in Environmental Toxicology

1. To enable students, who already have a B.Sc. in the sciences and who are presently engaged in environmental work, to update their training, to fill information gaps, and to familiarize themselves with other areas of environmental toxicology of which they might not be aware but which are essential to the recognition and assessment of potentially hazardous situations in the environment.
2. To provide these students with practical experience in recent laboratory assay techniques enabling them to critically evaluate the data generated by these techniques.

3. To give the students a guide to the prediction of the environmental impact of a toxic agent when released, by accident or design, so that appropriate precautions are taken before damage is done to the environment and its population.

Environmental Toxicology, Course Proposals

A total of eight courses, six of which are modified or new courses in various departments, are proposed as core courses for the Environmental Toxicology programs.

Course outlines and detailed description of new courses are attached.

CORE COURSES.

The core courses can be sub-divided into two groups.

#1. Undergraduate, Introductory Courses.

- BISC. 432-2, Chemical Pesticides and the Environment.
- BISC. 311-3, Introduction to Environmental Toxicology.
- CHEM. 371-3, Chemistry of the Environment.
- GEOG. 319-3, Physical Interactions in the Environment.

And one course from the following:

- BISC. 329-3, Experimental Techniques.
- CHEM. 357-3, Chemical and Instrumental Methods of Identification of Organic Compounds.
- CHEM. 416-3, Modern Methods of Analytical Chemistry.

#2. Graduate Courses.*

- BISC. 650-3, Industrial Toxicology.
- BISC. 651-3, Food and Drug Toxicology.
- BISC. 652-3, Problem Analysis in Environmental Toxicology.

- * BISC 650-3 and 651-3 are available for credit to M.Sc. and Ph.D. students in Biological Sciences on the recommendation of the student's Supervisory Committee.

Requirements

A. Requirements for entry to the Minor Program in Environmental Toxicology

Lower division courses as prerequisites (33 semester hours minimum)

- BUSC 101-4, 102-4, 201-3
- CHEM 104-3, 105-3, 115-2, 251-3, 256-2, 232-3, 261-3
- GEOG 111-3
- MATH 101-3, 154-3, 155-3
- PHYS 101-3

B. Requirements for entry to the Extended Studies Diploma Program in Environmental Toxicology

Entry into this program is restricted to students who have graduated with a bachelors degree in one of the sciences.

Course requirements for a MINOR in Environmental Toxicology

This program may be undertaken within the B.Sc. degree.

Upper division requirements (15 semester hours minimum) chosen from the core courses described above in #1.

15-16 hrs.

Note - If credit for any of the above core courses is already being used towards another degree or diploma, additional credits will have to be obtained from the courses listed below in order to satisfy the minimum credit requirements of 15 semester hours in upper division courses for a Minor in Environmental Toxicology.

None of the courses listed below can be counted towards the requirements for more than one program.

BICH. 301, 412, 440

BISC. 301, 305, 347, 401, 405.

KIN. 405, 406.

Due to the infrequent offering of certain courses, it is advised that students wishing to pursue a Minor in Environmental Toxicology contact the Department of Biological Sciences as soon as possible.

Realizing that many of the prerequisite courses for an Environmental Toxicology Minor are already required for the various Major degrees it is helpful to summarize those courses which are not included in the prerequisite requirements for students in certain disciplines.

Prerequisite courses for a Minor in Environmental Toxicology to be taken in addition to those required for the following major program.

BISC. Majors.

CHEM. 232-3, 261-3	6
GEOG. 111-3	3
Total	<u>9</u>

BICH. Majors.

BISC. 201-3	3
CHEM. 232-3	3
GEOG. 111-3	3
MATH. 101-3	3
Total	<u>12</u>

CHEM. Majors.

BISC. 101-4, 102-4, 201-3	11
GEOG. 111-3	3
MATH. 101-3	3
Total	<u>17</u>

GEOG. Majors (B.Sc.)

BISC. 201-3
CHEM. 251-3, 256-2, 232-3, 261-3

8.
3
11

14

Total

KIN. Major.

CHEM. 232-3
GEOG. 111-3
MATH. 101-3
PHYS. 102-3

3
3
3
3

12

Total

Course Requirements for an Extended Studies Diploma Program.Option A. Industrial Toxicology.

Core courses group 1	15-16 hrs.
BISC. 650, Industrial Toxicology	
BISC. 652, Problem Analysis in Env. Tox.	9 hrs.
BISC. 846, Insecticide Chemistry and Toxicology (6 hrs of electives in upper division courses in consultation with a faculty advisor.)	6 hrs.

30-31 hrs.Option B. Food and Drug Toxicology.

Core courses group 1	15-16 hrs.
BISC. 651, Food and Drug Toxicology	
BISC. 652, Problem Analysis in Env. Tox.	12 hrs.
BISC. 846, Insecticide Chemistry and Toxicology	
BISC. 405, Cell Physiology	
3 hrs. of electives in upper division courses in consultation with a faculty advisor.	3 hrs.

30-31 hrs.

If, in this program, course credit has already been used towards another degree additional electives in area of specialization will be required.

The courses in this program have been designed to make future expansion into a minor or major program, or other programs into highly specialized areas, possible. This is illustrated by means of the attached flow chart.

FLOW CHART INDICATING THE RELATIONSHIP OF CORE COURSES IN THE ENVIRONMENTAL TOXICOLOGY PROGRAM

GENERAL INTRODUCTORY ENVIRONMENTAL TOXICOLOGY

- BISC. 329-3, Experimental Techniques or CHEM. 357 or 416
- BISC. 432-3, Chemical Pesticides in the environment
- BISC. 311-3, Introduction to Environmental Toxicology
- CHEM. 371-3, Chemistry of the Environment
- GEOG. 319-3, Physical Interactions in the Environment

MINOR PROGRAM

EXTENDED STUDIES DIPLOMA PROGRAM

OPTION

A

INDUSTRIAL TOXICOLOGY

- BISC. 650-3, Industrial Toxicology
- BISC. 652-3, Problem Analysis in Environmental Toxicology
- BISC. 846-3, Insecticide Chemistry and Toxicology

B

FOOD AND DRUG TOXICOLOGY

- BISC. 651-3, Food and Drug Toxicology
- BISC. 652-3, Problem Analysis in Environmental Toxicology
- BISC. 846-3, Insecticide Chemistry and Toxicology
- BISC. 405-3, Cell Physiology

WASTE TREATMENT

INDUSTRIAL HYGIENE

WATER POLLUTION

AIR POLLUTION

COMPUTER MODELING AND SIMULATION

ELECTROMAGNETIC RADIATION

DRUG TOXICOLOGY

FORENSIC SCIENCE

SCREENING AND TESTING

FOOD TOXICOLOGY

(POSSIBLE FUTURE EXPANSION INTO MORE SPECIALIZED AREAS)

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

Department: Biological Sciences

1. Calendar Information

Abbreviation Code: BISC Course Number: 311 Credit Hours: 3 Vector: 3-1-0

Title of Course: Introduction to Environmental Toxicology

Calendar Description of Course: A course intended to give the student a general understanding of environmental toxicology with in-depth treatment of the toxic effects of a few representative examples.

An opportunity is given for students with varying backgrounds to up-date their knowledge of basic ecological, physiological and biochemical processes.

Nature of Course Lecture and tutorial/seminar

Prerequisites (or special instructions):

Completion of at least 60 semester hours credit in the biological sciences program, or permission of the Department.

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? 1980-3

Which of your present faculty would be available to make the proposed offering possible? Dr. C. Van Notten

3. Objectives of the Course

To introduce the student to the many interacting factors important in the field of environmental toxicology, and to illustrate its scope and application to present day environmental problems.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas: see memorandum 28 May 1980, M. Mackauer to J. Webster.

