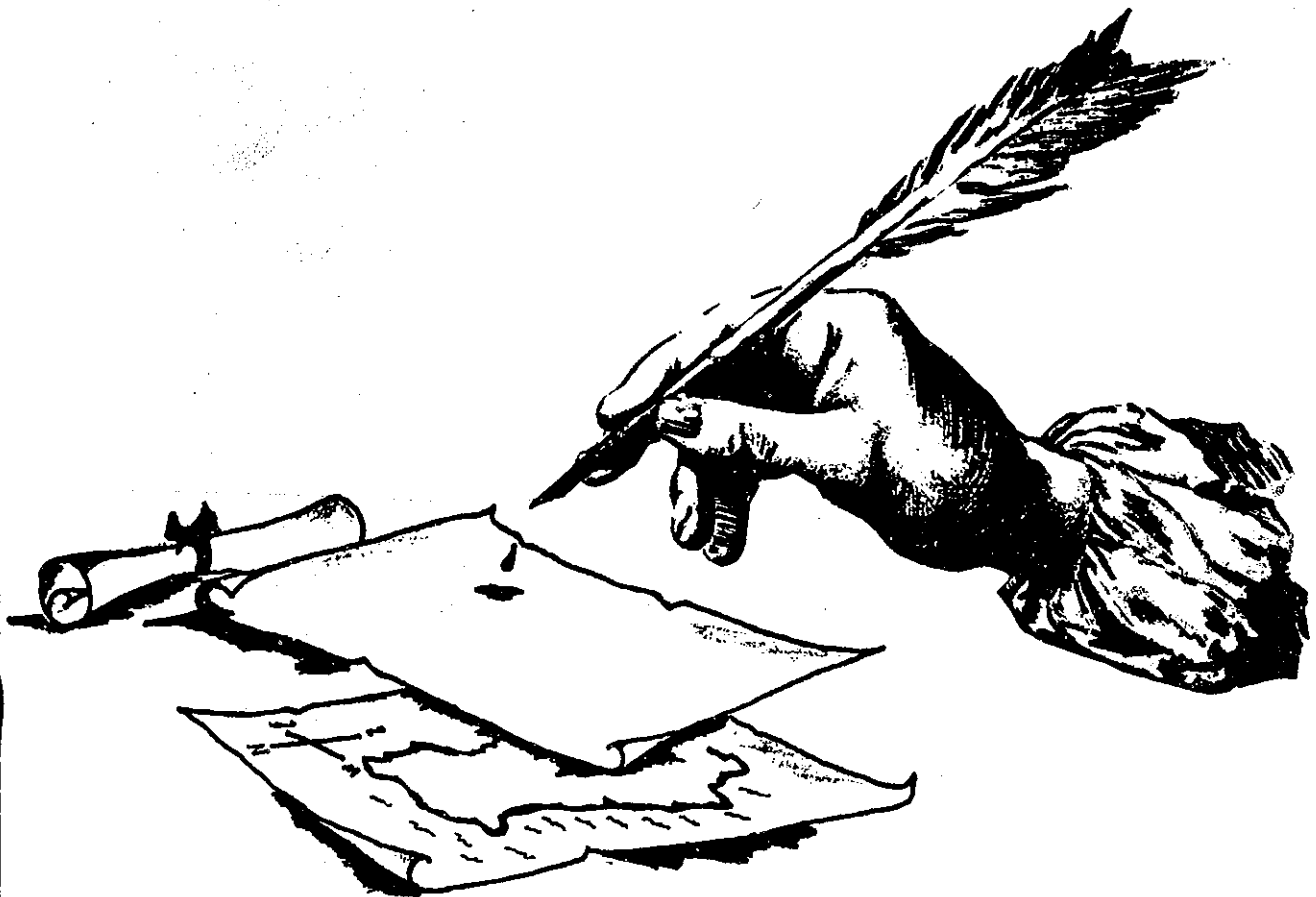


Review '89



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Editor/Typist - Jacqueline O'Donnell B.A.
Cover Design - Mary Coleman B.A.

Editorial

Milieu 89 continues to propagate the work and interests of the geography students in Maynooth College, and this publication is a fine example of the variety, and depth of their enthusiasm.

By glancing at the table of contents one can see a great resurgence in interest in physical geography, often considered the more difficult and scientific area of the discipline. This resurgence is heartening to note as it shows that students are willing to take up the challenge of scientific fact. With the global affects of man's habitation becoming more and more obvious, the origin of the landscape and atmosphere, and what affects it are of current importance.

It has been an active year for Maynooth geography students. I was glad to see a Geography society committee dominated by ladies, I am sure it was a refreshing change.

The Geography Congress, its successful planning and the victory of Alan Kehoe were undoubtedly the highlights of an enjoyable weekend.

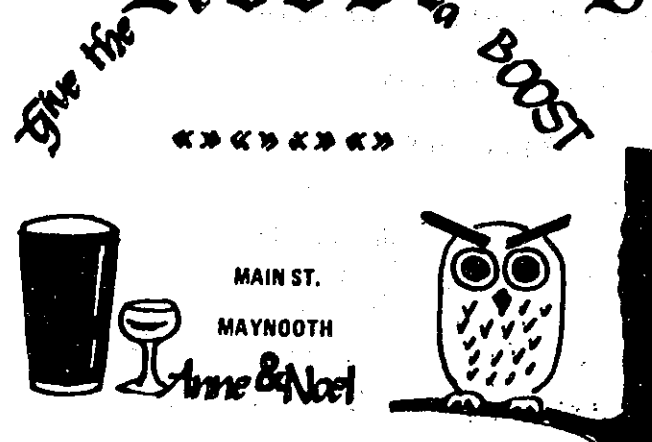
Thanks must be given to the various distinguished speakers who contributed to the success of this year; Dr Peter Lloyd, Dr Julian Orford, Fred Aalen, and last but not least, Professor T. Jones-Hughes, who gave his second public lecture here since his retirement.

Finally I must thank Mary Coleman for the cover, and to wish Jim Walshe continued success.

Jacqueline O'Donnell - Editor

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MILIEU 1989

The appearance of MILIEU once again signals the termination of yet another academic year and the continuation of a student publishing tradition that is the envy of many societies within the college and indeed the cause for comment from departments of Geography elsewhere in Ireland.

The present year has been immensely rewarding for Geography in Maynooth. Last October saw the augmentation of the teaching and research strengths of the Department by the welcome arrival of Jim Walsh, an agricultural geographer with a strong interest in regional development. Already he has made his presence felt in lecture theatres and field trips alike.

Among the student body the greatest achievement must surely have been the very successful hosting of the student geographical congress in February. Galway, Cork, Belfast, and U.C.D. All attended and an array of worthwhile research papers was presented - most with a considerable degree of maturity and flair. Maynooth was awarded first and second prize by the jury, a result which was well deserved. Heartiest congratulations go to Alan Keogh (winner), and to Pat Mc Kenna, and Mary Quinlan.

The present academic year has also had considerable significance for our graduates. Dymphna Mc Loughlin and Gerald Toal both received their Doctorates from Syracuse University, and Maurice Leavy won a prize of 1,000 in the N.U.I. travelling studentship. Maurice goes to Toronto in September to pursue further study in climatology and will be funded by a Connaught Fellowship.

W.J. SMYTH.

Auditor's Report

Another year is drawing to a close and once again time to evaluate another busy year in the Geography society. Fairs Day proved highly successful for the geography Society, with membership rising well above the 200 mark. I'm certain that the fact that the committee who literally dragged people to the stand has no bearing on the increased numbers whatsoever.

We were very fortunate to have for our inaugural lecture, Dr Peter Lloyd (Dickens and Lloyd fame) from Manchester University, now currently engaged with Liverpool University. Because of snow in Zurich??? Dr Lloyd was delayed at Manchester Airport. After much confusion and many telephone calls from the Geography Department offices, Dr Lloyd arrived alive and well. His lecture on the "Geography of Labour Markets in Britain" was well received by a packed theatre and overall the event was a great success.

Our second speaker was Dr Julian Orford, Q.U.B. His chosen topic "Development Problems in Sri-Lanka" proved very interesting, and an enjoyable evening was had by all. In January, Fre Aalen travelled from T.C.D. to give a lecture on "Health and Housing - Problems in Victorian Dublin". The lecture was well received especially by Denis Pringle who, as we all know has a soft-spot for the area. Our last lecture of the year was given by the distinguished Professor Tom Jones-Hughes. We were privileged to have Professor Jones-Hughes as one of our guest-speakers. His lecture "Aspects of Irish Historical Geography" was his second public lecture since his retirement from U.C.D.

Now to the undoubtedly, the highlight of the year - the Inter-college Student Geography Congress, which Maynooth had the privilege of hosting this year. Student geographers travelled from Q.U.B., UCD, UCC, and UCG - the first time in many years UCG students have competed in this event. The weekend proved highly successful.

My congratulations to Alan Kehoe (3rd Arts) for winning the Fahy Memorial trophy. This is the first time Maynooth College has won this coveted trophy - well done Alan!! Congratulations also to Pat McKenna for being placed second and to Mary Quinlan, who gave a tremendous paper, despite interrogations from the Q.U.B. judge.

I would like to thank all those who helped in organising the congress. Their help was much appreciated and will not be forgotten. I would also like to extend my thanks to the Geography department especially to John Sweeney and Professor Smyth. Without their help and support throughout, the Geography Society would not have enjoyed such a successful year.

And last, but by no means least, credit is due to the enthusiasm and hard-work all year by the remaining members of the committee. They are Audrey Mooney, Karen McGrane, Maria McKenna, and Mark Rave. My thanks also to Conor Donnelly who helped with the advertising for Milieu. It should also be noted that Audrey's book-keeping won £10 for herself, and £25 for the Geography Committee.

And also a word of thanks to Joe Leyden for all his help and advice throughout the year.

Catherine Sproule - President

Pleistocene Geomorphology of the Slieve Bloom Mountains

The Slieve Bloom mountains provide a remarkable insight into the legacy of the Irish Pleistocene. Both the Munsterian and the Midlandian glaciations affected the mountains but in remarkably different ways. The most recent glaciation of the two, the Midlandian, had the most profound affect on the landscape of the mountains.

This glaciation advanced on the Slieve Blooms from the north about thirty thousand years ago. The ice mass was relatively small and therefore was not powerful to surmount the mountains. As a result the ice split into halves, one went around the mountains to the east and the other to the west. This banking of the ice on the Northern side of the mountains has left behind a vast network of eskers and glacial till in the area. Cross-sections of some of these eskers has revealed the typical sorting that is to be expected in a fluvio-glacial deposit.

The ice mass that went around the mountains to the west deposited many blocks of Galway granite and a large block of quartzite. The natural bedrock of the Slieve Blooms is old red sandstone, with some small deposits of Silurian and Devonian origin, but both granite and quartzite are completely foreign to the mountains. This means that they must have been deposited by an external force that originated in the west of the country. This force was the Midlandian glaciation.

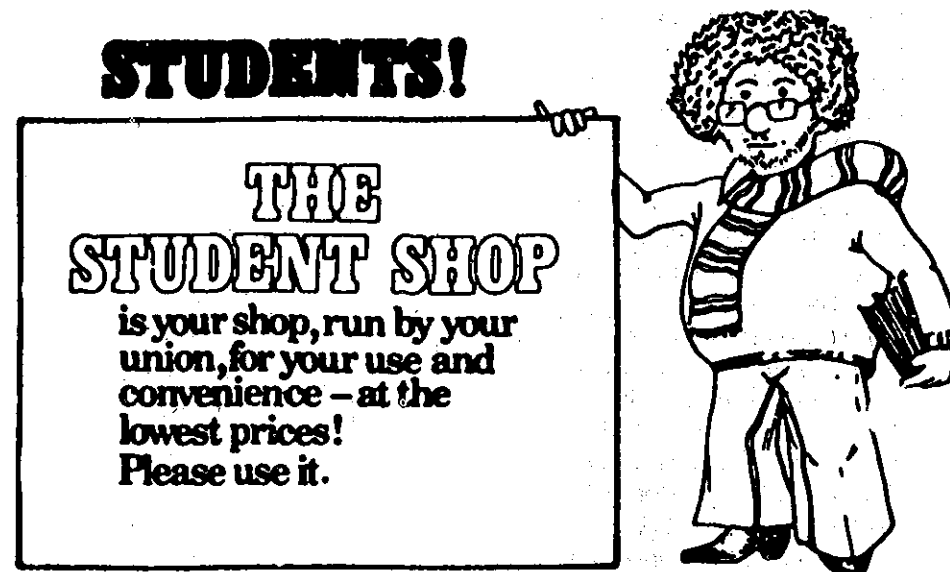
The lobe of ice that went around the mountains to the east also left excellent evidence of its existence. Glenbarrow is a glen in the northeast of the mountains and it provides one of the most striking examples of the magnitude of the Midlandian glaciation that exists in the mountains. The river Barrow has eroded its way through the glacial till in the area and in doing so has left a 150ft cross-section of this till. The till consists mainly of large cobbles in a clay and sand matrix. The extent of this deposit (150ft high and continues downstream for 2 miles) does give some indication of the extent of this glaciation.

