ENVIRONMENTAL EDUCATION

FOR ADAPTATION

AN APPRAISAL OF THE SCOPE FOR UNDERGRADUATE TEACHING

TO ENABLE GRADUATES TO ADDRESS MATTERS OF ENVIRONMENTAL CONCERN

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THE UNIVERSITY OF EDINBURGH

CENTRE FOR HUMAN ECOLOGY
UNIVERSITY OF EDINBURGH

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The Centre for Human Ecology brings together many different interests, departments and organizations concerned with the interactions between humankind and the environment. The Centre's work involves the social and natural sciences as well as the humanities. Its activities include research, teaching and consultancy.

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Preface

Environmental issues have now received international political recognition. The United Nations Commission on Environment and Development (the Brundtland Commission, "Our Common Future") reported in 1987. It recognised that humankind had now affected planetary systems fundamentally, and pleaded "that security must be sought through change" towards "sustainable development." Universities clearly have a strong responsibility to provide an education that meets the needs of the future, increasingly threatened by ecological degradation. What is needed is a change from domination over nature to cooperation with and maintenance of the biosphere.

We know that the answers are diverse and complex; it is not hard to identify the problems, but it is very difficult to perceive how the changes can be made. Certainly, most disciplines are in some way involved, not only - by any means - the sciences and technologies. Indeed, it is clear that culture is a major determinant of ecological behaviour. The humanities and social sciences have at least as vital a role to play as the sciences and their applications; the arts can show ways forward for human interrelationships and humanity's relations with nature.

This challenges the more conventional aspects of university education. We are dealing not only with defined subjects, but with ways of life, based on both cultural and scientific perceptions. For these reasons, all disciplines are in some way relevant and the whole university is involved.

Therefore, in describing the teaching part of the Environmental Initiative, we are calling for something more than a subject-based environmental education. The newer requirement is for an awareness and a new conscious study of the root causes of degradation of the planet, fostering the creativity and imagination to seek solutions. We lack a clearly defined vocabulary to indicate the nature of such ecological study. "Environmental education" could be confined to the science and technology of monitoring the environment, developing technologies for control of pollution or growing higher yielding crops, and so on. We prefer "ecological education" or even "human ecological education" to distinguish the more holistic ecology which includes the behaviour patterns and culture of our species. But we recognise that the distinctions are blurred, and remain so in this report.

In carrying out our task of investigating environmental and ecological teaching in the University, we have by design worked through heads of departments and the Faculty coordinators (as described below), so as to give an over-all, but not fully detailed, picture. Many others have also provided valuable advice and we warmly thank all contributors.

Summary

1. *"...all undergraduates ...should be exposed to teaching about the wider and more fundamental issues of society's relationship to the environment, including complex social, economic and ethical questions..." (Edinburgh University Educational Policy Committee, 1990/91).*

2. The Centre for Human Ecology was given the remit to research the relevant teaching throughout the University. This was carried out by consultations with Faculty Environmental Co-ordinators, and through questionnaires sent to almost all Heads of Departments followed by telephone interviews.

3. Some distinction was drawn between technical 'environmental' areas already extensively taught, mainly in the Science & Engineering and the Social Science faculties, and the social and cultural questions which underlie ecological issues. The study found that the "two cultures" division is still very apparent.

4. The study confirmed that much education relating to the environment is already carried out within most faculties. There is wide (but scattered) interest throughout to develop greater ecological awareness and to coordinate relevant research.

5. There are also constraints - of resources, of institutional inertia in the complex university structure, of the difficulties of adding to an already full curriculum, of considerable lack of interest or lack of realisation of the relevance of ecology in many disciplines, and of the needs for validation by professional institutions.

6. Several conclusions are drawn and recommendations made - which at this stage must be considered preliminary - to stimulate discussion and action.
These include:

a) a recognition of urgency - corresponding to a time of rapid global change; however, of practical necessity, an evolving, adaptive approach towards providing environmental education throughout is recommended;
b) a continuing group, such as the Faculty Co-ordinators together with the Centre for Human Ecology and others, should be constituted to continue the teaching initiative;
c) the many opportunities for a deeper level of ecological input to existing courses should be taken as the first steps, by encouraging existing environmental expertise and through the recommendations made below.
d) the need for seminars, workshops and background materials which were indicated by many faculties and departments. These would serve to raise awareness as well as exchange expertise. The resource implications would be small and would be shared between faculties and

departments;
e) environmental research would also stimulate and provide materials for teaching; this applies especially to areas of research that combine the humanities with the sciences.

7. More substantial change would require new resource allocations; these could be justified - possibly with the backing of recommendations from the Secretary of State's Working Party on Environmental Education - in accordance with the Government's White Paper on the Environment. There is a parallel with the new government funding which was made available for information technology education.

8. While most disciplines could in principle readily integrate environmental teaching into existing courses, there is also the desire for some form of core or inter-faculty courses which deal with fundamental matters outside the disciplines. There are existing opportunities for the latter, as with the present courses given by Geography and Biology, Science Studies, and some others; and specific possibilities, as within the Arts General MA.

9. Professional requirements in many subjects, such as law, engineering, medicine and veterinary medicine, restrict the opportunities; yet if the recent rate of increasing ecological concern continues, the professional bodies will soon demand some environmental inputs; and the University is in a good position to take early positive steps toward this.

10. Recruitment of staff should take environmental interests in the widest sense into account, all other things being equal.

11. With the apparent increasing student concern about the state of the planet, the University should use the Environmental Initiative as a central part of its marketing strategies. As the Initiative becomes a selling point for recruiting high calibre students, so the University should attract the appropriate staff as well as new funding.

12. Institutional consistency should be maintained and encouraged: the initiative in environmental teaching should be dovetailed with those in environmental research and institutional behaviour being promoted at the same time.

13. Students should be involved throughout, through boards of studies, student newspapers and in the standing group on environmental teaching recommended above.

14. Progress can be expected to be phased. If innovative departments are given encouragement, others are likely to follow in due course.

PART 1

INTRODUCTION AND APPROACH

1.1 The Edinburgh University Environmental Initiative

At the meeting of University staff in November 1990 and in the University's Bulletin of 5th December 1990 the Principal, Sir David Smith, outlined his concepts for a **University Environmental Initiative** which would address the three areas of teaching, research and institutional aspects within the University.

With regard to the teaching initiative Sir David spoke of "*the need to explore the extent to which treatment of environmental issues could become part of general undergraduate teaching in every discipline, and not just restricted to obviously relevant subjects*" (The Scotsman, 12th December 1990).

Concerned that the deteriorating environment "*may have a serious and possibly calamitous consequence for some later generation*", Sir David outlined profound concern that many graduates "*remain ill-informed and confused [lacking] informed consideration of what is really needed*" (ibid.).

The objective of the resultant **Environmental Teaching Initiative** as agreed by the Educational Policy Committee is that "*all undergraduates, at some time in their course, should be exposed to teaching about the wider and more fundamental issues of society's relationship to the environment, including complex social, economic and ethical questions [as well as] some understanding of basic technical issues*" (EP 90/91).

Sir David has suggested that this remit involves not only the content but also the process of teaching. Graduates should be better adapted to the changing societal and personal imperatives of moving towards a more sustainable world. This includes scientific, ethical, aesthetic, legal, economic, consumer, and other such considerations.

There is growing evidence that many students are personally concerned about how their careers will relate to the state of the world. European legislative changes and emerging consumer awareness suggest that employers who are not environmentally sensitive may find it increasingly hard to attract good graduates. (An Environmental Education conference as well as a recent study carried out by Scottish Enterprise (SDA) for the Centre for Human Ecology, partially supported this view, but more evaluation is required.)

Accordingly, the environmental initiative can be expected to have relevance to graduates not only at the ethical level of "state of the world" issues, but also to their professional competence. Through improving the professional impact on

environmental issues, the University will be enhancing its high reputation.

1.2 Environmental Educational Response of other Institutes

Many centres of higher education are preparing plans to encompass the diverse aspects of environmental education.

Reports of their activities can be found in a number of publications; for example:-

A workshop to consider the needs, the scope, the methods of delivery and to compare the efforts of many European universities, met in Brussels in June 1989, organised by the Centre for Human Ecology, Free University of Brussels and sponsored and published by UNESCO.

A workshop coordinated by International Network of Resource Information Centres (the Balaton Group) through the new Central European University for Environment in Budapest, meets in Edinburgh on 29th Nov to 1st Dec, to coordinate a listing of university ecological courses internationally.

The University of Goteborg, Sweden, has prepared lists of relevant university departments and centres (Tengstrom, 1985). The European Association of Human Ecologists (Hens et al, 1990) and the US Society for Human Ecology (Borden & Jacobs, 1989) similarly maintain large directories. (These publications are available at the Centre for Human Ecology.)

In the USA, several universities give undergraduate and postgraduate ecological courses. Dartmouth has a well-known environmental programme, staffed by members of several other faculties. The College of the Atlantic, Maine, was founded as a human ecological university.

In Europe, several universities in the southern countries together give a Certificate in Human Ecology. There are under- and post-graduate courses in Madrid, Brussels, Amsterdam, Copenhagen, Aarhus, Goteborg, and many others. Huddersfield Polytechnic has long given a BSc course in human ecology, the only one in the UK.

The above gives examples of whole degree courses; much less is known about individual course options within other degrees, and hence of the integration of ecology into other subjects.

In the UK, East Anglia has a long established School of environmental sciences; Lancaster has centres for independent study and is setting up ecological courses; Oxford and Imperial College have set up Environmental Institutes with research as well as teaching functions; Oxford plans to incorporate a Centre within its institute to include the social and ethical aspects; Oxford also has the Pauling Institute for Human Studies, which has long given courses in "human ecology".

In Scotland, Stirling University has an environmental initiative; at present this is more involved with institutional aspects than courses, but it includes the School of Environmental Sciences, and houses the Scottish Environmental Education Council. Glasgow has begun a postgraduate course on culture and ecology.

The Secretary of State for Scotland has set up a working group to examine the scope and direction of environmental education throughout Scottish society. Eight areas of concern have been identified (e.g. industry, agriculture, etc.) and the Centre for Human Ecology has representation on the sub-groups concerned with the home environment, nature conservation and post-school education. The post-school education working group is taking considerable interest in the progress of the Edinburgh University Initiative, which appears to be considerably more advanced than most other Scottish universities.

1.3 Remit and Methodology of this Study

The remit given to the Centre for Human Ecology by Educational Policy Committee (EP) was to "*take the lead in preparing a central register of information about relevant teaching which is going on in the University, together with any other information which is helpful to those involved in teaching*".