- Faculty
- Staff
- Library
- Audio Visual
- Space
- Equipment

5. Approval

Date: Nov 21 1980 11 June 80 AUG 5 80

[Signature] [Signature] [Signature]

Department Chairman Dean Chairman SCUS

Course Description and Outlines
(New or Modified Courses)

BISC. (311). Introduction to Environmental Toxicology.

This course intends to give the student a general understanding of environmental toxicology with in depth treatment of the toxic effects of a few representative examples.

In this course an opportunity is given for the student with varying backgrounds to update their knowledge of basic ecological, physiological and biochemical processes. Prerequisites: 60 semester hours in the biological science program or permission of the department.

1. Heavy Metals (example lead)
2. Hydrocarbons and halogenated hydrocarbons (PCB's)
3. Dust, smoke and other air contaminants (asbestos)
4. Food additives (artificial sweeteners)
5. Food contaminants (aflatoxin)
6. Common drugs (Birth control pills)
7. Electro-magnetic radiation (x-rays)

Each of the above examples shown in brackets will be systematically investigated under the headings shown.

- a. Historical background
- b. Environmental sources and distribution
- c. Absorption - skin, lungs. GI tract.
- d. distribution
- e. excretion
- f. placentar and milk transfer
- g. toxicological effects
 - i. General toxicity - (metabolic, neurological immunological, endocrine reproductive, behavioural, etc.)
 - ii. Mutagenicity
 - iii. Teratogenicity
 - iv. Carcinogenicity
 - v. Synergistic and antagonistic effects
8. Toxic effects (cancer)
9. Screening procedures and tests for carcinogens and other hazardous chemicals in the environment.

List of reference material for BISC. 311-3, Introduction to Environmental Toxicology.

General Reference

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- Stryer, L. 1975. Biochemistry, Freeman.
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Specific Reference Material

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SENATE COMMITTEE ON UNDERGRADUATE STUDIES

NEW COURSE PROPOSAL FORM

1. Calendar information

Abbreviation Code: CHEM Course Number: 371

Department: Chemistry
Credit Hours: 3 Vector: (0,0,0)

Title of Course: Chemistry of the Environment

Calendar Description of Course: Chemical processes in the aqueous, terrestrial and atmospheric environment, with emphasis on the quantitative treatment of the variables determining the composition of natural systems.

Nature of Course Lecture and tutorial.

Prerequisites (or special instructions):

CHEM 232-3 or CHEM 333-1, CHEM 251, CHEM 261

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 (depends upon demand).

Semester in which the course will first be offered? Spring, 1981

Which of your present faculty would be available to make the proposed offering possible? S.K. Lower, J.M. D'Auria, A.G. Sherwood, T.N. Bell

3. Objectives of the Course

The objective of this course is to develop an understanding of the natural environment based on earlier courses in organic, inorganic and physical chemistry. Application of the principles to specific environmental problems will be explored.

This course is a requirement of the Extended Studies Diploma Program and of the proposed undergraduate program in Environmental Toxicology.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty

Staff

Library

Audio Visual

Space

Equipment

NONE

5. Approval

Date: 20 Feb 1980

CHW. Jones
1? Department Chairman

[Signature]
Dean

[Signature]
Chairman, SCUS

COURSE content.

1. Review of basic principles. Free energy, chemical potential and equilibrium. Acid-base equilibria, buffers. Carbon dioxide in solution. (6 lectures)
2. Precipitation and dissolution. Oxides, hydroxides, and carbonates; effects of polymorphism and solid solution formation. The phase rule, binary and ternary phase diagrams. Kinetics of dissolution. (4 lectures)
3. Metal ions in aqueous solution. Coordination with water, hydrolysis, hydroxo-metal complexes. Chelates, organic complexes in natural waters, oxidation-reduction. (3 lectures)
4. Surfaces and colloids. Nature of the solid-solution interface; surface tension and adsorption, the electric double layer. Colloids and their stability, particle agglomeration. Ion exchange. Surface chemistry of natural solids. (2 lectures)
5. Factors regulating the composition of natural waters. Chemical weathering of mineral substances; stability regions of solid phases. Detailed examination of carbonate and silicate systems. Leaching of soils. Seawater. Effect of organisms on waters. (3 lectures)
6. Natural solids. Clay minerals and soils. Magmas and their crystallization products; metamorphism. (3 lectures)
7. The atmosphere. Composition and structure of the atmosphere; optical properties; particulate constituents. Residence time and circulation. Photochemistry of atmospheric constituents and pollutants. (5 lectures)
8. Radioactivity of the environment. Natural radioactivity. Interactions of ionizing radiation with matter. Dosimetry. Man-made sources of radioactivity. (3 lectures)
9. Chemical aspects of environmental pollution. Environmental aspects of energy conversion; introduction to trophic analysis; Sources and sinks of natural and industrial pollutants. Dynamics of environmental change. (5 lectures)
10. Environmental monitoring. Survey of methods of trace substance analysis in soil, water, and air. Limits of detection, biological indicators. (2 lectures)
11. Case studies. Selected examples, following a single substance through its entire environmental cycle. (Student project)

Calendar description: "The natural processes of the hydrosphere, lithosphere, and atmospheric environment, with emphasis on the quantitative treatment of the variables determining the behavior of natural systems."

Representative books and reference materials:

- BAILEY R, CLARKE ET AL: "Chemistry of the Environment"
Academic Press, 1978
This text serves as the basis for a course at Rensselaer Polytechnic Institute.
- BRODINE, VIRGINIA: "Radioactive Contamination"
Harcourt-Brace, 1975
- EDWARDS, JOHN: "Combustion: formation and emission of trace species"
Ann Arbor, 1974
- PAUST, S., HUNTER J: "Organic Compounds in Aquatic Environments"
Dekker, 1971
- GARBELS R M, CHRIST C: "Solutions, Minerals and Equilibria"
Addison-Wesley, 1964
- KEEPER, G W: "Managing Heavy Metals on the Land"
Dekker, 1978
- MASTERS, GILBERT: "Introduction to Environmental Science and Technology"
Wiley, 1974 TD174 M38
- PANTELL, R H: "Techniques of Environmental Systems Analysis"
Wiley, 1976 TD170.2 P36
- KRAUSKOPF, K: "Introduction to Geochemistry"
McGraw-Hill, 1967
- NOORE, JOHN & ELIZABETH: "Environmental Chemistry"
Academic Press, 1976 QD31.2 M63
- ODUM, HOWARD: "Energy Basis for Man and Nature"
McGraw-Hill, 1967

WILLY, J. P., SKIFFER, G.: "Chemical Oceanography"
Addison-Wesley, 1964

BRIDGEMAN, JOHN: "All Principles of Physical and Chemical Fundamentals"
McGraw-Hill, 1974

STUMM, W: "Equilibrium Concepts in Natural Water Systems"
Am Chem Soc, 1967

QD142 E6

STUMM, W AND J. MORGAN: "Aquatic Chemistry: An introduction
emphasizing the chemistry of natural waters"
Wiley, 1970

One of the "classic" texts in the field.

VAN ALPHEN, H: "Introduction to Clay Colloid Chemistry"
Wiley, 1963

SENATE COMMITTEE ON UNDERGRADUATE STUDIES

20

NEW COURSE PROPOSAL FORM

Calendar Information

Department: GEOGRAPHY

Abbreviation Code: GEOG

Course Number: 319

Credit Hours: 3 Vector 2-0-2

Title of Course:

Calendar Description of Course: The course will review and analyse those physical processes in the environment that can be used to predict the dispersion of toxic agents etc.