These two lobes of ice reunited on the southern side of the mountains and came to a halt. It was in this region that the ice began to melt. Therefore this area also contains many eskers and the undulating landscape associated with glacial till is also prevalent. The southern side of the mountains also exhibits the only major example of a glaciated valley in the mountains. Glendine East exhibits the classic over-deepened profile that is to be expected. The ice that was flowing out of this valley flowed into the area where the east and west lobes of ice were in conflict and so some of the glacial deposits on the southern side of the mountains consist mainly of rocks of local origin (ie. red sandstone).

The evidence that exists for the Munsterian glaciation is not nearly as dramatic for a number of reasons. The primary reason is the fact that this glaciation preceded the Midlandian, and so many of the deposits it left behind have since been obliterated. There has never been a confirmed deposit of Munsterian age in the Slieve Bloom mountains, although it is known that the ice mass was powerful enough to surmount the top of the mountains. Recently however, a

deposit of granite was exposed at a height of about 1,600 ft. This granite is well above the range of the Midlandian glaciation and so could not be of Midlandian origin. This assumption is reinforced by the fact that the granite is of a type previously unseen in the mountains. This rock is very white in colour and is very fine in composition as it is only partially metamorphosed. In fact it is nothing like the darker, much coarser granite deposited by the Midlandian waves of glaciation that were mentioned earlier. These profound differences mean that this rock was not deposited by the Midlandian glaciation. This is, therefore the first ever confirmed Munsterian deposit in the Slieve Bloom mountains.

Alan Kehoe (3rd Arts) The Winning paper at the Geographical Congress



The Soviet Union - Some Misconceptions Exploded

To many in the west, the Soviet Union is a cold place, not only climatically, but socially also.

On a short visit to the Soviet Union recently, I viewed most of the well known tourist attractions, but I also took the Metro to places 'off the beaten track'.

We perceive that the Russian people are miserable in their existence. I must say that this is not an accurate assumption. While my eyelashes froze and fell off, as well as my face exploding with frostbite in -14 conditions, the Russian ladies looked serene. Some of them quite beautiful. A far cry from my vision of large, clumsy and visually plain women.

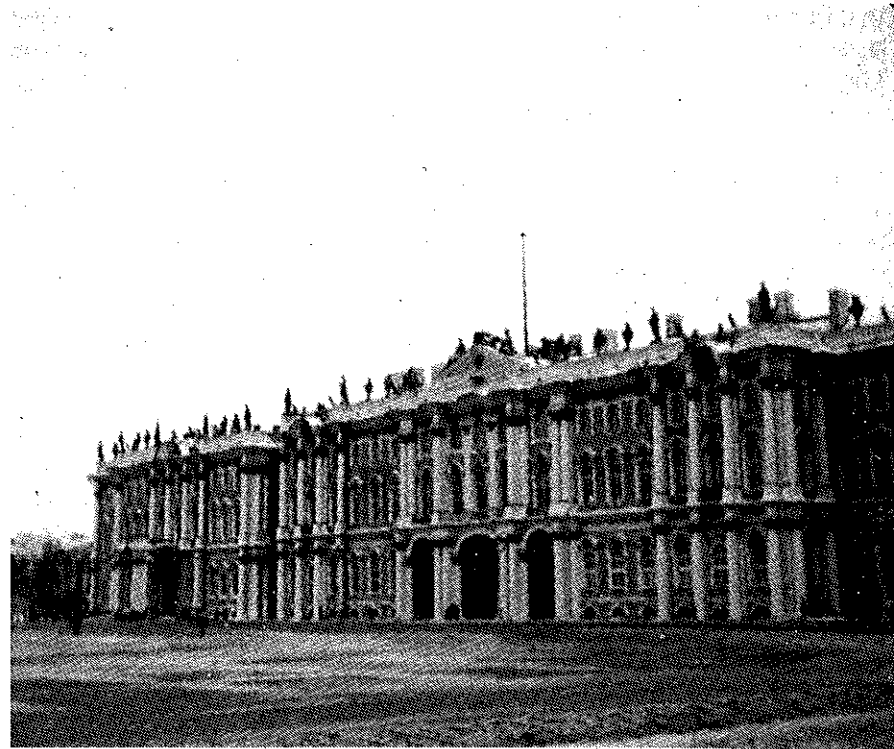
In such cold conditions, life went on as usual. Public buses were parked and left running all night. Women sold delicious savoury pancakes on the street by day from portable warm cabinets. There were queues for everything. Queues for ice-cream, sold from lorries outside the Metro stations. I was amazed by this and asked the Guide why ice-cream was so popular in such cold conditions. She laughed, explaining that ice-cream may not have been on sale for over 6 months, so they took it whenever they got it.

The contrast between Leningrad and Moscow is a very stark one. Leningrad (formerly St Petersburg) is a beautiful and elegant place. It was the Czarist capital, and this is obvious everywhere. The architecture is full of grandeur. The natives appear to be strangely proud of this city. The Winter Palace, the former home of the Czars is now a museum, with all artifacts perfectly preserved. The city is full of gardens and small parks, the trees covered to protect them against the extreme cold.

Moscow is purely functional. Apart from the colourful and bronze-plated domes, which are scattered around the city, the remainder is grey and unattractive. Although it must be admitted that Red Square is spectacular. The Metro system facilitates Moscow's functional role. Without it, everything would grind to a halt. Lenin's vision of the Metro being of primary importance to the life of the average Russian is fulfilled. On the subject of Lenin, he is revered as a prophet. A full museum is dedicated to him. There is no trace of Stalin, it is as if he never existed.

The Russian people appear happy, they do not look suppressed. They are a nation of readers. Every second shop is a bookshop or Library. They stand around the streets talking and laughing, even though it is many degrees below zero.

Russian television is something. There is much imitation of the western programmes, and this is amusing. Reader, I wonder do you remember Starsky and Hutch? - a programme where the cops jump into a flashy car in pursuit of the baddies. In Russia, they have their own version. The cops do chase the bad guys. I could'nt imagine anyone getting caught, as the Russian cops sped off in a Lada.



The Winter Palace - former home of the Czars



St Basil's Cathedral in Red Square

IRISH GEOGRAPHY - A DERIVATIVE DISCIPLINE

Irish Geography is a comparatively young subject in an old country. To judge whether it is a derivative discipline, this article will look at:

- (1) The fields of studies in Irish Universities prior to the emergence of Departments of Geography.
- (2) The reasons for founding Geography Departments.
- (3) The three founding fathers of Irish Geography.
- (4) First generation Irish Geographers.
- (5) More recent Influences.

(1) The fields of Studies in Irish Universities prior to the emergence of Departments of Geography

Trinity is about to celebrate its quadricentenary and the three constituent colleges of the federal Queen's University of Ireland and Newman's Catholic Universities are just over one hundred years in existence, and Maynooth is almost 200 years old.

Geography had been taught in various forms as part of a general degree in these Universities mostly as physical geography under the mantle of geology departments or combined within the natural science faculties.

Professor Joseph Jukes read his remarkable paper on 14th May 1862 which drew attention to the certain anomalous features in the drainage patterns in Southern Ireland, especially the way the rivers Shannon, Barrow, Blackwater, and Nore leave extensive lowland to follow narrow constricted courses through mountain ridges. Jukes' paper was a pioneer in the evolution of a regions' drainage patterns.

Professor Charlesworth was appointed to the chair of Geology at Queen's Belfast in 1921 and made major contributions to the Quarternary Studies.

Robert Lloyd Praeger was a pioneer and leading biogeographer. his origins were in the natural sciences. It was Praeger who initiated an invitation in March 1934 to invite the Danish palynologist, Professor Knud Jessen to visit Ireland, a momentous year for biogeography, and for the young Frank Mitchell who assisted Jessen in his field work.

(2) The Reasons for Founding Geography Departments

In Britain, it was not until the end of the 19th century that geography as a subject was recognised as an independent academic discipline. Educationalists saw the need for a supply of qualified teachers of the subject in view of the growth of secondary school geography.

After the first World War, the student numbers had doubled at Queens University Belfast from 514 in 1913-14 to 1225 in 1926-27, and it was felt appropriate that additional teaching staff should be appointed and one should be a lecturer in geography, to establish a new course in human and regional geography - supplementing the already existing courses in structural and physical geography and geology, taught by Professor Charlesworth and his staff. E.Estyn Evans was appointed from 1st October 1928, and ever since, Evans and the progress of geography at Queens have been synonymous.

Whether Trinity was in any way influenced by the geographical developments at Queens is hard to say. But by

1931, the Board of Trinity College decided to appoint Louis Smyth as the first lecturer in geography: second was Van Byl in 1934. The third and most influential appointment for the progress of geography was Thomas Walter Freeman, who took up his duties at Trinity College on 17th January 1936.

Four years after the chair of geography was established at Queens in 1945, the Geographical Society of Ireland began to take an interest in the status of geography within the other institutes of higher learning and urged upon the President of University College Dublin the importance of making geography a degree subject. Subsequently, Tom Jones Hughes was appointed to the staff of UCD as the lecturer in geography in 1951.

UCC and Magee College Derry also opened Geography Departments around this time.

(3) The Three Founding Fathers of Irish Geography

Estyn Evans The early and continuous presence of Estyn Evans in Queens Belfast has done much for the development of human geography in Ireland. His training began in the joint schools of geography and anthropology at Aberystwyth, where he was fired with enthusiasm for the Vidal de la Blanche 'pays' school of Geography, as interpreted by his lecturer, H.J. Fleure.

Much of Evans' early field trips were the study of Ulster Megaliths of the Neo-lithic period. He wrote:-

"Most of us must have felt at one time or another the mystery surrounding these great stone monuments which stand so impressively in lonely places and fit so pleasingly into our wildest landscapes"

Estyn Evans had an eye that could read the landscape like a map or printed paper. Studies of pre-Celtic antiquities at Gweedore on the edge of the west Atlantic proved that the inhabitants were able to absorb new elements brought in by successive intrusions. The inland and outland strip farming and seasonal transhumance showed adaptation to the harsh physical environment. Perhaps the 'Mourne Country' is his most ambitious approach to regional description. His aim being to trace the intimacy of a small and well loved region. An example of the physical and human responses which make up the Irish countryside. His writings are essentially reading for any geographer seeking to understand the foundations and subtleties of Ireland's human geography, which more often than not, remains invisible to the eye of the English officialdom.

Thomas Walter Freeman T.W. Freeman was lecturer in geography at Trinity from 1936-1949. He graduated with a 1st class degree from the University of Leeds. The topic of his M.A dissertation was Asiatic migrations. Before coming to Ireland he was a lecturer in Edinburgh with Professor Ogilvie.

Almost single-handed Walter Freeman led an assault on Ireland's economic and social geography. No one before him had explored the census and government commission reports with such intensity. His book *"Ireland, its Physical, Historical, Social and Economic Geography"* was an invaluable guide for a whole generation of Irish geographers. Such a specialised systematic treatment of economic geography was a rarity at this stage. *"Pre-famine Ireland"* is probably his best book on Ireland.

He was author of a series of studies published in the Journal of the Statistical and Social Inquiry School of Ireland, and also wrote an important series of Irish regional studies based on information from his many field trips. His enthusiasm and legacy of research in the Bulletin of "Irish Geography" fired enthusiasm for Irish Geography students at Trinity for years to come. Freeman's *"A Hundred Years of Geography"* 1961, is a more recent attempt to provide a history of the discipline.

Tom Jones Hughes T. Jones Hughes, another Aberystwyth graduate, was appointed to UCD as the first professional geographer in 1950, and has in turn trained a whole generation of Irish geographers.

Much of his work has been on the dialectic between intrusive and indigenous forces in post-plantation Ireland. Landlordism was nothing new to him as his father and kinsmen had been tenant farmers in Caernarvonshire in the heartland of native speaking non-conformist Wales. Unlike Evans, who could be criticised for lack of documented evidence, and for using word of mouth and great leaps of imagination, Jones Hughes used the official and richly documented 19th century sources, particularly the Griffiths evaluation as well as extensive field studies. Jones Hughes pioneered the examination of the complex regional and local distribution of the varied socio-economic strata that characterised both rural and urban Ireland in the mid 19th century.

Regional geography, as a study of the totality of areas, taught by Professor Bowen at Aberystwyth was used by Jones Hughes in his approach to deal with Irish problems with much understanding and sympathy. Jones Hughes never insisted on narrow orthodoxies of creed or discipline and allowed wide freedom of action in departmental and research activities. He has published widely in *Irish Geography* and other publications and has contributed essays - one in particular is "Towns and Baile in Irish Placenames"

(4) First Generation Irish Geographers

In the early days, geography departments were the Cinderella's of University disciplines with maybe one or two lecturers, very small libraries and few maps or equipment. The first students would have been exposed to literature and personnel from Britain. Estyn Evans chose H J Fleure by then lecturer at the University of Manchester and Professor Bowen from Aberystwyth as early outside examiners at Queen's. All through their careers, Estyn Evans and Carl Sauer mutually respected each others work and had a close working relationship.

There appears to have been a strong bias towards Cultural, Historical and Rural topics in the Republic following the dominant ethos of De Valera's Ireland, whereas Emrys Jones and Fred Boal pioneered urban and social geography in Belfast. Other geographers of this era are:- Desmond Mc Court, R.H. Buchanan, Brendan MacAoda, Joe Houghton, and Desmond Gillmor.

(5) More Recent Influences

After the 2nd World War, academic research could no longer operate in a void. work in universities had to accommodate the world outside and instruct students in academic frameworks suitable to current needs of society. Post war

rebuilding led to urban planning, updating of maps which had proved inadequate during the war, led to aerial photography etc. - meteorology into climatology, and so on.

