

## The Arctic Studies Program at the Arctic Centre, University of Lapland

John C Moore and Manfred A Lange  
Arctic Centre  
University of Lapland  
Box 122  
Fin 96101 Rovamemi  
Finland

### Introduction

The Arctic Centre (AC) is a relatively new institution at a young university. The recent trend of studying peripheral areas, such as the Arctic, actually in the region is a welcome and interesting development in education (see Lange 1994 for a discussion of the benefits of such developments). The AC was set up to provide several roles: research into the impacts of change in the Arctic, an information and data service for the scientific community and for decision makers in the political and private sectors, and a science centre exhibition for the public; and to provide an education in the many facets of the Arctic for students from all over the world via The Arctic Studies Program (ASP). The ASP was first introduced in the spring of 1992, with the first full year program run in the academic year 1993-4. Because the ASP is designed as an international course, all tuition is in English.

The ASP is an undergraduate course that aims to instil an interdisciplinary approach to the problems of the Arctic. The course content covers a wide range of disciplines from the humanities, social sciences, and natural sciences. Also, the students come from a wide range of undergraduate and postgraduate degree courses (Figure 1), and from an increasingly wide range of countries (Figure 2). Rather than equipping conventionally trained specialists (whether scientists, lawyers, or economists) with a global (or Arctic) multidisciplinary outlook, the ASP seeks to change the traditional mind-set of the specialist student into a much freer and more rounded one. The students themselves certainly appreciate this approach to the course (Frame, in press: results of student evaluation of the ASP), and the chance to broaden their horizons. In many ways the wide ranging and interrelated issues that they tackle in the course provide a much more realistic training for future careers and lives after leaving university.

The ASP is therefore in some ways an alternative to a masters course, especially for students who may not wish to follow an academic career - those students

who will play important roles as future law makers, industrialists, engineers, and decision makers. Thus in practical terms, courses like the ASP are of value in providing a broad multidisciplinary approach for students who will hopefully shape a more enlightened development of future society.

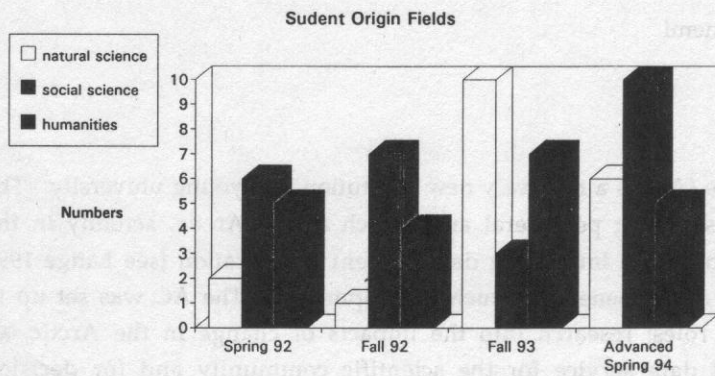


Figure 1. Breakdown of ASP students by field of their degrees in the first 3 ASP Introductory phases and the Spring 1994 Advanced Phase. The natural sciences include physics, biology, botany, environmental science, and geography; social science includes anthropology, economics, sociology; humanities include law, history, international relations, and education.

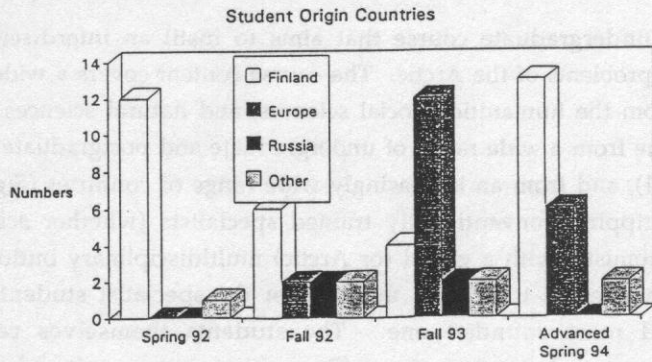


Figure 2. Breakdown of ASP students by their country of origin in the first 3 ASP Introductory phases and the Spring 1994 Advanced Phase. Europe includes EU and Eastern European countries; others include Canada, U.S.A., and Venezuela.

