

INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

ANNUAL REPORT
1979

10 Burlington Road, Dublin 4

Pr1.9270

INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

Annual Report of the work of the
Institute and its Constituent
Schools presented by the Council
to the Minister for Education
in respect of the year ended
31 December 1979

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INSTITIÚID ÁRD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

Summary of Annual Report
of the work of the Constituent Schools
for the year ended 31 December 1979

School of Celtic Studies

Dr. Heinrich Wagner took up a post as Professor in October 1979. He had held the Chair of Celtic in Queen's University, Belfast, for twenty years, and had been a Research Associate of the School for most of that time. The Institute published the four volumes of his Linguistic Atlas and Survey of Irish Dialects during the period 1958-1969.

Research work in various branches of Celtic continued and two seminars were held each week during academic terms. Nine papers were read at the annual symposium, five being by members of the School. At the International Congress of Celtic Studies held in Galway in July 1979, three members of the School read papers in the plenary sessions, and five members contributed to the sectional sessions.

The outstanding event of the year was the publication of the six volumes of D. A. Binchy's Corpus Iuris Hibernici. Three other new works were published, and four previous publications reprinted.

School of Theoretical Physics

A Summer Seminar on Current Problems in General Relativity was held from 2 to 6 July. Thirty-four participants came from abroad and eleven from Irish universities and institutes of higher education.

The use of the School's facilities for research continued to increase; twenty-five research workers from the universities and other institutes of research or higher education were admitted to research associateships with the School. Thirty-three scientists from abroad visited the School.

Research in the School continued in the areas of general relativity, statistical mechanics and probability, dielectric theory, wave propagation, quantum field theory, group theory, high

energy physics, solitons and holomorphic functions. One book was published, and one number of the series A of Communications of the Dublin Institute for Advanced Studies (the second edition of an earlier number); thirty-four contributions to scientific journals, or proceedings of scientific conferences, were published.

Members of the School attended twenty-two international conferences and gave eleven lectures (or series of lectures) at them; they also gave sixteen lectures (or series of lectures) at home and abroad, at other institutions.

The Christmas and Easter Symposia were held as in previous years, and the Wednesday seminars and weekly joint meetings (with UCD, TCD, Maynooth) in special subject areas were also continued. Five courses were given, including one for final year undergraduates (or first year postgraduates) from the Dublin area.

The Ciaran Ryan Memorial Lecture was given at DIAS; the School's Statutory Public Lecture was given at UCD on 22 November by Professor Sir Sam Edwards, F.R.S. (Cambridge), on 'Turning rubber into glass'.

School of Cosmic Physics

Astronomy Section

Research continued on the description of Cepheid light curves for characterising stellar population, on stability criteria for orbits of minor planets, successfully identifying the existence of a 'hyperperiod' as necessary for stability in respect of the Kirkwood gaps, and on problems connected with the upper layers of the solar and stellar atmospheres. Other research concerned galaxy brightness contours and historical records of supernovae. A major auxiliary instrument was completed for the instruments planned at the La Palma Observatory and observers participated in seeing tests at that site.

Cosmic Ray Section

The co-operative programme with ESA of assembling cosmic-ray detector materials destined for extended exposure by Space Shuttle launching was advanced considerably, although the launch date is now August 1982. Improvements have been made in the type of plastic employed. Exposures of material made at various institutions have contributed to further work of measurement and analysis. Work on mathematical formulation of classical electrodynamics and the relativistic study of tachyons has been effectively presented and the implications have been studied in detail.

Geophysics Section

Marine magnetic work in the Irish Sea has been carried out for survey purposes, with various potential applications. A special gravity survey in Co. Offaly was also carried out.

The Section's seismic network was in full operation during the year and many uses were made of routine and special records, and regular exchange has been established with other data networks.

INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

Annual Report of the work of the Institute
and its Constituent Schools presented by
the Council for the year ended
31 December 1979

In accordance with the provisions of Section 29 of the Institute for Advanced Studies Act, 1940 (No. 13 of 1940), the Council of the Institute has the honour to present to the Minister for Education for submission to the Government a report of the work and activities of the Institute and its Constituent Schools for the year ended 31 December 1979.

The general purpose which it is hoped to accomplish is clearly stated in the Act establishing the Institute, namely, the Institute for Advanced Studies Act (No. 13 of 1940) and in the Establishment Orders establishing the three Constituent Schools, namely, the Institute for Advanced Studies (School of Celtic Studies) Establishment Order, 1940, the Institute for Advanced Studies (School of Theoretical Physics) Establishment Order, 1940, and the Institute for Advanced Studies (School of Cosmic Physics) Establishment Order, 1947, and need not be referred to here. It is deemed desirable, however, to include in the report for the purposes of record certain particulars about the constitution of the Council of the Institute and the membership of the Governing Boards of the three Constituent Schools on the 31 December 1979.

The report is presented under the following principal heads:-

- I - Constitution of the Council of the Institute and of the Governing Boards of the three Constituent Schools on the 31 December 1979.
- II- Report of the Governing Board of the School of Celtic Studies.
- III- Report of the Governing Board of the School of Theoretical Physics.
- IV - Report of the Governing Board of the School of Cosmic Physics.

I Constitution of the Council of the Institute and of the Governing Boards of the three Constituent Schools on the 31 December 1979

1 THE COUNCIL OF THE INSTITUTE

Chairman

Professor W. B. Stanford, M.A., Litt.D., S.F.T.C.D.

Ex-Officio Members

Thomas Murphy, M.D., D.P.H., B.Sc.Pub.H., President, University College, Dublin; Francis S. L. Lyons, M.A., Ph.D., Litt.D., F.B.A., Provost, Trinity College, Dublin; Proinsias Mac Cana, M.A., Ph.D., President, Royal Irish Academy.

Members appointed by the Governing Boards of Constituent Schools

Professor David Greene, M.A., D.Litt.; Senator T. K. Whitaker, D. Econ. Sc.; Professor J. T. Lewis, B.Sc., Ph.D.; Dr. A. J. McConnell, M.A., M.Sc., Sc.D., F.T.C.D.; Professor P. A. Wayman, Ph.D.; Professor E. F. Fahy, M.Sc., Ph.D.

2 GOVERNING BOARD OF THE SCHOOL OF CELTIC STUDIES

Chairman

Proinsias Mac Cana, M.A., Ph.D.

Senior Professors

James P. Carney, B.A., Fil.Dr., D.Litt.; David Greene, M.A., D.Litt.; Brian Ó Cuív, M.A., D.Litt.

Appointed Members

Tomás de Bhaldraithe, M.A., Ph.D., D.Litt.; Gearóid Mac Eoin, M.A., Ph.D.; Seán Ó Tuama, M.A., Ph.D.; Ernest Gordon Quin, M.A., F.T.C.D.; Gerard Victory, B.A., Mus.D.; Thomas Kenneth M. Whitaker, D.Econ.Sc.

3 GOVERNING BOARD OF THE SCHOOL OF THEORETICAL PHYSICS

Chairman

Albert J. McConnell, M.A., M.Sc., Sc.D., F.T.C.D.

Senior Professors

John T. Lewis, B.Sc., Ph.D.; Reverend James R. McConnell, M.A., D.Sc.; Lochlainn Ó Raifeartaigh, M.Sc., Ph.D.

Appointed Members

Michael A. Hayes, M.Sc., Ph.D.; Thomas E. Nevin, D.Sc.;
Patrick Quinlan, B.E., D.Sc., Ph.D.; Thomas D. Spearman,
M.A., Ph.D. (Cantab); Seán Seosamh Tóibín, M.Sc., Ph.D.;
William Wright, M.A., Ph.D., C.Eng., F.I.C.E., F.Inst.Prod.E.,
F.I.E.I., F.R.S.E.

4 GOVERNING BOARD OF THE SCHOOL OF COSMIC PHYSICS

Chairman

Edward Francis Fahy, M.Sc., Ph.D.