To study the progress of Irish geographers and the focus of their interests "the Irish Geographer and Geographical Viewpoint" give almost complete records of their activities, not only as members of staff of 3rd level institutions, but also those "out in the field".

In the 1950's, sociological thought of man's relationship with his environment emerged in the Chicago School and North America, becoming the centre for much philosophical debate. Many Irish geographers have studied in North America over the last 20 years and will have been influenced by the debate in recent years as to the proper philosophy for the discipline. Some would say it has gone full circle. Is the new regional geography "Estyn Evan's geography in a later 20th century guise?"

Conclusion

Irish Geography has been shaped like the country itself, by the coming together of the native and the immigrant, the interaction of the outsider and the insider and application of techniques and perspectives from the wider geographical community has provided us with a lens through which to view the complexities of this island. The expanding role of geography in Irish life today can be gauged by the teaching and research emphases of the full time staff members in Irish Colleges.

Irish Geography began as a derivative discipline and reached maturity over the last 20 years, producing its own first class geographers. With the world shrinking into a global village, no one can escape outside influences. Irish geography will continue to be a derivative discipline, but with its own geographers shaping its future and producing geography graduates relating Irish requirements for the 1990's.

Jacqueline Taylor (3rd Arts)

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CARBON DIOXIDE AND CLIMATE CHANGE

Carbon dioxide (CO₂), a naturally occurring gas in the earth's atmosphere, is an important determinant of the earth-atmosphere thermal balance. This gas traps energy, since it is transparent to incoming shortwave radiation but absorbant of outgoing terrestrial radiation (in the wavelengths 7-14 μ m) which would otherwise escape to outer space. Thus warming of the surface of the lower atmosphere occurs by what is called a "greenhouse effect". The levels of this gas in the atmosphere have increased from 260 to 300ppm (parts per million) in 1880 (considered the pre-industrial value) to 335ppm in 1980. Although there is difficulty in estimating future production of CO₂ there is general agreement that atmospheric CO₂ could reach 600ppm by 2080. In screening the existing knowledge about the possible effects of such a doubling of CO₂ levels, a panel of the U.S. National Academy of Sciences (N.A.S.) found the most probable warming effect to be an increase of 3 \pm 1.5 c. in mean global surface air temperature. Clearly such an increase in surface air temperature is significant and would result in changes in other climatic parameters. Such an increase would make the earth warmer than for the past 125,000 years, the peak of the last interglacial and possibly warmer than for the last two million years. Further the N.A.S. body pointed out that they:

"Have been unable to find any overlooked or underestimated physical effects that could reduce the currently estimated global warmings due to a doubling of CO₂ to negligible proportions or to reverse them altogether" (Bach 1984)

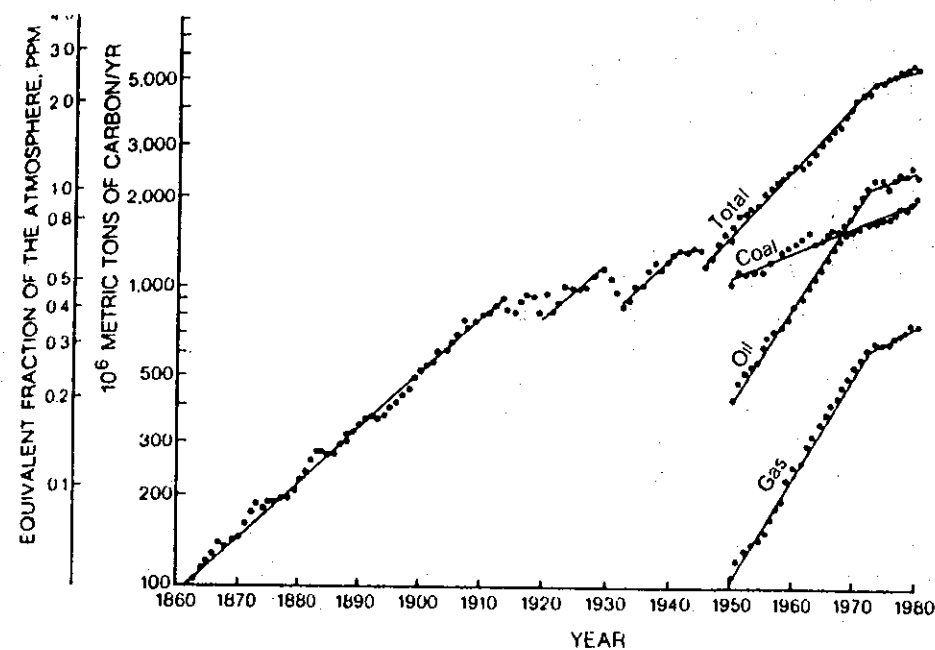
This paper first looks at sources of carbon dioxide emission and present rates of emission. From these, it will become evident that CO₂ emission is increasing and will continue to increase. To assess the impact of increasing carbon dioxide on climate it becomes necessary to predict future CO₂ emission. In dealing with the prediction of future CO₂, rates of emission and concentration are considered. While prediction is a difficult task, some predicted future energy scenarios are presented and discussed. Following from the prediction of future CO₂ levels, two methods of assessing the future impact on climate - climatic modelling and paleoclimatic reconstruction - are discussed. Having seen some of the methods for assessing the impact of increased CO₂, consideration of some of the consequences can be made. The paper concludes with discussion of the problem of detecting CO₂-induced climate change.

CO₂ EMISSION

The principal source of increased atmospheric carbon dioxide is the burning of fossil fuels such as oil, gas, coal, and other carbon based materials. Release of carbon dioxide to the atmosphere also occurs when ecosystems of high carbon density e.g. forests, are replaced by those of a lower carbon density e.g. agricultural or grazing land. Thus deforestation and soil

disturbance involve the release of CO₂ to the atmosphere. If we consider the agricultural explosion (i.e. the development of agriculture in for example the U.S.A. Eastern Europe, Australia) and the increased use of fossil fuels over the past century (see fig. 1) it is hardly suprising that the amount of atmospheric CO₂ has increased. The present pool of 711GT (gigatonnes) of carbon is being added to by about 5GT per year. From 1860 through to 1980 the amount of CO₂ in the atmosphere increased from approximately 3.67GT to 5.36GT. This corresponds to an average exponential growth rate of 3.4% per year. Ignoring breaks in CO₂ production caused by wars and the depressions the generally quoted growth rate is that of 4.3% per year. The 1973 energy crises had a big effect on energy production. The growth of oil production was slowed down from 7.1% p.a. to 1.0% p.a. Similarly gas production was reduced from 8.0% p.a. to 3.2% p.a. Of the fossil fuels only coal has shown a small increase in this time from 1.7% p.a. to 2.5% p.a. In the past oil has been the biggest contributor to atmospheric CO₂ it now looks as if coal will replace it. The good news is that overall CO₂ emissions have been reduced considerably and now stand at 1.8% p.a. Since the energy crises there have been moves towards energy conservation as a consequence of the increased price of fuel.

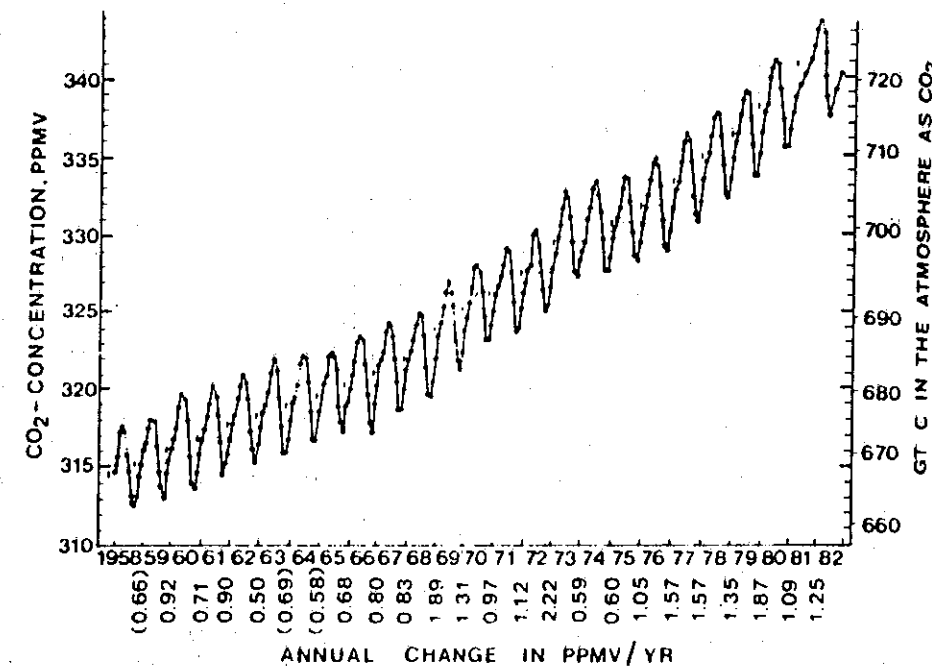
FIGURE 1: GLOBAL CO₂ EMISSION FROM FOSSIL FUELS, GAS FLARING, AND CEMENT 1860 - 1980
SOURCE: BACH (1984.1)



There has been accurate measurement of atmospheric CO₂ in Mauna Loa in Hawaii since 1958. Since then figures have indicated an increase of about 8% from 315ppm to 340ppm in 1982 (see fig. 2). In the same period the activity of terrestrial plants has increased by 0.66% per year or by 13% over the past 20 years thus adding to the atmospheric CO₂. What becomes a critical consideration is the "airborne fraction" of the CO₂ emitted. This fraction represents the amount of CO₂ emitted

which actually stays in the atmosphere. Estimates of this airborne fraction vary; however, we can safely say that the airborne fraction ranges from 0.38 to 0.72. Knowledge of the sources of CO₂, recent records of atmospheric CO₂ concentration and its airborne fraction indicate that atmospheric CO₂ will indeed continue to increase. To what extent then, is it possible to predict future levels of atmospheric CO₂?

FIGURE 2: ATMOSPHERIC CO₂ CONCENTRATION AT MAUNA LOA, HAWAII, 1958 - 1982
SOURCE: BACH (1984 1)



PREDICTING FUTURE CO₂ LEVELS: EMISSION AND CONCENTRATION

In order to predict future atmospheric CO₂ levels it is necessary to know what fraction of CO₂ will remain in the atmosphere (i.e. and therefore influence the concentration) and what CO₂ emission scenarios are possible.

CONCENTRATION: as we have seen the airborne fraction is quite variable (it ranges from 0.38 to 0.72). Oeschger and Heinmann (Bach, 1984(1), p.87) for prediction purposes have defined an effective airborne fraction as "the ratio of CO₂ increase due to fossil fuel alone to the integrated CO₂ production"(ibid.p.87). In calculating the airborne fraction for the period 1958-1978 at Mauna Loa a 20ppm increase in atmospheric CO₂ is observed. While over the same period the amount of CO₂ released from fossil fuel burning was 36ppm (Rotty 1983). Thus the airborne fraction for this period at Mauna Loa was 0.55 (i.e. 20ppm/36ppm). The calculation of an airborne fraction is essential but fraught with difficulty due to many uncertainties such as: errors in the past estimate of fossil fuel burning and related CO₂ emissions; potential

natural fluctuations in the background CO₂ concentration and uncertainties regarding the biospheric and oceanic sinks. The oceans play a big role since they are thought to have the capacity to absorb c.0.4 of total atmospheric CO₂ production, however their future role is uncertain.

EMISSION: predicting future CO₂ emission is a difficult task. There is much difficulty in estimating biomass change (through deforestation, reforestation, soil destruction and CO₂ stimulation of photosynthesis), production of CO₂. As to future energy consumption and use of fossil fuels it remains highly speculative. Most projections focus on the future energy growth rate and the fossil fuel proportion of energy use while neglecting the other variables such as changes in the amount of biomass or the fraction of CO₂ taken up by the ocean.

Fossil fuel use is limited by available resources. Full use of oil and gas will increase CO₂ abundance by <50% of the pre-industrial amount. Oil and gas depletion are near the 25% level at which, use of a resource normally begins to be limited by supply and demand forces. But as indicated earlier coal will not be so constrained for several decades, since it has only been depleted by 2 to 3 percent. The key choice is then between coal and alternatives that do not increase atmospheric CO₂ e.g. nuclear/renewable resources or synfuel - a coal derived synthetic fuel replacing oil and gas. Although an old idea, scientists investigating nuclear fusion have claimed that recent experiments have been successful, if this is true then the production of energy in the future will be vastly different to that anticipated by most experts.

There are only very few quantitatively detailed energy projections on a global level. And of these their wide spread of projections (see table 1) is indicative of the uncertainties and different growth philosophies.