EP assisted fulfilment of this remit by requesting all eight Deans to appoint a Faculty Environmental Co-ordinator to liaise with the Centre.

After meeting with each of the Co-ordinators, the Centre's staff in most cases approached heads of departments to seek further information. Exceptions were Music, where there are no departmental heads (Professor Kimbell, as Dean, is Environmental Co-ordinator), and Veterinary Medicine, where arrangements were made for a meeting to be held with the full Faculty. In all other Faculties heads of departments were sent a background document which included a questionnaire, with responses to be solicited by telephone conversation, asking:

a) In what ways does teaching within your department integrate environmental awareness?

b) Is there potential to extend this, either through foundation courses or the development of existing modules?

c) It has been suggested that effective environmental education should "involve the whole person of teacher and pupil, including all of their capabilities and intelligences". How far does and could your department go in moving beyond traditional didactic approaches? (Examples of this recognised by the University's Enterprise Initiative are small group work, work

experience, self-directed learning, communication skills and personal development planning skills.)

d) Where the above questions identify scope for greater integration of environmental awareness within your department, what material resource and staff training/time requirements might implementation require?

We provide some justification for this interviewing approach, which was criticised by several heads of departments, as follows:

1. There are diverse opinions about what "environmental" means; this is a highly complex area.
   We are aware of the problem (as indicated in the Preface) and for the present have included a range of interpretations.
2. Though a consistent, 'stratified' sampling approach was deliberately used, inevitably there is some sampling bias in approaching only department heads: all of course present their departments in the best possible light!
   The problem of some bias seems unavoidable. However, if our recommendations serve only to raise awareness, then part of the objectives will have been achieved.
3. The study is not a fully comprehensive assessment of environmental teaching in the University, because the required wide overview sacrifices detail, and some valuable inputs are lost.
   There are certainly gaps, and we apologise in advance to those whose environmental teaching has escaped our notice. The Centre for Human Ecology also has many associates; some of their views are incorporated as appropriate.
4. The value of an overview is that it involves a consistent and easily understandable - though introductory - examination of environmental teaching in all departments, and thus provides a basis for communication between them. Staff naturally knew most about their own departments and less about the rest of the Faculty and University.

The responses were summarised onto only 1-2 pages for each department and the summary was agreed with the departmental head. A synopsis was then produced for each Faculty and this was agreed with the Faculty Environmental Co-ordinators. All co-ordinators met at the Centre for Human Ecology to discuss the recommendations specific to their Faculty and to look at overall recommendations for the University.

Part 2 of this report summarises for each Faculty the responses to the four questions asked and makes specific recommendations. These recommendations were discussed in general with other staff, but they are our own perceptions of the opportunities as they seem to us and they must at this stage be preliminary; misjudgments remain our responsibility and are of course open to criticism and change.
Part 3 addresses recommendations general to the University, and looks at wider considerations such as the marketing and PR consequences of developing the Environmental Initiative.

The central register of information derived from responses to the questionnaires is not appended because of the large number involved. However, copies of the responses for a particular Faculty have been given to each Faculty Co-ordinator and the complete set of responses is available for consultation at the Centre for Human Ecology. Some specimen responses - thought particularly informative - are included in the appendix to this report. One example has been taken from each Faculty, with the exception of Music and Veterinary Medicine where a different approach was used.

PART 2

FACULTY SYNOPSES AND SPECIFIC RECOMMENDATIONS

2.1 Faculty of Divinity

2.1.1 Present degree of integration of 'environmental awareness'

In the study of both Testaments of the Bible, environmentally-relevant themes of human responsibility and stewardship, domination of nature, creation, etc., can be explored. In the current curriculum, there are courses on Ecology and Christian Theology, Science and Religion, and sections of courses on ecology and ethics. Students in the Department of Christian Ethics have the option of doing an ethics project or an honours dissertation on environmental ethics.

Some departments have expressed minimal interest in the environment on the grounds that they do not teach much twentieth-century history, and that the Church's interest in Green issues is quite recent. Though they might address issues of tensions between science and religion (e.g. Darwinism), their courses are not principally concerned with the environment, but with the more central moral problems of good and evil, to which environmental issues may be incidental. In other departments, there is a strong interest in the environment because of the perceived responsibility of the Church, both in the sense of shouldering some blame for environmental problems, and in their desire to take a role in improving the situation.

The consensus is that students as a whole may be more environmentally aware than staff.

2.1.2. Potential to extend environmental education

The ties between religion and ecology could be strong. Students tend to have considerable knowledge of environmental ethics, but little of ecological facts. The majority of departments would welcome an increased emphasis on the environment, and see room for exploration. This could take several forms, including: choosing the environment as the topic for Religion 4; teaching comparatively about more "earthbound" religions; looking at wider social and philosophical issues such as the role of the Church in influencing attitudes toward nature; and strengthening ties between departments with courses in ecological history and religion.

The main question seems to be: if environmental studies come in, what goes out? There is competition with other modern 'causes', such as sexism and racism, and the loss of other

topics would also be controversial.

2.1.3 Appropriateness of teaching methods to environmental education

Divinity students seem more interested in the abstract realm than in concrete nature. Within the confines of the classroom, many methods are explored, including interactive projects, discussion, seminars, small modules, lectures, tutorials, debates, and both the Enterprise Centre and TLA have had inputs. These experiments have been more strongly developed in some departments than others.

2.1.4 Material resource and staff training implications

Except in those departments in which environmental education is of minimal interest, there has been a call for outside help from those interested in taking ecological themes further.

2.1.5 Recommendations and comment

To help those staff with environmental interests, seminars providing some relevant ecological background would be valuable. Seminars or workshops could explore connections between religion and ecology. These could be provided by centres or departments in other faculties.

Bringing in outstanding outside environmentalists would stimulate interest, as with the Gifford Lectures by Professor J. Moltmann a few years ago.

Areas of common interest with the Department of History could be further developed.

New positions should in time be developed, especially one in environmental ethics which could be created jointly with the Department of Philosophy.

2.2 Faculty of Law

2.2.1 Present degree of integration of 'environmental awareness'

Each of the five Law departments has something distinctive to offer relating to environmental law and public policy, though in few cases is the environment a primary focus of this teaching. At the more ideas-oriented end of the spectrum in the Faculty, Criminology & Social Philosophy studies the sociology of public policy implementation, which may include the pros and cons of government legislative/administrative measures against pollution (like 'Green taxes' versus direct regulation), and of more decentralised and 'popular' responses like environmental education. International law, which concentrates on principles of reciprocity between sovereign

states, is particularly relevant to the regulation of ecological problems with a global scale, including atmospheric ones like acid rain, and to the allocation of natural resources whose ownership is disputed or non-existent, such as international fisheries. The Europa Institute covers histories of development and principles of implementation of EC policies, including anti-pollution directives. Constitutional & Administrative Law is concerned in part with procedural principles of planning applications and public inquiries, which frequently impinge on environmental issues, and covers many other administrative procedures which can have environmental consequences. Scots Law covers the whole area of property law, which has obvious environmental relevance, and includes analyses of legal rules of evidence - principles for decision-making which have been invoked (by political scientists) in environmental public policy analysis.

In other words, the substantive (and, at a stretch, methodological) environmental areas covered remain somewhat incidental to the primary purposes of law teaching, such as training students in abstract legal principles and in institutional procedures relevant in many different substantive areas. For example, in Scots Law, teaching about property statutes and regulations - many of them environmentally-relevant (under any definition of the term "environmental") - is perhaps ultimately more concerned with providing understanding of, and familiarity with, the principles of statutory interpretation than the substantive areas the statutes happen to cover. (However, this emphasis on more abstract principles is apparently reduced to some extent in later-year courses, such as the Europa Institute's fourth-year course on European Institutions, in which one topic out of the ten given is EC environmental policies.)

The level of "environmental awareness" amongst Law students, in the sense of concern and understanding about popular environmental issues, is apparently not well-known to staff, perhaps because these emotive issues do not arise frequently in teaching, which is addressed to less normative concerns. Interest in actually practising environmental law also seems lower than for Continental law students, which may in part be because employment opportunities in this new area are not readily perceived by Edinburgh law students, who apparently are often conservative in career choice - though several interviewees cited instances of rising demand from employers even in the local area.

2.2.2 Potential to extend environmental education

Since law is concerned (in part) with the fulfilment of democratic public policy, it is to be expected that it will reflect strong public concern (and government policy-making based on it) over a popular issue like 'the environment'. Thus there may well be more environmental considerations in the Faculty's teaching than there were ten years ago, as Prof. Murray suggested; and there is interest amongst a significant

proportion of staff in expanding environmental law teaching - from the Europa Institute's interest in increasing the coverage of EC environmental policies, and the suggestion from Dr. Khan of International Law that the disparate environmental areas presently covered by the Department could be consolidated into one course, to (most importantly) the interdepartmental Environmental Law course planned under the guidance of Chris Himsworth (Constitutional & Administrative Law), which will cover areas such as planning law and statute relevant to environmental questions.

Although the law reflects the current concerns of a democracy formalised in legislation and judicial public debate, its principles and practice also conform to the historical constitutional role of the judiciary (in part, checking the power of legislature and executive): the public interest in dealing with pressing current issues must be balanced by the law with the public interest in ensuring that the established institutional 'rules' of society are conformed to. Legal professional standards therefore require not only rigour but also considerable conformity in training. This is reflected in education, where mandatory core courses predominate, students have a heavy teaching load, and there are apparently few extra-Faculty inputs. In these circumstances, areas like environmental law (and, especially, more general environmental education) must compete with other innovative and/or less-central areas favoured by different staff. So, while some of those interviewed thought that increased understanding of ecological processes might be a good aim in theory (as in international law, where dynamic ecological systems of atmosphere and ocean often provide the context), most suggested that students' time constraints would make such scientific teaching impossible or inadequate in practice.

2.2.3 Appropriateness of teaching methods to environmental education

The educational requirements of the profession also influenced the answers given to this question. Critical training concentrates on linguistic and logical abilities rather than the exploration of ideological controversies; and it is a tenet of professional training that practitioners keep their own personal beliefs removed from professional activities in order to provide dispassionate, objective advice to clients. Skills encouraged by a legal training that might have relevance to possibly environmentally-useful activities, such as research and political action, include the ability to find and utilise primary source materials, and the confidence to debate contentious issues.

