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Proposal for a New
Environmental Studies Program
at Middlebury College

During the Fall of 1980, the Ad Hoc Committee on Geography-Environmental Studies, a committee appointed by President Robison, has considered how environmental studies could be enhanced at Middlebury College. The goals of the Ad Hoc Committee have been to incorporate the best aspects of the existing program, the Geography Department's curriculum and the Northern Studies Program into a single, integrated and cohesive program.

The Committee has had to resolve two conflicting objectives: 1) to ensure adequate depth in a single field, and 2) to provide interdisciplinary breadth. Depth is required to build a high degree of competence in a particular field, and to keep graduate school doors open; breadth is needed to provide students with appropriate sensitivity to the complex, and thus inherently interdisciplinary, environmental issues.

The proposed curriculum reflects these objectives. To provide interdisciplinary breadth there is a group of entry level courses that will be required for all Environmental Studies majors. These courses deal with the spatial organization of human society and people's relation to the environment, field work in ecology, interdisciplinary topics in the humanities (The Vision of Nature and Ethics and the Environment) and mathematical techniques of environmental analysis.

After completing the entry level courses, each Environmental Studies major would do in-depth work in one of four "major tracks": Ecology, Geography, Northern Studies (natural science) or Northern Studies (social science). Each major track would consist of an eight-to-ten course sequence including field work and a senior thesis and both of the Northern Studies tracks would require a semester-in-residence at the Center for Northern Studies in Wolcott, Vermont.

In addition to the major track, each student would be required to complete one of several concentrations designated as appropriate to the Environmental Studies Program. These concentrations must be taken in a division different from the division identified with the student's major track. A student whose major track is ecology could concentrate in humanities, international development or economics, but not in chemistry or geology. Furthermore, each student majoring in Environmental Studies will be required to elect either a major track or a Concentration from the Division of Natural Sciences. This regulation insures that all majors in Environmental Studies will have a substantial exposure to the sciences that are so important in understanding and addressing environmental problems.

Each year senior Environmental Studies majors will participate in an interdisciplinary seminar focusing on one or more current environmental issues. In these seminars lead by the staff of the Environmental Studies Program, students will discuss, from the perspective of their major track or, more particularly, their theses, the topic under consideration. In addition to and apart from this senior seminar, each major in Environmental Studies shall complete a senior thesis.

The curricula we propose for the several tracks in the new program, and combinations of courses we propose as satisfactory Environmental Studies Concentrations, are listed in Appendix A. Appendix B contains a more detailed description of the courses that will be offered as a part of the proposed program.

Beyond the curriculum for the major, the Ad Hoc Committee on Geography-Environmental Studies proposes a new version of the extended major concept that would allow students majoring in a traditional discipline to get a solid set of Environmental Studies courses as a part of their major program. The courses comprising the extension of the major would be chosen in consultation with the Director of the Environmental Studies Program and the chair of the major department. In addition to the selected Environmental Studies courses, a student would complete a senior thesis that would relate his major field to an environmental problem. The approval of this extended major presented in Appendix C would not preclude the possibility of designing a joint major in Environmental Studies with any appropriate traditional major.

Appendix A

OUTLINE OF CURRICULUM

I. Entry Level Courses Required of All Majors

- ES 190 Perspective on the Environment
- ES 190 Ecology
- ES 110 The Vision of Nature, or ES 111 Ethics and the Environment
- ES 106 Statistics or EC 210 Economic Statistics ('A 112 prerequisite for EC 210) (Students should consult major track advisor in making choice.)
- ES 200 Techniques of Environmental Analysis

II. Major Tracks

Students are required to choose one of four major tracks. The four tracks are: Ecology, Geography, Natural Science Northern Studies, and Social Science Northern Studies. Each track is considered in turn.

Ecology Track

The ecology track requires the completion of the following eight courses, which include the senior thesis. (Students seeking certification from the Ecological Society of America must complete 8 courses in biological science, 3 courses in ecology, plus 4 courses in physical science including math.)

1. BI 125 Introduction to Biological Principles
2. BI 190 Ecology (included in the core requirement)
3. BI 203 Botany
4. BI 311 Ecosystems Analysis
5. BI 316 Animal Behavior
6. BI elective
7. BI 700 Senior Thesis (2 course credits)

Geography Track

The geography track requires the completion of eight courses, one of which must be senior thesis. Five courses are specified. The student then chooses three additional courses.

