DUBLIN REPORTS

The National Institute for Higher Education (Dublin)

Introduction

The NIHE (D), after its initial planning stage (begun in 1975), was brought into existence through THE NATIONAL INSTITUTE FOR HIGHER EDUCATION (DUBLIN) ACT, 1980. The institute sees itself as having two main roles:

1. To train well qualified graduates with a breadth of practical knowledge attuned to a rapidly changing technologically-based society.
3. To engage itself in research and associated activities especially as they pertain to Irish industry.

The Academic Organization is structured along faculty lines, at present there being six faculties: Mathematical Sciences; Engineering and Design; Science and Paramedical Studies; Communications and Human Studies; and Education studies. Through the schools in these faculties, the institute offers degree/diploma programmes up to the Masters and Ph.D. level, which are accredited by the NATIONAL COUNCIL FOR EDUCATIONAL AWARDS. Normally a first degree programme is of four years duration and consultation with industry and business is a vital component in course planning. One special feature of the undergraduate training is the INTRA (Industrial Training) element which places the student in industry for a period of six months usually in the third year.

School of Mathematical Sciences

Among third level institutions in Ireland, NIHE (D) is unique in having a complete faculty devoted to Mathematics in its broadest sense (constituent schools: School of Mathematical Sciences; School of Computing and Quantitative Methods). The grouping of these schools in one faculty is designed to facilitate the integrated development of computing, statistics and mathematics.

At present, the school of Mathematical Sciences provides service teaching, up to final year, across the entire spectrum of undergraduate courses offered by the institute. A proposal for a degree in Mathematical Sciences itself is currently being considered by the NCEA and it is hoped that this course will have its first intake of students in October 1983. Besides teaching activities the school has active research interests which are fostered by weekly seminars as well as colloquia for visiting speakers. In 1982 the latter have included Prof. R. Lewis, University of Alabama in Birmingham; Dr. R.B. Paris, Association CEA-Euratom, Fontenay-aux-Roses, France; and Prof. J. Toland, University of Bath. In addition members of the school are active participants in the seminars and colloquia of other third-level institutions in the Dublin area and in conferences overseas. A special significance is placed by the school on the development of close cooperation with industry. This is stimulated by meetings with members of the industrial community and also by the efforts of the institute's liasion office. In this context comment seeking questionnaires have been circulated, aimed at both informing industry of our activities and determining the nature of its present needs. The school is also investigating the possibility of providing a course teaching mathematics through modelling in conjunction with the NIHE Distance Education unit. On a social level, the school is working on the formation of a "Walk-in Numeracy Centre" to cater for the needs of the less numerate in the local community. A preliminary meeting of this new venture on 13 December 1982 was well supported by the community and adult education workers in the area. It was agreed to go ahead with recruiting and training volunteer helpers with a view to operating four two-hour sessions a week.

Staff

Currently there are five full-time staff members (which is expected to steadily increase with student intake over the

coming years). Besides individual research interests it has been decided to concentrate combined research in the area of differential equations: theory, analytical and numerical approximations together with applications.

The Staff Members are:

Dr. A.D. Wood (Head of School)	B.Sc. Ph.D. F.I.M.A.	St. Andrews
	(Differential Equations, especially Asymptotic Theory)	
Dr. R. Flood (Lecturer)	B.Sc. M.Sc. Ph.D.	(Queens University, Belfast) (Linacre College, Oxford) (U.C.D.)
	(Interacting Particle Systems, Applications of Stochastic Processes)	

Assistant Lecturers

Dr. M.J. Clancy	B.Sc. M.Sc. Ph.D.	(U.C.G.) (U.C.G.) (University of Notre Dame)
	(Differential Geometry/Applications to Physics)	
Dr. D.W. Reynolds	B.A. M.S. Ph.D.	(Oxford) (Carnegie-Mellon University) (Carnegie-Mellon University)
	(Viscoelasticity, Elasticity, Lifurcation theory, Volterra Integral Equations)	
Dr. G. Moore	B.Sc. Ph.D. G.I.M.A.	(Bath) (Bath) (Bath)
	(Numerical Analysis: Finite Element Approximation. Applied Functional Analysis: Bifurcation Problems)	

Our Lady of Mercy College (Carysfort College)

Our Lady of Mercy College is a College of Education for student teachers for Primary Schools. It was founded by the Sisters of Mercy in 1877 and was transferred to its present location at Carysfort Park, Blackrock, in 1903. Significant changes occurred in 1975 when Carysfort became a recognised College of the National University of Ireland, the B.Ed. degree replaced the old-style N.T. qualification and male students were admitted for the first time. The Mathematics Department was founded in 1975. Of course, Mathematics had been taught as a subject in the N.T. qualification and indeed the late Eamonn De Valera taught Mathematics at Carysfort between 1907 and 1916.