Senior Professors

Cormac Ó Ceallaigh, M.Sc., Ph.D.; Thomas Murphy, D.Sc.;
Patrick Arthur Wayman, Ph.D.

Appointed Members

Peter Kevin Carroll, M.Sc., Ph.D.; Mart de Groot, Ph.D.;
Brian Henderson, B.Sc., M.A., Ph.D., F.I.P.; George F.
Imbusch, Ph.D., D.Sc.; Reverend Thomas P. G. McGreevy, M.Sc.,
Ph.D.; Patrick Nolan, Ph.D., D.Sc.; Neil A. Porter, Ph.D.;
P. K. Rohan, M.A.; Ernest T. S. Walton, M.A., M.Sc., Ph.D.,
D.Sc., F.T.C.D.

5 ADMINISTRATIVE STAFF

Registrar

Lt. Col. John P. Duggan

Senior Clerk

Maura Devoy

Accounts Clerk

Mary A. O'Rourke

Clerks

Angela Stubbs; Noreen Granahan; Mary Quirke; Desmond Pender.

II - Annual Report of the Governing Board of the School of Celtic Studies for the year ended 31 December 1979, adopted at its meeting on the 18 April 1980

1 STAFF, SCHOLARS AND EXTERN RESEARCH WORKERS

Professor Emeritus

D. A. Binchy

Senior Professors

Brian Ó Cuív, Director of the School to 30 September 1979; James Carney; David Greene, Director of the School from 1 October 1979.

Professor

Heinrich Wagner (appointed 1 October 1979).

Assistant Professors

Pádraig de Brún; Fergus Kelly; Rolf Baumgarten

Assistants (Part-time)

Mrs. Nessa Doran; Mrs. Anne O'Sullivan

Research Assistants

Micheál Ó Siadhail; Malachy McKenna

Junior Research Assistants

M. Katharine Simms; Liam Breatnach

Research Associates

Proinsias Mac Cana; Gearóid Mac Niocaill

Assistant Librarian/Clerk

Máire Breatnach

Technical and Clerical Staff

Maire Uí Chinnseala; Patricia Dunne (appointed 1 October 1979).

Scholars

Kim R. McCone, R. Mark Scowcroft, M. J. McCloskey (to 30 September 1979); Gwenaél Le Duc, Muireann Ní Bhrolcháin; Diarmuid Ó Sé (from 1 July 1979); Dáibhí Ó Cróinín, Ian Hughes, Robert Elsie (from 1 October 1979)

Extern Research Workers

Dr. Cecile O'Rahilly; Dr. Ludwig Bieler; An tAthair Pádraig Ó Fiannachta; Professor J. J. O'Meara; Dr. N. J. A. Williams.

The long-awaited publication of the six volumes of Corpus Iuris Hibernici took place on 25 May 1979, at a ceremony held in the Institute.

The sixth International Congress of Celtic Studies was held in Galway in July. Professors Binchy, Carney and Greene read papers in the plenary sessions, and sectional papers were contributed by Mr. Fergus Kelly, Dr. M. Katharine Simms, Dr. Kim R. McCone, Mr. Gwenaël Le Duc, Dr. M. J. McCloskey.

On October 1, Dr. Heinrich Wagner, formerly Professor of Celtic in Queen's University, Belfast, took up the Professorship vacated by Dr. Breandán Ó Buachalla in 1979. Dr. Wagner has been a Research Associate of the School for many years, and the Institute has published the four volumes of his Linguistic Atlas and Survey of Irish Dialects (1958-1969), as well as his monograph Gaeilge Theilinn (1959).

2 RESEARCH AND EDITING

Professor D. A. Binchy, whose edition of Corpus Iuris Hibernici, Vols I-VI was published during the year, prepared the following articles for publication: (i) 'Bergin's Law' for Studia Celtica XIV-XV (Festschrift for Kenneth Jackson); (ii) 'A pre-Christian survival in medieval Irish hagiography', Kathleen Hughes Memorial Volume (Cambridge University Press). See also §§ 6, 7.

Professor Brian Ó Cuív continued work on (i) linguistic and literary material from the Early Modern Irish period; (ii) personal names; (iii) contributions for A New History of Ireland. As Editor of Celtica XIII he checked first proofs of the articles. He read and revised proofs of Dr. Bieler's edition of The Patrician Texts in the Book of Armagh; he revised the bibliography for the reprinted edition of D. Hyde's A Literary History of Ireland. In October 1979 Professor Ó Cuív was appointed Rhys Research Fellow and Visiting Senior Research Fellow in Jesus College, Oxford, where he began work on the manuscripts in the Irish language in the Bodleian Library. The following articles were accepted for publication: - (i) 'The Verbal Noun Termination -ail and Related Forms' (Celtica XIII); (ii) 'Irish Words for "Alphabet"' (Ériu XXXI); (iii) 'Some Gaelic Traditions about the Wren' (Éigse XVIII). See also §§ 5, 6, 7.

Professor James Carney supervised the work of the following scholars: Mark Scowcroft, Dáibhí Ó Cróinín, Muireann Ní Bhrolcháin, Ian Hughes. He read Dr. Hildegard Tristram's work on Sex Aetates Mundi and Mrs. Anne O'Sullivan's text for the sixth and final volume of The Book of Leinster and collated this with the photostat of the manuscript. Work continued on Archaic Irish verse with the co-operation of Liam Breatnach. He began a study of a manuscript of a life of James Lynchehaun by Brother Paul Carney and its medieval, folkloristic, sociological and historical content. An article on a study of linking alliteration was accepted for publication in Eigse. See also §§ 5, 6, 7.

Professor David Greene completed the preliminary editorial work on Saltair na Rann and continued work on the history of the Irish language. See also §§ 4, 5, 6, 7.

Professor Heinrich Wagner prepared the following articles for publication: (i) 'The origins of the Pagan Irish Religion' (for the Journal of

the Ulster Place-Names Society); (ii) 'Notes on Esnada Tighe Buchet and the Leinster Tradition' (Festschrift for Tomás Ó Máille); (iii) 'The Present Position of the Irish Language' (Proceedings of the Sixth International Congress of Celtic Studies). Some preparatory editorial work for ZCP 38 was commenced. See also §§ 3, 4, 5.

Dr. Pádraig de Brún continued work on (i) Catalogue of Irish MSS. in TCD (in association with Mrs. Anne O'Sullivan); (ii) poems by and concerning Piaras Feiritéar; (iii) materials for a biographical account and edition of the correspondence of John O'Daly; (iv) investigation of background of early nineteenth-century Bible Societies using the Irish language, of teachers employed in this work, and of its relevance to a study of the contemporary scribal tradition in Irish. An article entitled 'Kildare Place Society in Kerry: I. Schools and lending libraries, Aenglish - Gunaborough' was accepted for publication in the Journal of Kerry Archaeological and Historical Society and 'Amhrain a thiomsaigh Eoghan O Comhrai' was accepted for Ceol. See also § 7.

Mr. Fergus Kelly worked on an edition of The Old Irish Triads and completed the preparation of the Vocabulary to Saltair na Rann (II. 3813-8393). See also §§ 4, 6, 7.

Mr. Rolf Baumgarten worked on the printer's copy and the indexes of the Bibliography of Irish Linguistics and Literature.

Mrs. Nessa Doran continued her work on the Catalogue of Irish Manuscripts in the National Library of Ireland. She corrected galley and page proofs of Fasc. V; checked the typescript of Fasc. VI and catalogued manuscripts G 235-296. See also § 6.

Mrs. Anne O'Sullivan resumed work on re-cataloguing the Irish Manuscripts in the Library of TCD. She read the transcript of her edition of the Book of Leinster which is to be checked by Professor Carney and by Professor Pádraig O Riain of University College, Cork who is to check the genealogies of the Irish saints. This edition will be published as the sixth volume of the Book of Leinster. See also §§ 6, 7.