Required:

1. GG 202 Cartography and Graphics
2. GG 250 Physical Environmental Systems
3. GG 260 Human Environmental Systems
4. GG 300 Environmental Analysis Methods
5. GG 700 Senior Thesis

Choose 3 from among the following:

1. GL 252 Geomorphic Processes
2. GG 330 South and East Asia
3. GG 331 Middle East and North Africa
4. GG 351 The Urban World: Patterns, Problems, and Policies
5. GG 352 The Geography of Development
6. GG 353 Natural Hazards
7. GG 354 Weather and Climate
8. GG 355 Hydrology and Water Resources

Natural Science Northern Studies Track

Students in this track are required to take the following courses:

1. NE 151 Introduction to Polar Environments
2. BI 190 Ecology (included in the core requirements)
3. *NE 310 The Quaternary Period
4. *NE 320 Terrestrial Biota and Ecosystems of the Polar North
5. *NE 330 Indigenous Cultures of the Circumpolar North
6. *NE 335 Marine and Aquatic Ecosystems of the Polar North
7. NE 700 Senior Thesis (2 course credits)

Social Science Northern Studies Track

This track requires students to take the following courses:

1. NE 152 Public Policy in the Circumpolar North
2. EC 155 Microeconomics
3. BI 190 Ecology (included in the core requirements)
4. **NE 360 The Political Economy of Resource Management
5. **NE 361 Political Analysis for Northern Studies
6. **NE 362 Community Development in the Circumpolar North
7. **NE 363 Northern Legal Issues
3. NE 700 Senior Thesis

*Fall semester-in-residence at the Center for Northern Studies.
 **Spring Semester-in-residence at the Center for Northern Studies.

III. Approved Environmental Concentrations

Must be taken in a different division than major track.
 Other concentrations may be added as the program develops.

1. Ecology

- BI 125 Introduction to Biological Principles or BI 100 Evolution by Natural Selection
- BI 190 Ecology
- BI 203 Botany
- BI 311 Ecosystems Analysis or BI 316 Animal Behavior

2. Geography

- GG 250 Physical Environmental Systems
- GG 260 Human Environmental Systems
- GG 300 Environmental Analysis Methods
- And two of the following:
- GG 351 The Urban World: Patterns, Problems and Policies
- GG 352 The Geography of Development
- GG 353 Natural Hazards
- GL 252 Geomorphic Processes

3. Northern Studies - Natural Science

- NE 151 Introduction to the Polar Environments
- NE 310 The Quaternary Period
- NE 320 Terrestrial Biota and Ecosystems of the Polar North
- NE 330 Indigenous Cultures of the Circumpolar North
- NE 335 Marine and Aquatic Ecosystems of the Polar Regions

4. Northern Studies - Social Science

- NE 152 Public Policy in the Circumpolar North
- NE 360 The Political Economy of Resource Management
- NE 361 Policy Analysis for Northern Studies
- NE 362 Community Development in the Circumpolar North
- NE 363 Northern Legal Issues

- 5. EC 155 Introductory Microeconomics
- EC 355 Microeconomic Theory
- EC 365 Environmental Economics
- EC 470 Public Finance

6. Humanities (Images and Ideas of Nature)

- ES 110 The Vision of Nature or ES 100 Ethics and the Environment (required for core curriculum)
- AL 202 American Literature: 1830-1865
- AL 212 America: The Visual Environment
- EL 313 English Romanticism
- RE 312 Mysticism East and West

7. International Development

- PA 201 International Relations, or PS 103 Comparative Politics, or SA 103 Selected Topics in Socio-cultural Anthropology
- GG 330 South and East Asia or GG 331 Middle East and North Africa
- GG 352 Geography of Development
- PS 404 Poverty and Progress in the Third World or GG 451 Seminar in Economic Geography

*Courses marked with an asterisk will be submitted to the Curriculum Committee for consideration as Foundations Courses.