Nature of Course Lecture: laboratory

Prerequisites (or special instructions): Geog. 111-3

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

2. Scheduling

How frequently will the course be offered? 1 in 6

Semester in which the course will first be offered?

81-1

Which of your present faculty would be available to make the proposed offering possible? CBC, FFC, EJH, IH, MCR, RBS

Objectives of the Course To provide a solid grounding in the basic dispersal and precipitating mechanisms that operate in air, water and land. A major aim will be to demonstrate the capability of predicting (toxic) material transport and dispersion within and between the three media.

4. Budgetary and Space Requirements (for information only)

What additional resources will be required in the following areas:

Faculty	None
Staff	"
Library	"
Audio Visual	"
Space	"
Equipment	"

5. Approval

Date: 80-02-05

AUG 5 '80

Michael C Roberts
Department Chairman

Dean

David R. Binkley
Chairman, SCUS

Course Outline

Physical Interactions in the Environment

Introduction The course treats conceptual and empirical knowledge of the physical processes in the transportation, storage and dispersal of materials through, in and between air, water and land.

Schedule One 2 hour lecture each week, one 2 hour lab. which will include discussion of relevant topics and exercises. There will be at least one one-day field trip.

Grades Based on lab. work (20%), an essay (40%) and a final examination (40%).

Weekly themes

Week 1 (Lecture) 1. Course overview: The nature and the role of the air-land-water system in toxic material transfer.

Intro. to the Atmosphere: component and bulk properties: stability of the atmosphere. Sources, residence time and sinks of contaminant material.

Lab. (L) Discuss weekly arrangements etc.

Week 2 1. The General Circulation of the Atmosphere: the drive and geodetic constraints; concepts of scale.

Role of moisture in the Atmos.: energy and change of phase; global (and local) sources of moisture and preferred sinks.

L. Geographical distributions: time-averaged vertical and horizontal motion.

Week 3 1. Turbulence in the atmosphere - the diffusion mechanism.

L. Space-time distribs.: diffusion from point, linear and areal sources.

Week 4 1. The real-world horizontal transport of diffusing matter - advection.

Summary- atmospheric dispersal through case reviews.

L. Modified real case - Acid rain.

Week 5 1. From air to water: similar role, different modes.

L.

Week 6 Lecture 1. Erosive and depositional process: general
Intro. to the Oceanic environment

L.

Week 7 Lecture 1. ...the lake scene:
Surface and ground waters

L.

Week 8 Lecture 1. Concentration and dispersion of contaminants by water
Summary...

L.

Week 9 Lecture 1. The Air/Water/Land system - interlinked and dependent process
Intro. the nature of hard and soft rock environments

L.

Week 10 Lecture 1. Transfer process and storage in the geologic sphere: in
the hard-rock environment

L.

Week 11 Lecture 1. The soft-rock mode
Summary - contaminant flow in the regolith

Week 12 Lecture 1. The nature of the vegetative interbody.
Absorption, concentration and/or dissipation of toxic materials
by vegetation.

L.

Week 13 Lecture 1. Review of process role and intensity, in and between the
three major media.

L. Open.

Geography 319

Text : No suitable text available

Readings : From prepared notes; selected portions of reserve texts, xerox material, 'stack' journal articles and from Government sponsored research reports.

Reserve:	<u>Meteorology</u>	Barry & Chorley	A.W. & C.
		Oke	Boundary Layer Climates
		Pasquill	Atmos. Diffusion
		Nunn	Biomet. methods
		Peterson	Intro. to Met.

Hydrology Gregory, K.J. & Walling, D.E. 1973, Drainage basin form and process, Arnold, London, 456 pp.

Geology Bouwer, H., 1978, Groundwater Hydrology. McGraw Hill,

Biogeog.

List of 'current' articles from: Atmos. Environments (Pergamon), Boundary-Layer Meteorology (Perg.), Water, Air, Soil Pollution (Raidel), J. Water Pollution Control, Water Research Bull. Water Research, J. of Environmental Quality, Science, Nature...

to be assembled.

1. CALENDAR INFORMATION:

Department: Biological Sciences Course Number: BISC 650

Title: Industrial Toxicology

Description: This course will give a detailed overview and study the toxic effects of the major contaminants and waste products present in the environment due to the industrial activity of the human population.

Credit Hours: 3 Vector: 3-1-0 Prerequisite(s) if any: BISC 311

Note: Available for credit to M.Sc. and Ph.D. students in Biological Sciences on the recommendation of the Supervisory Committee.

2. ENROLLMENT AND SCHEDULING:

Estimated Enrollment: 15 - 20 When will the course first be offered: _____

How often will the course be offered: once each year

3. JUSTIFICATION:

see attached sheet

4. RESOURCES:

Which Faculty member will normally teach the course: See memorandum dated 28 May 1980 from

What are the budgetary implications of mounting the course: M. Mackauer to J. Webster

Are there sufficient Library resources (append details): See library evaluation, Summary appended.

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

Approved: Departmental Graduate Studies Committee: [Signature] Date: 3 April 1980

Faculty Graduate Studies Committee: _____ Date: _____

Faculty: [Signature] Date: 11 June

Senate Graduate Studies Committee: _____ Date: _____

Senate: _____ Date: _____

Justification

BISC 650 Industrial Toxicology

This course is one of the core courses for the industrial toxicology option of the proposed extended studies diploma program in environmental toxicology, and is designed to address problems derived from toxins of industrial origin.

As no similar course is available at Canadian universities, many science graduates, presently employed in the public and private sector who have already obtained credit for the course "Introduction to Environmental Toxicology" have expressed great interest in extending their training at SFU in industrial toxicology at the graduate level.

The purpose of this course is to give a detailed overview of the major contaminants and waste products present in the environment due to the industrial activity of the human population.

All elements, compounds or classes of compounds will be systematically investigated under the following headings:

- a. Historical background
- b. Environmental sources and distribution
- c. Absorption - skin, lungs, GI tract.
- d. Distribution
- e. Excretion
- f. Placental and milk transfer
- g. Toxicological effects
 - i. General toxicity - metabolic, neurological, immunological, endocrine, reproductive, behavioural, etc.
 - ii. Mutagenicity
 - iii. Teratogenicity
 - iv. Carcinogenicity
 - v. Synergistic and antagonistic effects

1. Heavy metals: mercury
cadmium
nickel
selenium, etc.
2. Hydrocarbons: oil spills, etc.
3. Halogenated hydrocarbons: aerosols
PBB's
dioxin, etc.
4. Air contaminants: Oxides of carbon
Oxides of sulphur
Oxides of nitrogen
Dust
Smoke
Vapours
5. Electro-magnetic radiation: high voltage transmission
radar
microwave
nuclear

Suggested text: Toxicology, The Basic Science of Poisons.
L. Casarett and J. Doull. MacMillan, 1975.

Selected articles for BISC 650, Industrial Toxicology.

Bresnick, E. 1978. Biological and Pharamcalogical effects of metal contaminants Symposium. Fed. Proc. Vol. 37, No. 1.

Kingsley, K. 1977. Polybrominated biphenyls (PBB) environmental contamination in Michigan. 1973-1976. Env. Research 13, 47-93.

Poland, A., and Kende, A. 1976. 2,3,7,8,-Tetrachlorodibenzo-p-dioxin: environmental contamination and molecular probe. Fed. Proc. Vol. 35, No. 12.

Miller, K. 1979. The effects of Asbestos on macrophages. CRC Critical reviews in Toxicology. 319-355.

Carter, L. 1979. Uncontrolled SO₂ Emissions bring Acid Rain. Science Vol. 204.

Cleveland, W. 1979. Photochemical air pollution in Northeast United States. Science Vol. 204, 1273.

Singhal, R. 1978. Environmental pharmacology of the lung. Symposium Fed. Proc. Vol. 37, No. 11.