Micheál Ó Siadhail finalised the typescript of Learning Irish (an introductory self-tutor to the Irish of Cois Fhairrge) and arranged for its publication and that of related cassette recordings. Work commenced on aspects of syntax in Irish dialects. An article entitled 'Diabhal (Deamhan 7rl) mar dheis chomréire sa nGaeilge' was accepted for publication in Ériu. See also §§ 6, 7.

Dr. Malachy McKenna completed work on Part III of the Breton of Guemene-sur-Scorff which was accepted for publication in ZCP 38 and continued work on (i) an edition of 'The Spiritual Rose' and (ii) a survey of S. E. Ulster Irish as seen in the Linguistic Atlas and Survey of Irish Dialects (Vols. I and IV). Some preparatory work was done on an article entitled 'Gutaí fada neamhaiceanta in Oir-Dheisceart Uladh'; a review of Foclóir Gaeilge-Béarla (N. O Domhnaill); a review of Le Breton parlé à St. Pol-de-Léon (A. Sommerfelt). See also §§ 6, 7.

Dr. Mary Katharine Simms continued work on a survey of the extant corpus of bardic poetry c. 1200-1650 with a view to computer analysis and eventual publication of a descriptive catalogue; she collated galley proofs of the Annals of Ulster Vol. I with the TCD manuscript. The

following articles were accepted for publication:- (i) 'Gabh umad a Fheidlimidh - a fifteenth-century inauguration ode?' (*Eriu* xxxi); (ii) "'The King's Friend" : O Neill, the Crown and the Earldom of Ulster' (*Anglo-Irish Relations in the later Middle Ages - Essays presented to A. J. Otway Ruthven, ed. J. F. Lydon*); 'Bauerntum: Irland' (*Lexikon des Mittelalters - Artemis Verlag, München*). See also §§ 5, 6, 7.

Liam Breatnach prepared an edition of 'The Cauldron of Poesy'. An article entitled 'Some Remarks on the Relative in Old Irish' was accepted for publication in *Eriu* 31 and a review of Ulrike Roeder's edition of *De Chophur in da Muccida* is to appear in a forthcoming volume of *Kratylos*. See also § 4.

Professor Proinsias Mac Cana checked first proofs of *The Learned Tales of Medieval Ireland* which was sent to press in October.

Professor Gearóid Mac Niocaill checked galley proofs of *The Annals of Ulster* and collated these with the manuscript at Trinity College, Dublin. Collation of the Rawlinson manuscript will be done by arrangement with Dr. T. M. Charles-Edwards at Oxford. The Indices are now in typescript and it is expected that these will add 100 pages to the volume. Preparation of an edition of *Chronicon Scotorum* is completed and the typescript checked; work on the index is progressing.

Dr. Kim R. McCone presented his thesis on 'Aspects of Indo-European sentence patterns and their role in the constitution of the Old Irish verbal system' to the University of Oxford and was awarded the degree of D.Phil. The following articles were accepted for publication:- (i) 'The Diachronic Possibilities of the Indo-European Amplified Sentence - a Case History from Anatolian' (*Szemerényi Festschrift*); (ii) 'The Nasalizing Relative Clause with Object Antecedent in the Glosses'; (iii) 'Final /t/ to /d/ after Unstressed Vowels, and an Old Irish Sound Saw' (*Eriu* 31). See also §§ 5, 6, 7.

Mr. R. Mark Scowcroft completed research on the Irish section of his doctoral thesis and wrote three of the chapters of this section. Work began on the manuscript tradition of *Leabhar Gabhála*. See also § 6.

Dr. M. J. McCloskey saw his book *Transformational Syntax and Model Theoretic Semantics: A Case Study in Modern Irish* through the press. He worked on the syntactic and semantic properties of the Modern Irish verbal noun construction and the preliminary results of this work were presented as articles and lectures. The articles in question are 'A Note on Modern Irish Verbal Nouns and the VP-Complement Analysis' which is to be published in *Linguistic Analysis* and 'Is There Raising in Modern Irish?' (*Eriu* 31). See also §§ 4, 6, 7.

Mr. Gwenaél Le Duc prepared an edition of the *Miroir à Confession*; an edition of 500 locutions from Goello (1890-1900); established a catalogue of the Breton and Cornish books preserved in the Heinrich Zimmer Library; catalogued the wax cylinders of the Vallée collection containing Breton and Welsh (1903-1906) in the National School of Music; continued the preparation of the catalogue of the Breton manuscripts in DIAS. The following articles were accepted for publication in *Etudes Celtiques*:- (i) *Le Donet: Grammaire Latine en Moyen-Breton (suite): Les gloses au Liber Vocabulorum* (texte et notes); (ii) *Le Donet (suite): Le verbe leen* (lire) dans le Donet; (iii) *Le Donet (suite): L'emploi du passif dans le Donet*. See also §§ 6, 7.

Muireann Ní Bhrolcháin continued work on her Ph.D. thesis - an edition of the prose Banshenchas which includes text, translation, an exhaustive index, ms. tradition, sources, dating and genealogies based on the text. An article entitled "Women in Irish Myths and Sagas" was accepted for publication in The Crane Bag. See also § 6.

Diarmuid Ó Sé spent some weeks in Dun Chaoin making tape recordings and notes of the Dialect. This material was later phonetically and phonemically transcribed and indexed. See also § 6.

Dáibhí Ó Cróinín worked on a critical edition of the Irish Sex Aetates Mundi: medieval Irish concepts and doctrines of history, with particular reference to the so-called 'Synthetic Historians'; co-editing (with Fr. Martin McNamara M.S.C.) a collection of essays to commemorate the 800th anniversary of the death of Laurence O'Toole. An article entitled 'The oldest Irish names for the days of the week?' was accepted for publication in either Ériu or Celtica and a review of Fragmentary Annals of Ireland (Ed. Radner) was accepted for publication in Éigse.

Dr. Robert Elsie did some initial research and gathered material for a proposed project on the diachrony of Celtic linguistics.

Dr. Cecile O'Rahilly continued work on the preparation of the synthesis of researches on Tain Bo Cuailnge and checked proofs of her articles in Éigse, Celtica and Ériu. See also § 7.

Dr. Ludwig Bieler's edition of The Patrician Texts in the Book of Armagh was published in December.

An tAthair Pádraig Ó Fiannachta checked first proofs of Clár Lámhscríbhínní Gaeilge Fascúl II.

Professor J. J. O'Meara checked first proofs of I. P. Sheldon-Williams' edition of Liber III of Iohannis Scotti Eriugena Periphyseon (De Divisione Naturae) which he is seeing through the press.

Dr. N. J. A. Williams checked first proofs of his edition of Pairlement Chloinne Tomais.

3 STATUTORY PUBLIC LECTURE

A public lecture entitled 'Origins of Pagan Irish Religion' was delivered by Professor Heinrich Wagner at Trinity College, Dublin on 30 November 1979.

4 SEMINARS

The following weekly seminars were held:-

Professor David Greene:	<u>Saltair na Rann</u> (Hilary and Trinity terms)
Mr. Fergus Kelly:	'Old Irish Triads' (Hilary term)

- Dr. M. J. McCloskey: 'Generative Syntax and the Syntax of Modern Irish'
- Liam Breatnach: 'The Cauldron of Poesy' (Michaelmas term)
- Professor Heinrich Wagner: 'Irish Dialects' (Michaelmas term)

5 SYMPOSIUM

On 23-24 March 1979 a symposium was held for university and college staff and research workers. The following papers were read:-

- James Carney : Fidirad freccomail
- Anders Ahlqvist : The paradigm(s?) of bé and ben
- Heinrich Wagner : Notes on Esnada Tige Buchet and the Leinster tradition
- Tomás Ó Concheanainn : Dhá scéal Meán-Ghaeilge: roinnt gnéithe cosúla
- Daithí Ó hUaithne : crú agus crú
- M. Katharine Simms : Computerized analysis of bardic poetry: a progress report.
- Kim McCone : Final t to d after unstressed vowels, and an Old Irish sound law
- Brian Ó Cuív : From b l n to a b c

6 EXTERNAL ACTIVITIES

Professor Brian Ó Cuív attended (i) the 11th Conference of the Council for Name Studies in Great Britain and Ireland in Nottingham, 6-9 April and lectured on 'Borrowed Elements in the Corpus of Irish Personal Names from Medieval Times'; (ii) the sixth International Congress of Celtic Studies at Galway, 6-13 July. On November 13, at Oxford, he delivered a lecture on 'Linguistic Training in the Medieval Bardic Schools'.