2.2.4 Material resource and staff training implications

The introduction of environmental law (and other environmental) education to the Faculty is hampered both by tight time constraints and limited financial resources. The first constraint will be mitigated in the planned

Environmental Law course by offering it as a 3rd/4th year Honours option, but the financial constraint - unless reduced - will mean competition with other desired 'peripheral' subjects. If more resources were available, the above course could be offered in consecutive rather than alternate years, and more, needed primary reference sources could be acquired. The Environmental Law course might require the creation of one full-time lecturer's post (though obviously this will be less than full-time if the course is given only in alternate years), with smaller inputs from other staff from different departments; while outside this course - in other environmental areas already taught - development of existing staff could probably cope with any expansion.

2.2.5 Recommendations and comment

From the ecological point of view, the Faculty of Law suffers from its success and its full vocational curriculum. Yet law remains central for ecological improvement, both nationally and internationally. In practice, there are many ways in which law has been used to justify (because it became "legal") the exploitation of nature. Our first recommendation therefore must be to encourage the existing interests in environment within the Faculty to explore ways in which the legal professions can positively assist in ecological improvement, involving the many avenues of legislation which exist. It will very probably become increasingly important for the profession to follow changes on the Continent and in USA where there is a strong demand for environmental lawyers.

Although there are too many applicants for Law, and so no need to attract new students on environmental grounds, there is much need for raising awareness, to identify areas where firm steps can be taken. The proposed Environmental Law course is only for 40 undergraduates, out of 500 students, and such new developments need to be strengthened.

The Faculty provides an example of where, despite existing constraints, ecological concern will in the fairly near future become part of the profession itself.

2.3 Faculty of Medicine

2.3.1 Present degree of integration of 'environmental awareness'

Many interviewees claimed that "the environment" was of direct relevance to all medicine: the subject studies harmful interactions between the inner human environment (body) and the outer human environment of physical and social interrelations (involving, for example, chemical and biological agents, and simpler to more complex psychological factors, from sensory influences to 'stress' to the influence of family systems). By necessity, therefore, medicine studies not merely bodily symptoms, but also the environment from

which they derive.

Where (as is often the case) a simple causal relationship between environmental factor and illness is not easily demonstrable, epidemiological methods may sometimes be used to establish statistical correlations between environmental factors thereby distinguished from environmental 'noise', and illness. Epidemiology provides a more holistic, or inclusive, treatment of complex environmental factors than controlled experiment, which seeks to demonstrate causation by eliminating alternative influences. In this sense of being able to treat more complex structures of environmental influence, epidemiology is a more 'environmentally aware' methodology. Environmental awareness (in this literal sense) can be connected with methodological holism: the more holistic the methodology, the greater the complexity and variety of environments studied for their relevance to health. (At the reductionist extreme, 'the' cause, or single material determinant, of a disease may be sought, in order to remove it; at a slightly more holistic level, the major interacting (perhaps cumulative or synergistic) material determinants may be looked for; and still more holistically, both material and psychosocial influences may be studied - but since the social context, for example, cannot be physically removed, 'treatment' may involve devising adaptive strategies to cope with this given environment.) The Faculty displays a variety of degrees of holism, or technical 'environmental awareness' as outlined above, usually in accordance with the physical/research or social/practice orientation of individual departments. Evidently the debate between those supporting the two conflicting approaches is a long-standing one, and any decision about where the overall balance should lie is probably one that the Faculty, which is very familiar with the problem, should come to internally.

Opinions about students' 'environmental awareness' in the more popular sense - the extent to which they are well-informed and concerned about ecological problems - varied widely, with views expressed that concern is high (though it is somewhat naively idealistic - so presumably not well-informed); that relevant concern and knowledge is high (concern, because of the obvious connection between many ecological and health problems, and knowledge because medical students are required to have studied 'environmental' sciences); and that concern is low (because some students have a primarily materialistic motivation in training for highly-paid jobs).

2.3.2 Potential to extend environmental education

Within the Faculty: general ecological problems and principles not directly related to health are obviously outside the Faculty's area of expertise. But if 'ecology' is defined as the study of biological/physical interactions in the physical

environment, then 'ecological' interactions between the biological/physical environment and the human organism are of course taught in the Faculty, in terms of scientific relationships of varying degrees of complexity (the most complex ones, perhaps, being studied in epidemiology). Some interviewees suggested that there should be more teaching about the physical environment relevant to health - in terms of the atmospheric science of 'the ozone hole', in Dermatology, or increased study of the physical industrial environment, in Medicine (RIE), for example - and that this could be done with their existing expertise.

The effects of the social environment on health are of course specifically taught in a number of departments, especially Community Medicine (now Public Health Sciences), Child Life & Health and Psychiatry, and others with a holistic orientation such as General Practice. Some with a strong physical medicine orientation recognise the importance of social influences on health (eg. Dermatology), and of the influences of medicine on the social environment (eg. Obstetrics & Gynaecology), but recommend little if any more coverage of these areas than is already given; while one particularly physically-oriented department, Pharmacology, apparently attempted to give a course on the social effects of drug abuse, but was unable to do so. This department therefore, and General Practice (which is offering a new course on the social aspects of dying, such as bereavement), would evidently welcome more coverage of the wider social environment of which medicine is a part.

The issue for many Medicine departments seems to be how far, if at all, to expand teaching beyond their specific vocational remits: some believe that the clinical training they perform is too crucial to be detracted from by also offering 'peripheral' (ie.? environmental) teaching; some (described above) believe that the social environment is important in medical practice; and several evidently believe that medical ethical dilemmas (such as animal experimentation v. animal welfare, increased survival at birth v. increased pressure on Third World resources, and high technology in childbirth v. more 'natural' methods) are of sufficient professional importance to be given increased emphasis in teaching. (Such issues are often seen as 'environmental' ones, involving the pros and cons of applying scientific 'engineering' techniques to 'nature'.) There are several specific constraints on expanding beyond the technical, core areas taught in each department: the workload of students is extremely high already; resources (including time) are limited, so that a change in teaching emphasis would mean having to give up something else; and there are stringent General Medical Council vocational requirements for courses taken (though they may soon be relaxed: see below). Since the Faculty has an interdepartmental curriculum, however, several department heads suggested that ethics teaching might be given in a Medicine department that could readily specialize in this area.

Outside the Faculty: there may be a specific opportunity in the near future to broaden the education of medical students, which meets most of the objections noted above. It is apparently planned that, some time in the near future, students will take a core medical course with options - which is in line with a possible relaxation of its mandatory requirements by the GMC, involving allowing options early in the curriculum. Several interviewees (from Community Medicine, Medicine (RIE), Obstetrics & Gynaecology, for example) welcomed the idea of more, and more formal, interactions between the Medicine and Science Faculties; and this, together with the general support for allowing options (courses or lectures) early in the curriculum, could provide a specific 'slot' for inputs from the Science Faculty (and others) on ecology and environmental ethics - areas that are at present unlikely to be taught within the Medicine Faculty because of lack of expertise and/or lack of apparent professional relevance.

2.3.3 Appropriateness of teaching methods to environmental education

Several ideas, based on present educational methods, were put forward about ways in which teaching techniques could be, or were already, compatible with environmental awareness-raising. Perhaps the most obvious was that student-patient contact - which is part of standard clinical training - involves complex human interaction, a process which is more 'holistic' (or provides awareness of a wider relevant environment of interactions) than abstract learning from textbooks, for example. General Practice, which is known as a 'holistic' department, educates very largely by means of exposing students to health care experience, rather than didactically transmitting information - the aim being to promote an understanding of each patient's complex individuality and particular social context, or environment. The more community-oriented departments (Child Life and Community Medicine), particularly, teach students in groups, where interaction and appreciation of complexity is fostered, particularly in multidisciplinary settings. Here and elsewhere, self-directed diagnosis and debate are required, which may encourage the independence of thought and responsibility perhaps necessary to take on environmental challenges.

2.3.4 Material resource and staff training implications

As mentioned above, any increase in environmental education within the Faculty, given generally very limited resources at present, would probably entail an unpopular reallocation of resources at the expense of an existing subject. This might not be so where an incremental increase in teaching about the relevant physical environment is envisaged, as in Dermatology: such a small shift in emphasis could apparently be accomplished with existing staff and resources. Where an increase in ('environmental') ethical teaching is thought

desirable, as in physically-oriented departments such as Pharmacology, this would have to be by a new, expert staff member or another department specializing in this general area, such as Community Medicine; but that department is presently burdened with increased student numbers coinciding with staff cuts. More holistic methods are also often compromised by reduced resourcing: small group teaching may be replaced by more didactic methods as student:staff ratios increase; student-patient interactions may be curtailed because of severe time constraints; and more interactive methods, such as encouraging debate on contentious topics, involves more staff time.

Of course, provision of optional environmental courses by other Faculties would require no extra resourcing within Medicine.

2.3.5 Recommendations and comment.

The Board of studies plays the substantial role and might consider which departments should be most involved in environmental matters.

There would seem to be no "experts" in ecology in the Faculty, so outside inputs are indicated; and there is a specific opportunity to introduce environmental options with the proposed curricular changes, which will allow for choice. These options could well develop the themes raised in the report above, especially the issues of population and demographic transition, which become ethical dilemmas because of ecological constraints.

We suggest that the Department of Public Health Sciences (formerly Community Medicine) could take an initiating role. Existing areas of coordination with the Health Board would also provide many areas of ecological interest for teaching purposes.

2.4 Faculty of Arts

2.4.1 Present degree of integration of 'environmental awareness'

Amounts of teaching relating to the physical environment vary widely within the Faculty, from no coverage at all (as in English Language) to a fairly strong focus (as in Archaeology). In departments where the subject-matter is an entire geographical area and/or culture, some study of the relevant physical environment - which is likely to be an integral part of that culture - is usually included: for instance, East Asian Studies (an 'area studies department') includes some coverage of Chinese geography and its natural environment, Classics incorporates the physical environment of ancient Greece and Rome, Celtic covers the land-based culture of the Celtic peoples, ancient and modern, and History centres

much of its analysis on human utilization of natural resources and the human effects of large-scale natural occurrences. In departments where literature is a major part of study (the languages and English Literature), the relevant cultures are supposedly 'mirrored' in the written word - analysis of which therefore reveals something about attitudes towards the physical environment. Archaeology and Fine Arts, on the other hand, as well as studying aspects of culture also comprise practically-oriented disciplines involving hands-on participation in the physical environment. Finally, Philosophy is concerned with the normative relations between the human and non-human environment, as well as with associated conceptual and critical issues.