Marino, A. 1978. High Voltage Lines. Environment, Vol. 20, No. 9.

Health aspects of radio frequency and microwave radiation exposure, part 1. Health and Welfare Canada. 1977.

Savage, J. 1979. Chromosomal aberrations at very low radiation dose rates. Nature Vol. 277.

Carter, L. 1978. Uranium Mill Failings: Congress addresses a long-neglected problem. Science Vol. 202, 191-195.

New Graduate Course Proposal Form

1. CALENDAR INFORMATION:

Department: Biological Sciences Course Number: BISC 651

Title: Food and Drug Toxicology

Description: A course designed to investigate those toxic compounds in the environment which are added to, contaminate, or supplement one's diet.

Credit Hours: 3 Vector: 3-1-0 Prerequisite(s) if any: BISC 311

Note: Available for credit to M.Sc. and Ph.D. students in Biological Sciences on the recommendation of the Supervisory Committee.

2. ENROLLMENT AND SCHEDULING:

Estimated Enrollment: 20 When will the course first be offered: _____

How often will the course be offered: once each year

3. JUSTIFICATION:

see attached sheet

4. RESOURCES:

Which faculty member will normally teach the course: See memorandum dated

28 May 1980 from

What are the budgetary implications of mounting the course: M. Mackauer to J. Webster

- Are there sufficient Library resources (append details): See library evaluation, summary appended.

- 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: 2 April 1980

Faculty Graduate Studies Committee: _____ Date: _____

Faculty: [Signature] Date: 11 June '80

Senate Graduate Studies Committee: [Signature] Date: 17 July 80

Senate: _____ Date: _____

Justification

BISC 651 Food & Drug Toxicology

This course is one of the core courses for the food and drug toxicology option of the proposed extended studies diploma program in environmental toxicology, and is designed to investigate those toxic compounds which are added to, contaminate, or supplement one's diet. No similar courses are available at Canadian universities, forcing science graduates, employed in the public and private sector, to enrol in courses offered by universities in the United States, at great expense of time and money.

This course will investigate those toxic compounds in the environment which are added to, contaminate, or supplement one's diet.

All compounds or classes of compounds will be systematically investigated under the following headings:

- a. Historical background
 - b. Environmental sources and distribution
 - c. Absorption - skin, lungs, GI tract
 - d. Distribution
 - e. Excretion
 - f. Placental and milk transfer
 - g. Toxicological effects
 - i. General toxicity - metabolic, neurological, immunological, endocrine, reproductive, behavioural, etc.
 - ii. Mutagenicity
 - iii. Teratogenicity
 - iv. Carcinogenicity
 - v. Synergistic and antagonistic effects
1. Food additives: colouring agents
preservatives
artificial sweeteners
particulate matter
 2. Food contaminants: plant and animal toxins
bacterial and fungal toxins
industrial toxins
 3. Common drugs: vitamins
analgesics
sleeping pills
anti-depressants
stimulants
artificial hormones
psychoactive drugs

Suggested text: Toxicology, The Basic Science of Poisons. L. Casarett and J. Doull. MacMillan, 1975.

Selected reference material
BISC. 651, Food and Drug Toxicology

Khera, S. K. 1979. A review of the specifications and toxicity of synthetic food colors permitted in Canada. CRC Critical Reviews in Toxicology, Vol. 6, No. 2, 81-134.

Dietary Fiber. Food Technology. 1979.

Brody, A. 1977. Impact of external influences on food packaging. CRC. Critical Reviews in Food Science and Nutrition.

Dimsen, N. 1975. Toxicology and regulation of Natural Colors. Food Technology 40.

Hay, A. 1978. Neurotoxins may go unrecognized. Nature, Vol. 274.

Berry, L. J. 1977. Bacterial Toxins. CRC. Critical Reviews in Toxicology, Nov. 1977.

Ruggiere, G. 1976. Drugs from the Sea. Science, Vol. 194.

Wieland, T. 1978. Amatoxins, Phallotoxins Phallolysin and Antamanide: the Biological Active Components of Poisonous Amanita Mushrooms. CRC. Critical Review in Toxicology, Vol. 5, No. 3.

Vorhees, C. et al., 1979. Psychotropic Drugs As Behavioural Teratogens. Science, 205. 1220-1225.

Johnson, F. C. 1978. The Antioxidant Vitamins. CRC. Critical Reviews in Toxicology. Vol. 11, No. 3.

Jacobs, B. L., and Trulson, M. E. 1979. Mechanism of Action of LSD. American Scientist, Vol. 67.

New Graduate Course Proposal Form

1. CALENDAR INFORMATION:

Department: Biological Sciences Course Number: BISC 652

Title: Problem Analysis in Environmental Toxicology

Description: A course designed to provide the student with practical experience of the methods used to monitor toxic agents in the environment.

Credit Hours: 3 Vector: 1-1-6 Prerequisite(s) if any: BISC 650 or BISC 651 or permission of the Department.

2. ENROLLMENT AND SCHEDULING:

Estimated Enrollment: 15 - 20 When will the course first be offered: _____

How often will the course be offered: once each year

3. JUSTIFICATION:

see attached sheet

4. RESOURCES:

Which Faculty member will normally teach the course: See memorandum date

What are the budgetary implications of mounting the course: 28 May 1980 from M. Mackauer to J. Webster

Are there sufficient Library resources (append details): See library evaluation. Summary appended.

- Appended: a) Outline of the Course (Appendix 111)
- b) An indication of the competence of the Faculty member to give the course.
- c) Library resources

Approved: Departmental Graduate Studies Committee: Donald C. Fenske Date: 2 April 1980

Faculty Graduate Studies Committee: _____ Date: _____

Faculty: [Signature] Date: 11 June 80

Senate Graduate Studies Committee: [Signature] Date: 17 July 80

Senate: _____ Date: _____

Justification

BISC 652 Problem Analysis in
Environmental Toxicology

This course is one of the core courses for the proposed extended studies diploma program in environmental toxicology, and is designed to provide practical experience in advanced laboratory and field methods currently used to monitor toxic agents in the environment. This proposed course will provide practical backup for the industrial, and food and drug toxicology options described earlier.

A practical course in environmental toxicology. Specific environmental problems will be analyzed in depth at the theoretical as well as the practical level using the most advanced techniques available.

Environmental problems specific to the students' area of interest will be selected and subjected to a detailed investigation, including problem identification, sampling methods, application of appropriate biological and chemical analytical techniques, data evaluation, and integration with the realm of environmental toxicology in order to generate the appropriate data base for the design of possible recommendations.

Suggested texts and reference material:

Environmental Impact Data Book. Golden, Quелlette, Saari and Cheremisinoff. Ann Arbor Science, 1979.

Instrumental Methods of Analysis. Willard, Merritt and Dean. 5th ed. Van Nostrand Company, 1974.

Methods in Immunology. Campbell, Garvey Cremer, Sussdorf 3rd ed. W. A. Benjamin, Inc. New York 1977.

Work, T. S., and Work, E. 1979. Laboratory Techniques in Biochemistry and Molecular Biology. Vol. 7.

Knoll, G. F. 1979. Radiation detection and Measurement. John Wiley.