Professor James Carney delivered a lecture entitled 'Early Irish literature - the state of the question' to the Celtic Congress at Galway on 12 July; on 6 December he lectured to the Royal Society of Antiquaries of Ireland on 'Irish saga - fact or fiction'.

Professor David Greene lectured on 'The coming of the Celts to Britain and Ireland: a linguistic view' at the Celtic Congress at Galway on 12 July; at McGill University, Montreal on 17 October he delivered a lecture entitled 'The present state of the Irish language'; at Québec on

22 October he lectured to Université Laval on 'Le bilinguisme secondaire en Irlande'.

Professor D. A. Binchy attended the Sixth International Congress of Celtic Studies in Galway in July and read a paper entitled 'Corpus Iuris Hibernici - Incipit? or Finit Amen?'.

Mr. Fergus Kelly delivered a lecture entitled 'What life was like in ancient Ireland' on 14 January at St. Columba's College, Rathfarnham, Co. Dublin; on 5 April at Bangor, N. Wales he lectured at the Welsh Law Colloquium on 'Irish Legal Manuscripts and Irish Legal Families'; at the Sixth International Congress of Celtic Studies at Galway, on 10 July he lectured on 'Triad in Celtic Literatures'.

Dr. M. Katharine Simms lectured on (i) 'Bardic Families in Gaelic Society' to University College Cork History Society on 11 January; (ii) 'Bardic Poetry 1600-1650' to UCD Irish Department Postgraduate Seminar on 23 February; (iii) 'Meath and Breifne in the 12th-13th centuries' to the Dublin Historic Settlement Committee UCD on 28 February. She attended (i) the Annual Conference of the Group for the Study of Irish Historic Settlement held at Waterford from 27-29 April; (ii) the Sixth International Congress of Celtic Studies in Galway 6-13 July and read a paper on 'Gabh umad a Fheidhlimidh - a 15th century inauguration ode?' (iii) the Annual Conference of the Irish Economic and Social History Society from 14-16 September.

Dr. Kim R. McCone attended the Sixth International Congress of Celtic Studies at Galway 6-13 July where he read a paper entitled 'The Nasalizing Relative Clause with Object Antecedent - the Statistics from the Glosses and their Historical Evaluation'.

Mr. Gwenaël Le Duc attended the Sixth International Congress of Celtic Studies at Galway 6-13 July where he read a paper entitled 'The Breton Element in Edward Lhuyd's Archaeologia Britannica'.

Dr. M. J. McCloskey lectured on 'The Syntax and Semantics of Infinitival Complementation in Modern Irish' at the Department of Linguistics, University of Stanford, California, on 23 February; 'Gramadach na Gaeilge agus Teoiric na Gramadaí' to the Irish Department UCD on 4 May; at the Sixth International Congress of Celtic Studies Galway on 11 July on 'The Modern Irish Verbal Noun Construction and Generative Syntax'; 'The Modern Irish Prepositional Relative' and 'The Syntax and Semantics of Infinitival Complementation in Modern Irish' to the School of Social Sciences, University of Sussex on 21-22 August.

Dáibhí Ó Cróinín delivered a lecture entitled 'Na mainistreacha agus an léann le linn ré Lorcáin Uí Thuathail' at the Milltown Institute of Jesuit Studies on 25 October.

Members of the Staff and Scholars who attended the Sixth International Congress of Celtic Studies at Galway 6-13 July, in addition to those mentioned above, included Mrs. Nessa Doran, Mrs. Anne O'Sullivan, Micheál Ó Siadhail, Malachy McKenna, Mark Scowcroft, Muireann Ní Bhrolcháin, Diarmuid Ó Sé.

7 PUBLICATIONS

(a) Books published by the Institute

Corpus Iuris Hibernici	Vols. I-VI.	D. A. Binchy	
		xxviii + 2343 pp.	£270
		(Single volume	£50)
Corpus Iuris Hibernici	Introductory Matter	xxviii pp.	£1
Lexique Étymologique de l'Irlandais Ancien	Lettres T-U	J. Vendryes	
		iv + 120 pp.	£12
Catalogue of Irish MSS in National Library of Ireland	Fasc. V	Nessa Ní Sheaghda	
		98 pp.	£6.75
Patrician Texts in the Book of Armagh	(Scriptores Latini Hibernia Vol.X)	Ludwig Bieler	
		(with a contribution	
		by Fergus Kelly)	
		vii + 288 pp.	£15

(b) Books published outside the Institute

David Greene:

Ériu xxx. Published by the Royal Irish Academy and edited by David Greene and Proinsias Mac Cana.

Gwenaël Le Duc:

Vie de Saint Malo, évêque d'Alet, version écrite par le Diacre BILI (fin du IX^e siècle), textes latin et Anglo-Saxon avec traductions françaises. Dossiers du Centre Régional Archéologique d'Alet, N^o B (Hors-Série), 1979. xx + 256 pp.

M. J. McCloskey:

Transformational Syntax and Model Theoretic Semantics: A Case Study in Modern Irish

Published by D. Reidel Publishing Company, Dordrecht, Boston, London.

(c) Reprints:

- 1 Críth Gablach
- 2 Studies in Irish Literature and History (with Index)
- 3 Bardic Syntactical Tracts
- 4 Gaeilge Theilinn

(d) Contributions to periodicals and other publications

Brian Ó Cuív

The Wearing of the Green. Studia Hibernica 17-18. 107-19

Borrowed Elements in the Corpus of Irish Personal Names from
Medieval Times. Nomina, Vol. 3, 40-51

James Carney

Aspects of Archaic Irish. Éigse xvii. 417-35

David Greene

Perfects and Perfectives in Modern Irish. Ériu xxx. 122-41

Pádraig de Brún

Two additions to the Franciscan Collection. Éigse xvii. 379-84

Irish in the prisons, 1822. ibid. 392

Fergus Kelly

Notes on Irish Words. The Patrician Texts in the Book of Armagh
142-7

Anne O'Sullivan

Limerick, Killaloe and Kells 1194-1250. Éigse xvii. 451-55

A Palmer's Poem. ibid. 456

Micheál Ó Siadhail

Roinnt Athrúintí suntasacha i gCanúint Chonallach.
Ériu xxx. 142-7

Malachy McKenna

The Breton of Gueméné-sur-Scorff Part II (continued).
Zeitschrift für Celtische Philologie 37. 1-29

M. Katharine Simms

The Battle of Dysert O'Dea and the Gaelic Resurgence in Thomond
Dál gCais No. 5. 59-66

Guesting and Feasting in Gaelic Ireland.
Journal of the Royal Society of Antiquaries of Ireland
Vol. 108. 67-98

Kim R. McCone

Pretonic Preverbs and the Absolute Verbal Endings in Old Irish.
Ériu xxx. 1-34

Gwenaél Le Duc

Grammaire Latine en Moyen-Breton (suite): Commentaires et notes
sur le texte de la Grammaire.
Études Celtiques xvi. 237-259

Une glose en Anglo-Saxon glosée en Brittonique.
ibid xvi 261-2

Cecile O'Rahilly

Repetition - a Narrative Device in TBC.
Ériu xxx. 67-74

III - Annual Report of the Governing Board of the School of Theoretical Physics for the year 1979 adopted at its Meeting on 6 June 1980.