In other words, many if not most Arts departments incorporate some concern with the physical and non-human environment into the context of their disciplinary concentrations. Only a minority, though, apparently do so with any recognition that what they are teaching could be called 'environmental'; and only History and (to some extent) Archaeology employ methodologies that might in any way be termed 'ecological' - focusing study on the integration of, and interactions between, individuals and their environments. In fact there is possibly a limited appreciation within the Faculty of what the term "environmental" may refer to - rather more than merely recycling and Third World development problems.

Levels of students' environmental awareness - and interviewees' perceptions of it - vary. Environmental concern probably parallels the range shown in the wider community (though students are part of a generally more concerned age group); while students whose interest in a particular geographical area has brought them to the department that studies it may also be motivated by the striking environmental problems of that area (eg. Islamic & Mid East Studies and East Asian Studies). Levels of understanding of environmental problems are possibly low, perhaps because of the Two Cultures divide - underlined by most interviewees - which may turn them away from science.

2.4.2 Potential to extend environmental education

Given the possibly limited appreciation in the Faculty in general of the scope of "environmental" subject-matter, and the fact that many interviewees had not previously related the term to what their departments teach, there seems to be value in raising the consciousness of the Faculty in order to provoke ideas for environmental integration. Focusing for the first time on environmental areas presently taught only in disparate parts of the curriculum, or extension of those areas because they are "environmental", is only possible, after all, if they have been identified as such. One interviewee (English Literature) apparently began to identify relevant areas in the course of the interview itself, connecting critiques of the machine metaphor in social philosophy with Romanticism, The Golden Bough, and even The Tempest, all

taught already, but disparately and with a different emphasis.

Several departments (eg. Classics and History) suggested they would prefer to concentrate on, and possibly develop, their own environmental teaching, rather than have foreign ideas imposed on their curricula from outside; and even where an outside course was thought desirable (perhaps on the broader principles of ecology, which might be of value in the History curriculum, for example), it should be optional, very relevant to the particular arts discipline, and in a form palatable to Arts students (eg. expressed as ideas rather than mathematics). Other departments, such as 'area studies' ones - which require a wide range of inputs on different aspects of culture and current events - already use, or would like to use, outside inputs from environmental experts (such as the Centre for Amazonian Studies in the case of Hispanic Studies, and botanists in Celtic). It is clear (in part from interviewees' lack of recognition of environmental teaching within the Faculty) that a general 'bottom-up' approach to any increase in environmental education that is decided on may not be adequate because of lack of existing expertise, at least in scientific environmental areas. Relevant outside inputs that were suggested include Literature & Environment and Humanities & Ecology lecture series, day conferences on the environment for Arts staff, and environmental bibliographies - all strictly related to the relevant arts subject.

Arts departments give a wide range of joint degrees with other departments in the Faculty and with Social Sciences, but there are apparently few interdisciplinary links with the Science Faculty - except between Archaeology and Geography (part of which is in Science), who plan to collaborate on a new degree in Environmental Archaeology from 1992; and in the MA General degree in Arts, where students must also take either maths or a science. (The MA General format in fact provides a ready-made vehicle for introduction of an optional ecological course for Arts students.)

2.4.3 Appropriateness of teaching methods to environmental education

Since Arts departments perform very little overt environmental teaching, in the sense of seeking understanding of the physical environment or analyzing socio-political aspects of humankind's relationship to it (which are tasks performed in the Science and Social Science Faculties), and since much of the teaching of arts is non-didactic anyway, this question is somewhat redundant. Teaching methods that interviewees thought would, hypothetically, be appropriate include the small, discursive groups and self-directed learning commonly employed, the hands-on and primary source empiricism of Archaeology, Fine Art and Scottish Studies, and the openness to ideas and freedom to challenge dogma encouraged by English Literature and History. An interesting perspective on environmental 'holism' came from the Celtic department: its visits to Scottish landscapes to discuss artistic forms

inspired by place might well encourage a more integrated type of holism than mere broadening of disconnected and abstracted scientific knowledge about the environment. Indeed the Department's self-described "crofting" style for survival within the University and its dislike for the technocratic language employed in this question indicate a split between the different 'environmental awarenesses' of closeness to place, and rationalistic analysis of environmental problems based on the application of knowledge and technique.

2.4.4 Material resource and staff training implications

While some departments, like Classics and History, recommended no more than slight shifts in emphasis in 'environmental' teaching they already give, with few resourcing implications, others were of the opinion that all innovations (short of unpopular reallocations) require increased resources. However, both Archaeology and (more speculatively) English Literature see the strong demand for environmental aspects of their subjects as itself a recruiting and resourcing opportunity. Equally, if increased environmental education in Arts merely meant allowing new options in outside courses, then departments could obviously at least promote these without requiring extra resources.

2.4.5 Recommendations and comment.

There clearly seems to be a need to raise awareness generally, especially to give confidence to recognise the environmental relevance of the Arts disciplines. As we indicated in the Preface, many of the arts, not only philosophy, could guide cultural change and scientific directions. Much of such work, initially carried out in research and then used in teaching, does not require a scientific background as such; the perceptions from the arts and humanities are surely valuable precisely for their own origins. In this connection, Language itself so strongly affects ecological understanding that there is much scope for development. This would of course include philosophy and overlap with social sciences.

Clearly, there is also a need for some assistance with social science and scientific areas. As for other faculties, seminars or workshops for those interested should be organised.

More departments within the Faculty could readily include ecological dimensions in their existing courses.

There is considerable scope for outside courses within the Arts degree course, especially the general MA. We strongly recommend that this be explored urgently, and that a specific ecological module be started within that degree and open to other Arts students as widely as possible. It might be possible to provide this from existing materials elsewhere in the University at quite short notice.

2.5 Faculty of Science & Engineering

2.5.1 Present degree of integration of 'environmental awareness'

Nearly all science subjects are relevant to the physical environment - most obviously the physical sciences, such as physics, chemistry, geology and biology (of which its component disciplines are "environmentally aware by definition", since they are substantively concerned with the natural, living environment); but also the engineering subjects, which are concerned with the application of scientific principles to the physical environment, as well as the more abstract sciences, such as artificial intelligence and mathematics, which provide widely-applicable technical methods for the physical sciences. Almost all Science departments, indeed, can make distinctive contributions to environmental research and practice - from Artificial Intelligence's modelling of adaptive learning and expert systems (of use in adaptive environmental assessment), to Computer Science's simulation modelling (useful in predicting the behaviour of biological systems), and Geology's modelling of large, dynamic and (technically) 'chaotic' systems of the earth such as atmosphere and oceans - fundamental in predictions of global warming. Popularly-conceived 'environmental' issues, such as chemical pollution in Chemistry, or acid rain and ozone depletion in Meteorology, are analyzed as ordinary parts of the relevant disciplinary context, though the popular significance of these topics does perhaps increase the emphasis they are given.

It is clear, though, that much of this teaching is technical, or narrowly-focused (and inevitably so, for application). Engineers, for example, learn technological solutions to pollution, Physics students apparently prefer analytical approaches to more holistic ones, and even ecology is taught in part by modelling mathematical relationships between pairs of phenomena, thereby not fully addressing the whole ecosystem. What may be under-appreciated in these cases are the wider interactions of natural systems, and their human implications. Even so, several departments - particularly those in Engineering, with their mandatory Engineer in Society first year course - do stress the social context of science, and the social responsibilities of scientists. Others, such as Meteorology and Geology, see less need to provide education on social context, at least within their own departments.

'Environmental awareness' - in the sense of concern and understanding about popular environmental issues - and perceptions of it, are varied within the Faculty. Engineering students are aware, apparently, at least about public concern over the environment, and are keen to be seen as environmentally aware as a profession. Other opinions of those interviewed ranged from a judgment that science undergraduates do tend to be idealistically-concerned about scientific ethical issues (which are often thought of as

'environmental'), and a perception that the particular science being studied provides a distinctive environmental perspective (such as Astronomy & Astrophysics' perspective, which may help students to appreciate global-scale chemical and physical processes, and thus ozone depletion and global warming), to a feeling (as in Chemistry) that there is a range of levels of awareness amongst students, from those who are very focused on the subject to those who are very socially-aware; a minority, only, suggested that general awareness might be low because the subject attracted students keen on a narrower technical focus.

The courses coordinated through the Biology Teaching Organisation have long included a range of more technically defined environmental topics. The new Human Population Biology (1h) course is more general and consists largely of human ecological topics; students generally are aware and very concerned about the issues raised, but a number consider that they came to study "biology" as a defined, disciplinary science only. Most courses leading to Botany or Zoology honours involve discussion of the threats of the present industrial system to habitats; many direct and indirect references are made to carrying capacity and sustainability. Students and staff in the biological departments in general have strong ecological interests; for example, many students in Honours Zoology seek conservation type employment.

2.5.2 Potential to extend environmental education

Many departments, as mentioned above, see a need for their students to be taught more formally about the social and ethical issues relevant to their disciplines. Several also see a specific opportunity to recruit more students by tapping the present demand from schools for tertiary environmental teaching, and by redressing the negative technical image that science seems to have acquired. The consensus about 'broadening' scientific education - both making it less exclusively technical, or somewhat more 'holistic', and covering substantive popularly-environmental issues - seems to be particularly strong in the Engineering departments, perhaps because engineering techniques are designed to be <u>applied</u> in the (natural) environment, where they will be under heavy public scrutiny; and indeed a new 12-lecture module on environmental topics is soon to be added to the Engineer in Society course, which presently includes coverage of areas such as global warming and renewable energy in its six lectures. Amongst Physics students there is apparently a need (and a specific opportunity) for broader conceptualisation - including more inputs on ideas and ethics - to redress a possibly conformist attitude; in Chemistry, exposure of students to the socio-political context of technological/environmental issues, such as nuclear energy, is favoured; and in the Institute of Ecology and Resource Management (IERM), where ethical and political aspects of biological science and technology frequently arise in the course of more technical teaching, it is felt that these areas

should be recognized for their importance to the discipline and rationalized in the way they are taught, which at present is inadequate.

Various ideas were expressed about the manner in which the desired broadening of scientific teaching could be achieved. Many departments welcomed the idea of receiving inputs from outside experts (outside the Faculty and/or University), though for the Institute of Ecology and Resource Management it was suggested that expertise in socio-political environmental areas be developed within the Institute, as the Institute of Cell, Animal & Population Biology (ICAPB) has done to some extent (eg., Zoology, as mentioned above). Several departments, such as Geology and Mathematics, suggested that the relevant courses or lectures (given within the department by outsiders, or given by an outside department) should be optional, rather than imposed on students. Several, such as Computer Science, also felt that such courses would best be given early in the curriculum, when students' timetables were less full - and when they would be more likely to choose these options freely. There would have to be limits on the broadening courses introduced, so that they were rigorously developed (apparently in contrast to a broad Environmental Science course discussed last year, according to Prof. Rankin of Chemistry, which was not initiated because its planned content was too vague); and they would have to form a limited part of departments' curricula, partly, as in Engineering, because of vocational requirements for technical education from professional bodies, and because environmental science is perhaps not seen as a 'hard' skill by employers.