Course Structure and Integr...

The ASP consists of two... September to Christmas (Ap... to June. The Introductory... lecturers in a wide range of... global change, whether it b... Arctic in the global system... topics (as in some courses... development in the Arctic... involved in hydrocarbon... interrelatedness of the issu... illustrated at the earliest sta... Kilpisjarvi Biological Resear... students sample, often for th... sauna, walk the fells, and... receiving lectures on Sami c... of the course is approximat... science, and humanities, wit... Students are also expected t... take a literature assignment... course, based on student inp... initial orientation exercise in... expected to highlight the n... Arctic issues. Topics in the... Arctic, lemmings, and futur...

The Advanced Phase has a... focused courses, usually last... choose 5 to make up their s... Arctic and the Global System... Sea Environment", "Winter... Resources", "Military and... Minorities", and "Art, Cultu... the course is in the form of... the Yamal Peninsula in Sib... such as the Calotte Academy... Nickel (Russia).

### Course Structure and Integration in the Arctic

The ASP consists of two semesters: the Introductory Phase running from September to Christmas (Appendix A), and the Advanced Phase from February to June. The Introductory Phase is structured as a set of courses provided by lecturers in a wide range of topics. Many of the topics address some aspects of global change, whether it be the more directly obvious, such as the role of the Arctic in the global system or the ice sheets and paleoclimate, or less obvious topics (as in some courses in the social sciences and humanities) on aspects of development in the Arctic, such as the environmental and cultural issues involved in hydrocarbon exploitation in the Russian Arctic. The interrelatedness of the issues in the real world is a constant theme and is illustrated at the earliest stage of the course during a week long field trip to the Kilpisjarvi Biological Research Station in the far north of Lapland. There the students sample, often for the first time, such Finnish cultural experiences as the sauna, walk the fells, and meet Sami people in their homes; in addition to receiving lectures on Sami culture and ecology. Back in Rovaniemi, the balance of the course is approximately equally divided between natural science, social science, and humanities, with typically 5 hours of lectures and seminars per day. Students are also expected to study a language (Finnish, Sami, or Russian) or to take a literature assignment. Assessment is based on overall performance in the course, based on student input to individual lecture courses, a field report of the initial orientation exercise in Kilpisjarvi, and a final paper on any subject that is expected to highlight the need and benefits of interdisciplinary approaches to Arctic issues. Topics in the past have included sustainable development in the Arctic, lemmings, and future economic development on the Kola Peninsula.

The Advanced Phase has a rather different structure with a range of short focused courses, usually lasting a week, being offered to students who typically choose 5 to make up their study plan. The courses on offer in 1994 were "The Arctic and the Global System", "Arctic Ecology and Management", "The Baltic Sea Environment", "Winter Ecology and Physiology", "Managing Biological Resources", "Military and Environment", "Legal Rights and Cultures of Minorities", and "Art, Culture and Design". Additionally an important part of the course is in the form of field trips such as to the Kola Science Centre and to the Yamal Peninsula in Siberia, and participation in international conference such as the Calotte Academy this May in Inari (Finland), Svanvik (Norway), and Nikel (Russia).

## Introductory Phase Lecturers

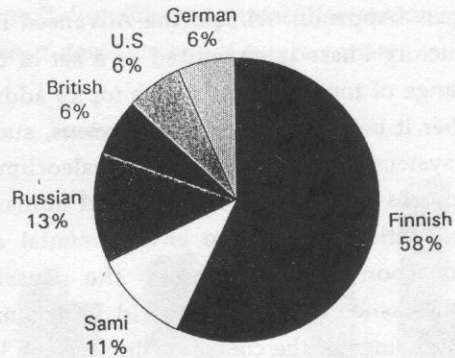


Figure 3. Breakdown of country of origin of ASP Introductory Phase teaching staff.