TABLE 1: RANGE OF RECENT WORLD ENERGY PROJECTIONS FOR GLOBAL PRIMARY ENERGY USE (TW) IN 2000 SOURCE: BACH (1984.3)

	Date of projection	Primary energy demand (TW)
Knop-Quaas (GDRI)*	1975	24.07 - 27.78
Frisch (French Electricity Board)*	1977	25.51
Rotty (Oak Ridge Assoc. Universities) (USA)	1976	23.12
German Shell AG*	1978/79	16.67 - 21.85
WEC	1978	16.46 - 21.84
WAES	1977	17.69 - 21.04
German Esso AG*	1978	19.44
Hafele et al. (IIASA)	1981	13.58 - 16.83
DIW/EWI/RWI*	1978	16.61
Colombo/Bernardini (Ital. Atomic Energy Commission)	1979	12.17
Marchetti (IIASA)	1977	8.80
Lovins et al.	1982	7.07

WEC = World Energy Conference
 WAES = Workshop on Alternative Energy Sources
 IIASA = International Institute for Applied Systems Analysis, Laxenburg, Austria
 DIW = German Institute for Economic Research, Berlin
 EWI = Energy Institute, Cologne
 RWI = Institute for Economic Research, Essen

All data with * extracted from Bienewitz et al. (1981); for all other data see Bach (1982).

One of the highest energy growth scenarios is perhaps the Oak Ridge study which allows for a linear increase in coal burning until 2100, while oil and gas increase exponentially. It is an unrealistic situation insofar as it assumes energy consumption is demand - led and not supply - constrained. The International Institute for applied Systems Analysis (Hafele et al 1981) study produced two future energy consumption scenarios one of high energy consumption growth and one of low growth, (see fig. 3a) In comparison to the base year 1975; a 4.4 fold and 2.7 fold energy increase in 2030 was recorded for the high and low scenarios respectively. The IIASA high scenario, shows a 3.4 fold increase in CO₂ emission and a 50% increase in CO₂ concentration (see fig.3b) leading to a four fold temperature increase from 0.4 to 0.6°C (see fig. 3c). The very high fossil fuel share of about 90% in 1975 is still kept high with close to 70% in 2030. In contrast a low growth scenario presented by Lovins et al (1981) suggests an eight fold reduction in CO₂ emission and only a 10% increase in CO₂ concentration resulting in a temperature increase of 0.8°C which is only half that of the IIASA high scenario. Lovins et al also predict an optimistic decline in fossil use of over 3.0% for the next 50 years. Ultimately future rates of energy growth, critical in importance for predicting future concentrations of atmospheric CO₂ and decisive in any attempt to avert CO₂ induced warming, are difficult to predict as they will be influenced by rates of population and economic growth, by different energy policies (e.g. the developed -versus- the developing world), by improvements in energy efficiency and by a changing mixture of energy supply. yet despite these difficulties there is widespread agreement among experts that within the next century atmospheric CO₂ levels will have doubled to 600ppm which will produce a warming of 3±1.5 c.

METHODS FOR PREDICTING THE EFFECTS OF A CO₂ WARMED EARTH

Measured and projected increases in carbon dioxide content of the atmosphere point towards a significant global warming. The effects of such a warming will be of primary importance in determining the social and economic consequences. There are four methods of arriving at tentative scenarios of a CO₂-induced warmed earth: (i) numerical modelling; (ii) extreme warm and cold year ensembles; (iii) dynamical/empirical reasoning; and (iv) paleoclimatic reconstructions of the analogous Hypsithermal epoch. Since consideration of all four methods is beyond the scope of this paper, priority is given to the methods of investigation using numerical models and paleoclimatic reconstruction.

(1) Numerical methods:

Numerical modelling involved the use of different computer models (i.e. E.B.M.'s K.C.M.'s and G.C.M.'s) designed to simulate the effect on climate of (among other things) future levels of CO₂. There are a number of problems with climatic models. Because of the enormous demands such models make on

FIGURE 3a: CO₂ EMISSION FOR A VARIETY OF ENERGY SCENARIOS

SOURCE: BACH (1984).3

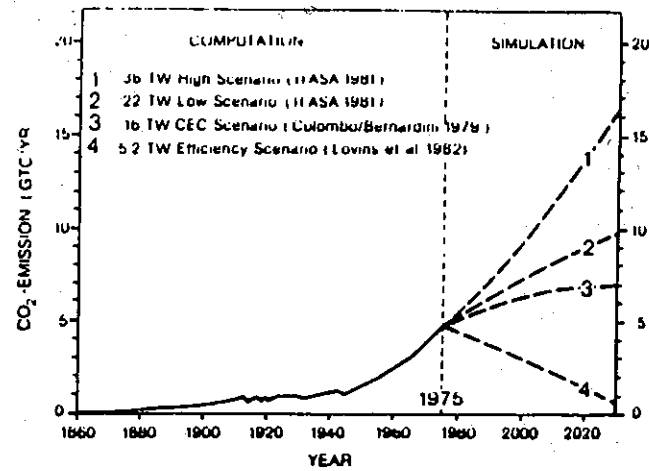


FIGURE 3b: CO₂ CONCENTRATION FOR A VARIETY OF ENERGY SCENARIOS

SOURCE: BACH (1984).3

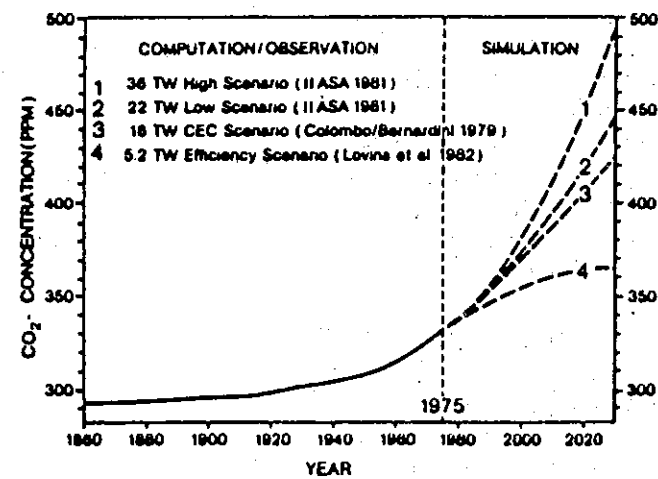
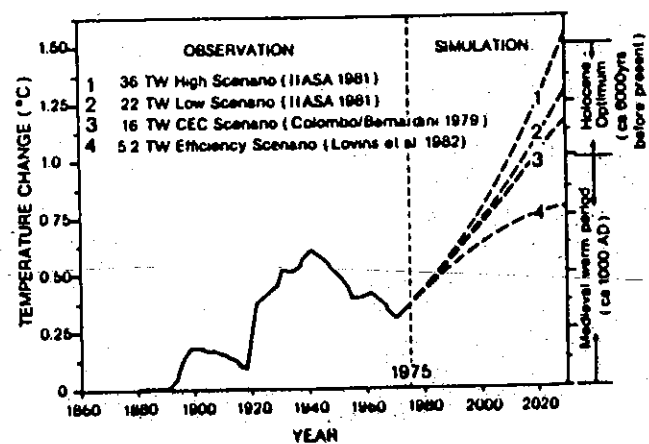


FIGURE 3c: TEMPERATURE CHANGE FOR A VARIETY OF ENERGY SCENARIOS

SOURCE: BACH (1984).3



computer facilities added to the many uncertainties as to the finer details of physical processes, many inputs to the model are simplified or omitted. However the effects of the omitted of simplified processes may become more important over longer time scales. This applies particularly to subtle positive and negative feedbacks such as: water vapour; solar luminosity; the aerosol content of the atmosphere; ground albedo alterations; cloud cover; and trace gases e.g. CFCs. (these feedbacks will be discussed later) An example of one such model is the widely quoted Manabe and Wetherald (1975) which does not account for oceanic circulation which might be expected to affect sea-surface temperatures in a real long-term warming situation. There is also a problem with the time dependant nature of human impact, up until recently models were run with a once for all doubling of CO₂ and not with a gradually increasing concentration over time. There is also a problem with data: uncertainty with oceanic data coupled with the lack of data from the southern hemisphere, means model data can be unrepresentative of 2/3 of the earth's surface. Thus the models representation of a CO₂ induced climate change remains imperfect, however this being said many of the problems are being overcome and the range of performance has narrowed. In fact as we shall see later models - with their different deficiencies - show a remarkable degree of consistency in describing a CO₂ warmed earth.

(2) Palaeoclimate reconstructions

The best overall analogy to a CO₂ warmed earth seems to be the maximum Holocene warming or hypsithermal period. However the reconstruction of this period faces special difficulties. An initial difficulty is to settle on a period most representative of such a warm epoch. Related to this is the problem of dating in all palaeoclimatic work. Another major difficulty concerns the qualitative nature of most palaeoclimatic inferences and the frequent ambiguity between higher temperatures or wind speeds and lower precipitation inherent in using proxy datum which is actually a response to aridity. There is the problem of limited spatial coverage and representativeness which is a particular problem in some regions e.g. arid areas, which yield limited palaeoclimatic data. Also the few warm periods were not as extreme as the warming projected to accompany full use of fossil fuels. Past climate change was probably not CO₂ induced and the climate forcings and rate of climatic change may have been different. Thus evidence from climate reconstruction - like climatic models - is limited.

Having looked at two methods of predicting a future CO₂ warmed earth, highlighting difficulties with the methods, it is important to note that both approaches have their merits. A combination of the approaches illustrates considerable consensus as to the potential consequences of a CO₂ warmed earth.

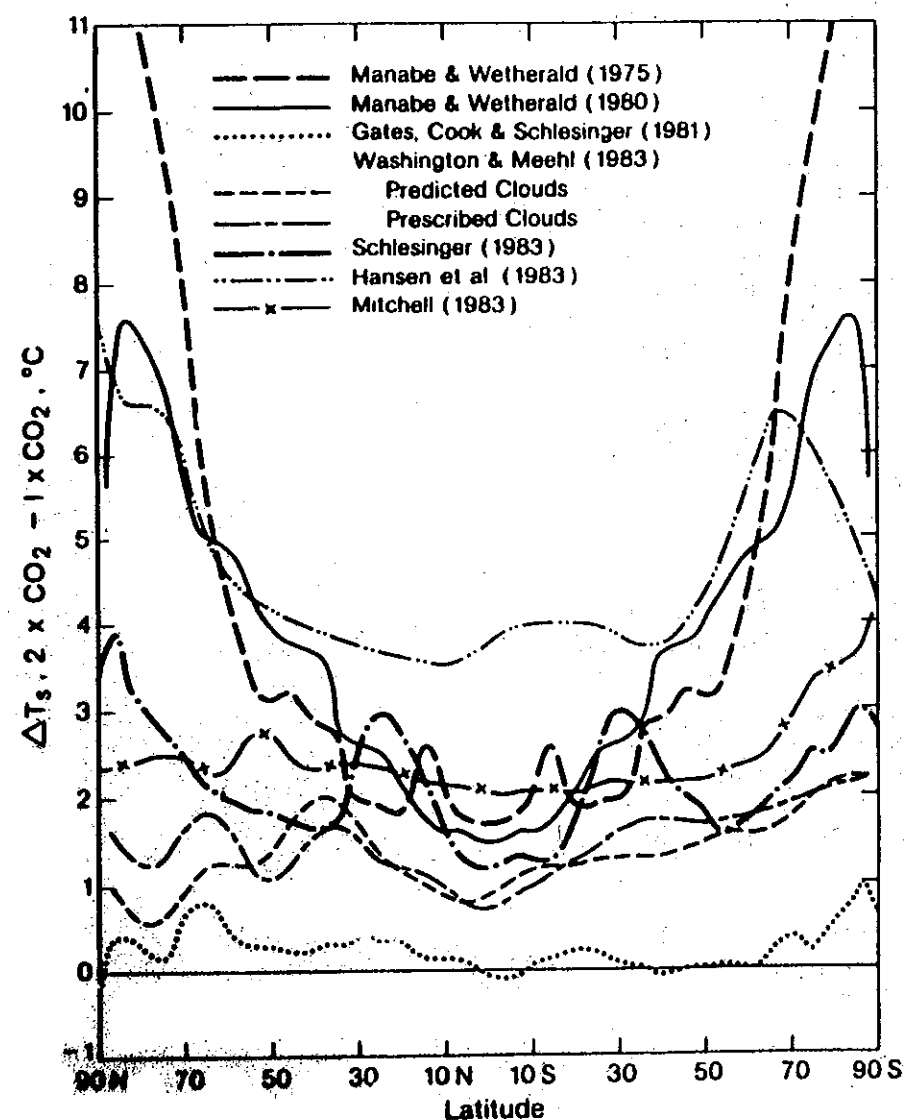
THE POTENTIAL CONSEQUENCES OF CO₂-INDUCED GLOBAL WARMING

The doubling of atmospheric CO₂ levels to 600ppm many experts agree, will cause an increase in global surface

temperatures in the range of 3 ± 1.5 c. The consequences of this warming are the subject of conflicting predictions which ultimately serve to highlight the limitations of the analogies and models currently employed. Paleoclimatic evidence suggests that surface warming at high latitudes will be two to five times the global mean warming. Fig.4 gives an idea of the latitudinal effect on temperature of a doubling of CO₂ as predicted by some general circulatory models - the most advanced of the climatic models. While warming would be significantly higher over the arctic than the antarctic. Climate models predict that the larger sensitivity of the higher latitudes is due to the ice-albedo feedback (warming causes ice melt at high latitudes, the global albedo decreases, causing further warming) and greater atmospheric stability, which increase the warming of near surface layers. Not only will temperature increases vary with latitude but there will also be seasonal variation. For example the Arctic will experience large variations in temperature with maximum warming occurring in winter and minimum warming in summer.