1 STAFF AND SCHOLARS

Emeritus Professor

John L. Synge

Senior Professors

John T. Lewis, Director from 1 January 1975; Rev. James R. McConnell; Lochlainn S. O'Raifeartaigh

Visiting Scientists

L. Accardi, 5-28 February; N. L. Balazs, 29 June - 7 July; J. A. Barroso, 28 March - 1 April; M. Van den Berg, 3 November - 20 December; J. H. Calderwood, 26 September - 2 October; R. H. Dalitz, F.R.S., 10-11 December; Sir Sam Edwards, F.R.S., 21-23 November; G. W. Ford, 30 June - 31 July; J.-L. Gervais, 21-28 May; W. Lang, 1-31 May; P. McGill, 22-23 March; H. B. Nielsen, 12-15 November; P. Rembiesa, 9 November - 7 December; G. Vincent-Smith, 1-30 November; Y. Takahashi, 20-27 October; A. Verbeure, 9-21 April.

Assistant Professor

A. Frigerio, from 1 January.

Research Associates

The appointments of S. Dineen, P. A. Hogan, D. J. Judge, Rev. J. D. McCrea, W. Sullivan (UCD), P. S. Florides, B. K.P. Scaife (TCD), Rev. J. Spelman, D. H. Tchakian (St. Patrick's College, Maynooth), J. M. Golden (Foras Forbartha), A. I. Solomon (Open Univ.), T. Garavaglia (Kevin St. College of Technology) M. J. Conneely, M. J. Newell (UCG) were renewed for the 3-year period 1979-1981; the appointment of M. Tuite was renewed from 1 January to 30 September; the following new appointments were made for the 3-year period 1979-1981; J. D. Gibbon, J. V. Pulè (UCD), R. K. Dodd, H. C. Morris (TCD), A. G. O'Farrell (St. Patrick's College, Maynooth), B. Goldsmith (Kevin St. College of Technology), R.A. Ryan (UCG), J. Adam, P. McGill (NUU): and a new appointment for the period 1 September 1979 to 31 December 1981: C. Nash (St. Patrick's College, Maynooth).

Scholars

L. A. de Moraes to 30 April; G. O'Brien to 30 September; Y. Fujimoto, A. Fordy, P. Houston, D. Pottinger; J. Gibbons from 1 October.

Librarian-Executive

E. R. Wills.

Clerk

M. Farrelly from 1 March.

2 GENERAL

A working seminar on Current Problems in General Relativity was held at DIAS from 2-6 July. There were thirty-four participants from abroad, who were accommodated in Trinity Hall, Dublin 6, and eleven participants from the Irish universities and other third-level colleges and research institutes. The emphasis of this workshop was on equations of motion in general relativity, and related topics.

The use of the School's facilities for research - especially the opportunities for informal discussions, and the library resources - continued to increase during 1979; twenty-five research workers from the universities and other institutes of research or higher education were admitted to research associateships with the School.

3 RESEARCH AND STUDY

Professor McConnell completed the preparation of material for a monograph on rotational Brownian motion and dielectric theory. He expressed results for complex permittivity in a manner suitable for comparison with experiments, and made a critical study of existing dielectric absorption and dispersion experiments. He collaborated with Professor J. H. Calderwood (Salford), Dr. G. W. Chantry (National Physical Laboratory, Teddington), Dr. H. A. Gebbie (Imperial College, London), and Professor G. R. Wilkinson (King's College, London) in planning future dielectric experiments. Professor McConnell also studied nuclear magnetic relaxation processes that arise from thermal motion; and he collaborated with Professor H. Fröhlich (Liverpool) in the study of polaron theory.

Professor Lewis worked on quantum stochastic processes, in collaboration with Dr. L. Accardi (Milan) and Professor Frigerio; this work is an attempt to get a theoretical framework in which results on models of dissipative systems can be organized. He collaborated with Professor G. W. Ford (Ann Arbor) in work on the application of averaging methods to the determination of the asymptotic evolution of an atom coupled to the electromagnetic field at non-zero temperature. Professors Lewis and Frigerio worked with Dr. Pulè on a mathematical study of averaging methods for stochastic differential equations and quantum mechanical evolution equations. In collaboration with Professor Winnick (Groningen) Professor Lewis worked on an investigation of the Atiyah-Singer index of states of the Clifford algebra, and in collaboration with Dr. M. van den Berg (Groningen) and Dr. Pulè on various problems concerning Bose-Einstein condensation. Professor Lewis continued his dialogue with Professor Synge on wave-propagation in heterogeneous media.

During the early part of 1979 Professor O'Raifeartaigh renewed the research on the long-range interaction of magnetic monopoles and the algebraic structure of spontaneous symmetry breaking which he had been doing at Syracuse in the previous year. The work on the latter topic was done in collaboration with Dr. Fujimoto; the quantum corrections to spontaneous symmetry breaking led them to consider the effective

potential, and, with Dr. Parravicini (Milan), they developed some of their earlier work on effective potentials to cover the spontaneously broken case. In September Professor O'Raifeartaigh commenced work on the field equations for multi-monopole systems, in collaboration with Dr. Houston; this work has produced some rather unexpected results, and is still in progress.

As well as the above-mentioned research in collaboration with Professor O'Raifeartaigh, Dr. Houston worked on instabilities in the QCD model of hadrons and the phenomena of gluon condensation, in collaboration with Dr. Pottinger.

Dr. Pottinger and Dr. Tuite collaborated in work concerning non-vanishing expectation values for fermions, and the consequences. Dr. Tuite also continued to study Dirac's quantization method for constrained Hamiltonian systems and the formulation of the Gribov ambiguity in the language of constraints.

Dr. Tchraikian completed work commenced during the previous year on instantons and monopoles on N-dimensional manifolds. He then turned to the Yang-Mills-Higgs system, and tried to find self-dual monopole solutions that are not spherically symmetric. His investigations of different approaches to this problem are still continuing.

Dr. Hogan developed previous work on equations of motion in linearized gravity; he studied the radiation of 4-momentum by sources of Robinson-Trautman fields. He constructed the plane gravitational wave solutions of Einstein's equations in a simple way, using a slight modification of Synge's technique for constructing plane electromagnetic waves.

Dr. O'Brien worked on the linearized vacuum Einstein-Maxwell field equations for a charged, rotating axially symmetric body, in order to determine what type of acceleration and rotation of the source is compatible with the requirements that the linearized field of the body and the linearized twist of the degenerate principal null direction of the Weyl tensor are 'directional' singularity-free. She worked also on twisting type N gravitational solutions, and on Einstein-Maxwell fields with null fluid present.

Professor Florides continued to work on the exact solution he had obtained for the combined Einstein-Maxwell field equations; this solution describes the complete field of a general, static, spherically symmetric distribution of charge. He is now applying his solution to the following two systems: (1) charged perfect fluid spheres, and (2) charged distributions with no radial matter stress. He has obtained exact solutions inside and outside the distributions; the solutions for system (1) above reduce, inside the distribution, to the Schwarzschild interior solution.

Dr. McCrea extended results (previously reported) on gravitational radiation damping for the case of a perfect fluid to the case of a material with a general form of stress tensor. He has also developed a series of programs in the algebraic computing language REDUCE, for performing calculations in general relativity.

Dr. Golden continued his work on viscoelastic contact problems, and on modelling of unsaturated flow through porous media.

Dr. Sullivan, in collaboration with Mr. R. Flood (Kevin Street College of Technology), continued the study of continuous time interacting lattice particle systems. They formulated the problem in terms of a specification for path space measures, the Gibbs states of which are currently being studied.

Dr. Goldsmith continued his work in Specker groups.

Dr. Solomon worked on a Lie algebraic model of an anisotropic fermion superfluid; he found that the spectrum and phases could be accommodated within the model. He also studied the application of differential geometric methods, such as forms and cohomology, to the superconductivity problem.

Dr. Garavaglia continued his study of polarization effects in electromagnetic interactions.

Dr. Fordy worked with Dr. Dodd on symmetries and prolongation; and later he worked with Dr. Gibbons on factorization of scattering operations and 'Miura' transformations.

Dr. de Moraes studied holomorphic problems.