8. Geology

- GL 112 Environmental Geology
- GL 161 Elements of Oceanography
- GL 201 Bedrock Geology of Vermont
- GL 252 Geomorphic Geology or GL 461 Stratigraphy and Paleontology

9. Applied Mathematics

- MA 112 Mathematical Analysis I
- MA 113 Mathematical Analysis II
- MA 200 Linear Algebra

and two of the following courses:

- MA 310 Probability
- MA 311 Statistics
- MA 315 Mathematical Models in the Social, Life and Management Sciences
- MA 318 Selected Topics in Operations Research

10. Chemistry

- NS 150 Environmental Science
- CH 101 Fundamentals of Chemistry
- CH 131 Systematic Inorganic Chemistry
- CH 211 Analytical Chemistry

Other concentrations may be designed to meet particular student needs in consultation with the director of the Environmental Studies Program.

IV

Senior Work

All Environmental Studies majors are required to complete a senior thesis in their major tracks (BI 700, GG 700, or NS 700) in addition to the Senior Seminar in Environmental Studies, ES 750.

Appendix B

*ES 100 Perspectives on the Environment

An examination of the spatial organization of human society and people's relation to the environment. The course is concerned with spatial patterns and relationships that occur on the earth's surface and, ultimately, with understanding the processes that account for such patterns and relationships. Concepts are explored in the context of current environmental issues at several scales: global, national, and local. The course considers both the physical and human aspects of environmental problems and the interrelations between them.

*ES 110 The Vision of Nature

An introduction to three topics of major importance to contemporary environmental thought: the origins of autobiographical art grounded in the landscape; the development of a wilderness-ethic from the revaluation of mountainous terrain; and the new synthesis of traditional Western thought with Native American, Buddhist, and scientific elements. The works of Wordsworth, Thoreau, Constable, Church, Muir, Whitehead, and Synder will figure prominently in the syllabus.

*ES 111 Ethics and the Environment

An introduction to aesthetical and ethical attitudes towards nature and the relationship between them. Attention will be given to the concepts of aesthetic and ethical disinterestedness, the aesthetic concepts of beauty and the sublime as they relate not only to a vision of nature but also to a vision of the moral self as seen against the natural environment. The course will be divided into three parts. The first part will consist of theoretical considerations in ethics and aesthetics. The second part will develop views of the self as these relate to aesthetic awareness and the third part will draw from the two previous ones, focusing upon the contemporary environmental situation and specific problems that now exist.

ES 106 Introduction to Statistical Science

An introduction to statistical methodology and its applications. Topics will include descriptive statistics, binomial and normal distributions, estimation, hypothesis tests, confidence intervals, t-tests, z-scores, chi-square statistics, regression, analysis of variance, and correlation. Emphasis is on the analysis of real data sets using statistical software on the computer. The course is especially appropriate for students in the physical, medical, and environmental sciences who have a modest background in mathematics.

*Courses marked with an asterisk will be submitted to the Curriculum Committee for consideration as Foundations Courses.

ES 200 Techniques of Environmental Analysis

An introduction to quantitative techniques used in studying spatial variation of environmental phenomena. Particular emphasis is placed on the use of the modern digital computer in analyzing spatial data. Topics include data collection, data description and presentation, and data use and interpretation.

AR 212 America: The Visual Environment

In a given year attention will focus on a major issue with regard to the design of or reaction to the visual environment. Such themes as landscape building, regional character, and the built environment will be investigated through the study of major figures, movements, or monuments-e.g., Frederick Church, The Catskills, Olmsted and Central Park, or town planning and growth in New England.

Northern Studies courses: Fall Semester (prereq. NE 151, BI 190)

The Quaternary Period - NE 310

The present environment of the Polar Regions is largely a function of the unique geological history of these areas, which have repeatedly been affected by events such as episodes of continental glaciation. Many of these events have also had profound implications for other parts of the world; in fact true polar environments characterized much of what is presently considered to be the temperate zone as recently as 15,000 years ago. This course discusses the events which have characterized the Quaternary Period, with particular emphasis on the relationship between events and physical processes and the biological environment of Polar and other regions.

Lab: practical experience in a variety of techniques which are commonly employed to gain insight into the nature and history of past environments, such as palynology and various dating methods. Also field consideration of geomorphic features associated with Quaternary events.