FIGURE 4: COMPARISON OF CHANGE IN ZONAL MEAN SURFACE AIR TEMPERATURE (ΔT_s) OR SURFACE TEMPERATURE (ΔT_g) SIMULATED BY DIFFERENT G.C.M.s FOR A DOUBLED CO₂

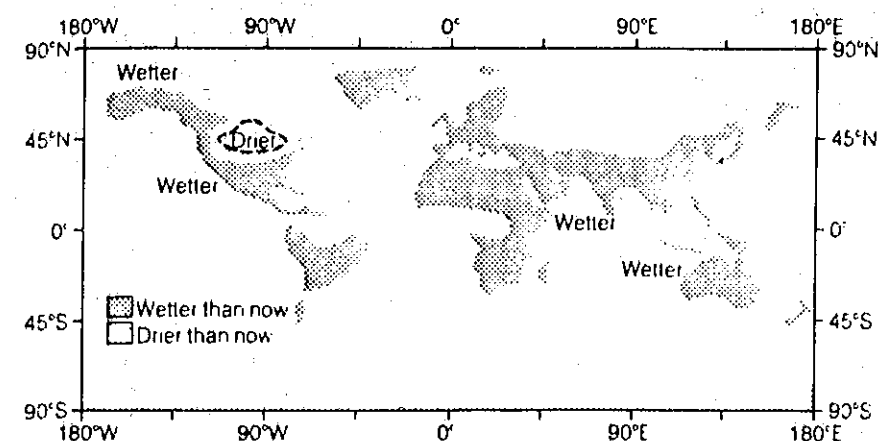
SOURCE: BACH (1984.2)



Climate models indicate that large regional climate variations will accompany global warming. Vinnikov (1987) has noted "variations of air temperature at the surface of the globe in specific seasons of the year, even against the background of a significant rise in average global characteristics" (Perry p.97.). One such regional variation is drier conditions in the central U.S. and central U.S.S.R. two of the worlds bread baskets. This comes about from the warmer temperatures and the diminished soil moisture reserves (see fig.5). On a practical level it is estimated that a 1% change in average temperature over the growing season would produce an 11% change in corn production while a 15% change would result if there was a 10% change in precipitation. Warmer and drier conditions would reduce corn yields while cooler and wetter conditions would increase it. Clearly, any reduction in North American grain yields has potentially severe consequences for the world grain market in terms of food shortages, especially for Third World nations with poor purchasing-power. Other regional effects include: dessication of the semi-arid Sahel zone; a more reliable monsoon system in very low latitudes, but a more irregular one in the northern part of the Indian sub-continent. In tropical regions it is probable then that there will be wetter and more regular monsoons. This might increase rice production but this advantage could be offset by the more general impact of more frequent flooding. Predicting agricultural impact is further complicated by the direct effects of carbon dioxide on plant physiology. "At high carbon dioxide levels, photosynthesis increases (increasing yield), but water demand also increases (increasing the susceptibility to reduced rainfall). Plant pests and disease will also be affected by changes in climate in ways which are at present, virtually impossible to predict" (Wigley 1981 p.316).

FIGURE 5: A CLIMATE SCENARIO IN WHICH DEVIATIONS FROM PRESENT GROWING-SEASON SOIL-MOISTURE PATTERNS ARE PLOTTED FOR A WARMED EARTH

SOURCE: ELSON (1987)



A beneficial result may be the increased length of the growing season. But this too is deceptive - Major efforts may also be required to re-adjust land-use and crop

characteristics. Also such major modifications of regional climate patterns may cause major dislocations of human populations. Finally it is not clear whether the world will be able to feed its population.

With regard to energy demand, some of the anticipated changes might be beneficial. It has been estimated, for example, that a doubling in CO₂ might result in a reduction of more than 10% in winter heating requirements, but this is liable to be offset somewhat by increased demand for summer air conditioning. Such effects are, however, secondary to the changes in demand resulting from increasing population and from development in Third World countries.

The effect of CO₂ warming on the world's ice-sheets is purely speculative. CO₂ warming could result in a growth or shrinkage of ice-sheets. The melting of land-based ice-sheets is of great import since shrinkage is capable of rising the sea-level. In this respect of particular importance is the West Antarctic ice sheet, because it is below sea level it is particularly vulnerable to rapid disintegration in the case of general warming (evidence of higher sea levels in the past may indicate that calving of the West Antarctic ice sheet took place in the last interglacial). The temperature here is c. -5.0°C should the temperature rise by 5°C then deglaciation could be rapid resulting in a 5 to 6m rise in sea-level. Such a rise would flood many of the lowlands of the world e.g. the densely settled deltas of Asia. Climatic models indicate that a c. 2°C global warming is required to cause c. 5°C warming at the West Antarctic ice-sheet. A 2°C increase in global temperature is likely to occur before the end of the 21st century. It is also expected that the warming at higher latitudes for doubled CO₂ should melt the floating polar sea ice and in consequence open the Northwest and Northeast passages along the borders of the American and Eurasian continents. The possibility of easier ocean transport around the north of North America and Siberia, and easier access to high latitude fossil fuel deposits could perhaps be counted as a significant plus in terms of the overall impact of CO₂.

There are many other likely effects. Even though knowledge of the natural variability of stratospheric temperatures is meagre, it is predicted that while surface temperature would increase, the stratosphere would experience cooling with little latitudinal variation. It is expected that global mean rates of precipitation and evaporation will increase. Annual mean runoff (precipitation minus evaporation) is expected to increase over polar regions.

This list of possible consequences is by no means definitive and is based on paleoclimatic reconstruction and results from 3-dimensional atmosphere-ocean coupled General Circulatory Models such as N.A.S. (1982); Schleisinger (1983); Manabe (1983). Obviously the impact of climate change can be either positive or negative, with local and regional imbalances of advantage and disadvantage. However any change requires adaption, adaption may cause large amounts of time, effort and investment. Clearly, detailed spatial studies are essential in order to be prepared for any eventuality. However, both preparation and detailed spatial studies are hampered by the

problems of detecting CO₂ induced change.

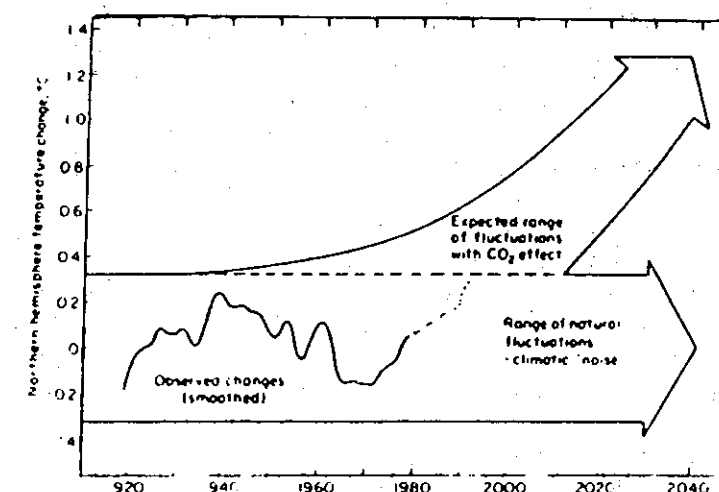
THE PROBLEM OF DETECTING CO₂ INDUCED CHANGE

As mentioned earlier, there is a problem with detecting CO₂ induced change. While this poses a major problem for climatic modellers it has a more serious consequence: If a clearcut signal of CO₂ induced climatic change cannot be detected, then the urgent need for corrective action is drowned in the fact that unequivocal detection is impossible. Indeed there is disagreement among experts that the recent warming trend observed since the 1960's is CO₂ induced. This viewpoint recognises that the climate system may be almost intransitive (Lorenz 1970) and one climate mode may prevail for a periods of time followed by a relatively abrupt change to another mode for a further period. Such transitions could be possible without external forcing resulting from the highly non-linear internal dynamics of the climate system (Lamb 1981). In fact Jones et al (1981) note that there is no reason to associate recent warming with the effects of increasing CO₂.

Identification of the CO₂ warming depends on the magnitude of climate variability due to natural climatic variability and other factors. The detection problem is summarised in figure. 6. Although there has been warming in recent years, this is still considered part of the natural "noise" level. Natural climate variability and other factors are capable of counteracting or reinforcing the CO₂ warming.

FIGURE 6: THE DETECTION PROBLEM

SOURCE: WIGLEY AND JONES (1981)



The first factor considered is solar luminosity. A 1% increase would warm the earth 1.6°C at equilibrium. Put in perspective a change of 0.3% would change the global mean temperature by 0.5°C which is as large as the warming caused by the cumulative increase in atmospheric CO₂ from 1880 to 1980. Astronomers at a high altitude observatory in Boulder Colorado found in the late 1970's a regular pulsation in the solar diameter and they suggest that from about 1940 to the 1970's both solar and volcanic influences were acting to cool the earth, perhaps more than compensating for the build up of CO₂. These astronomers predict that sometime in the 1980's (!) the solar influence will begin to boost the greenhouse effect and thus cause rapid

and pronounced warming of the globe.

Oceans play an important part but at present there is only a limited understanding of their role. The upper 70-100m of the ocean are heated by the sun and agitated by the wind therefore it is well mixed and an effective absorber of CO₂. Beneath this layer lies the thermocline - stabilised by decreasing temperature and increasing density to a depth of about 1000m. Below this is a much larger region of cold (<5 °C) deep ocean. Diffusion of CO₂ downward is a slow process but the ocean still has great potential, as a sink for CO₂. However as the upper oceanic layers become saturated with CO₂ the fraction of atmospheric CO₂ which oceans can absorb is reduced thus exacerbating the CO₂ problem. Wrigley and Jones (1981) suggest that the oceanic influences might cause climate response to lag 15 to 20 years behind CO₂ forcing. Such a lag in itself is a significant factor in determining when the effects of CO₂ might be detected. The correct modelling of the oceans presents one of the biggest challenges to climatic modellers. Another major challenge to modellers is to model the effect of water vapour. Water vapour blocks outgoing terrestrial radiation very effectively. When warming occurs there is more evaporation, more trapping of outgoing terrestrial radiation and consequently warming is enhanced. The reverse with respect to cooling applies. In fact, water vapour is the principal greenhouse gas.

The role that atmospheric aerosol effects have depends on aerosol altitude, size, composition and global distribution. Aerosol content can cause substantial cooling especially after a large volcanic eruption. The impact of tropospheric aerosols is uncertain in sense and magnitude due to their range in composition and spatial distribution. Temporal variability of stratospheric aerosols appear to have longer term effects on climate change (as shown by the temperature change of the last century). In recent times the spring 1982 eruption of El Chichon was the biggest eruption this century in terms of the amount of material injected into the stratosphere, it has resulted in cooling of the surface temperature but the exact climatic response time is not known.

The changing patterns of vegetation cover have been suggested as a cause of global climate variation on time scales of decades to centuries. While this is not considered a major source of climate variability, its effects should be explored and considered.

The role clouds play in climate is not well known or easily modelled. High and low clouds have opposite effects on surface temperature, high clouds having a greenhouse effect while low clouds cool the surface. Clouds in the middle and lower atmosphere may have effects on the albedo, while high clouds e.g. cirrus, have lower albedos, but have greenhouse effects. Thus, in a future warming, more low cloud following warming would tend to increase the albedo and dampen further temperature rise and more high cloud would further restrict outgoing radiation and enhance warming. In a warming situation there will certainly be more cloud formation, whether this

would enhance or reinforce warming depends on the height of the cloud formation. Seasonal and interannual cloud variation may give us some knowledge as to the nature and causes of variability of cloud cover, optical thickness and altitude distribution. But at present there is little development in the field of cloud climatology and much difficulty in incorporating clouds into climatic models.

Trace gases that absorb in the infrared can warm the earth if their abundance increases. One such group are chlorofluorocarbons (C.F.C.s) whose abundance in the atmosphere has increased markedly over the past few decades. The net impact of trace gases for the past century has been 0.1 °C, but if recent trends continue, trace gases will greatly enhance the greenhouse effect. It is estimated that trace gases could account for 40% of the future greenhouse effect with CO₂ accounting for the remaining 60%.

Given that the earth's climate is governed by so many factors it is necessary to separate out their relative importance so as to reveal the change in climate resulting from CO₂. However as we have seen this is not an easy task and CO₂ induced warming may be disguised by other warming or cooling factors. But, given the recent failure of North American harvests, the continuing desertification of Sahelian Africa, and the fact that the Global Instrument Record has now had its warmest year record broken five times in the 1980's: 1980, 1981, 1983, 1987 and 1988, it is becoming increasingly difficult to reject the claim that the present climate is not showing a CO₂ signal.

CONCLUSION

In assessing the effect of levels of CO₂ on climate change, projected effects depend on a number of factors. The effect of increased atmospheric CO₂ first depends upon the future energy growth and the proportion derived from fossil fuels. The effect also depends on the fraction of CO₂ emissions that remain airborne. While attempting to ascertain effects we are dependant on methods such as paleoclimatic records and climatic models which are helpful but ultimately imperfect. Finally the regional effects of CO₂ induced climatic change are difficult to ascertain. This situation makes it easier for the political and economic forces affecting energy use and fuel choice not to take decisions which would restrict the imminent global warming. The effects of CO₂ may not be acknowledged until the turn of the century, but by that time atmospheric CO₂ concentration will be sufficient to produce significant, unavoidable climatic change.

Damien Faughnan.