Research Reports

Research work during the year was written up in the first instance in research reports. Two lists of titles of these reports (preprints) were prepared, but (because of the postal dispute) only the second of these was circulated; the circulation list included approximately 180 research institutes and university departments of mathematics and physics throughout the world. As far as available copies of the preprints were supplied, on request, to research workers in these institutes and departments.

- DIAS-STP-02: L. de MORAES: Holomorphic functions on strict inductive limits.
- 03: L. de MORAES: Theorems of the Cartan-Thullen type and θ -envelope of the holomorphy for every holomorphy type θ .
- 04: L. de MORAES: θ -Runge domains for P-holomorphy types θ .
- 05: J. L. SYNGE: Status report on general relativity.
- 06: P. A. HOGAN: Equations of motion in linearized gravity: IV external fields.
- 07: P. A. HOGAN and G.O'BRIEN: On the motion of rotating bodies in linearized gravity.
- 08 G. O'BRIEN: Equations of motion in linearized gravity: III rotating sources.
- 09 P. HOUSTON and J. KENNEDY: Vector-meson contributions to the isovector magnetic nucleon form factor.

- DIAS-STP -10: T. GARAVAGLIA: Polarized electron scattering on spin zero and polarized spin $\frac{1}{2}$ targets: Deep inelastic scattering, elastic electron-muon scattering, and elastic electron-nucleon scattering.
- 12 D. H. TCHRAKIAN: Axially-symmetric Prasad-Sommerfield solution.
- 13 Y. FUJIMOTO: The generalized Kobayashi-Maskawa CP violation matrix.
- 14 G. M. O'BRIEN: Equations of motion in linearized gravity: charged rotating sources.
- 16 L. O'RAIFEARTAIGH, S. Y. PARK and K. C. WALI: On the interaction of monopoles.
- 17 M. SCHEUNERT: The theory of Lie superalgebras. An introduction.
- 18 L. O'RAIFEARTAIGH: Remarks on the algebraic structure of spontaneous symmetry breaking in unified gauge theories.
- 19 P. HOUSTON: Non-canonical currents and deep inelastic polarized electroproduction.
- 20 L. de MORAES: Envelopes for types of holomorphy.
- 21 G. R. FLOOD and W. SULLIVAN: Path specification for interacting jump processes.
- 22 P. HOUSTON and D. POTTINGER: Gluon condensation and QCD.
- 24 P. A. HOGAN: Plane gravitational waves.
- 25 P. HOUSTON and D. POTTINGER: Gluon condensation in the quark confining phase of QCD.
- 26 J. T. LEWIS and M. WINNICK: The Ising model phase-transition and the index of states on the Clifford algebra.
- 27 J. V. PULE: A unified approach to classical and quantum KMS theory.
- 28 D. H. TCHRAKIAN: Self-dual solutions to gauge field equations on N-dimensional manifolds.
- 29 A. FRIGERIO, V. GORINI and J. V. PULE: Open quasi-free systems.
- 30 Y. FUJIMOTO: The renormalization effects in SU(6), SO(10) and E(6) models.
- 32 P. HOUSTON and D. POTTINGER: Gluon condensation for arbitrary colour gauge groups.
- 33 P. A. HOGAN: Equations of motion in linearized gravity: Radiation of 4-momentum.
- 34 G. O'BRIEN: A note on twisting type N solutions.

- DIAS-STP-35 P. HOUSTON and L. O'RAIFEARTAIGH: On monopoles with axial and mirror symmetry.
- 36 A. I. SOLOMON: The general Bogoliubov transformation.
- 37 A. I. SOLOMON: Group theory and superfluid systems.
- 38 A. P. FORDY and J. GIBBONS: Some remarkable non-linear transformations.
- 39 A. P. FORDY and J. GIBBONS: Factorisation of operators I: Miura transformations.
- 40 Y. FUJIMOTO: SU(8) grand unified theory - A consequence of introducing a horizontal symmetry.
- 41 G. O'BRIEN: An Einstein-Maxwell field with null fluid present.

4 SEMINARS AND REVIEW LECTURES

Review and seminar lectures were held throughout the year, and as in previous years they were attended by members of staff and students from Trinity College, Dublin, University College, Dublin, St. Patrick's College, Maynooth, and the College of Technology, Kevin Street, as well as by members of the School of Cosmic Physics.

The following lectures were given:

- Dr. J. ANDERSON (Penn. State Univ.): Irreducible representations of C^* -algebras.
- Prof. N. L. BALAZS (SUNY): Semiclassical dynamics.
- Prof. J. A. BARROSO (Univ. Fed. R. d. Janeiro): Infinite dimensional complex analysis.
- Dr. M. van den BERG (Groningen): Statistical mechanics of Coulomb-like systems.
- Prof. J. F. COLOMBEAU (Bordeaux): Convolution operators on locally convex spaces.
- Sir S. EDWARDS, F.R.S. (Cavendish Lab., Cambridge): Basic theory of viscoelasticity of polymers.
- Dr. A. P. FORDY (DIAS): On the Gel'fand-Dikii approach to isospectral flows.
- Dr. Y. FUJIMOTO (DIAS): Colour embeddings, charge assignments and proton stability. (2 lectures)
- Prof. J. -L. GERVAIS (ENS, Paris): Hadronic string states in chromodynamics.
- Dr. J. GIBBONS (DIAS): On KAM theory and perturbed solitons.
- Dr. W. LANG (Karlsruhe): Analogy between critical phenomena in solid state, polymer and particle physics.
- Prof. J. T. LEWIS (DIAS): Averaging - with applications to atomic and molecular physics.

- Prof. J. T. LEWIS (DIAS): Some new results on the Hilbert space theory of stochastic processes.
- Prof. J. R. McCONNELL: The Rocard formula.
- Dr. P. McGILL (NUU): Methods of analysis in abstract Wiener spaces.
- Prof. P. NOVERRAZ (Nancy): Plurisubharmonicity in Banach algebras.
- Dr. R. J. N. PHILLIPS (Rutherford Lab.): Looking for new flavours.
- Dr. D. RAY (QMC, London): Exact solutions of classical non-linear field equations.
- Dr. G. VINCENT-SMITH (Oxford): A Kolmogorov-Daniell construction and Markov property of a process based on a semigroup of completely positive maps in a C*-algebra.
- Dr. A. I. SOLOMON (Open Univ. & DIAS): Group theory of superfluid helium 3.
- Prof. Y. TAKAHASHI (Univ. of Alberta): Field theoretical methods in statistical mechanics.
- Dr. D. H. TCHRAKIAN (Maynooth & DIAS): N-dimensional instantons and monopoles.
5-dimensional monopoles.
- Prof. A. VERBEURE (Leuven): C*-algebras and statistical mechanics.
- CIARAN RYAN MEMORIAL LECTURE: the Lecture for 1979 was given at DIAS under the auspices of the School; it was given by Prof. R. H DALITZ F.R.S. (Oxford), on Quarks and Leptons.
- UCD-TCD-DIAS Series in Pure Mathematics: Lectures were given at DIAS as follows:
- Dr. R. RYAN (UCD): Duality of polynomials (2 lectures).
- Dr. R. ARON (TCD): The entire functions.
- Dr. L. de MORAES (DIAS): Strict inductive limits of Frechet spaces.
- Dr. K. BIERSTEDT (Paderborn): A projective description of weighted locally convex inductive limits for holomorphic functions.
- Dr. D. O'DONOVAN (TCD): Isometric images of C*-algebras.
- Journals' Club (TCD-UCD-Maynooth-DIAS Particle Group): School members and School Visitors gave the following lectures:
- Prof. R. H. DALITZ, F.R.S. (Oxford): Quantum chromodynamics and the baryon spectrum.

- Dr. P. REMBIESA (Cracow): $1/N$ and mean field expansion in quantum field theories.
- Prof. L. O'RAIFEARTAIGH (DIAS): Monopole interaction.
Spontaneous symmetry breakdown structure.
- Dr. D. POTTINGER (DIAS): Perturbative QCD.
- Prof. H. B. NIELSEN (Copenhagen): Ansätze for QCD vacuum and bounds on the bag constant.
- Prof. Y. TAKAHASHI (Univ. of Alberta): Generalized Ward-Takahashi identities.