Indigenous Cultures of the Circumpolar North - NE 330

For at least the past 15,000 to 30,000 years, the native peoples of the Circumpolar North have been a significant factor in the natural environment of the region. This course offers an introduction to the various indigenous cultures of the northern regions at a time immediately before extensive contact was established with modern western culture. Some consideration will also be given to long established rural western communities in northern areas. Major emphasis is placed on the historical context of the emergence and establishment of these cultures, as well as on the ways in which the cultures have interrelated with the natural environment.

Terrestrial Biota and Ecosystems of the Polar Regions -NE 320

This course provides a detailed introduction to the various "players", including animals and plants which are involved in the web of interactions in the boreal forest and tundra ecosystems. The first portion of the course is strongly oriented toward identification of and familiarization with the various organisms. The latter portion is more deeply concerned with the roles these organisms play in the various communities, and the various physical factors that influence the distribution and significance of these organisms.

Lab: Initial sessions involve familiarization with the organisms in the field and in museum collections. Later sessions treat the description and ordination of polar "communities".

Marine and Aquatic Ecosystems of the Polar Regions-NE 335

The marine and aquatic ecosystems of the Polar Regions are of immense interest, both intrinsically as paradigms for the understanding of the interrelationships which are basic to an ecological perspective, and also in terms of their present and future economic potential. The deepest penetration of polar waters and their attendant biotic communities into the temperate regions of the world is off the New England coast. Furthermore, the aquatic ecosystems of Northern New England display many of the features which are typically associated with high latitudes. This course is similar to the preceding one in that the early portions are devoted to identification and familiarization with the relevant organisms. The latter portion considers theoretical and practical ecological concerns relevant to the understanding, preservation, and utilization of the marine and aquatic resources of the Polar Regions.

Lab: consists of field identification work in Newfoundland and a several day long field trip to the coast of Maine. In addition, field and lab work will be carried out on the local aquatic ecosystems, including lakes, bogs, and streams, in the Wolcott area.

Winter Term (Prerequisites NE 151, BI 190)

Winter Ecology - NE 350

Among the most important challenges to polar organisms are intense seasonal change of conditions, intense cold, limited energy resources in the environment, and the establishment of long term snow and ice cover. These factors have provided selection pressure for a remarkable series of adaptations by polar organisms. This course examines the physiological, anatomical, and behavioral adaptations of polar plants and animals to winter and seasonal conditions in both terrestrial and aquatic ecosystems.

Lab: The course is taught largely in an intensive lab and field work format. Topics include the observation of animal behavior, including radio tracking, the nature of cell adaptation in plants (and some animals) to below freezing temperatures, the behavior of aquatic ecosystems under thick ice cover and low light penetration, and the means by which organisms have adapted to the presence of a deep snow cover.

Spring Term (Prerequisites NE 152, EC 155)

The Political Economy of Resource Management - NE 360

A study of societal decision making concerning the use of natural resources and the maintenance of environmental quality. The first half of the semester is devoted to an examination of three approaches to this subject: the microeconomic perspective, the ecological perspective, and the institutional perspective. This is followed by substantive applications dealing with marine fisheries, forest management, Outer Continental Shelf development, National Interest Lands, and air/water pollution.

Policy Analysis for Northern Studies - NE 361

A study of the role of the State with special reference to Northern Regions. Topics covered include: the proper function of the State, the selection and implementation of specific public policy, and impact of government activity on the broader society, and the evaluation of existing policies. Special attention will be given to alternative modes of policy analysis. All students will conduct research on contemporary policy issues pertaining to the Circumpolar North.

Community Development in the Circumpolar North - NE 362

The rural communities and villages of the Circumpolar North suffer from a variety of social problems (For example, large scale emigration, extensive unemployment, financial insolvency, and high rates of alcoholism). While these problems are especially severe in predominantly native communities, they are pervasive throughout the Circumpolar North. How did these conditions arise, and what can be done to alleviate them? This course focusses on various explanations of the contemporary problems of these rural communities and on an analysis of alternative strategies for alleviating these problems.

Northern Legal Issues - NE 363

Legal Research and analysis differs greatly both from Natural Science and from Social Science. Using cases relating to the Circumpolar North, this course offers students an introduction to legal materials, processes,

institutions, and modes of thought. In any given semester, case materials will be drawn from controversies pertaining to public land, Native claims, offshore oil and gas development, hard rock mining, water rights, forest management, wildlife, fisheries, and international resource agreements.