From the start, the national and international cooperation has been an important part of the ASP with teachers and experts coming from many countries (Figure 3): from institutes such as the University of Aberdeen, the Nordic Sami Institute (Kautokeino, Norway), and the Kola Science Centre; and from many in Finland (e.g., University of Oulu). (See Heininen 1994 for a fuller discussion of the mechanics and cooperation of the ASP.) A significant disadvantage of the ASP and probably of other undergraduate courses is the lack of opportunity to develop research projects that would exist as the basis for student thesis work. The Arctic Centre research section would like to address this problem by bringing in graduate students to do research in the AC, leading to either masters or doctoral degrees, or to a one year diploma. The Advanced Phase of the ASP requires students to complete a 15 page report that, while providing a challenge to undergraduates, is usually limited by time and other course commitments to fairly straightforward literature reviews and field work accounts. The future development of this research aspect of the ASP is aided by the AC proximity to, and good relations with, the Kola Science Centre (KSC) in the Murmansk Oblast of Russia. The KSC is the largest research institute in the Circumpolar Arctic and can provide numerous research opportunities through cooperation and student exchange. (Several KSC employees have participated in the ASP as students and lecturers.) The direct experience of the Kola Peninsula with its severe economic and environmental problems provides the ASP students with firsthand experience of the problems of Russia in general, and exemplify the problems of development in the Arctic.

## Global Environmental C

For a number of reasons within the study of global curriculum of a course d changes in the Arctic a Phase, as well as in a fo we stress the interconn hand, and the linkages This theme also lends its processes and the social global change issues in general issues of inter integration into other glo relating to political decis at least mitigate, global we address the role of th of climate information f impact of industrial deve be expected, relies rather Advanced Phase course, students are expected to and role playing exercises

Dealing first with the pa paper's authors in the re is used to present bot variability of the climate being involved in a la combination is designe accompany real scientific course is the justification accompanies such a proj GRIP being funded, wh Another aspect is the of limits of current scientifi scientific knowledge of consequently the limits o

### Global Environmental Change Aspects of the ASP

For a number of reasons the polar regions attract ever increasing attention within the study of global change (see below). This fact should be reflected in the curriculum of a course dealing with the Arctic. We do this by presenting global changes in the Arctic as one of the overarching themes in the Introductory Phase, as well as in a focused short course of the Advanced Phase. In so doing, we stress the interconnectedness of the components of the Arctic system on one hand, and the linkages between the Arctic and the global system on the other. This theme also lends itself nicely to addressing the feedback between the natural processes and the social/human dimension issues in the Arctic. By addressing global change issues in the ASP, we also have the opportunity to deal with general issues of international research programs in the Arctic and their integration into other global change programs. Finally, we also cover questions relating to political decision making, as applied to policies that seek to avoid, or at least mitigate, global environmental changes in the Arctic. More specifically, we address the role of the Arctic in controlling the earth's climate, as a repository of climate information from the past that is available from ice cores, and the impact of industrial development in the region. The Introductory Phase, as may be expected, relies rather more on lectures and fairly direct teaching than does the Advanced Phase course, "The Role of the Arctic in the Global System", where students are expected to make much more active contributions during seminars and role playing exercises.

Dealing first with the paleoclimatic record, the personal experience of one of this paper's authors in the recent deep drilling program in central Greenland (GRIP) is used to present both the scientific findings regarding the pronounced variability of the climate in the past, and also the more personal impressions of being involved in a large scale international scientific collaboration. This combination is designed to try and instil the sense of excitement that can accompany real scientific research. One of the things that is not neglected in the course is the justification for the damage to the environment that necessarily accompanies such a project in the Arctic, and the political priorities that led to GRIP being funded, while other perhaps equally deserving science was not. Another aspect is the often lively debates that ensue during the course on the limits of current scientific knowledge and also on the limits of the imperfect scientific knowledge of the past and present, in modelling the future, and consequently the limits of science in political decision making.