All undergraduates follow a three-year course of studies for the B.Ed. degree, consisting of Education, theoretical and practical, and one elective subject chosen from the range: Irish, English, History, Geography, Mathematics, French and Music. One additional subject from this list is taken in the first year.

The Bachelor of Education degree programme in Mathematics centres around the core areas of Algebra, Analysis and Number Theory. Carysfort also has a well-equipped microcomputer laboratory and Mathematics students take Computer Studies units in their second and final years. They cover topics such as Mathematics-related computing, computer-aided instruction, files and record-keeping. The Mathematics Department also offers courses in Carysfort's Inservice Summer School. The members of the Department are:

Dr. Gerald Ryder	B.S. M.S. Ph.D.	(Carnegie-Mellon University) (Carnegie-Mellon University) (Carnegie-Mellon University)
Dr. John Cosgrave	B.Sc. Ph.D.	(London) (London)
Dr. Michael Barry	B.A., M.A. M.S., Ph.D.	(U.C.D.) (University of Notre Dame)

St. Patrick's College of Education

St. Patrick's College was founded in 1875 for the education of teachers for primary schools and, in 1975, was accepted as a Recognised College of the National University of Ireland. The College offers a three years Honours B.Ed. Degree, a one-year course for graduates leading to a Teacher's Certificate (Primary) and a one-year Diploma in Special Education.

Students following the B.Ed. Course, take Education and one subject chosen from Irish, English, History, Geography, Mathematics, Music, French and Biology (First Year only) for all three years, with an additional subject from the above list in first year.

The B.Ed. programme in Mathematics consists mainly of courses in Analysis, Algebra, Probability and Statistics, covering such topics as real analysis, vector spaces and matrices, groups and rings. Also included is a course in computer science in which a programming language is taught. This course includes application of the computer to problems in number theory and statistics.

The Mathematics Department is involved in an advisory capacity in the mathematics education courses. These form a component of the Education course which all students take. Here the methodology and content of the primary school mathematics curriculum are covered.

The Mathematics Department has a staff of three:

Rev. Brendan Steen (Head of Department)	C.M. M.Sc. H. Dip. Ed.	
Frederick S. Klotz	B.S. Ph.D.	(University of Pittsburgh) (Syracuse University)
Olivia Bree	B.Sc. M.Sc.	(U.C.G.) (U.C.G.)

NUMERICAL METHODS IN DYNAMICAL WEATHER PREDICTION

J.R. Bates

1. Introduction

The scientific problem of forecasting the weather using dynamical methods was first tackled successfully by a group working under the leadership of John von Neumann at the Institute for Advanced Study, Princeton, in the late 1940s. At that time the first electronic computer, the ENIAC, had just become available. Von Neumann recognised that the new machine was ideally suited to performing the hugh volumes of computations necessary to predict the non-linear development of fluid systems, including the motions of the atmosphere. Using observed initial data derived from balloon ascents over the continental U.S., an integration was performed which succeeded in predicting the main features of the actual evolution of the 500-mb flow for a 24-hour period over the area in question. (Charney, Fjørtoft and Von Neumann, 1950). The integration took 24 hours of computer time, however!

An essential ingredient of the success of the integration, due to von Neumann himself, was the development of a computationally stable numerical scheme for representing the differential equations governing the flow. It had been discovered two decades earlier (Courant, Friedrichs and Lewy, 1928) that not all consistent numerical representations of partial differential equations lead to realistic solutions. The method devised by von Neumann was an explicit leapfrog method based on a grid point representation in space and time.

The vast increase in the speed of computers over the past three decades, coupled with progress in devising more efficient numerical schemes for solving the equations of motion, has made it possible to compute the weather fast enough for the forecasts to be used operationally. The computer forecasts have for some time been more accurate than those which