A particular area of interest for broadening scientific education, and for preparing scientists for applied work in the environmental field, is in interdisciplinary collaboration between Science departments. Several departments, such as Artificial Intelligence, Chemistry, Geology, Meteorology and Mathematics, already contribute their expertise to other Science departments (as in A.I.'s assistance to Forestry in simulation modelling, and Geology's formal links with Environmental Chemistry, Environmental Engineering and the Institute of Ecology and Resource Management), or would be happy to do so, perhaps as part of a multidisciplinary team. New environmentally-relevant interdisciplinary degrees are to be given in 1992 in Civil & Environmental Engineering (exposing engineering students to biological courses, for instance), Geology & Physical Geography, and Environment Geoscience. In addition, the WITH system, used in the Social Science Faculty to introduce single topics like gender into a wide variety of courses and departments, provides a ready-made vehicle for introducing relevant environmental issues to many Science courses and departments.

2.5.3 Appropriateness of teaching methods to environmental education

This question provided heads of departments with an

opportunity to list non-didactic, or at least non-lecture, methods used in their departments' teaching, somewhat regardless of whether these might have a logical connection to an increase in environmental awareness - because no such connection was immediately obvious. Many practical tasks and forms of group work engaged in by Science students were mentioned, as were interactions with companies (which might at least broaden the awareness of working environments in which graduates later find themselves), as well as practice of public skills for the public and political milieu in which those engaged in environmental research and decision-making are likely to be involved - the latter method being more often intended than accomplished so far. A few departments hinted that their teaching is mainly didactic, sometimes partly because of resource shortages which entail paring teaching to the bare technical essentials. Prof. Boulton (Geology) also stressed that the ability of scientists from different disciplines to communicate with each other - which is crucial for the multidisciplinary work so often necessary in resolving the scientific aspects of environmental problems - should be an educational priority, and would be furthered by the formal interdisciplinary links being forged by his department. Self-directed learning, which might well be a means of redressing the strictures of didactic biological teaching, is extremely time-consuming for staff to guide, perhaps requiring employment of a professional environmentalist with wide-ranging (as opposed to solely narrow, technical) knowledge.

2.5.4 Material resource and staff training implications

Many departments cited the common problem that more 'environmental' teaching would not be possible, given presently constrained resources, without sacrificing other areas already taught, which would of course be unpopular. A few conceded that existing staff and resource levels could handle the administration of environmental inputs from outside experts, but many suggested that new resources are needed for the new teaching even where qualified staff and local expertise are available (as in Engineering's environmental addition to The Engineer in Society course, and in the new Civil & Environmental Engineering degree). Mechanical Engineering could only mount a new course on 'Green Engineering' with help from other Engineering departments.

An obvious means of raising funds in these new areas, mentioned (and practised) by several departments, is to recruit new students with environmental enthusiasms. This may be something of a Catch-22 situation, however, because to recruit new students requires new environmental courses, which require new resources - which may only be provided by recruiting new students. Perhaps this problem can be overcome by 'selling' the environmental credentials of Edinburgh University far more forcefully - and prerequisites for this task are a good definition of, and strong belief in, its environmental 'product'. Tapping strong environmental demand, as mentioned above, would also reduce the present resourcing

problems experienced across the whole Science Faculty. Prof. Whittemore (IERM) considered that the social, political and ethical environmental areas that many believe should be taught in the Faculty can best be provided by a multidisciplinary body such as the Centre for Human Ecology, which is part of the Faculty and has the capability (if properly resourced) to act as a co-ordinating 'Faculty enabler'.

2.5.5 Recommendations and comment

Dr Truman, the Science Faculty environmental co-ordinator, suggested that there should be further environmental options within the Faculty on the lines of The Engineer in Society, to include aesthetic, social, economic and ethical aspects; obviously, these require that time be made available in the curriculum.

Some courses, like Human Population Biology 1h, serve non-biologists in any Faculty (provided they had taken a previous biology course); however, with 300 students already, most of whom are in fact biology undergraduates, this course is already at its maximum capacity. Other courses of this type are therefore indicated.

Awareness raising in the more physical science departments, including teaching about managerial, political, and employment issues, would be valuable in helping future graduates to effect change.

In many cases, staff need more confidence and competence in the non-technical areas - the converse of Arts and Divinity; and similar workshops would be valuable.

2.6 Faculty of Music

2.6.1 Present degree of integration of 'environmental awareness'

Undergraduate teaching within the Faculty has focused mainly on European music. The honours curriculum includes such areas as composition, history of music, the scientific study of sound, and studies related to performance. Courses such as Music in the Church and Music in Society (both First BMus) place the subject in its social context, but the relevance of music to the natural environment has not been given specific consideration.

The Faculty is involved with the conservation of two collections of historical musical instruments: these feature importantly both in its teaching and its research.

2.6.2 Potential to extend environmental education

If one views environmental education in a narrow sense, the role in it for music is not immediately apparent. But if one

reflects for a moment on such myths and legends as those associated with Orpheus or with the Music of the Spheres, or indeed on the meaning of such commonly used words as "concord", "harmony", "compose" (though perhaps not "orchestrate"!), it rapidly becomes apparent that the place of music in the total order of things is potentially more significant than is always recognized. The least that can be said is that those who are regularly and intelligently involved in the performance of music are likely to have a sharp perception of the meaning of interdependence; that musical composition can be an important means of releasing one's creativity and powers of non-verbal communication, involving little cost in terms of the consumption of natural resources; and that students the core of whose courses entails creative work, performance, historical studies and the science of sound are unlikely to be unaware of the claims of interdisciplinarity.

In recent years scientific and medical research have begun to restore intellectual respectability to Orpheus (in many societies it would never have been questioned); and the healing powers of music - its capacity to "compose the soul", as well as to liberate human creativity - have come to be widely recognized. The Faculty is exploring some of these new/old dimensions in a Music in the Community course (running for the first time in the current 1991-92 session), which is expected to develop to embrace a wide range of interdisciplinary issues.

2.6.3 Appropriateness of teaching methods to environmental education

The Faculty believes that its teaching methods are appropriate to the range of subjects taught; they vary widely from course to course, but teamwork is the essence of many of them.

2.6.4 Material resource and staff training implications

Little or no extra teaching could be undertaken without additional resources. Ethnomusicology is already seen as important in helping students perceive that music plays a different social and environmental role in other cultures; (several of them are actively involved this year in the Royal Botanical Garden's Rain Forest Project). Unfortunately there is no-one in the Faculty who is primarily an ethnomusicologist, so it is dependent upon assistance from Dr. Cooke of the School of Scottish Studies and occasional guest teachers to maintain the programme of study.

2.6.5 Recommendations and comment

The appointment of an ethnomusicologist would be a high priority were further funds to become available.

Teaching staff might appreciate the opportunity to discuss the wider significance of music and musical education with people

knowledgeable about environmental issues. An appropriate occasion would be a meeting of the Board of Studies in Music.

2.7 Faculty of Social Sciences

2.7.1. Present degree of integration of 'environmental awareness'

The social sciences have grappled for at least a century with questions of the relationship between the natural and the social environments, of social adaptation to the physical environment, of contextualism. Environmentalism, in this literal sense, is for many of them more of a tradition than an initiative.

Most departments recognize and have practitioners in well-established environmental fields - ecological anthropology, landscape architecture, environmental design and planning, environmental history, physical and cultural geography, urban and rural sociology, environmental economics, and the sociology of development. In addition, many conduct research and give courses on specific environmental issues, including a comparison of indigenous and scientific knowledge, social forestry in tropical rainforests, Third World development (particularly in Southeast Asia), the history of sanitation and pollution reforms, of urban/rural relations, industrialization, global energy and government environmental policy.

Courses currently offered with what interviewees suggested is an 'environmental' focus, or a large environmental component, include: Provisioning Society, and courses on ecology and development, in Social Anthropology; Corporate Social Accounting (Accounting and Business Method); Social History 1 & 2, Economic History 2; Population, Economics and Society in Western Europe; Industrialization, Work and the Environment (all Economic and Social History); Natural Resource and Environmental Economics, and Public Choice (Economics); Global Change, Population and Environment; Environmental Sensitivity and Change; and many other human and physical geography courses, from development in the Tropics, to studies of soils and watersheds, rural change, tourism, etc. (Geography); Politics of the Environment (Politics); and Sociology of the Environment (Sociology/ Science Studies Unit). With a few clear exceptions, environmentalism is well integrated in the curriculum and research interests of the Social Science departments. Many of these courses are available for students from other faculties (those given by Science Studies being timetabled after 5pm for this reason).

2.7.2. Potential to extend environmental education

In most departments, there is considerable interest in extending environmental education. Departments might create additional honours options in environmental studies, bring

together good supportive bibliographies on the environment (for use, in part, by outside groups), recommend specific outside lectures on the environment to students, strengthen links between departments, and (this was particularly popular) employ the WITH system (a thematic interdepartmental program) to address environmental issues. There was considerable discussion, and no agreement, about foundation courses to be taught by staff outside the Faculty. Gaps were noted in technical environmental information, resource management, environmental ethics, and environmental impact analysis. Science Studies, with an established background in some of these fields, is planning further courses. In several departments, it was felt that students did not have an adequate appreciation of the natural environment or the physical sciences, though in others, students were sophisticated in the sense that they did not subscribe to popular environmental oversimplifications.

2.7.3. Appropriateness of teaching methods to environmental education

The teaching methods employed included fieldwork, project-based study, community work, highly interactive tutorials and critique sessions, quantitative methods, studio work, small group work, self-directed learning, seminars, clinical placement, the development of communication skills, practicals, and open learning. Many departments were interested in methodological areas such as systems theory, cost benefit analysis, regional studies, idiographic/nomothetic dichotomies, "cultural osmosis," information processing, statistics, remote sensing, predictive modelling and chaos theory - all applicable to environmental questions. Departments tended to be critical of reductionistic, deterministic, formalistic, or Post-Modern approaches. But there was considerable diversity within the Faculty, and some departments were unfavourably disposed to "alternative theories," Green economics, systems theory, and "limits to growth" models. Others emphasized that they are pluralistic in outlook, and not wedded to any particular ideology.