Third Arts

A.I.D.S. Thesis

Congratulations to Emmett Harte, who graduated with a B.A.(hons) in Geography in November 1988, on the publication of his undergraduate thesis on A.I.D.S., which was referred to recently in the *Irish Independent* (15/2/89)

The research included a comparative study of the current situation in the United States, Europe and Africa and brought out some valuable geographical insights into this modern disease, which according to Thomas Malthus (1798), represents a modern plague keeping positive checks on the population. The problem of A.I.D.S. is likely to persist for many decades as we enter the twenty-first century, and will spread from the groups with which it was originally associated (homosexuals, bisexuals, intravenous drug users, haemophiliacs, and prostitutes) into the general population. As we will all know someone within the next five to ten years who is either HIV-positive or has AIDS, it might be worth reading the thesis which gives a good introduction to an epidemic of appalling dimensions which is going to be with us in the foreseeable future.

The thesis was chosen for publication by the editor of the Maynooth Occasional Papers Series, Dr Denis Pringle, from whom copies may be purchased (No. 9 in the series).



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The Irish tertiary (c.65 million years before the present to c.2 mbp) was a period of intense diastrophism with such deformation, denudation and creation of the landscape. There are two main hypotheses regarding the formation of Ireland. The traditional approach suggests that Ireland was once some thousand metres above sea level. Jukes et al believed that Ireland had a thick, relatively uniform cover of coal, and that the island emerged from the sea at the end of the Carboniferous period. The island has been eroded ever since. Cole, on the other hand, concluded that Ireland emerged from the sea at the end of the Cretaceous period with widescale erosion since then. Both hypotheses were substantiated with very little hard evidence. It is my opinion, while there is some truth to both hypotheses, they need to be developed further:

"Complexity of geomorphic evolution is much more common than simplicity" (W.D. Thornbury 1954)

It is now accepted that Ireland finally emerged from the sea during the Tertiary period. However, Ireland didn't exist as we know it today. At the beginning of the tertiary, the area north and west of a line roughly from Dundalk to Galway was attached to the North American land mass along with Scotland. The Southern and Eastern part of the present island was attached to the South European land mass. The areas were separated by the Proto-Atlantic which was a narrow sea, perhaps no more than 800 km wide. By the end of the Tertiary, Ireland (north-west) and Ireland (south-east) had come together, but did not crash together. I firmly believe that it was a gentle unification because there is very little evidence of large scale folding of rocks, as there is in California, where there are many layers of folded mountains close to the zone of convergence of the Pacific and American plates. It is also possible that the plates of Ireland did not meet properly, and that the lowlands of the Central Plain are remnants of the proto-Atlantic. The result of this unification was the opening up of the Atlantic west of Ireland, and Rockall being abandoned later by the North American plate.

It seems that both Irelands (NE and SW) were much closer to the equator prior to the Tertiary than today because there is some evidence of subtropical plant pollen such as "symplocos" found only in the warmer parts of Asia, Australia, and America: and the chalk underneath the Antrim basalt indicated the growth of some subtropical vegetation.

Unfortunately, the diastrophism of the Irish Tertiary has left us with a very ambiguous picture of the past. North-east Ireland has remained virtually unchanged due to the basalt laid down on the area. For instance, it is known that this area was submerged during the Jurassic/Cretaceous period but evidence of Cretaceous chalk is thin on the ground elsewhere in Ireland. How much chalk covered Ireland? How much has been removed? These questions along with many others apply to the Jurassic, Triassic, Permian and Carboniferous periods

too. Two hundred and fifty million years remain unaccounted for.

Fortunately, there is a fresh approach which may help to answer these questions. It is accepted for the North-east, and has been extended to accommodate the whole island. Herries Davies and Stephens believe that there was differential tertiary earth movements with areas of massive denudation, corresponding with areas of uplift. "Ireland's saucer-like form may owe almost as much to differential earth movements as to differential denudation"

The midland's pre-Carboniferous rock is below sea-level and covered by limestone, whereas at the rim of the island, pre-Carboniferous form Ireland's largest rocks. Differential earth movements would explain the disappearance of the aforementioned rocks. Jukes may be correct about Ireland (or parts) emerging from the sea at the end of the Carboniferous period. It may have suffered massive denudation for some millions of years before submerging. Ireland (or parts) submerged for the Cretaceous period and collected a layer of chalk before emerging from the sea, post-collision during the Tertiary. This was eroded during the Tertiary. Evidence suggests that this was very large-scale erosion. This would account for the lack of Permian, Triassic and Jurassic rocks. The early Tertiary plutons of the MDurnes were exposed when an estimated 800 metres of cover rock were removed. The intruded granite of Wicklow must have had a thick insulating layer of rock above it 400mbp and when it was uplifted the schist roof was eroded, except in a few isolated places such as Lugnaquilla. It is also believed that today's Atlantic coastline was formed during the Tertiary.

Rock creation during the Tertiary seems to have been limited to volcanic activity. The mountains around Carlingford Lough and Doon Hill in Galway are about the extent of granite intrusions. The basalt of the Antrim plateau cooled above ground to give rise to hexagonal blocks over chalk. Further to the aforementioned activity, there was also some subsidence. The Irish sea lowered, perhaps relative to the East coast mountains of Ireland rising. The Lough Neagh basin was lowered c.35 mbp as a result of the downward dropping of a large block. In borings taken in the Lough Neagh clay, there is evidence that the basalt was eroded which implies that North east Ireland, at least, was above sea level at that time.

Wynne's discovery of fresh-water deposits at ballymacadam from the Tertiary period further proved that Ireland was above sea-level. Walsh's discoveries of chalk at a low level in the Gweestin valley finally killed the idea of a high level block which was the the core of traditional hypotheses.

In conclusion, there was intense diastrophism during the Irish tertiary. Ireland (or parts) went up and down, and underwent extensive erosion. Ireland finally emerged from the sea in a shape not dissimilar from that of today.

Pascal Desmond (2nd Arts)

Where do we go from here?

Since first opening its doors to lay students, the student body at St Patrick's College Maynooth has increased substantially. If one considers the past fifteen years, the number of registered first year students has risen from 168 in 1973, to 554 in 1988, an increase of 230% over the period. Perhaps the most dramatic growth has taken place in the last five year period with an increase from 360 first years registered in 1983, to 554 registered in 1988, an increase of 54%. With this growth, the distribution of origin of students has changed both in extent and nature.

To examine this spatial phenomenon, a series of dot maps were produced. The information for these maps was obtained from consultation of the College Kalendar for the years 1973-1978, 1983 and 1988. Student numbers were plotted according to county of origin. Clerical students, although being registered for both arts and science were excluded from this study, as they are not open to the same flexibility of choice where third level education is concerned. Also for the earlier period especially, when clerical numbers were substantial, their inclusion would have the effect of creating an unreal spatial distribution of first year entrants.

Considering fig 1. which displays the spatial origin of first year entrants from 1973, a number of points are immediately obvious. It is clear that the main catchment area of Maynooth College is the Leinster region. Within this area a concentration is centred upon counties Kildare and Dublin, with the concentration becoming less intense the further one ventures away from these counties. Outside the Leinster region, while there are representatives from Connaught and Munster, their numbers are few. An interesting aspect is the numbers travelling from Donegal to Maynooth for a university education. As will be noticed, this concentration remains relatively constant throughout the the period under study.

Figure 2 deals with the place of origin of first year entrants to Maynooth for the year 1978. The main trends over the five year period between 1973-78 have been a deepening of concentration in the Leinster region, with spread also taking place into the Munster region. The numbers originating in the core counties of Dublin and Kildare has increased, but equally significant is the increase in numbers originating from the other Leinster counties. It is obvious that Maynooth beginning to spread its sphere of influence. Within Munster, the places of origin are quite evenly distributed, while the numbers originating in Co Donegal, while displaying some increase, remains relatively constant.

Figure 3 dealing with the year 1973 displays a continuation of the trends of the previous five years. The number recording a place of origin in the Leinster region continues to grow, while the concentrations from Dublin and Kildare continues to deepen perceptively. Likewise, a spreading of influence in all directions continues. Numbers coming from Munster continues to

increase while representative travelling from Connaught also became influential. However, it remains obvious that the main catchment area for Maynooth College is centred upon the midlands area.

It is perhaps during the following five year period, from 1983-88, that most change has occurred. As can be seen from figure 4, which shows the distribution of place of origin of first year entrants for the year 1988, the catchment of Maynooth College has become quite wide-spread. While a heavier concentration can be recognised in the Leinster counties, it must be admitted that the distribution is becoming more evenly spread. In particular, the numbers originating from Connaught have increased substantially. While the desirability of a university education in the face of restricted job opportunities is an important factor, perhaps the changing of Maynooth's image as a place of education is equally important. Maynooth is beginning to be viewed as a university in its own right, and not just as a college of education for future priests. While this idea may have been recognised in the Leinster region for some years, it is only recently that it is becoming acceptable elsewhere. However an even more obvious development in the last five year period has been the dramatic deepening of the concentration of first year entrants originating in the Dublin region.

To examine this change further, a histogram was constructed for the main catchment area for Maynooth students. This includes the counties of Dublin, Kildare, Meath, Westmeath, Louth, Laois and Carlow. The numbers originating from each county are represented as a percentage of the total number of first years registered for each individual year. This histogram highlights a decline in the relative importance of counties Meath, Westmeath, and Carlow, while Louth, Laois, and Kildare have maintained a certain stability. The most obvious change has been in the dramatic increase in the relative importance of Co Dublin over the period. Therefore, from a position where Dublin and Kildare were at a par in 1973, Dublin has moved to a position in 1988, where it is double the importance of Kildare. As a result, in 1988, 32% of first year entrants into Maynooth College have their place of origin within county Dublin. Furthermore, a combination of the first year students from Dublin and Kildare reveals that they represent 45% of all first year students registered in 1988 (the respective figures for 1973, 78, and 83, are 28%, 28%, and 37%).

If one further divides the entrants of first year according to origin in Dublin county and city, additional information is gained. This information is presented in figure 6 and 7 for the years 1983 and 1988 respectively. For 1983, it can be seen that representation from Dublin city and county were almost equal with 47 students having addresses in Dublin city while 31 had addresses in Dublin county. However by 1988 this picture has changed dramatically. The concentration of students from Dublin city had deepened significantly with an increase of 180% (from 47 to 132) while those from Dublin county increased by 50% (from 31

to 47). In 1988, the students whose origin is Dublin city represent 24% of all the first year student intake into Maynooth for that year.

Of course with this dramatic change in student intake, the character of the college has been altered considerably. Unfortunately, unlike Yeats, one cannot say "a terrible beauty is born..". In fact within the past five years Maynooth College society has undergone what can be considered a cultural revolution. These changes are obvious to the seasoned campaigners who have existed on the college campus for a number of years. Often those who return to their Alma Mater have to stop and ask what has happened to the 'auld place'. The reaction is quite similar to those of the ageing clerics who shake their discontented greying heads at the unconventionally clad young females who strut nonchalantly along the hallowed walks of St Joseph's square.

With the passing of time, Maynooth has lost much of its rurality, which typified the earlier days, to be replaced by an uncompromising urbanity. One obvious physical manifestation is the droves trudging along the muddy path between Maynooth railway station and the College campus. With uninhibited enthusiasm they brave hail rain and snow, and even muddy brogues to attend their 9am lectures. To the innocent passer-by, their unbridled wit and carefully nurtured accents must seem as common-place, as a group of German anglers on the waters of Lough Conn, even if their existence does not arouse similar interest. However to many who were unaware of what things were like in the 'good auld days' everything appears as normal.

The mode of dress of the 'average' student has altered also. For a period last year one would suspect that there was an official student mourning in progress owing to the extent of black clothing, especially in the college canteen. From the level of activity even mere mobility ones' suspicions that a mass death had occurred might be confirmed. Of course, Maynooth was always a good place for black clothing, however in this case it was not clerical. Indeed, within clerical circles charcoal grey had become the norm, maybe in an attempt to distinguish themselves from the "common people". On inquiring further as to the reason for the dominance of the black, one was informed of the latest trends. This might confirm an often levelled criticism that the church is "behind the times". Just as it is becoming trendy to be seen in black, its more prominent, "in touch members" are changing to grey. On the other side of the coin though, perhaps one could say the church is a trend setter.

Another trend has been the re-appearance of faded, patched and often strategically torn jeans. Now this is perhaps something an 'old timer' could identify with. Yet once again inquiry led to the acquisition of new information. Jeans were not the object of many years of hard-wearing, and the strategically placed patches were no longer a means of preserving to some degree privacy or to prevent one causing offence, nay one was informed that these items of clothing could in fact

be purchased in this condition, and not at the annual parish jumble sale either.

What more can one say.

Some items of clothing have disappeared completely. While it was once normal, indeed commonplace to be the proud owner of a parki coat, these nowadays have become almost a collectors item. Their replacement has been none other than the long coat, or trench coat familiar in the early days of the foundation of the state. Little did De Valera know what he was doing.

Although the thatch cottages, the turf fires and the comely maidens at the crossroads never really caught on, the long coat, which one imagines, served many purposes, perhaps even keeping the comely maidens from reaching the crossroads, have made a dramatic reappearance. Short jackets are also quite common, similar to the jacket of the confirmation suit which was always a good investment. However, if one was to inquire "did you get that for your confirmation?" one might be faced with the difficult task of actually explaining what confirmation is. On viewing the texture of these items it was discovered to be of tweed origin, with the accompanying silk tie, that is missing now is the hunting tack and the horses, not to mention the innocent fox.