The second role of the Arctic as a major player in the global climate system is covered with extensive reference to the current high profile of the greenhouse effect and the ozone hole. The IPCC reports on future climate change (Houghton et al., 1990, 1992) illustrate the very large changes in temperature that are expected to occur in the Arctic as a result of anthropogenic greenhouse gas emissions. The temperature rises predicted from GCM models are of the order of 3°C over the next 50 years. Such rapid changes exceed any changes in the historical record of climate, and almost certainly exceed any changes that have occurred since the end of the last ice age. The ice core records suggest that the last 8000 years of climate history have been remarkably stable compared with the previous 100,000 years at least. The reasons for such stability and the causes of its breakdown are under keen investigation at present, but it appears that changes in oceanic circulation play an important role. A majority of the sea ice in the Arctic Ocean spends the summer at temperatures within 2°C of the melting point, a rise in temperature would lead to a rapid decrease in sea ice cover in the Arctic Ocean as the positive feedback effect of lowering albedo by removing sea ice allows more heat to be absorbed causing more sea ice melting. Thus, it can be imagined that rather dramatic changes could take place within a very short period of time in one of the climate system's main parts.

The third aspect of the Arctic in environmental change concerns the human impact of industrial development in the Arctic. This is particularly obvious in the marine pollution of the Arctic Ocean with significant input of radiation around Murmansk and Novaya Zemlya, and large, very seasonal (due to freezing) inputs of PCBs and heavy metals from the main rivers of Russia into the Arctic Basin. The recent changes in the political situation in Russia have allowed investigation of the environmental damage around the large metal smelting plants in the Kola Peninsula to be internationally monitored. Damage to the ecosystems in such a fragile environment are likely to take generations to recover, if ever. Several research projects at the AC are studying the effect of air and water pollution on trees and sea ice organisms. It is, however, very striking that the attitudes towards environmental damage that are characteristic of most westerners are not shared by the Russian inhabitants of the Kola peninsula, most of whom are very happy to have well-paid employment in the mines, factories, and nuclear power plants, instead of doing the same job for half the pay in middle Russia (if they can get a job at all). While there is concern for the future state of the environment, the more everyday problems associated with providing themselves and their families with adequate food and other necessities mean

that problems that may appear factor is a very important element of academic course the results of the damaged during a visit to the region. a key element in studies of the Arctic plant life is limitations of the often simple plant species limits and agricultural not take into account of biodiversity that will arise Arctic plant species.

One further aspect that involves indigenous peoples of the Arctic there is currently interest in (passage) to serve the Siberian from Western Europe to the Arctic if climate warming reduces sensitive to rises of a few degrees and pollution in the Arctic and hunting activities of the easier communication with life.

Assessment of the individual the lecturers and is therefore the Arctic in the global system given by each student on the Climate Change", "Greenhouse a Warmed World", "The Role of Cereal Agriculture in a Greenhouse the course, students produce interdisciplinary nature of required the student to exemplified by the following

that problems that may appear in 20 or 30 years time have low priority. This factor is a very important one to consider, and contrasts with the standard element of academic courses in which students are usually only presented with the results of the damaged environment. It is something that is best grasped during a visit to the region. The fragile nature of the Arctic environment is also a key element in studies of the impact of climate change in the region. Most of the Arctic plant life is limited not by climate, but by nutrient availability. The limitations of the often simplistic assumptions used by models of changes on plant species limits and agricultural practices resulting from climate changes, do not take into account other important factors such as the reduction in biodiversity that will arise as less cold hardy plants out-compete the traditional Arctic plant species.