5 COURSES AND SERIES

A course on Quantum stochastic processes was given by Professor A. Frigerio (DIAS).

A series of seminars on Statistical mechanical applications of C^* -algebras was given by Professor A. Verbeure (Leuven).

A course on Non-commutative probability was given by Dr. L. Accardi (Milan).

A series on Partons, hadrons, and QCD was given by Dr. S. Sen (TCD).

A series of lectures suitable for final year undergraduates, and beginning graduate students, in Mathematics and Mathematical Physics, to last a full academic year to June 1980 commenced in October, as in recent years. The course for this year is on Statistical Mechanics, and is being given by Professor J. T. Lewis (DIAS).

6 STATUTORY PUBLIC LECTURE

A Statutory Public Lecture under the auspices of the School was delivered by Professor Sir Sam Edwards, F.R.S. (Cambridge) on 22 November, in University College Dublin; the title of the lecture was 'Turning rubber into glass'.

7 SYMPOSIA

Two Mathematical Symposia were held during the year, 11-12 April and 20-21 December. The attendances (65 in April, 51 in December) included professors, lecturers, and graduate students from the Irish universities and other third-level institutions, and from institutions abroad.

The inclusion of separate parallel sections of the Symposia for Pure and Applied Mathematics was continued, and the following lectures (in addition to the short communications (previews)) were delivered:

APRIL:

Review:

Prof. J. T. LEWIS: Averaging.

Dr. J. V. PULE (UCD): Quadratic forms.

Dr. P. F. HODNETT (NIHE, Limerick): Large-scale ocean circulation:
Implications of recent observations.

Dr. W. G. SULLIVAN (UCD & DIAS): Representations of groups.

Applied Mathematics:

Dr. J. D. GIBBON (UCD): Solitons in rotating fluids.

Dr. A. I. SOLOMON (Open U. & DIAS): Cohomology and superconductivity.

Pure Mathematics:

Dr. J. P. J. McDERMOTT (UCG): Highly transitive groups.

Dr. S. DINEEN (UCD & DIAS): Nuclear sequence spaces.

DECEMBER:

Review:

Dr. R. ARON (TCD): Can we teach calculus using non-standard analysis?

Prof. A. G. O'FARRELL (Maynooth): News about the Cauchy integral, and
the solution of the Painleve problem.

Dr. T. LAFFEY (UCD): On the similarity of a matrix to its transpose.

Dr. A. P. FORDY (DIAS): Geometric approach to non-linear partial
differential equations.

Applied Mathematics:

Dr. J. DUNWOODY (QUB): Breakdown of laminar shearing flows for second
and higher order fluids.

Dr. D. O'MATHUNA (US Dept. of Transportation, Boston): Non-linear
hyperbolic equations.

Pure Mathematics:

Dr. R. RYAN (UCG): Polyanalytic functions in one or many variables.

Dr. W. SCHILDERS (TCD): Singularly perturbed differential equations.

8 WORKING SEMINAR

A Working Seminar on Current Problems in General Relativity was held in the School from 2 to 6 July. The number of participants was 45, including 34 from abroad; the latter were accommodated in Trinity Hall, Dublin 6. The main lectures of the seminar were given as follows:

- Prof. I. ROBINSON (Univ. of Texas at Dallas): The run-away electron.
On simplifying field equations.
- Prof. R. A. MATZNER (Univ. of Texas at Austin): The method of virtual quanta and gravitational radiation (2 lectures).
- Prof. J. EHLERS (Max-Planck-Inst., Munich): Isolated systems in general relativity (2 lectures).
- Prof. J. L. ANDERSON (Stevens Inst. Tech., Hoboken, N.J.): Non-linear perturbation schemes in general relativity (2 lectures).
- Prof. W. G. DIXON (Cambridge): Description and motion of extended bodies.
A new approach to relativistic thermodynamics.
- Prof. R. F. O'CONNELL (Louisiana): Spin, rotation and quantum effects in the gravitational interaction. (2 lectures).
- Dr. P. HOGAN (UCD & DIAS): Sources of some Robinson-Trautman fields.
- Dr. J. D. McCREA (UCD & DIAS): Radiation damping in Synge's equations of motion.
- Prof. P. S. FLORIDES (TCD & DIAS): The complete field of charged perfect fluid spheres.
- Dr. M. LUDVIGSVEN (York): An H-space approach to equations of motion in general relativity.
- Prof. A. ROSENBLUM (Temple Univ., Philadelphia): Gravitational radiation energy loss in scattering problems and the Einstein quadrupole formula.

Short communications were given by Prof. B. O. J. TUPPER (Univ. New Brunswick), Dr. P. YASSKIN (Harvard Univ.), Mr. W. W. WOODSIDE (McMaster Univ.), Dr. R. BEIG (Univ. of Vienna), Mr. R. H. SCHATTNER (Max-Planck-Inst., Munich), Prof. F. TANGHERLINI (Worcester, MA), Prof. N. O'MURCHADHA (UCC), Prof. E. P. PARKER (Syracuse Univ.) and Dr. W. G. BROWN (NRC, Ottawa).

The participants visited the Computer Centre at UCD, and a lecture was given there by Mr. J. E. AMAN (Stockholm) on the use in general relativity of SHEEP and the interactive algebraic computer system.

9 VISITORS

For lectures given by visitors, see §§ 4, 5, 6, 8.

Dr. L. Accardi (Naples) 5-28 February.

Prof. J. L. Anderson (Stevens Inst., Hoboken) 2-6 July.

Prof. N. L. Balazs (SUNY) 29 June - 7 July.
Prof. J. A. Barroso (Rio de Janeiro) 28 March - 1 April.
Dr. M. van den Berg (Groningen) 3 November - 20 December.
Dr. K. Bierstedt (Paderborn) 26 February.
Dr. K. Cahill (Louisiana) 8-15 May.
Prof. J. H. Calderwood (Salford) 26 September - 2 October.
Prof. J. F. Colombeau (Bordeaux) 7 May.
Prof. R. Dalitz, F.R.S. (Oxford) 10-11 December.
Dr. E. B. Davies (Oxford) 24-25 September.
Prof. W. G. Dixon (Cambridge) 2-6 July.
Prof. E. B. Dynkin (Cornell) 11 June.
Prof. Sir Sam Edwards F.R.S. (Cambridge) 21-23 November.
Prof. J. Ehlers (Max Planck Inst., Munich) 2-6 July.
Prof. G. W. Ford (Ann Arbor, MI) 30 June - 31 July.
Prof. D. Froot (Lakehead, Ont.) 1-30 June.
Prof. J.-L. Gervais (ENS Paris) 21-28 May.
Dr. V. G. Hart (Queensland) June.
Dr. W. Lang (Karlsruhe) 1-31 May.
Dr. P. McGill (NUU) 22-23 March.
Prof. R. A. Matzner (Texas) 2-6 July.
Dr. H. B. Nielsen (Copenhagen) 12-15 November.
Prof. P. Noverraz (Nancy) 23 April.
Prof. R. F. O'Connell (Louisiana) mid-June to mid-August.
Dr. R. J. N. Phillips (Rutherford Lab.) 21 February.
Dr. J. H. Rawnsley (Warwick) 3 December.
Dr. D. Ray (QMC, London) 3 July.
Dr. P. Rembiesa (Krakow) 9 November - 7 December.
Dr. M. Scheunert (Wuppertal) 2-5 July.
Dr. T. Sherry (ICTP, Trieste) 1-14 August.
Dr. G. Vincent-Smith (Oxford) 1-30 November.
Prof. Y. Takahashi (Alberta) 20-27 October.

10 EXTERNAL ACTIVITIES

Professor McConnell attended the meeting of the Dielectrics Society at Cambridge, 3-5 April. He visited the National Physical Laboratory and the Cavendish Laboratory during April. He spent two weeks at the University of Salford in April/May. During October he visited the University of South Florida, the National Physical Laboratory, King's College, London, and Imperial College, London.