Course Descriptions

(Existing Courses)

- BISC. 405 Cell Physiology
The physiology of cells with emphasis on the Physical and chemical natures of specialized activities.
- BISC. 329 Introduction to Experimental Techniques.
This course is designed to introduce the students to basic measurement methods and instrumentation as used in modern biology.
- BISC. 432 Chemical Pesticides and the Environment.
The properties, uses, modes of action, and good and bad consequences of the use of chemicals to prevent or control pest damage and plant diseases.
- BISC. 846 Insecticide Chemistry and Toxicology
The chemistry of insecticides, with emphasis on their toxicology, metabolism and fate in the environment.
- CHEM. 357 Chemical and Instrumental Methods of Identification of Organic Compounds.
Basic principles of infrared, ultraviolet, nuclear magnetic resonance and mass spectroscopy as applied to the identification of organic compounds.
- CHEM. 416 Modern Methods of Analytical Chemistry
Instrumentation, techniques and scope of application of analytical methods based on optical properties, electrochemical phenomena and interphase separations. Applications to problems in pure and applied chemistry and biochemistry.

Appendix I

- A. The following information was gathered, by means of questionnaires and personal communication, from students enrolled in a pilot course in Environmental Toxicology, BISC. 472 IV. Fall, 1978.

Enrollment

Credit students	36
Audit students	4
Special audit students	8
Total enrollment	<u>48</u>

Type of Students

Undergraduates	21
Graduate and MPM	4
Other	23

The 23 students belonging to the last group were made up out of representatives from various industrial and government agencies such as:

- Department of Health and Welfare
- Ministry of the Environment
- Municipality of Burnaby
- R.C.M.P.
- B. C. Hydro
- Hospitals
- B.C.I.T.
- Labour Movement
- Environmental consulting companies
- Pest control companies
- Government laboratories.

Most, if not all, of these representatives possessed a B.Sc. and often higher degrees, including Ph.D.'s (3).

The reasons for taking this course are the same as those already outlined in the introduction of this proposal.

- B. Many government and industrial agencies are presently being contacted and their response to the proposed program will be compiled in the near future.

Appendix I, continued.

Enrollment characteristics of BISC. 472, Selected Topics in Environmental Toxicology, Fall, 1979. Figures for BISC. 472, Fall 1979 are shown for comparison.

<u>Enrollment</u>	Fall, 1978	Fall, 1979
Credit Students	36	52
Audit	4	3
Special Audit	8	17
Total Enrollment	<u>48</u>	<u>72</u>
<u>Type of Student</u>		
Undergraduates	21	35
Graduate Students	4	3
Other	23	34

The 34 students belonging to the last group were representatives from:

- B.C.I.T.
- B.C. Hydro
- Can-Test Ltd.
- City Analyst Laboratory (Coroners Lab)
- City of Vancouver, Health Department
- Environmental Consulting Companies
- G.V.R.D., Parks Department
- Health and Welfare Canada
- MacMillan and Bloedel
- National Water Research Institute
- Provincial Health Ministry
- R.C.M.P., Crime Detection Lab
- Vancouver General Hospital
- Workers' Compensation Board.

Appendix II

July 12, 1979.

Dr. Paul B. Hammond,
 Professor of Environmental Health,
 University of Cincinnati, Medical Center,
 3223 Eden Avenue,
 Cincinnati, Ohio 45267,
 U.S.A.

Dear Sir,

I am in the process of preparing a report on the feasibility of starting a program in environmental toxicology at Simon Fraser University. It is my understanding that you are the director of the toxicology training program which is available at the University of Cincinnati. Consequently in that capacity, could you provide me with some helpful information. The questions I have at this time are as follows:-

- What are the projected requirements for individuals with training in environmental toxicology by government and industry both at the B.Sc. and the Ph.D. levels?
- What is the student demand for training in this area and what is their background?
- If my information is correct the University of Cincinnati also offers a program in Industrial Hygiene and, although I personally can see the need for a separate program in toxicology, what were the original reasons for separating these two related fields and not combining them as often appears to be the case at other universities?
- What other Universities in the U.S.A. offer programs in toxicology, specifically environmental toxicology?

If you could provide me with some information regarding the above questions, I would greatly appreciate it.

Yours sincerely,

C. van Netten, Ph.D.

CvN/lt



University of Cincinnati Medical Center

3223 Eden Avenue
Cincinnati, Ohio 45267

INSTITUTE OF ENVIRONMENTAL HEALTH
KETTERING LABORATORY
(513) 872-5700

August 23, 1979

Dr. C. van Netten
Department of Biological Sciences
Simon Fraser University
Burnaby, B.C., Canada V5A 1S6

Dear Dr. van Netten,

I must apologize for the unseemly delay in responding to your letter of July 12. Hopefully, this will still be of use to you.

In answer to your first question, there are no reliable projections as to the demand for toxicologists. A couple years ago I served as co-chairman of a committee which attempted to evaluate the supply-demand situation in a number of environmental health disciplines including toxicology. We really were unable to make any definitive estimate as to demand for toxicologists. I can only tell you that the placement service of the Society of Toxicology has been unable to provide enough qualified applicants to satisfy the needs of potential employers. I enclosed one summary of our studies concerning supply and demand.

In connection with your first question, however, I would like to offer a personal opinion concerning the demand for B.Sc.'s in toxicology. I do not feel there is much demand for this type of graduate. What would he do? I suspect he would operate at the level of technical assistant on research projects. His background would likely be rather diffuse. It seems to me that research assistants do not need to know very much about environmental issues and concepts to serve effectively in this capacity.

I am not sure that I understand your second question, but I suppose you want to know how much interest students have in the field. If that is what you mean, I can tell you that I receive more than 100 inquiries concerning our program. Most of these students have or are receiving baccalaureate degrees in chemistry, biology, or a combination thereof.

In regard to your third question, the distinction between industrial hygiene and toxicology seems quite clear to us. The emphasis in industrial hygiene is on the monitoring and control of exposure to toxic substances. The focus in toxicology is on the toxic effects of exposure to chemical substances. The industrial hygiene students are required to take a single course in toxicology. It is a survey course which deals with the principles of toxicology, the methods used in the evaluation of toxicity and some

Dr. C. van Netten
August 23, 1979

Page 2

examples of toxic problems e.g. heavy metals, gases and vapors and economic poisons (rodenticides, insecticides, herbicides).

Your question concerning other programs in environmental toxicology cannot be answered with assurance as to completeness. I know that the University of California, Davis offers a B.S. degree in toxicology. I know of no other such programs. At the graduate level, the major programs I know of are at the University of Rochester, Departments of Pharmacology and Radiobiology, University of Texas, Department of Pharmacology, University of Kansas, Department of Pharmacology, University of Tennessee, and Purdue University, School of Pharmacy. If you want a complete list, I suggest that you contact Dr. Margaret Hitchcock. She has received a contract from the National Institute of Environmental Health Sciences to undertake a continuing survey of supply and demand in the area of toxicology. Her address is:

Dr. Margaret Hitchcock
Yale University
School of Medicine
Department of Epidemiology and Public Health
60 College Street
New Haven, Connecticut 06510

I enclose three items which provide further details regarding our toxicology program: 1) brochure 2) course requirements and 3) course descriptions. I hope they are helpful.

Sincerely,



Paul B. Hammond, D.V.M., Ph.D.
Professor of Environmental Health

PBH/mjl

Enclosures

PART 2

Dr. M. Wideen, Faculty of Education
Dr. J. Dickinson, Kinesiology
Dr. E. W. Roberts, L.L. & L.

New Course BISC 311-3

Dr. M. Mackauer, Chairman,
Dept. of Biological Sciences.

April 2, 1980.

I am enclosing herewith a new course proposal (Introduction to Environmental Toxicology, BISC 311-3) for consideration of course overlap.

If I do not hear from you by April 18 I will assume that there is no overlap and submit the proposal to our Faculty Undergraduate Curriculum Committee.

Mack
M. Mackauer.

MM/ms
Encl.

SIMON FRASER UNIVERSITY

MEMORANDUM

To: Mr. N. ...
From: Mr. ...

Subject: New Course Proposals
BISC 311, 422, 650, 651, 652.

Date: May 28, 1980.