One further aspect that we like to cover is the impact of change on the indigenous peoples of the Arctic. This again can be illustrated in Russia where there is currently interest in developing the Northern Sea Route (the North-East passage) to serve the Siberian Arctic Ocean ports and function as a trade route from Western Europe to the Far East. This could become much easier in future if climate warming reduces the Arctic Sea ice cover (a factor which is very sensitive to rises of a few degrees in temperature). Increased commercial traffic and pollution in the Arctic would clearly have impact on the traditional fishing and hunting activities of the indigenous people, and the possibility of much easier communication with the region would also bring changes to their way of life.

Assessment of the individual courses of the ASP depends on the requirements of the lecturers and is therefore quite flexible. For the Advanced Phase course on the Arctic in the global system, assessment was based on a 15 minute seminar given by each student on the last day of the course. (Topics included "Natural Climate Change", "Greenhouse Gases: Sources, Sinks and Trends", "Sea Level in a Warmed World", "The Role of Sea Ice in the Climate System", "Changes in Cereal Agriculture in a Greenhouse World".) Secondly, in the 2 weeks following the course, students produced an essay of 3-5 pages in length that emphasised the interdisciplinary nature of decision making in environmental issues and required the student to express a personal but well-founded view. This is illustrated by the following selection of essay topics:

"Explain the possible benefits of global warming in the polar regions and weigh them against the adverse effects of warming. What would be the balance between benefits and adverse effects in your view?"

"Suppose you were asked to make a choice between building a large nuclear power plant or to utilize an alternative form of energy production (hydropower, wind power) in the Arctic. What would be your choice, based on an assessment of relevant environmental factors, and how would you justify it?"

"Consider that you are a high-ranking politician. You have to make a decision of a) initiating a profitable development project (e.g., exploitation of oil and gas) in an area that is occupied by indigenous people, which would considerably raise the standard of living of these people through shared benefits; or b) of 'leaving them alone', knowing that it will take them a long time before they will ever 'catch-up' with the 'modern world'. What would your decision be and why?"

In summary then, the Arctic Studies program seeks to provide a rounded education for undergraduate students from across the range of the humanities and the natural and social sciences. Global changes and their relationships to the Arctic are a fundamental part of the course structure and provide one of the main thematic links between the individual courses that make up the ASP structure. Finally, by emphasising the links and feedback between the human and social worlds of the Arctic and the fragile, but still relatively undeveloped natural environment, we hope to leave a lasting influence on the students in whatever career they take up on leaving university.

#### References

- Frame S (In Press) A season of discovery - reflections on the Arctic studies program and a winter in Lapland. Arctic Centre News.
- Heininen L (1994) Arctic studies - for academic and practical purposes. In: *Teaching the North: the Challenge of Circumpolar Studies Programs*, L Heininen and L Muller-Wille (eds), Arctic Centre, University of Lapland Rovaniemi, 17 - 19.
- Houghton JT, Jenkins GJ and Ephraums JJ (eds) (1990) *Climate Change. The IPCC Scientific Assessment*, Cambridge University Press, Cambridge.
- Houghton JT Callender BA and Varney SK (eds) (1992) *Climate Change 1992. The supplementary report to the IPCC Scientific Assessment*, Cambridge.
- Lange MA (1994) The Arctic in a changing world: new challenges for circumpolar universities. In: *The Changing Circumpolar North: Opportunities for Academic Development*, L Heininen (Ed) Arctic Centre Publ. 6., Rovaniemi, 151-165.

#### Arctic Studies Program A Program for the Introduction

The Arctic Studies Program (ASP) consists of several study weeks, which provide a rounded education in various aspects. This introduction covers the Arctic affairs, to demonstrate the complex interrelationship between the Arctic and the rest of the globe. It also strives to illustrate the interrelationship between the Arctic or the Circumpolar region and the indigenous peoples living there.

The Introduction to the Arctic Studies Program consists of an excursion to Kilpisjärvi in Lapland. The course consists of several thematic areas, which are covered in an international seminar. The course is open to students from all departments (through the University Language Centre) and is available in several departments. The preparation of a 20 page study paper is required.