2.7.4. Material resource and staff training implications

Ignoring those departments which did not see the relevance of the environment to their discipline, or presumed that it would compete with vocational training, most departments reported severe understaffing constraints on expanding environmental education. Anthropology noted that enrolment increased by one third (190-305) in the past year, perhaps partly as a result of increased interest in the environment. The Geography Department is officially underfunded by four positions, but has managed to be very successful at recruiting undergraduates, again partly because of the demand for "environmental" education. The Politics Department has grown by two-and-a-half times in the last eight years, with only one further staff member recruited, and is particularly interested

in adding a staff member with expertise in the politics of nuclear waste. The Social Sciences are seen by many students as being environmentally friendly, yet faculty feel are not at present receiving the support they need.

2.7.5. Recommendations and comment

The richness of environmental expertise in the Faculty could be used much more fully as a recruiting and resourcing device. Social Sciences could also augment its already strong links with other Faculties in environmental matters, and there is immense scope to link research more strongly with environmental teaching.

Economics, which can already contribute much to environmental teaching, nevertheless presents a wide opening for the future in ecological economics - even though the Department may feel that there is at present no viable alternative to neoclassical economics.

Psychology, bridging the sciences and social sciences, also has great scope for advancing the understanding of human attitudes and behaviour which affect nature; however, while many psychologists are personally interested in ecological issues, this does not yet seem to have been reflected in the Department's teaching.

As in the Arts Faculty, some departments are perhaps chary of quantitative science, and may need help in building confidence for scientific understanding. As mentioned in the Preface, the Humanities are crucial in providing new perceptions about humankind's relation to nature. There is much scope and need for both research and teaching.

2.8 Faculty of Veterinary Medicine

(This summary is based on minutes made by CHE staff of a meeting of the Faculty of Veterinary Medicine on 9th October 1991, at which CHE solicited Faculty responses to the Environmental Initiative. It is not, therefore, in the format used elsewhere in this report.)

Several indications were given by Faculty members of what 'environmental' meant to them in the Veterinary Medicine (and, particularly, animal production) context. The idealistic motivation of many vets - to care for, and cure, animals - and the desire to participate in the natural environment, were referred to, as were possible ethical dilemmas about animal welfare in intensive production, and about the environmental effects (side-effects in nature and for human health, from consumption) cf intensive chemical treatment of animals. These non-technical, ethical areas are apparently covered to some extent in the Faculty's teaching, though staff would not claim full professional expertise here.

Other areas where 'the environment' might be relevant also involved questions of professional choice. For example, it was suggested that the veterinary profession might have a vested interest in intensive animal production, in that vets are required to treat the maladies that inevitably result. There may also be professional (and teaching/training) implications of changing patterns of demand (based on cultural changes) for animal products, including public shifts away from chemically-treated meats in favour of more organically-produced food. (Dr. Loening of the Centre for Human Ecology noted that there is already a small demand for 'organic' vets.) The 'environment' issue therefore raises some ethical and economic/training questions with direct (and perhaps increasing) relevance to veterinary medicine; and these questions could be addressed without having to take on much broader environmental issues (a concern expressed at the meeting).

In fact the meeting generally expressed interest in tackling the type of issues raised. Various strategies were suggested for doing so: there was support for incorporating consideration of the issues in existing courses (though staff felt they lacked the necessary expertise - but perhaps someone from CHE could act as 'devil's advocate' at some vet. classes); and there was some support for offering an outside course (though this might be a strain on students' busy schedules, and possibly not given the necessary attention by students if unexamined - but Dr. Loening considered from past experience that testing would be possible). Such courses should perhaps be offered early in the curriculum, before necessary vocational specialisation took place, it was suggested. There were also possible staff training implications (a staff seminar with CHE was suggested), and these and the other strategic issues could be addressed by interested Faculty members meeting further with CHE.

Recommendations and comment

Issues that might be discussed at an initial seminar include identification of exactly which 'environmental' concerns are relevant to the veterinary profession, what is the likely interest and motivation of veterinary students in this area, and what are vets' environmental responsibilities.

It seems clear from subsequent reaction to this meeting that although environmental education is not felt to be of immediate pragmatic benefit to the Faculty (which is in no need of enhancing its recruiting potential), environmental 'awareness-raising' would be welcomed as part of broader teaching objectives, particularly if it could be shown that such issues were strongly relevant to the profession. Formal applied ethics teaching from an outside Faculty would probably be less welcome.

PART 3

CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusions

This survey brought out several primary influences likely to set the direction for development of environmental education at Edinburgh University.

It became clear that there is wide (but scattered) interest as well as expertise throughout the University - in every Faculty - to develop greater ecological awareness and understanding, and to coordinate the relevant research with the teaching programmes.

Having stressed the opportunities, the negative influences must also be summarised. Our research suggested that:

a) the hard reality of presently severe resource constraints was likely to be a major stumbling block;
b) as the University is itself a complex integrated structure, or system, radical change is unlikely to occur rapidly;
c) within many departments, there was little or no interest in "human ecology", and the departmental subjects were considered of no relevance to ecological matters;
d) in several subjects, it was considered that current research and teaching already fulfilled the needs for environmental education, and there was sometimes no willingness to consider expansion of the subject. (Our own judgement - following the definition in the Preface - is that some of these subjects do indeed involve 'environmental' management of a technical nature, but not necessarily a new and critical awareness of the whole.)
e) although in many cases the environment may be relevant, the curriculum is already full; and outside professional bodies control much of the content of teaching and the level of technical expertise required.

In these circumstances - propitious but challenging - many of those consulted for their overviews of the University suggested that an evolutionary, or 'contextualized', approach to environmental education would be most appropriate. Its tenets should be:

a) *pluralism* - bringing out the existing environmental strengths of individual staff and departments across the University, and ensuring that any environmental introductions recommended are demonstrably relevant to their own disciplines;
b) *integration* - promoting stronger links in this area between departments and between Faculties, and ensuring that environmental teaching is incorporated into existing studies rather than merely tacked on as an outside 'package'; and

c) *choice* - so that environmental education is open to all students, and indeed a means of expanding their choices, but not forced insensitively upon them.

This evolutionary or "adaptive" approach might at first involve 'consciousness-raising' amongst those who had not previously appreciated the breadth of implications of environmental thought and practice, nor therefore the relevance of environmental issues to their own disciplines. A broadening of vision beyond the single discipline to encompass others, thereby facilitating ecological thinking, would help to break down some long-standing barriers, such as the rigid Two Cultures divide between arts and science (the latter still being viewed as the main repository of "environmental" knowledge). It might also redress the implied pejorative in the word "environment" itself, meaning that which is extraneous or peripheral, rather than integral, much as nature 'out there' is still seen as peripheral to mankind. There is a case for making a priority of attempting to remove such environmental 'blinkers', because this is likely to effect the most significant change.

There is a danger, though, that an adaptive, evolutionary approach may not set sufficiently strong goals for change to overcome inevitable institutional inertia. While those staff consulted for University policy advice favoured an 'umbrella' approach for addressing and adapting University structures and processes (such as links between different internal organizations, which could be strengthened, and teaching methods, which could be updated) in order to institutionalize more environmentally-compatible teaching over the long term, they agreed that specific, immediate measures should also be taken (see Recommendations, below) to maintain the impetus of the Environmental Initiative.

3.2 Recommendations

3.2.1 Recognition of Urgency

"The environmental crisis" is not a crisis that will go away; there will be a continuing necessity for change and University education must ADAPT accordingly. Our general recommendation therefore is that EP moves the University in the directions indicated by the Brundtland Commission ("security must be sought through change...") and the Government White Paper on the Environment, "This Common Inheritance" ("Nature is under threat").

3.2.2 Monitoring and Advancement of the Teaching Initiative

The adaptive approach, involving all sections of the University, requires a coordinating body. The way in which this study was set up could provide the nucleus. We recommend that Faculty Environmental Co-ordinators be constituted into a working group on environmental education, which should

continue to develop these recommendations (perhaps with the Centre for Human Ecology) and report to EP indicating progress throughout the University on the teaching initiative.

3.2.3 Material Resourcing

It is recommended that opportunities be taken, recognising the constraints of the University's funding situation, to give budgetary priority to environmental teaching initiatives, particularly where these involve possible foundation courses for a whole Faculty or inter-Faculty initiative. The University might give serious consideration, in the context of the White Paper on the Environment, to proposing that the Government makes new money available for financing environmentally pertinent teaching. One forum which might be appropriate for such representation is the Secretary of State's Working Party on Environmental Education. Parallels can be drawn with new funding that was made available when education in information technology was being introduced in Britain.

3.2.4 Focusing existing environmental expertise and courses

We recommend that the existing environmental interests throughout the University be strengthened and coordinated, so that best possible use can be made of this expertise. This can be done without significant changes in resource requirements.

Existing courses and course structures can profitably be adapted, as indicated in several of the reports. This will be assisted through the recommendations made below.

3.2.5 Workshops, materials for staff involvement

We recommend the introduction of seminars, workshops and background materials in order to assist faculties and departments - as many suggested would be necessary - in teaching subjects outside their immediate areas. Some reallocation of resources and possibly some new funding may be needed, but many environmental developments are likely to be cross-disciplinary, and thus use only existing resources or distribute the resourcing burden between different departments. Recruitment of staff should take environmental interests into account, all other things being equal.

3.2.6 The value of research for teaching

Environmental research, of obvious benefit in its own right, will also stimulate and provide materials for teaching. We recommend that research into the many questions that any discipline could ask of another in respect of ecology and environment, be promoted. This applies especially to those areas that connect the humanities and the sciences.

Our discussions revealed some dearth of appreciation of how

ecological thinking could help enlarge a specialist discipline, and vice versa. Though it may risk treading on each others' toes, we nevertheless remain convinced of the value of critical questioning between one discipline and another, from which new insights into "human ecology" can arise.

3.2.7 Core or foundation environmental teaching

During this study, there was much discussion of both the needs and the difficulties of providing some core or interfaculty environmental courses. While desirable, this would obviously present serious difficulties in extra student loads, in the large numbers of students involved, in extra staff time and resources needed, and in the position that such courses could take in the overall curriculum. However, there are possibilities and specific existing opportunities, such as in the Arts General MA, in the Science Studies courses, and in some biology and geography courses. Further, some variations on existing lecture series, such as those given by the Centre for Human Ecology, could be developed. We recommend that these openings be explored as the next step. The educational value of the institutional component of the environmental initiative, as in the Pollock Halls recycling initiatives, should also be emphasised.