I thought you might wish to have copies of the attached memoranda from Sheila Roberts, Secretary of the Faculty of Arts Curriculum Committee.

Copies of the above course proposals were sent to the Faculty of Arts, Education and Interdisciplinary Studies for consideration of course overlap. Please note that I asked for a reply by 18 April, failing that, I would assume the absence of overlap. A reply was received only from the Faculty of Arts and Education.

M. Mackauer
M. Mackauer.

MM/ms
Encls.

MA. 1. E. 200

MEMORANDUM

Dr. M. Mackauer, Chairman
Department of Biological Sciences
Subject BISC 311 and 422

From Sheila Roberts, Secretary
Faculty of Arts Curriculum Committee
Date May 21, 1980

The Faculty of Arts Curriculum Committee at its meeting of May 8, 1980, considered BISC 311 and 422 in terms of overlap and found no substantial overlap with the courses offered in the Faculty of Arts

Sheila Roberts

S. Roberts

c.c. H.M. Evans

SR/md

MAY 2 1980

MEMORANDUM

o
A.G. Sherwood, Chairman
Faculty of Science U.C.C.
subject NEW COURSE CHEM. 371-3

From Marvin Wideen
Undergraduate Programs
Faculty of Education
Date February 26th, 1980

Please be advised that there is no overlap between the proposed course, Chem. 371-3 - Chemistry and the Environment and any offered in the Faculty of Education.

Marvin Wideen
Undergraduate Programs
Faculty of Education

MW:vs

MEMORANDUM

To..... Dr. J. M. Webster, Dean of Science.	From..... Dr. M. Mackauer, Chairman, Dept. of Biological Sciences.
Subject..... Environmental Toxicology Program	Date..... May 28, 1980.

My earlier submission for Faculty of Science approval of a proposal leading to a Minor and E.S.D. in Environmental Toxicology did not address the question of resources required for mounting the Program.

The Program incorporates some existing as well as the following 6 new courses:

BISC 311-3	Introduction to Environmental Toxicology	(Vector 3-1-0)
CHEM 371	Chemistry of the Environment - I	(3-0-1)
GEOG 319	Physical Interactions in the Environment	(2-0-2)
BISC 650	Industrial Toxicology	(3-1-0)
BISC 651	Food and Drug Toxicology	(3-1-0)
BISC 652	Problem Analysis in Environmental Toxicology	(1-1-6)

All BISC courses are proposed to be offered once a year, CHEM 371 will be offered once a year or as needed, and GEOG 319 will be offered once in 2 years. The CHEM and GEOG courses can be mounted without additional resources, at this stage, according to their Department submissions.

However, the 4 new BISC courses will require additional resources, both in faculty as well as some equipment. The main requirements are the following.

2 new Faculty positions, one at the Assistant Professor level and one at the Assistant/Associate Professor level

\$50,000 Capital funds to set up BISC 652.

Justification

All core courses will be offered once a year to enable students to complete their program in a reasonable period of time. Assuming that Faculty hold the tutorials in the upper levels courses, though not necessarily in the lower level BISC 311, the total number of faculty contact hours generated by the new courses is 16 hrs per annum, which is equivalent to 1-1/2 faculty workloads. The remaining 1/2 faculty position is needed for program co-ordination and liaison with industry.

As there will be considerable start-up work in developing the new courses and in particular in setting up and testing laboratory exercises for BISC 652, both Faculty positions should be established as early as possible, that is, as soon as we receive UCBC approval. In the absence of such approval inclusive of approval for the new positions the Department will not be able to offer the Program.

May 28, 1980.

Dr. J. M. Webster,
Re: Environmental Toxicology

I do not anticipate any additional requirements for staff (excepting GTAs as justified by enrolments), AV, space, or equipment (excepting the initial cost of equipping BISC 652 and the usual annual operating costs in materials and supplies or minor equipment). However, it may be desirable at a later time to provide technical support through LI-Is rather than through GTAs.


M. Mackauer.

MM/ms

cc C. van Netten
C. L. Kemp
R. C. Brooke

MAY 28 1980

SIMON FRASER UNIVERSITY

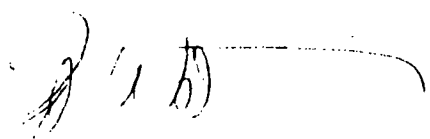
MEMORANDUM

Part 4

To..... Prof. A. Sherwood.....
..... Faculty of Science U.C.C.....
Subject..... New Course CHEM 371-3.....

From..... E. A. Weinstein.....
..... Library - Sciences Division.....
Date..... 80/03/11.....

This is to confirm that library resources are adequate to support new course CHEM 371-3, as stated on the new course proposal form.



ah

Evaluation of Library Resources in Support of
Environmental Toxicology
as described in a

'Proposal for a Minor and an Extended Studies Diploma Program
in Environmental Toxicology'

by
Dr. C. van Netten
Biological Sciences
2 October 1979

Maurice Deutsch

24 February 1980

Library

Simon Fraser University

- - - d r a f t c o p y # 2 - - -

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Purpose

The purpose of this report is to summarize the Library's book and monograph, journal, and index and abstract collections with a view to supporting 3 new and 2 modified courses and the proposed program in Environmental Toxicology.

The Program

The following new or modified courses are proposed for the Environmental Toxicology Program:

New Courses

- Introduction to Environmental Toxicology, Bisc 4xx,* Undergraduate;
- Industrial Toxicology, Bisc 5xx,* Graduate;
- Food and Drug Toxicology, Bisc 5xx,* Graduate;

Modified Courses

- Environmental Chemistry, Chem 3xx*, Undergraduate;
- Physical Interactions in the Environment, Geog 4xx,* Undergraduate.

Other courses required by this program are already offered by the Biology, Chemistry, and Geography Departments and are currently supported by the Library.

* These courses have subsequently been designated BISC 311-3, BISC 650-3, BISC 651-3, CHEM 371-3 and GEOG 319-3 respectively.

The Library's Collections

Books and Monographs

For convenience the relevant portions of the book and monograph collection (reference works, textbooks, treatises, handbooks, government publications, proceedings of symposia, conferences, congresses, etc.) have been arranged in the following 9 broad subject areas outlined below. This represents approximately 12,745 volumes in support of the new program and the 5 proposed courses. The 500 volume toxicology subset (RA1190 - RA1270) will probably become one of the most important and useful parts of the book collection for students in this program.

- Hydrology and Hydrosiences; Physical Geology, Earth Surface, Landforms, Geomorphology; Surface and Underground Water; Oceans, Lakes, Rivers, Estuaries; Snow, Ice, Glaciers, Permafrost; Remote Sensing
GB7 - GC1580 2200 v.¹
- Meteorology, Climate, Weather
QC851 - QC998 1200 v.
- Geology, Mineralogy, Petrology, Dynamic and Structural Geology
QE1 - QE654 5150 v.
- Biogeography; Marine, Freshwater, and Brackish Water Biology, Ecology, and Pollution
QH83 - QH199 730 v.
- Ecology; Ecological Research, Interactions, Interrelationships; Environmental Chemistry, Pollution, Contamination; Bios-Geos Interactions
QH540 - QH545 730 v.
- Environmental Health, Medicine, Hygiene, Quality, Hazards, Safety, Contaminants, Pollutants (Air, Soil, Water)
RA565 - RA591 100 v.
- Toxicology; Toxic Effects of Pesticides, Food Additives, Smoke and Smoking, Drugs, Organic and Inorganic Chemicals (Man-made or Natural), Noise, Radioactive Substances, etc.
RA1190 - RA1270 500 v.

¹Approximate number of volumes.