Gone also is the ubiquitous plastic carrier bag which held the key to success in many examinations.

In its place, the leather (well leatherish) brief case, with combination lock and sturdy handle. Obviously, the spellbinding lectures have had a spin-off effect. With all these changes, one could not be faulted for believing that Maynooth college has become the location for a perpetual convention of encyclopaedia sales persons.

As for hair styles, again what can one say.

Perhaps they have become more purposeful, to the extent that they are more deliberate. Gone are the days when a trip to the barber was compulsory only when rats mazes became unmanageable. Now a haircut is almost a necessary part of every week even the results of such visits are negligible. Of course there are others who change their hairstyles so frequently they would be unrecognisable from one day to the next, if it not for an unchanging IQ level. While for others the Bohemian look, necessary to convince the impressionable of a shallow eccentricity, is a necessary adjustment.

The application of gel also gives the impression that life is being lived at a hair-raising pace.

Entertainment has changed also. While the frequent and indispensable bar extensions are as well attended as ever, one must admit that the smokey air has a different taste and odour. Ceill's are still part of college life, although their appeal may have narrowed somewhat to the traditional groups Cumann Péile, Cumann Lanainacht, and the religious groups such as the CLM and YCS. Their appeal to clerical attendance surely adds weight to their restricted audience, especially when those in attendance could be considered pushing on in years. Often those who come to scoff remain to stare from behind a cloud of sweet smoke at the remnants of De Valera's comely maidens, and to discuss indeed if there is the difference of the price of a heifer between the pretty and the plain.

Another feature which has become an acceptable part of the college week is the alternative night in the Student's Union. On one occasion, while the presence of a group who were considering attending such a function, one pondered aloud,

perhaps somewhat naively, knowing the position of the college authorities on such matters, if such a gathering was in fact legal. By the number of astonished stares and polite, though patronising answers one began to realise that perhaps one maybe off the point slightly and that age was showing. Yet one remains unconvinced remembering stories of 50 pence pieces being stuck to the floor.

Perhaps alternative means something different but at today's prices one is not likely to inquire any further. Having already displayed one's ignorance of the pleasures of modern life inquiry as to what these acid parties were all about was shelved indefinitely. Having some knowledge of what weak carbonic acid can do to limestone rock perhaps an avoidance of such events may be advantageous to one's health.

All in all, it may be wise to remain in the dark on this issue.

A certain amount of graffiti has made its appearance also on the college campus. It is evident in the various public conveniences, as well as appearing on desks in the new college library. As of yet nothing displaying any obvious mental ability has appeared, but perhaps one should not be shocked at this observation. The spelling and expression used shows little development upon notices circulated by the College Science societies announcing the various events organised by the student science societies. Perhaps originality of thought and facility of expression are confined to the field of academic pursuit, yet little evidence of this phenomena also exists.

Sitting in on the "Great debate" held recently among the hopeful candidate for the positions of Sabbatical officers of the Student's Union, it was obvious the importance attached to student entertainment in the college year. As suggestions made ranged from the absurd to the ridiculous, one felt enveloped by a aura of familiarity. Yet for one fleeting moment it appeared as if all was to be shattered. One "mature" candidate asked the probing question "what are we all here for anyway?", (something which the majority of the audience and practically all the candidates thought they were discussing.) The expressions of shock, horror and total amazement greeted reply of his "education". As the candidate continued to expound his ideas on the revolutionisation of the education system a belief that he was either a comedian with a perverse sense of humour, or was "of his rocker" prevented him from being torn to pieces limb by limb. Obviously being an intelligent chap and knowing to quit while remaining in possession of all his necessary bodily appendages, his outburst quickly fizzled out. Of course, judging by the reaction of the audience only a complete idiot would have pursued his line of reasoning. As discussion again returned to the vital topic of entertainment, the aura of familiarity again settled around. In this rapidly changing world, it is good to see that the Student's Union remains such as essential, serious and respected institution on the college campus. Confidence in the discerning abilities of the student body were further reinforced when the "mature" candidate was defeated by more fitting for the task at hand. Of course the role of the Student's Union has changed also. Not many years ago the most valuable piece of information obtained during orientation week was how to prevent your bicycle from being stolen. However with dawning of the computer age and imminent approach of a single Europe, advice on IUD or is it VDU and

French letters are freely given. Although being a victim of a bicycle thief despite following Union guidelines, one may perhaps be advised to go elsewhere for information on the above. The demonstrators in the Computer Centre have always been quite helpful.

With the growing number of commuters, perhaps advice on bicycles is no longer necessary.

Life in the village has also changed. As the morning is characterised by a mass influx, the evening is characterised by a mass exodus.


By the weekend, this exodus is almost complete, with only a skeleton crew of real ruralities remaining. It seems as if the Roost has in particular, suffered from this change. One can enter this venerable institution on a Saturday night and reach the bar without bumping into anyone. Indeed the situation has reached a level whereby a friendly conversation with the barman is possible. To some this may appear a blessing, if the current trend continues it is likely that the last stalwart of student civility will be invaded by locals.

As for the locals, a very friendly lot, always ready with a cheery greeting and helpful advice. Both young and old they have always been a pleasure to encounter. Over the years they have ensured top quality accommodation at very moderate prices. With the greater numbers commuting, concern has been expressed privately (displaying the genteel nature of the locals, never ones to enforce their wishes). Of course the concern does not emanate from any potential loss of income, money has always been taken from the student population reluctantly, but from a fear that Maynooth University will become an office university, operating from nine-to five, serviced only with commuters, resulting in less vitality, often associated with a university town.

The food in the college canteen has remained of a high standard throughout the years. Although frequently defying chemical analysis, few reports of food poisoning have been received, none of which proved fatal. Indeed it can be said, without fear of contradiction that the college canteen is responsible for the healthy appearance of most of the student body. From the amount of time the "average" student spends within its precincts, it could be considered the social, cultural and educational centre of the college. However a disturbing trend is that less canteen food is being eaten. With the growing numbers of travellers, the packed lunch is more in evidence. There has been a considerable decline in student nutritional levels. The last remaining hope is the canteen tea, which seems to be acquiring more and more ingredients daily. Yet with the decline in student nutritional levels, student mobility has also decreased. As a result fewer students seem to be capable of the sustained effort needed to remove themselves the few paces to the lecture halls. It is likely that all university activity will, in the near future have transferred to the college canteen.

Indeed many more cultural changes have occurred, but in order that some may reach print a halt must be called to ramblings (the typist wipes her fevered brow). The question might well be asked, "What is all this about, and what has it to do with geography?" Indeed, it is a question one is often faced with, while dealing with the uncomprehending products of secondary education. Its about many things. Its about a sense of place. Its about continuity and change. Its about

temporal change. Its about human mobility. Its about culture. Its about the transfer of cultural traits and their physical manifestation on space and through time, associated with the movement of people. Its about Geography.