1. Orientation
2. The Arctic in the Global Context
3. Indigenous People of the Arctic
4. The Arctic as a Distinctive Region
5. Languages or Literature of the Arctic
6. Study Paper



## Arctic Studies Program

### A Program for the Introduction to the Arctic

The Arctic Studies Program (ASP) starts with the Introduction to the Arctic (15 study weeks), which provides a broad introduction to the Arctic and its manifold aspects. This introduction aims to broaden students in arctic and northern affairs, to demonstrate the complexity of processes in the region, and to highlight the interrelationship between these processes and others at work around the globe. It also strives to illustrate the interdisciplinary nature of issues relevant to the Arctic or the Circumpolar North and the particular role played by the indigenous peoples living there.

The Introduction to the Arctic includes orientation comprising both field (an excursion to Kilpisjarvi in Finnish Lapland) and classroom work. The basic course consists of several thematic units, seminars, and, if possible, participation in an international seminar or conference. In addition, language courses (through the University Language Centre), literature, and offerings from other departments are available. Course requirements include the research and preparation of a 20 page study paper.

#### Structure of the program

- |  |                 |
|--|-----------------|
| 1. Orientation   | (2 study weeks) |
| 2. The Arctic in the Global System                     | (3 study weeks) |
| 3. Indigenous People of the Circumpolar North          | (3 study weeks) |
| 4. The Arctic as a Distinctive and Multiple-Use Region | (3 study weeks) |
| 5. Languages or Literature                             | (2 study weeks) |
| 6. Study Paper   | (2 study weeks) |

**Academic Fields:**

All themes and subthemes of the program are under the following three academic fields:

- A. Natural Sciences, "Ecology"
- B. Humanities, "Peoples"
- C. Social Sciences

The teaching of the program runs either under the three academic fields or be interdisciplinary teaching. Interdisciplinary teaching will mostly concentrate on a relationship between ecology and social affairs.

**A Weekly Class Schedule:**

Teaching from each of the academic fields during the ten week study period will be done three days each week from Tuesday to Thursday. The teaching will include both lecturing and, once a week, an interdisciplinary seminar or discussion, which deals with a relationship between topics of two or three academic fields. On the 'rest days' of the week (Monday and Friday), there will be languages, individual studying of the literature, and a study paper.

**Study Paper:**

All students will write a study paper on a chosen topic, which should deal with the themes discussed during the program, emphasizing the interdisciplinary nature of issues and problems of the Circumpolar North. The paper should be based on written material, lectures, and discussions, and not exceed 20 pages.

The paper will be a university exercise, but it should be prepared like a scientific paper, e.g., with complete references. Student work will be supervised by one of the scientific staff members of the Arctic Centre or by one of the key lecturers of the ASP. The idea is that students prepare the paper during the course (by the beginning of December) and discuss it in a seminar in the middle of December.

**Assessment System:**

The studies of the ASP students will be assessed according to the elements of the course, e.g., a study paper, a report from the Kilpisjarvi excursion, languages, and each student's overall performance (participation in discussion, seminars, group work or other activities, and a seminar of study papers). Details of the assessment system are given to students in September at the beginning of the program.

Examples of some topics on which students are assessed are given in Appendix B.

The following exercise is... whether you have been... have!), but they are rather... give me **your** view on iss

Please, do not take more t... page to answer each ques... than one hour of your tim... clearly, thus helping me t

1. What are some of the... global system? Identifi... reduced if changes in... Arctic.
2. Can you provide (at l...  
- disturbances on t...  
- adverse effects of
3. How would you defi... addressed in order to... change?
4. Suppose you were a t... policy actions (e.g., e... minimise man-induc
5. Returning to our first... benefit analysis for e... Please note that "cost... connotation and inclu... labour, losses in pers

Please hand your answer... later than November 26.