3.2.8 Vocational training and professional requirements

Although the claim is often made that the curriculum is full, and that the professional institutes demand the established input which makes up the bulk of this material, we recommend nevertheless that environmental issues be gradually incorporated into the vocational teaching. Ecological understanding will surely be an increasing requirement of the professional institutes, as it is already in some cases. The university is in a position to take early positive steps towards this.

3.2.9 Marketing

The Environmental Initiative should become a central part of University marketing initiatives, understanding marketing as the process of aligning what an institution can offer with what present and future users require. We recommend that further research be undertaken, in close liaison with the University's Director of Development, into probable future trends in student demand and how the market for environmental education is segmented.

3.2.10 Public Relations and Promotion

It is recommended that the Environmental Initiative for teaching, and the parallel processes taking place in institutional behaviour and research, should be adopted as one of the University's primary unique selling points for recruiting high calibre students and new staff, and for

attracting funding.

3.2.11 Institutional consistency

The importance of the University itself being a role model highlights the necessity of building the institutional and research aspects of the Environmental Initiative in parallel with the teaching aspect, so that students and others live in an environment which practises what is being taught.

3.2.12 Expectation of Phased Progress

Progress towards the ideal of all students graduating with an awareness of how their discipline pertains to the state of the world environment cannot be achieved immediately. We recommend that the initial focus and any additional resources should be targeted towards those areas of the University where there is greatest potential and willingness for change, in the expectation that others will catch up in due course. This is a process which might be spread over the next five or more years.

3.2.13 Student involvement

Students should be involved throughout in our recommendations. The progress of the environmental initiative can be strongly influenced and promoted through student newspapers, through boards of studies on which students sit, etc. It is noteworthy that in our current Rector, students have elected someone who is known for the ecological and social content of his music.

Appendix: A note on Environmental Education.

Environmental education sets new aims and challenges and differs in at least the following respects from most conventional education in both content and process.

1. The "subject" pervades most other subjects; it requires rigorous disciplined thinking outside the conventional disciplines. The latter have mostly become defined over the last century or two by externalising subjects that are not immediately relevant. Not only an inter-disciplinary approach is needed, but one that transcends and restructures narrowly defined disciplines.

2. Environmental education involves the whole person of both teacher and pupil, all of their capabilities and intelligences. While developing understanding and appreciation, it must equally contribute practical ability and skill for action. Conventional education concentrates on the linguistic and logic/mathematical intelligences.

3. Environmental education, if it is to approach the needs for change to overcome environmental degradation, must be not only descriptive, to lead to knowledge and understanding, but also normative, to bring about that change: the purpose is to adapt the habits of society. A cultural shift in attitudes in addition to appropriately applied technologies, is needed.

None of these three features fit easily into the structure of university courses.

Perhaps the anthropologies and geography come nearest to the first requirement; but they have not till recently received the acclaim and respect that is accorded to the "hard" sciences.

The second characteristic can be met by a broadening of educational methods; for example, by an interplay of experience, reflective observation and experimentation, rather than mainly one-directional teaching; or by the close contact developed (surprisingly) by "self-paced" learning; or through gaming. Competitiveness must be re-evaluated. Practical experience as in field courses becomes vital. Universities can and do try such approaches, but nevertheless tend to maintain and transfer the traditional abstracted and reductionist culture.

The third feature appears to challenge the whole ethos of objective education. But the need for change does not imply that the education becomes prescriptive; rather that such education should provide "ways to look at the economic [and environmental] order that differ from the ways most people have viewed it. This does not force a change on anyone, but an area of thought, feeling and subsequent behaviour that was formerly determined should now be opened up for choice. Freedom is expanded."[1] Challenging a culture to address the changing needs of the age continues to be a primary role of universities.

Ulrich E Loening

1. H.Daly & J.Cobb, For the Common Good, 1989

SPECIMEN QUESTIONNAIRES

FACULTY: DIVINITY REF.NO.38 DATE 26.9.91
DEPT.: ECCLESIASTICAL HISTORY NO.U/G STUDENTS:250/300 IN WHOLE FACULTY
CONTACT: PROFESSOR S. BROWN POSITION:HEAD

A. Existing position re integration of environmental awareness

This Department teaches significant numbers of History students as well as Divinity ones. Ecclesiastical history is the history of the Christian Church, which includes its historical context. Prof. Brown saw the relevance of this teaching to the environment as "minimal". The Department does not teach much 20th century history (beyond the introductory survey level), and it is only recently that there has been significant interest from the Church in "Green" issues. Even so, the relationships between history, religion and science are considered - for example, the controversy over Darwin's theories, and their relation to Christianity, in the 19th century.

The environmental awareness of students in this department is not known by Prof. Brown.

B. Potential (ie. perceived need, and/or opportunity) to extend environmental education via integration and/or foundation courses

He feels that there is room for exploring questions such as the inter-relationships of religion, history and science, which might have an "environmental" aspect; and there is also scope to increase the study of social context and community in historical/religious terms: for example, pre-industrialised society and the role of the Church in influencing attitudes towards nature in a less materialistic age. The present movement towards less institutional and political treatment of religious history could allow more social, economic, and ecological issues to be considered.

Prof. Brown considered that more attention should be given to ecological history - which is now a strong area of interest in History itself - and this could successfully be brought into Divinity. He would welcome ecology input, so long as it fitted into the Department's existing teaching (i.e. it must also have a Church and historical connection).

C. Consistency of teaching methods with environmental awareness (eg. small groups, work experience, self-directed learning, communication skills and personal development planning,...)

Teaching is mostly in seminar form; there is only one large lecture class. Recent reform of the curriculum has meant more small modules/seminars, focusing on debate.

D. Material resources + staff training implications of inc'd environmental education

Any expert ecology input (see B above) would obviously have to come from an outside source.

FACULTY:LAW **REF.NO.45** **DATE 3.10.91**
DEPT.:PUBLIC INTERNATIONAL LAW **NO. U/G STUDENTS:see below**
CONTACT: DR. K. KHAN **POSITION: HEAD**

A. Existing position re integration of environmental awareness

Number of undergraduate students: 90 in the general International Law course at ordinary level, 20 at honours level, and 40 in the International Economic Law course, which includes some social scientists. "Environmental" areas covered by International Law: especially international treaties and conventions (which are often required to deal with oceanic and atmospheric - i.e. large scale interactive - environmental problems); questions of international jurisdiction (which are at the heart of the problems of international natural resource allocation, such as fisheries); and assessment of the institutional practices of international lending agencies such as the World Bank. Teaching in these areas looks at the descriptive issues of what international legal provisions there are, and what sanctions or measures there are to enforce them. So, for example, the policies of the UN Environment Programme, and how they are implemented, are described. Ethical issues are also treated in a "positive" manner (i.e. not from a normative point of view): e.g. the refusal of India to sign the 1990 International Convention on the Environment because it feels the convention would impose an inequitable burden on India as a developing country.

The level of student interest in environmental issues (such as acid rain and rainforest development) is thought by Dr. Khan to be quite high, though at undergraduate level teaching is probably not specialised enough to consider these substantive issues in detail, and anyway many environmental problems are so new that good primary (legal) information about them is not available.

B. Potential (ie. perceived need, and/or opportunity) to extend environmental education via integration and/or foundation courses

Dr. Khan sees the value of introducing an integrated, self-contained course incorporating the international environmental issues already treated in an un-integrated way, as noted above. There are no specific plans to introduce such an integrated course at present, the constraint being money rather than lack of interest.

International environmental issues inevitably involve some understanding of complex ecological systems and Dr. Khan reckons that the Department could certainly benefit from expert ecological input from outside the Faculty.

At present the teaching of the Law Faculty emphasises pragmatic, vocational law, which would probably not include environmental law, Dr. Khan thinks.

C. Consistency of teaching methods with environmental awareness (eg. small groups, work experience, self-directed learning, communication skills and personal development planning,...)

The Law Faculty concentrates particularly on small group teaching:

it is seminar based. Communication skills are emphasized, especially debates and oral presentations; this is inevitably part of the training for a lawyer, so the Faculty probably provides a better education in these practical skills than most other Faculties.

D. Material resources + staff training implications of inc'd environmental education

Dr. Khan thinks that the present staff is fully competent to teach environmental international law; but redirection of resources in this direction would be extremely difficult at present because of existing commitments. For example, even the highly popular International Economic Law, which last year had 50 applications from postgraduate students, is difficult to allocate time to.

FACULTY: MEDICINE REF.NO. 23 DATE 23.9.91
DEPT.: GENERAL PRACTICE NO. U/G STUDENTS: 25 FTE's
CONTACT: PROFESSOR JOHN HOWIE POSITION: HEAD

A. Existing position re integration of environmental awareness

The Department teaches undergraduate students in groups of 15 for 4 weeks at a time. Only one day a week is spent in teaching; the rest of the time students are attached to local practices, and make the rounds with practising doctors. (This takes place in 4th or 5th years, depending on the 'carousel' of the curriculum.) The Department aims to develop interviewing and listening skills, i.e. particularly the psychosocial aspects of patient care, treating individuals as humans. The aim is to redress the balance away from what is seen as over-factual clinical teaching in the hospital, which does not adequately teach students about the patient-doctor relationship or about the position of the patient in his or her community. In this treatment of the whole person of the patient, and in the significance placed upon the patient's community, the Department is holistic in philosophy, and is identified as such by students. There is an emphasis on setting and context, rather than technical reductionism.

Environmental, or community illnesses - e.g. from drugs and alcohol abuse - are picked up on informally, though there is no actual formal session on these subjects. Substantive environmental medicine is not taught: this is the speciality of Community Medicine.

B. Potential (ie. perceived need, and/or opportunity) to extend environmental education via integration and/or foundation courses

From July 1992 onwards, the Department is to share a 16 week block of teaching with the Psychiatry Department - with General Practice's teaching being doubled from 4 to 8 weeks. New subjects to be covered include ethical and social ones, such as death, dying and bereavement (i.e. medical sociology); and ethical principles - e.g. the ethics of the community versus the individual, and of the treatment of AIDs.

C. Consistency of teaching methods with environmental awareness (eg. small groups, work experience, self-directed learning, communication skills and personal development planning,...)

Almost all education within the Department is non-didactic. There are initial, flexible seminars, but these are soon replaced by student projects which include self-assessment of videos they have produced, working with each other, etc. Self-directed learning is encouraged: students are given a topic and then required to follow it up on their own. The topic might, for example, be diabetes as it is seen by the patient (e.g. the social stigma involved); another topic might be dealing with the families of patients, which affect both the patient's health and the interaction of patient and health-carers.