- Industrial Medicine and Hygiene; Occupational Diseases
RC963 - RC967 35 v.
- Pharmacology
QP 903 - QP981, RM 500 v.
- Environmental Monitoring, Chemistry, Instrumentation,
and Engineering; Treatment of all Aspects of Polluted
Environments; Environmental Assessments and Studies
TD5 - TD949 1600 v.

Online information retrieval systems provide a modern, efficient and expedient means of obtaining titles of books, reference works, journals, proceedings of conferences, symposia, etc., from machine readable card catalogs and journals' lists produced by CISTI (Canada Institute for Scientific and Technical Information, previously known as the National Science Library) and the NLM (U.S. National Library of Medicine).

CAN/OLE (Canada/Online Enquiry System, Ottawa) and MEDLINE (Medical Information Online, Bethesda, Maryland), two government supported information retrieval systems, were used to search CISTI's card catalog (OCN) and the NLM's card catalog (CATLINE) for book material received since January 1978. Searches were keyed into a terminal located on the fifth floor of the Library and connected to remote computers by telephone accessible data communications networks (DATAPAC and TELENET). Printouts of the retrieved citations were mailed to the Library and were received in about a week. The following subjects were searched:

- food, drug, perfume, and cosmetics toxicology;
- toxicology of other organic and inorganic substances;
- environmental toxicology and environmental diseases;
- industrial and occupational hygiene, medicine, diseases, and toxicology;
- environmental chemistry and environmental interactions.

The book and monograph collection can adequately support the proposed courses and the proposed program. Weaknesses occur in such areas as:

- industrial and occupational diseases, medicine, hygiene;

- pollution treatment, engineering, and technology;
- food and flavor science and technology;
- drugs and pharmacy;
- perfume and cosmetics science and technology.

The Library's chief means of obtaining science books and monographs, an application of computerized information retrieval to book selection and distribution, is through the specification of a comprehensive set of subject headings (a profile of interest) designed and used by BNA (Blackwell North America) Book Agents. The BNA profile ensures that English language material in appropriate areas of the life and physical sciences and most areas of toxicology will be received automatically by the Library.

A list of suggested book purchases (titles only for the sake of brevity) follows; arrangement is by publication date.

Book Candidates Published in 1980

Developments in Occupational Medicine.

Book Candidates Published in 1979

Advances in Pesticide Science: Plenary Lectures
Presented at the Fourth International Congress
of Pesticide Chemistry, Zurich, Switzerland,
July 24-28, 1978.

Aquatic Toxicology: Proceedings of the Second Annual
Symposium on Aquatic Toxicology: A Symposium
Sponsored By ASTM Committee E-35 on Pesticide,
Cleveland, Ohio, 31 Oct. - 1 Nov. 1977.

Controversial Chemicals: A Citizen's Guide.

Current Approaches to Occupational Medicine.

Forensic Toxicology: Controlled Substances and
Dangerous Drugs.

Fundamentals of Industrial Hygiene.

Hazardous and Toxic Effects of Industrial Chemicals.

Health Effects of Halogenated Aromatic Hydrocarbons.

Lecture Notes on Occupational Medicine.

TLVS: Threshold Limit Values for Chemical Substances
in Workroom Air Adopted by ACGIH for 1979.

Toxicology.

Toxicology and Occupational Medicine.

Book Candidates Published in 1978

Asbestos and Disease.

Canadian Occupational Safety and Health Law.

Cancer and Chemicals.

Cadmium Studies in Japan: A Review.

Chemicals and Agriculture: Problems and
Alternatives; Proceedings of a Seminar Held at
Echo Valley Centre, Fort Qu'Appelle,
Saskatchewan, November 3 and 4, 1977.

Clinical Toxicology Manual.

The Diseases of Occupations.

Distribution of Trace Elements Related to the
Occurrence of Certain Cancers, Cardiovascular
Diseases, and Urolithiasis.

Factors Influencing Metabolism and Toxicity of
Metals: Proceedings of an International Workshop
Meeting Organized by the Scientific Committee on
The Toxicology of Metals of the Permanent
Commission and International Association on
Occupational Health: Stockholm, July 17-22,
1977.

Fluorocarbons, An Industrial Hygiene Survey of
Worker Exposure in Four Facilities.

Folk Name and Trade Diseases.

Hazards of Medication: A Manual on Drug
Interactions, Contraindications, and Adverse
Reactions With Other Prescribing and Drug
Information.

Health of Women At Work.

Hepatotoxicity: The Adverse Effects of Drugs and
Other Chemicals on the Liver.

Industrial and Environmental Xenobiotics: In Vitro
Versus In Vivo Biotransformation and Toxicity:
Proceedings of an International Conference Held
in Prague, Czechoslovakia, 13-15 September 1977.

Methodological Approaches to Deriving Environmental
and Occupational Health Standards.

NIOSH Publications Catalog.

Occupational Health and Safety Concepts: Chemical
and Processing Hazards.

Occupational Health as Human Ecology.

Patty's Industrial Hygiene and Toxicology.

Pharmacological Methods in Toxicology.

Phosphorus in the Environment: Its Chemistry and
Biochemistry.

Principles of Ecotoxicology.

Proceedings of the First International Congress on
Toxicology.

Solvents, Adhesives, and Aerosols: Proceedings of a
Seminar Held in Toronto in May, 1977, by the
Ontario Ministry of Industry and Tourism in
Cooperation With the Addiction Research
Foundation.

Symposium on the Handling of Toxicological
Information.

The Third Advanced Course in Industrial Toxicology.

Underwater Physiology.

Work Capability and Physiological Effects in He-02
Excursions to Pressures of 400-800-1200 and 1600
Feet of Sea Water.

Book Candidates Published in 1977 and Earlier

Analytical Toxicology Methods Manual.

Chemical Mutagens.

Chemistry in the Natural World.

Conference on Women and the Workplace, June 17-19,
1976, Washington, D.C.: Proceedings.

Electron Microscopy and X-Ray Applications to
Environmental and Occupational Health Analysis.

Environment and Resource Management: Presented at
27th Canadian Chemical Engineering Conference,
Calgary, Alberta. (23-27 Oct. 1977)

Environmental Chemistry.

Environmental Toxicology.

The Evaluation of Toxicological Data for the
Protection of Public Health.

Guidebook, Toxic Substances Control Act.

Guidelines for Analytical Toxicology Program.

Industrial Health.

Information Sourcebook: Occupational Safety and
Health.

International Directory of Applied Research for the
Protection of Man at Work.

Introduction to Ecological Biochemistry.

Lead.

Occupational Health and Safety.

Occupational Health in Canada: Current Status.

Proceedings, Workshop on Behavioral Toxicology.

Trace Metals in Urban Aerosols.

Permissible Levels of Toxic Substances in the
Working Environment.

Journals and Periodicals

The Union List of Scientific Serials in Canadian Libraries (ULSSCL, part of the CAN/OLE System), a database of more than 43,000 journals and annuals held by 248 Canadian libraries, and CATLINE were searched online for journal titles in the following broad areas:

- toxicology
- industrial hygiene

The following list of 28 possible journal and supplement acquisitions is divided in two groups, those already available in B.C. and those not available in the province. Subscription prices are those found in Ulrich's International Periodicals Directory, 18th ed., 1979-1980 (F.R. Bowker, N.Y., 1979). Prices are in U.S. dollars. An asterisk indicates estimated average cost based on the 1978 average price of medical periodicals reported in Library Journal, July 1978, pp. 1356-1361. Formula used to calculate estimated current price is:

$$\begin{aligned} &(((57.06 \times 0.112) + 57.06) \times 0.112) + 63.45 = 70.55 \\ &(((70.15 \times 0.15) + 70.55) \times 0.1) + 81.13 = 89.24 \end{aligned}$$

rounded to \$90.00.