**I am looking forward to**  
Manfred.

## ARCTIC STUDIES PROGRAM: FALL 1993

<b>GLOBAL CHANGES AND THE ARCTIC: A TAKE-HOME EXERCISE</b>
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The following exercise is not so much meant to "test" your knowledge and whether you have been listening carefully to the lectures (I am assuming you have!), but they are rather intended to provide all of you with an opportunity to give me **your** view on issues that we have addressed during the last few days.

Please, do not take more than about ten minutes and do not write more than half a page to answer each question. The whole exercise should really not require more than one hour of your time. However, I would appreciate if you would write clearly, thus helping me to find out what you are saying.

1. What are some of the major processes that link the polar regions with the global system? Identify whether global warming would be enhanced or reduced if changes in these processes would take place in Antarctica or the Arctic.
2. Can you provide (at least) one example each for
  - disturbances on the Arctic system caused by human activities and for
  - adverse effects of global changes on Arctic societies?
3. How would you define the **three top** research questions that need to be addressed in order to better understand the role of the polar regions in global change?
4. Suppose you were a (very powerful) politician. What would be your three top policy actions (e.g., environmental laws) that you would introduce in order to minimise man-induced disturbances on the Arctic system?
5. Returning to our first carbon dioxide exercise (GC1), please provide a cost-benefit analysis for each of the four options in the action/problem matrix. Please note that "costs" in this context goes far beyond the usual monetary connotation and includes things such as "changes in lifestyle", time and labour, losses in personal choice, career options etc.

Please hand your answers in (you can collect them and have them sent to me) no later than November 26.

**I am looking forward to your answers. Thanks!**

Manfred.

## THE ROLE OF THE POLAR REGIONS IN GLOBAL ENVIRONMENTAL CHANGES

### TOPICS FOR ESSAYS

#### *Preface*

You are asked to pick one of the topics given below for a **three- to four-page** essay. The essay should not so much reflect any "learned knowledge" but rather your personal view. However, it is expected that the latter and what you express in your essays is well founded. So, simple "personal arguments" or any "hand-waving" won't do!

Your essay should be typewritten on A4 paper and should be handed in no later than **April 30** (12 o'clock a.m., sharp!!!). Please, contact either John or myself, if you have any questions.

We are looking forward to getting your essays!

#### *Essay Topics*

1. Suppose you were asked to make a choice between building a large nuclear power plant or to utilize an alternative form of energy production (hydropower, wind power) in the **Arctic**. What would be your choice, based on an assessment of relevant environmental factors and how would you justify it?
2. To what extent can/should research on global changes in the polar regions (i.e., Antarctica and the Arctic) be done with identical/similar methodologies and in what fields does it have to be done differently? Please explain and give concrete examples.
3. Explain possible benefits of global warming in the polar regions and weigh them against the adverse effects of warming. What would be the balance between benefits and adverse effects in your view?
4. Give a brief outline of a research project (including the rationale for choosing it) addressing the issue of global changes in the polar regions that you would consider to be of highest priority.
5. Consider to be a high-ranking politician. You have to make a decision of
  - a) initiating a profitable development project (for instance a project dealing with the exploitation of oil and gas) in an area that is occupied by indigenous people, which would considerably raise the standard of living of these people through shared benefits; or
  - b) of "leaving them alone", knowing that it will take a long time, before they will ever "catch-up" with the "modern world".
 What would your decision be and why?

### Education and Training in E

Panayotis A Siskos  
Laboratory of Analytical Che  
Department of Chemistry  
University of Athens  
Panepistimiopolis - Kouponi  
157 71 Athens, Greece

The first Earth Summit held the growing economic devel the European Communiti protection. The new Treaty objective the promotion of s (Act 2) (Commission of the E

The following characteristics

- it maintains the overall
- it maintains continuing
- it avoids lasting environ

Today there is growing wor the state of the environment systems. The ozone hole, th the loss of biodiversity are so second Global Earth Summ Agenda 21 for the protection

Greece, a member of Euro problems and follows the E became clear that the imple in protecting the environn trained activists and admini background in environment

In this paper, I will preser related to environmental s universities.