Proposed majors extended in environmental studies are designed to afford students with traditional majors the opportunity to take a or 2 courses in environmental studies which relate to and extend the chosen major. The student's senior thesis will apply the student's knowledge of the major field to a problem in the environmental sciences. The option is designed to take advantage of the unique opportunities presented by the Environmental Studies Program on campus and at the Center for Environmental Studies.

Students may propose extended majors with their academic needs. They should consult the Chairman of their major department and the director of the Environmental Studies Program. When agreement on the specific requirements of the extended major is reached, the proposal is submitted to the Curriculum Committee for final approval.

Examples: 1. A Chemistry major who seeks a career with the Environmental Protection Agency or the Department of Environmental Services or the Office of Public Health might elect an extended major using courses from the Ecology track. 2. A History major might take use of the Spring semester at Wolcott and do senior work using the resources of the Vilhjalmur Stefansson Collection at Dartmouth.

3. A Mathematics major could do an extended major in Environmental Geography and use statistical or other mathematical models in the senior work.

4. A Sociology-Anthropology major could focus on the cultures of the circum-polar region, and extend the major to include human and cultural geography.

5. A Russian major could do the spring semester at Wolcott and extend his/her interests to the Soviet role in the circum-polar family of nations.

6. A Geology major could have extended major in either Ecology or the Physical Polar Environment.

7. An Economics major could pursue an extended major in human and cultural geography (including regional planning) and do senior work on the cost-benefit analysis of alternative policy decisions in a specific context.

Appendix C

Proposal for an Extended Major in Environmental Studies

We propose the addition of an extended major to the curricular offerings of the Environmental Studies program. This major would provide students with a major in a traditional discipline the opportunity to extend their work into the environmental area, using the depth within the major field as a basis for work in environmental studies.

Proposal: Majors extended in environmental studies are designed to afford students with traditional majors the opportunity to take 4 or 5 courses in environmental studies which relate to and extend the chosen major. The student's senior thesis will apply the student's knowledge of the major field to a problem in the environmental "sciences." The option is designed to take advantage of the "unique" opportunities presented by the Environmental Studies program both on campus and at the Center for Northern Studies.

Students may propose extended majors which best suit their academic needs. They should consult the chairman of their major department and the director of the Environmental Studies program. When agreement on the specific requirements of the extended major is reached, the proposal is submitted to the Curriculum Committee for final approval.

Examples: 1. A Chemistry major who seeks a career with the Environmental Protection Agency or the Department of Environmental Services or the Office of Public Hygiene might elect an extended major using courses from the Ecology track.

2. A History major might make use of the Spring semester at Wolcott and do senior work using the resources of the Vilhjalmur Stefansson Collection at Dartmouth.

3. A Mathematics major could do an extended major in Environmental Geography and use statistical or other mathematical models in the senior work.

4. A Sociology-Anthropology major could focus on the cultures of the circumpolar region, and extend the major to include human and cultural geography.

5. A Russian major could do the spring semester at Wolcott and extend his/her interests to the Soviet role in the circumpolar "family of nations."

6. A Geology major could have extended major in either Ecology or the Physical Polar Environment.

7. An Economics major could pursue an extended major in human and cultural geography (including regional planning) and do senior work on the cost-benefit analysis of alternative policy decisions in a specific context.

Rationale:

1. The proposal would allow the Environmental Studies program to serve other academic areas and provide them with unique opportunities.
2. The program could attract a few students in the Humanities and Languages to pursue some "serious" scientific study.
3. The program provides physical science majors an opportunity to apply their scientific training to environmental areas.
4. The proposal would enhance the truly interdisciplinary character of the Environmental Studies Program.
5. The proposal would encourage some additional students to make use of the "unique" opportunities at the Center for Northern Studies in their senior work.
6. The proposal could help gain the broad-based support of colleagues, support that is needed by the new program.
7. The extended major could be viewed as innovative and unique to Middlebury, and might have some publicity value.
8. Establishing the extended major in Environmental Studies provides special recognition to students who elect to strengthen their major in this way. It also encourages students in traditional majors to relate the work in their majors to environmental problems.

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