Journal Candidates Not Available in B.C.

Advances in Modern Toxicology.	* 90.00
Archives of Toxicology.	\$ 234.00
Archives of Toxicology. Supplement.	* 90.00
Chemical-toxicological Series, Bulletin.	* 90.00
Clinical Toxicology Bulletin.	* 90.00
Current Topics in Environmental and Toxicological Chemistry.	* 90.00
Developments in Toxicology and Environmental Science.	* 90.00
Environmental Mutagen Society. Newsletter.	* 90.00
European Society of Toxicology. Proceedings.	* 90.00

Hazardous and Toxic Substances.	* 90.00
Health, Safety and Education.	* 90.00
International Journal of Clinical Pharmacology, Therapy and Toxicology.	* 90.00
Journal of Analytical Toxicology.	\$ 30.00
Journal of Environmental Pathology and Toxicology.	\$ 33.00
Journal of Toxicological Sciences.	* 90.00
Journal of Environmental Sciences and Health. Part C: Environmental Health Sciences.	\$ 44.00
Modern Pharmacology-Toxicology.	* 90.00
Neurotoxicology.	\$ 60.00
Pesticide and Toxic Chemical News.	\$ 200.00
Progress in Toxicology.	* 90.00
Reviews in Biochemical Toxicology.	* 90.00
Toxic Substances. (National Institute for Occupational Safety and Health).	* 90.00
Toxicological European Research. Recherche européenne en toxicologie.	* 90.00
Toxicology.	\$ 208.00
Toxicology Annual.	* 90.00
Toxicology Letters.	* 90.00
TOX-TIPS.	\$ 25.00
Veterinary and Human Toxicology.	

Journal Candidates Available in B.C.

Clinical Toxicology.	\$ 82.50
Drug and Chemical Toxicology.	\$ 40.00
European Journal of Toxicology and Environmental Hygiene.	* 90.00
Journal of Industrial Hygiene and Toxicology.	* 90.00
Journal of Toxicology and Environmental Health.	\$ 58.50
Modern Trends in Toxicology.	* 90.00
Toxicological and Environmental Chemistry Reviews.	* 90.00
Toxicon. (International Society on Toxicology).	\$ 108.00

Indexes, Abstracts, and Online Computer Searches

The real key to the published literature in the life sciences is the index and abstract collection. Below is a list of indexes and abstracts which the Library subscribes to and which provide access to environmental and toxicological citations in journals, society publications, proceedings of conferences, symposia, congresses, etc., technical and research reports, Ph.D. dissertations, governmental publications, and even planned and ongoing research projects.

- Biological Abstracts and Biological Abstracts/RRM
- British Columbia Government Publications Monthly Checklist
- Chemical Abstracts
- Current Contents -
 - a. Agriculture, Biology and Environmental Sciences
 - b. Life Sciences
 - c. Physical and Chemical Sciences
- Dissertation Abstracts International
- Environment Index and Abstracts
- Excerpta Medica
- Geo Abstracts
- Government Reports Announcements (NTIS)
- Index Medicus
- Meteorological and Geostrophysical Abstracts
- Monthly Catalog of Canadian Government Publications
- Monthly Catalog of United States Government Publications
- Pesticides Abstracts
- Pollution Abstracts
- Science Citation Index

- Selected Water Resources Abstracts

The only omission is the Bibliography and Index of Geology, a publication which provides access to many aspects of environmental interactions. This index would cost about \$1,000 per year.

Each of the above printed indexes, excluding Meteorological and Geostrophysical Abstracts, is accessible online from different commercial and government subsidized systems in Canada and the U.S. and can be searched by remote terminal from the Library.¹ As a guide, a typical search consisting of one database and about 40 printed references averages about \$15.

In addition to the above, there are two outstanding online databases one of which, TOXLINE, has no printed equivalent, and one noteworthy, conventionally printed drug and toxicology reference work which is in its 17th edition:

- TOXLINE, 1966- , is one of the most valuable toxicology databases consisting of references and citations selected from 11 indexes (8 of which are still currently published) rather than from the original literature. Provide access to information about naturally occurring and man made organic, inorganic, and radioactive chemicals, drugs, pesticides, pollutants, food additives, cosmetics, etc.
- Registry of Toxic Effects of Chemical Substances is available in both hardcopy and online. Provides access to documented toxicity data for 36,851 substances, accessible by 125,000 names, and includes threshold limit values, recommended standards in air, aquatic toxicity data, CA registry numbers (for about 20,000 substances), LD50, molecular formulas, synonyms, toxic effect, routes, organ affected, etc. Prepared by the U.S. National Institute for Occupational Safety and Health (NIOSH).
- Martindale, The Extra Pharmacopeia is an outstanding thoroughly comprehensive and encyclopedic compilation of information (including toxicological) about drugs, pharmaceuticals, cosmetics, creams, lotions, as well as organic and inorganic chemicals used in their

¹Two separate booklets are attached describing online literature searching in Life Sciences, and Physical Sciences and Technology at the SFU Library.

preparation.

Summary

The journal collection may need to be strengthened depending on the activity and growth of the anticipated program and the speed with which articles are needed. The most sensible approach at this time is to watch the development of this new program and enlarge the collection if and when a demand for additional material arises.

Interlibrary Loans can usually obtain books and photocopies of articles not available at SFU from UBC in about five to ten days. Interlibrary Loans is currently testing an online ordering system (part of CAN/OLE) for books and journal photocopies not available in B.C. from CISTI in Ottawa. So far response time has been good, about ten to twenty days.

SIMON FRASER UNIVERSITY

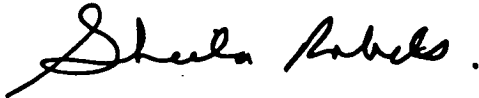
MEMORANDUM

To: Mr. Harry Evans, Secretary Senate Committee on Undergraduate Studies NEW COURSE PROPOSAL -	From: Sheila Roberts, Secretary Faculty of Arts Curriculum Committee Dean of Arts
Subject: DEPARTMENT OF GEOGRAPHY (Faculty of Arts)	Date: 1980-04-16

The new course proposal from the Department of Geography listed below has been approved by the Faculty of Arts Curriculum Committee at its meeting of April 10, 1980.

As the Faculty of Science Curriculum Committee is also involved in examining various course proposals which will become part of the Toxicology Program, I would suggest that you check with them before putting this course on the agenda of SCUS.

Thank you.



S. Roberts

SR/md

Attachments:

GEOG. 319-3, Physical Interactions in the Environment

c.c. Dr. C. Van Netten, Biological Sciences

Dr. D. R. Birch, Assoc. Vice-President, Academic

RECEIVED

APR 17 1980

REGISTRAR'S OFFICE
MAIL DESK

SIMON FRASER UNIVERSITY

MEMORANDUM

To Sheila Roberts, Secretary
Faculty of Arts Curriculum Committee
Dean of Arts

From M.C. Roberts, Chairman
Department of Geography

Subject GEOGRAPHY COURSE PROPOSAL

Date February 4, 1980

The Department of Geography approved a new course proposal at its departmental committee meeting Thursday, January 31, 1980. The title of the proposed course is "Physical Interactions in the Environment" and its suggested course number is Geography 319-3.

This course will be integrated into the proposed Environmental Toxicology Program which, in turn, will become a part of the Extended Studies Diploma Program.

As the Faculty of Science Curriculum Committee will be involved in examining various course proposals which will also become part of the Toxicology Program, I would suggest that faculty coordination would be helpful.

Michael Roberts

cc: Dr. C. Van Netten, Biological Sciences
Secretary, Faculty of Science Curriculum Committee

HM/nrb

OFFICE OF THE DEAN
FEB -6 1980
FACULTY OF ARTS