The Department practises continuous assessment of students, which has a larger share than formal examination. This is thought to redress the over-emphasis on the technical side of medicine.

D. Material resources + staff training implications of inc'd environmental education

The Department was formerly put at a disadvantage by the NHS (no funding was given for community medical teaching), until recently. £2million was recently made available by the Government, and the Department is now reasonably well-resourced from non-University sources. As indicated above, its activities are expanding at present; but in fact there has been no increase in staff, though no decrease either. Re-training is desirable, for the new courses planned, but difficult in the very limited time available to members of the Department who are practising G.P.s (70% of the Department's time is in actual medical practice).

FACULTY: ARTS **REF.NO.60** **DATE 18.10.91**
DEPT.: CELTIC **NO. U/G STUDENTS: 130 (years 1-4)**
CONTACT: PROFESSOR W. GILLIES **POSITION: HEAD**

A. Existing position re integration of environmental awareness

This Department teaches about historical and modern Celtic culture - placing emphasis, in the modern period, on Celtic culture in Scotland - and covers language, literature and history. Prof. Gillies suggested that this teaching is relevant to the environment in many ways, primarily because Celtic cultures have displayed a "tremendous sense of place", or closeness to place, through their history. (This has been particularly so in the culture of the Highlands of Scotland, with which the Department has strong links.) Celtic culture reflects the natural environment in its art, through the livelihood gained there, and in religion (for example, the Highlanders found biblical justification during the Clearances for their claim that the land belongs to the people who live there).

The Department works closely with colleagues in the School of Scottish Studies, whose involvement in 'environmentally-relevant' areas also taught by Celtic is many-sided. The course jointly sponsored with the School, Scottish History and Geography (the history of settlement in Scotland), is a prime example.

B. Potential (ie. perceived need, and/or opportunity) to extend environmental education via integration and/or foundation courses

The Department has a number of links with the rest of the University and beyond which are environmentally relevant. It has worked with ecologists and botanists (for example, from the Nature Conservancy Council, whose staff working in the Highlands are aided by an understanding of Gaelic place names); and outside experts have given lectures in the Department on natural history, geography, anthropology, etc - an input which could be expanded. There have also been links with the Highlands and Islands Development Board in the study of social and economic regeneration, including areas with important effects on the natural environment.

The Department would like to build more contacts with outside environmental experts. There is also scope for combining with other departments in particular areas which may have an environmental aspect, such as Scottish community studies (perhaps along the lines of the joint Scottish History and Geography course, mentioned above). The Department would also like to participate in a community-based study centre, perhaps in the Highlands.

C. Consistency of teaching methods with environmental awareness (eg. small groups, work experience, self-directed learning, communication skills and personal development planning,...)

Celtic studies cover a wide range of cultural experience. Sources are diverse, so students have to be resourceful in getting information. Students have made a unique collection of community poetry, song, proverbs, lore and stories in Gaelic, many of which involve the environment. Professor Gillies remarks that, "to us, as to the Gaelic bards, the eco-system includes man".

The Celtic Department has long incorporated teaching methods which are now seen as innovative even from a business or technical perspective, and the Department perhaps goes some way beyond those listed in this question. Of particular interest is that the Department is alive to the potential of, for example, field trips, to help students become sensitive to connections between the art and culture they are studying and the places that inspired and shaped them. By contributing to the understanding of folk attitudes to the environment, the study (in this department and elsewhere in the University) of Celtic regions may have considerable significance in building and affirming the cultural reservoir of values which have been lost in many other parts of the West but for which there may be a growing need in wider society. This provides a very different slant on "holism" from the perspective mentioned elsewhere - which 'merely' involves teaching a widened range of subjects academically.

D. Material resources + staff training implications of inc'd environmental education

Prof. Gillies believes that any innovation would cost money. He feels the Department is already stretched by a heavy teaching load and the distant geographical location of much of its subject-matter. Further resourcing would be of immense help, particularly for field work, whether in Scotland or the Celtic world beyond.

FACULTY: SCIENCE **REF.NO. 8** **DATE 20.9.91**
DEPT.: GEOLOGY & GEOPHYSICS **NO. U/G STUDENTS: 280 FTE's**
CONTACT: PROFESSON G. BOULTON **POSITION: HEAD**

A. Existing position re integration of environmental awareness

'Environmental' education within this Department is set within a disciplinary context solely - it is left up to students to be environmentally aware people. The geologist's point of view is fundamentally a historical one (over very long time-scales); the present is part of a continuum from the past: this is essentially a dynamic view. This more holistic geological philosophy complements the more reductionist sciences: for example, the mathematician aims to find analytical simplicity, whereas the geologist appreciates the complexity of the environment. Maths has underpinned the development of environmental modelling; but the philosophy that underlies geology emphasises that precise mathematical solutions are not required - the emphasis then shifts to computer trial-and-error learning and searching for solutions. Geology emphasises structure, not reduction to homogeneous elements and scientific laws. In fact maths is increasingly appreciating the importance of structure; for example, Chaos Theory allows the theoretical description of complex systems, by mathematical pattern-matching. Mathematically-based geological modelling can now describe circulatory patterns of oceans and atmosphere, and how they have changed over time. These models can be used to simulate complex systems behaviour in the future, and they can be tested against the excellent information on climatic change from the geological record of the past. Thus geology can give great insights into global warming, for example: it has a major environmental part to play, according to Professor Boulton.

B. Potential (ie. perceived need, and/or opportunity) to extend environmental education via integration and/or foundation courses

More and more of the kind of complex-systems prediction knowledge described above is coming into undergraduate courses. Two new degree subjects on environmental sciences are to be given in the Department: 'Geology and Physical Geography'; and 'Environment Geoscience' - with the latter being particularly relevant to the new thinking (above).
Professor Boulton sees the ability of geologists, and other scientists, to communicate with each other and with non-scientists as being extremely important. The Department is therefore planning that there should be formal interactions between departments in courses on environmental chemistry, environmental engineering and environmental geoscience. There are also close links between the Department and the Institute of Ecology & Resource Management: the course called 'Global Environmental Processes' given by the Geology Department, is planned to be given to biologists and ecologists.
Professor Boulton sees environmental interaction as consisting primarily of dynamic fluidical systems, and these underlie the subject-matter of many of the sciences, which therefore have common territory upon which to interact.

Professor Boulton believes that environmental ethics can be fed into science courses, but should be introduced gradually to develop the enthusiasm of scientists; it should not be imposed. There are already links between the Geology Department and environmental lawyers from outside the University.

C. Consistency of teaching methods with environmental awareness (eg. small groups, work experience, self-directed learning, communication skills and personal development planning,...)

Starting this year, in collaboration with the Enterprise Centre, Fourth Year students will undertake one week's work of practical, real-life problem-solving with the Shell Corporation. There are also plans to expose students to the political problems which form the context in which they will practise - for example, the social problems of land-use conflicts, interest groups, etc.: this is intended as an awareness-raising exercise for scientists in the political, real-world environment.

D. Material resources + staff training implications of inc'd environmental education

Material resources required for the expansion of environmental education in the Department are insignificant: after a massive review of earth science teaching in the U.K. four years ago, Edinburgh University was given additional resources to fend off increasing competition from abroad. There is a low student/staff ratio; and excellent research income.

Staff re-training will be required in, for example, fluid dynamics. Professor Boulton believes this will probably happen on the job; the aim is to encourage those who have already expressed interest in environmental subjects, and give them the necessary opportunity.

FACULTY: SOCIAL SCIENCES REF.NO.49 DATE 3.10.91
DEPT.: BUSINESS STUDIES NO. U/G STUDENTS: OVER 600 FTE's
CONTACT: PROFESSOR A. McCOSH POSITION:HEAD

A. Existing position re integration of environmental awareness

This department teaches the ways in which the market (i.e. industry and consumers) may have a positive effect on conserving the natural environment. For instance, it is suggested (in line with standard economic theory) that if a company is to be sustainable in the long run it must use a sustainable resource supply, and therefore has an incentive to maintain resource sustainability. Thus well-run companies have an incentive to restore renewable natural resources they use, other things being equal (e.g. so long as they cannot 'mine' the resource and move to another country.) The economic principle of consumer sovereignty also leads to the presumption that well-run companies will respond to the environmentally-aware wishes of their customers; and trade associations may prevent even maverick companies from tainting the environmentally-conscious image of the industry as a whole. It is therefore suggested that industry is to some extent environmentally self-regulating. Where companies are not well-run and do not "aspire to permanence", the theory is that it may be necessary for government to intervene to regulate environmentally-

damaging practices, though "government failure" means that this intervention is often less-than efficient. Some business law - the result of government legislative intervention in the market - is taught in the Department, but would not refer to the Polluter Pays principle or 'green' taxes except in passing.

B. Potential (ie. perceived need, and/or opportunity) to extend environmental education via integration and/or foundation courses

Prof. McCosh believes that "economic" issues are already fully covered in the Department; but there are departmental gaps both in the technical ecological information required for proper management of natural resources (e.g. measurement of sustainable harvest levels), and in ethical environmental input to business courses. He advocates the addition of a lectureship in the field of Environmental Ethics in Management, for all Business Study degree programmes, which he feels would be very popular provided it was "rigorous in content and form". Even so, he believes that the Department already exposes undergraduates to many social and ethical questions "for the relatively mundane reason that we could not claim to be teaching them how to be managers if we did not". Prof. McCosh also believes there would be value in educating ecology students about the business environment - particularly about the benefit to the community, and obviously the economy, of wealth creation: he believes society should balance the social benefits of business against its social (including environmental) costs, in a rational way.

C. Consistency of teaching methods with environmental awareness (eg. small groups, work experience, self-directed learning, communication skills and personal development planning,...)

In 2nd and 3rd years, all courses involve self-selected essay or project work, presentations by students of their results, and small group work. "These teaching methods are adopted because they work better than other methods, and have not been evolved because of environmental issues."

D. Material resources + staff training implications of inc'd environmental education

The Department does not have the expertise to deal with technical ecological questions (see above), or with some of the more esoteric aspects of environmental ethics; outside input would be welcomed in both areas. For example, "if it is felt that there is need for a course or series of courses, to augment the teaching we are already providing on the social and ethical issues raised by environmental analysis, we would be happy to put these through the necessary boards of studies in due course. We have a student staff ratio of about 22/1 at the moment, and would therefore require help to do it." Prof. McCosh also feels that the Department would not need "any additional resources for dealing with the economic issues of the environment. This aspect is dealt with very fully now."