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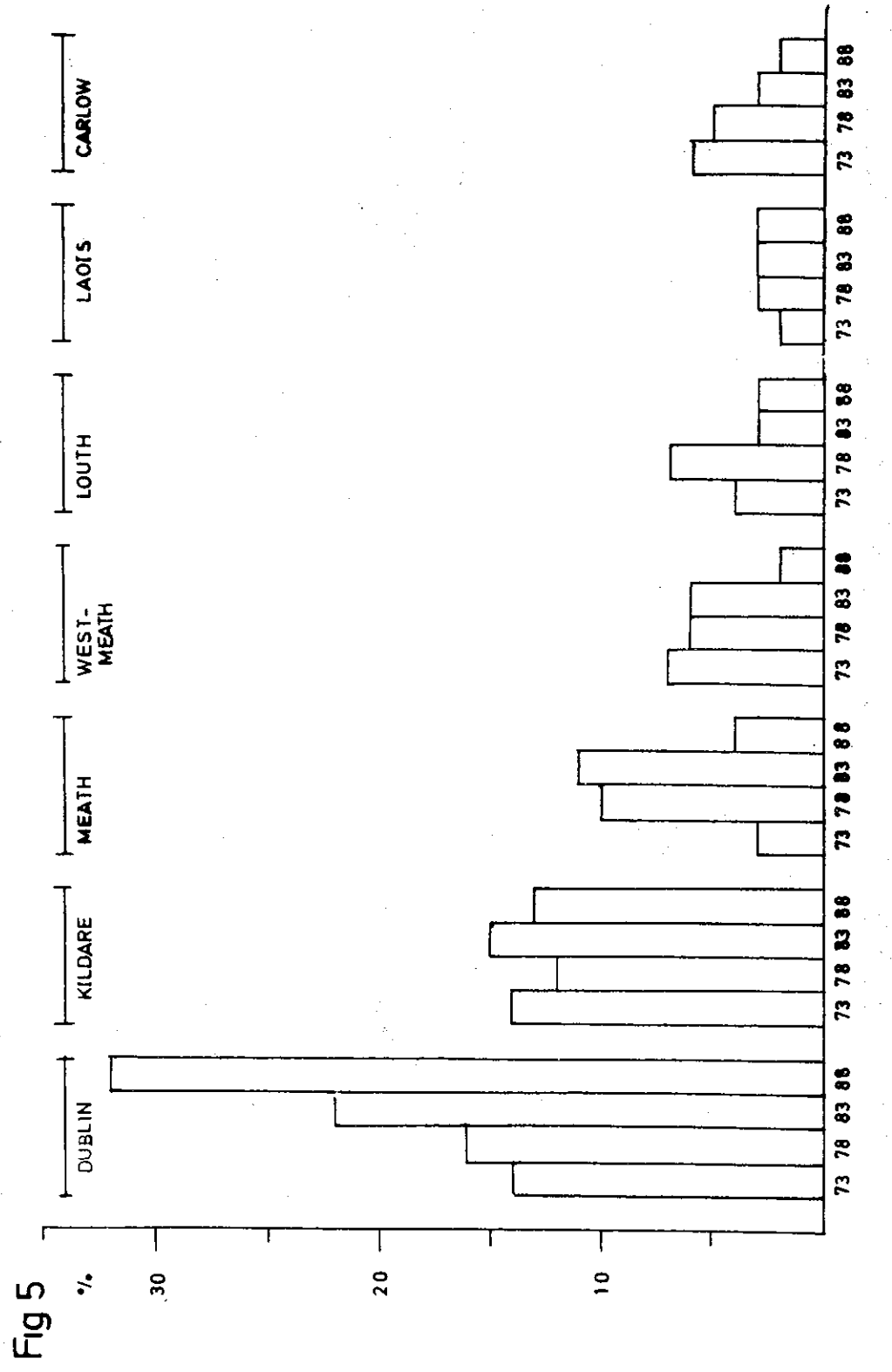
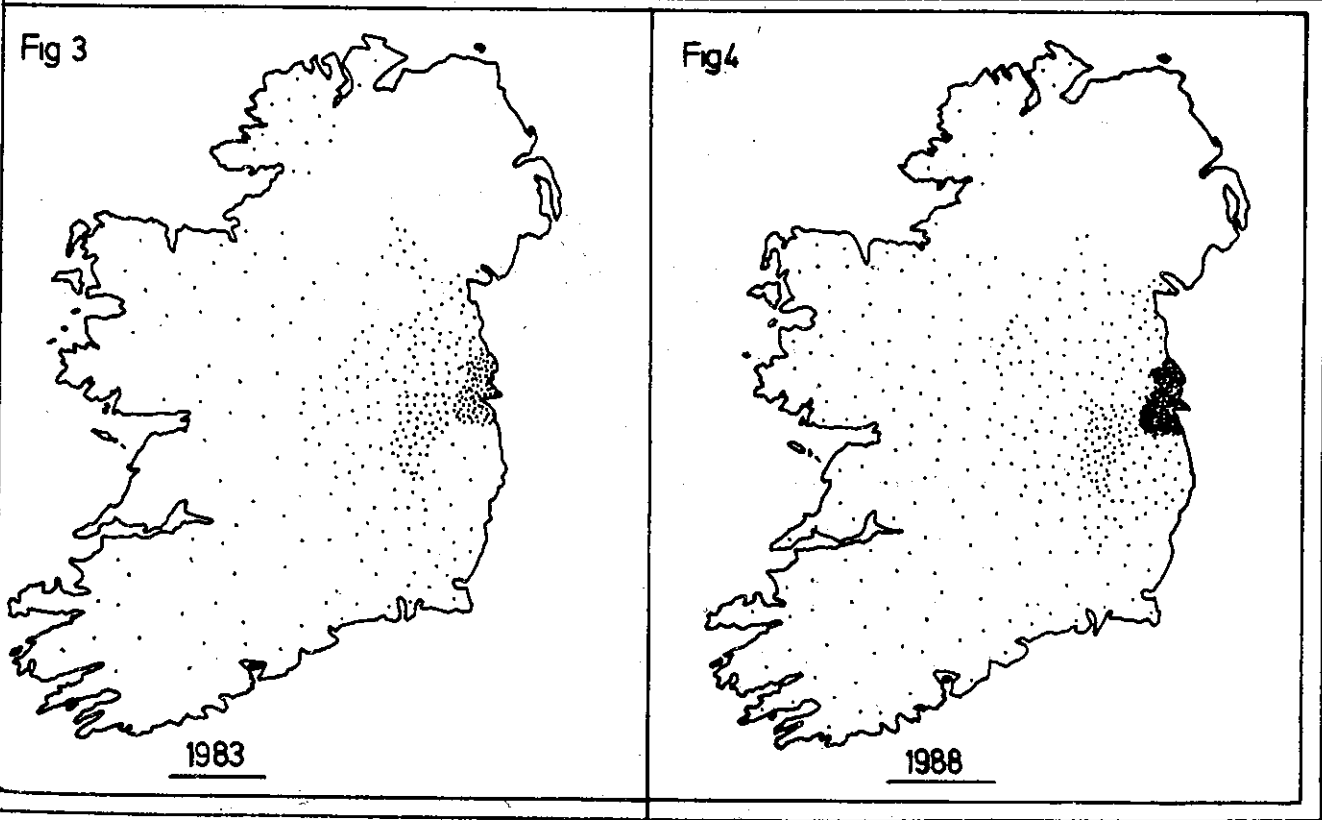
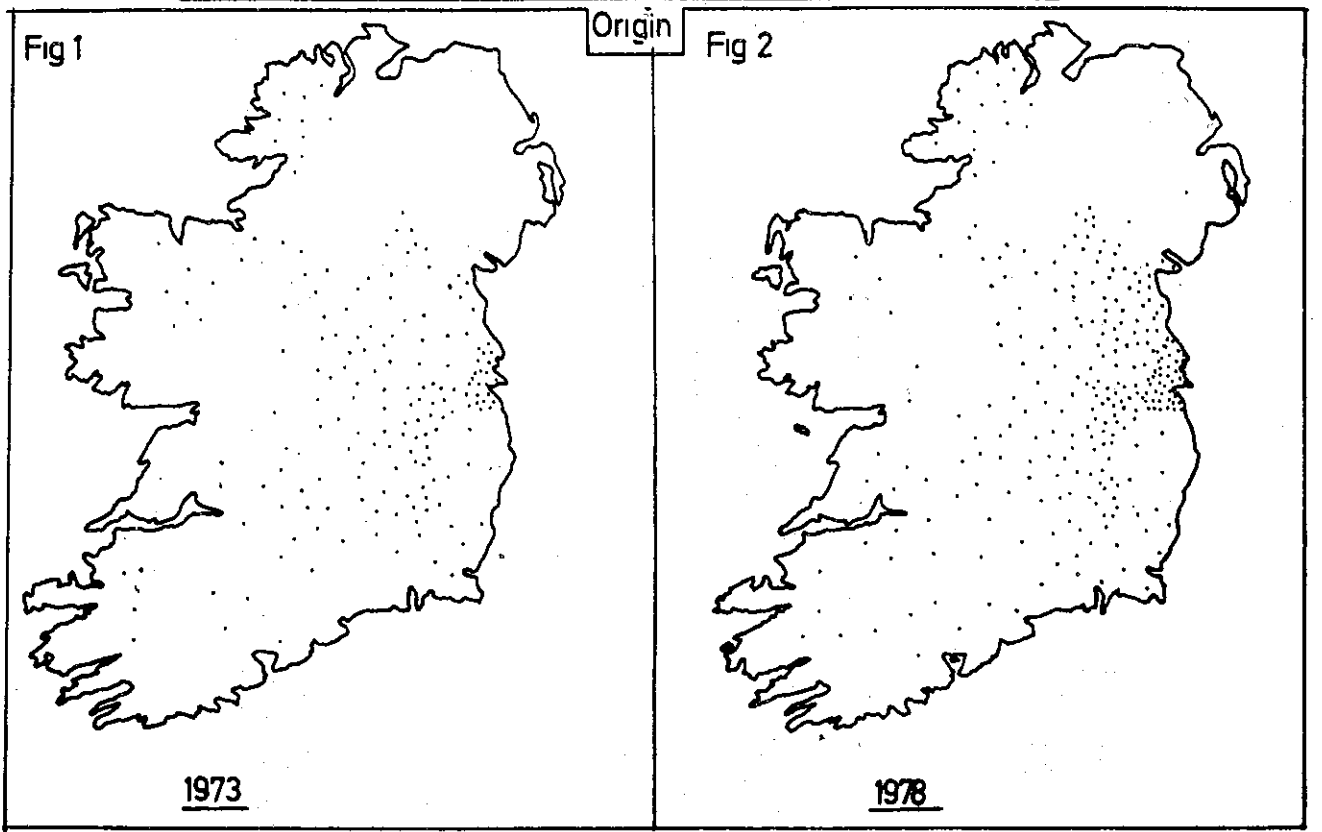
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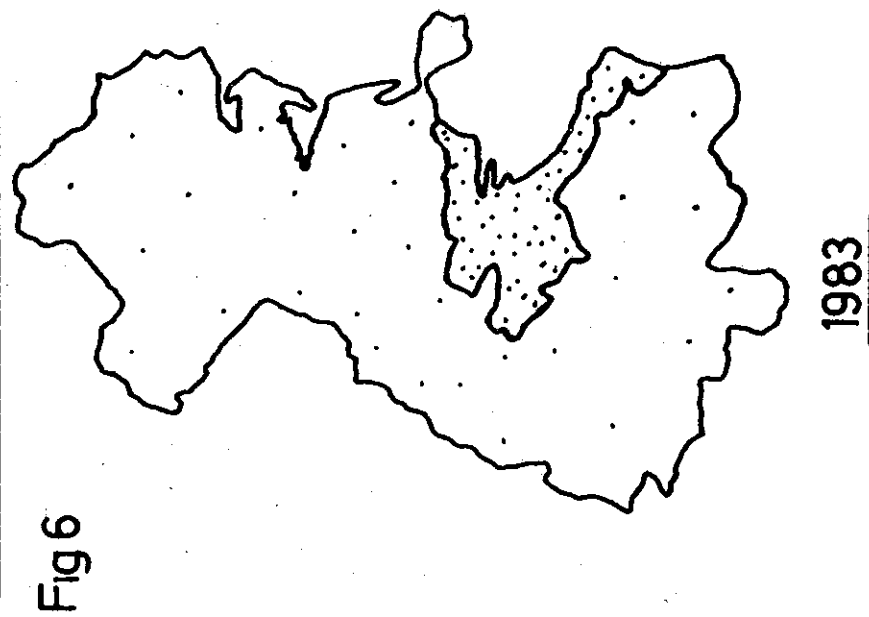
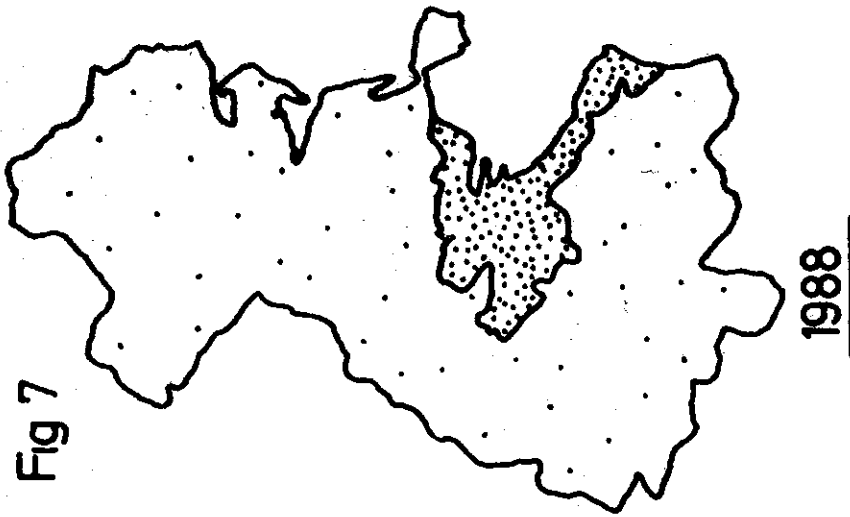
'KEVY MAC'S' is a name in every student's vocabulary

Distribution of First Year Entrants to Maynooth College by county of Origin



First year students for selected counties as a percentage of total registered first year students 1973-88

First Year Students with place of origin in Dublin County and City



The Inter-College Undergraduate Geography Congress

- A Report -

The Inter-college undergraduate Geography Congress was held in St Patrick's College Maynooth on the last weekend in February. The aim of this annual event being to bring together student geographers from the various colleges to compete "amicably" for the Fahey Memorial Prize.

The weekend got off to a great start with a cheese and wine reception on the Friday evening, then feeling well refreshed these "trainee professional geographers" made their way to a bar-ex held later that evening in the Students Union bar. Once here, everyone soon got down to the more serious business of "becoming acquainted", and success can be reported on several accounts. Considering the festivities on Friday night, it was surprising to see the level of attendance on Saturday morning.

The Congress (the real reason for this gathering) took the form of a series of lectures given by students on topics as varied as "Gentrification in an American City"..., "Building Boom in Dublin Suburbia"..., and "Migration in Sudan"..., to name a few. Each speaker spoke for approximately 20 minutes and then (the more difficult part of the event) was required to answer the questions of the audience. On the whole the lectures were interesting, informative and if anything, highlighted the great diversity to be found within the discipline. (But, of course, Maynooth Geography Students already know this...don't they?)

Maynooth College can take pride, not only in the overall success of the weekend, but also in its own participating students - Mary Quinlan, Alan Kehoe and "Prof" Pat Mc Kenna....with the latter two contestants taking overall first and second prizes respectively.

The Geography Society wish to extend their congratulations to both, and also their thanks to all those who helped accommodate all visiting participants and supporters. Finally, it must be said that the article in the UCD publication *Baile* is unworthy of comment. Our only hope is, that the author, or anyone who subscribes to his philosophy will not have a future in Irish geography. Perhaps, a journalistic post with *The Sun* would be more fitting to his talents.

Marie McKenna P.R.O.

The Geography Fieldtrip - Easter 1989

Silently the busload of eager geography students sat; awaiting the arrival of Fran the man, and Jimbo, to begin the journey to Dungarvan. 45 minutes later Fran arrived, with the sad news that Jimbo would not be joining us until Saturday - our hearts sank..

But as the bus travelled through the sunny countryside, our spirits lifted, as we caught sight of the beautiful landscape, the beauty intensified by Fran's suitable and aesthetic comments.

The main stop of the day was to visit the City of Kilkenny. A city well worth a visit as it maintains some of the originality and beauty of by-gone days. A tour encompassed the sights of Kilkenny castle, the Town Hall, Smithwicks Brewery. (Unfortunately, we were not offered a free pint..). As time was short, so was the tour, even the public toilets were interesting, its a pity the male natives weren't. The natives of Dungarvan were to prove much more interesting - especially the builders.

On arrival at the at Gold Coast holiday homes, the only gold to be found was in the alcoholics' pockets. Their savings poured out, and a quick start was made on the drinkathon. Meanwhile, a work rota for those of a sober inclination was established.

The night itself was uneventful except for a game of cards, at which Aislinn gave Fran a kiss, just to show her appreciation of how much she enjoyed her first day. However, her loyalties and appreciation switched to someone else before the end of the week.

Saturday and Sunday were spent observing the landscape and its peculiar uses. But the climax came at our joyful reunion with Jimbo in Waterford. But he still managed to lose everybody.

The evenings were hot at *Minnie's*, the hottest spot in town. (A few did pick up some hot-spots in their mini's, but they were quickly dropped because they didn't have a Hiace van. Nevertheless, the eager females among us had no problems getting lift home, except for Deirdre, because of her antics, got left behind.

Never mind, the drinkathon continued well into the night, and all were a sorry sight next day - pale faces all around. Monday to Thursday consisted of surveys on land-use patterns, emigration and rural landuse. Dungarvan itself, a small town, consists of business which is 90% inherited, as a result the majority of these business' had undergone little change in the last decade - except for the installation of a toilet in a plumber's eighteenth century shop.

Meanwhile, Barry studied graffiti, while poor Niamh did all the work. Needless to say, over the four days of fieldwork, numerous cups of tea were consumed by students in local houses, but no such invitation was extended to poor Barry - perhaps he looked too much like a *city-slicker*?

From being chased by sheep, dogs and cattle, hitching on tractors and bonnets of cars, trying to follow maps, some poor unfortunates did get side-tracked. A possey (search-

party) was sent out for Gerard and Mary, who, on their return were red-faced and muddy.

The Dungarvan/Clonmel area, although a rich agricultural area, also had its disparities in farming practices. The disparity existing between the large and efficient farms of Kilmacthomas, and the almost retiring farmer population of Comeragh and Knockmealdown.

Those endless meetings for which Barry was always late, and at which the drinkers were again competing for the best drinker of the year, were abruptly ended on Thursday, when those desperate girls ran off to meet the young Dungarvan builders mentioned earlier. However, two things remain stuck in the memory, Barry driving at 80 miles per hour on an empty petrol tank, and Paddy repeating the same jokes every night - seemingly he thought everyone forgot them - we didn't Paddy! (The whole of Dungarvan were word-perfect in your jokes by the end of the week!)

Meanwhile, poor Jimbo got evicted, and instead of moving in with four nice girls, had to settle for spin the bottle instead!

Alas, the day of return to base had to come. On Friday, a weary and dried-out bunch sadly left Dungarvan by bus, bound for home. The alcoholics, which by now consisted of everyone, dozed off.

On a serious note, our sincerest thanks to P.Breatnach, and Dr. J.Walsh, for putting up with us for a week, and contributing much to a very educational and enjoyable trip.

Josephine Coleman (2nd Arts)

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