Professor Lewis gave a seminar at UCD on 31 May, on wave propagation in inhomogeneous media; he gave an invited seminar (invitation of Sir David Bates) at Queen's University, Belfast, on 6 November; he attended the Conference of the Institute of Physics (Irish Branch) at Killarney, 6-8 April. With Dr. Sullivan he attended the Colloquium on Rigorous Results in Statistical Mechanics and Quantum Field Theory, Eszergom (Hungary), organized by the Bolyai Janos Mathematical Society of Budapest, 24-30 June; Professor Lewis spoke on The Ising model phase-transition and the index of the states on the Clifford algebra; Dr. Sullivan spoke on Path specification for interacting jump processes.

Professor O'Raiheartaigh visited the Physics Department at UCC on 5 February, and gave a lecture there on The unified theory of electromagnetic and weak interactions. He participated in the Einstein Centennial Symposium at the University of Southern Illinois, 23 February - 3 March, and gave an invited lecture there on the Structure of spontaneous symmetry breaking. He participated in the Easter School of the Physics Departments of the Karlsruhe and Innsbruck Universities, 8-18 April, and gave the same lecture there; and he again gave it in May at Queen Mary College, London, at Imperial College, London, and at the Rutherford Laboratory. On 8 May he delivered a paper on The renaissance of geometry in physics at the Inaugural Meeting for 1979 of the Dublin University Mathematical Society. He participated in the Summer School on Geometry and Physics at Durham University, 10-20 July, and gave an invited talk on the standard model of the weak and electromagnetic interactions. He participated in the Colloquium on Mathematical Physics (UNESCO supported) from 6-19 August, held at Bogazici University (Istanbul). and the Annual Meeting of the Canadian Mathematical Society, on gauge and topological methods, at McGill University (Montreal) 2-9 September; he gave invited talks on Long-range interaction of magnetic monopoles at the former, and at the session on Gauge Theory at the latter. En route to Istanbul he spent a day at Milan University for discussions with Dr. G. Parravicini on the completion of some earlier work. From 24-26 October he was invited to visit the Massachusetts Institute of Technology to participate in the 60th birthday celebrations of Professor I. Segal; he gave two informal talks. He then visited the Physics Departments at MIT and Harvard University, and gave the combined weekly seminar of those departments. On 13 November he gave a seminar at UCD on The interaction of classical Yang-Mills bodies. He attended the meeting on Gauge and Field Theory organized by the USSR Academy of Sciences at Svenigorod (near Moscow), 27 November - 1 December, and gave an invited talk on Multi-monopole field equations. On his return journey from Moscow he visited the Universities of Cracow and Wroclaw for one week, and lectured at both places on Effective potentials and unified gauge theory.

Professor Frigerio attended the International Conference on Mathematical Physics, organized by the Association of Mathematical Physics, at Lausanne, 20-25 August.

Dr. Tchraikian attended the UNESCO Colloquium on Mathematical Physics, Istanbul, and the International Conference on High Energy Physics, Geneva, from 27 June to 4 July; he gave seminars at Kaiserslautern in June on N-dimensional instantons, and at the University of Kent in November on Self-dual monopoles.

Dr. Solomon attended the Einstein Symposium, Jerusalem, 14-23 March, and the 8th international Colloquium on Group Theoretical Methods in Physics, Kiryat Anavim (Israel), 25-29 March; at the latter he gave a talk on The general Bogoliubov transformation.

Professor Florides gave a public lecture on Einstein - His life and work, at TCD on 26 April, and again in May to the Astronomical Society of UCD.

Dr. Gibbon and Dr. Fordy attended the Conference: Soliton Study Group, Trieste, 16-27 July; Dr. Fordy gave a seminar on Prolongation and symmetries.

Dr. Fujimoto visited the University of Wisconsin, 4-18 October, to complete some earlier work. With Dr. Houston he attended the 9th International Summer Institute on Theoretical Physics in Germany, Kaiserslautern, 13-14 August; they also attended the annual Rutherford High Energy Meeting, 18-20 December.

Dr. Houston visited the Universities of Wuppertal and Bochum in February, and gave seminars on Classical static structure of the Yang-Mills-Higgs model and the nature of multimonopole configurations.

Dr. de Moraes visited the University of Bordeaux, 11-14 June, and the University of Nancy, 15-30 June; at Bordeaux she gave a seminar on functional analysis.

11 PUBLICATIONS

Note: Items marked with an asterisk were recorded as in press in previous reports.

(1) Books:

Published:

*M. Scheunert. Theory of Lie Superalgebras. An Introduction. Springer 1979, LNM 716.

In the press:

J. R. McConnell. Rotational Brownian motion and dielectric theory. Academic Press.

(2) Communications of the Dublin Institute for Advanced Studies, Series A (Theoretical Physics):

Published:

No. 26 Differential forms in general relativity.
By W. Israel. Second edition. Price £3.15. pp. vii+80.
Published 28 February 1979.

(3) Contributions to periodicals and other publications:

J. L. Synge:

- * My relativistic milestones. Albert Einstein's theory of general relativity, ed. G. E. Tauber. Crown Publishers, 1979, 196-199.

G. W. Ford, J. T. Lewis and J. R. McConnell:

- * Rotational Brownian motion of an asymmetric top. Phys. Rev. 19A (1979), 907-919.

J. R. McConnell:

- * Recent theoretical investigations of inertial effects in dielectric relaxation. Conf. Electrical Insulation and Dielectric Phenomena, New York 1977. Nat. Acad. Sci. (Wash. DC) Ann. Rep. 1979, pp.3-12.

L. O'Raiifeartaigh:

- * Hidden gauge symmetry. Rep. Progr. Phys. 42 (1979), 159-224.
- * Axiomatic, or model-independent, approach to the symmetries of the elementary particles. Symposium on Mathematical Methods in the Theory of Elementary Particles, Liblice, Czechoslovakia, 1978. Czech. J. Phys. 29B (1979), 81-90

L. O'Raiifeartaigh, S. Y. Park & K. C. Wali:

- Magnetic-monopole interactions. Phys. Rev. 20D (1979) 1941-1950.

L. O'Raiifeartaigh & G. Parravicini:

- * Anomalous Behaviour of the effective potential. Feynman Path Integrals, Proc., Marseilles 1978, Eds. S. Albeverio et al., Springer, 1979, LNP 106, 374-388.

M. Scheunert:

- * Generalized Lie algebras. J. Math. Phys. 20 (1979), 712-720.

J. H. Rawnsley:

- * Some properties of half-forms. Proc. Conf. on Differential Geometrical Methods in Math. Physics II, Bonn 1977. Springer 1979, LNM 676, 311-314.

Self-dual Yang-Mills fields. Proc. Bienn. Sem. Canad. Math. Congr., Calgary 1978, Eds. M. Grmela & J. E. Marsden, Springer 1979, pp. 295-312.

On the Atiyah-Hitchin-Drinfeld-Manin vanishing theorem for cohomology groups of instantons bundles. *Math. Ann* 241 (1979), 43-56.

J. M. Golden:

- * The problem of a moving rigid punch on an unlubricated viscoelastic half-plane. *Quart. J. Mech. Appl. Math.* 32 (1979), 25-52.

P. S. Florides:

Einstein - His life and work. *Hermathena* No. 127, Winter 1979, 7-32.

P. A. Hogan:

- * A reconstruction in Minkowskian space-time of Einstein's assembly of test particles. *Gen. Rel. Grav.* 9 (1978), 1021-1030

Equations of motion in linearized gravity: IV External fields. *J. Phys. A: Math. Gen.* 12 (1979), 1781-1793.

P. A. Hogan & M. Imaeda:

- * Equations of motion in linearized gravity: I Uniform acceleration. *J. Phys. A: Math. Gen.* 12 (1979), 1051-1059.
- * Equations of motion in linearized gravity: II Run-away sources. *J. Phys. A: Math. Gen.* 12 (1979), 1061-1069.
- * On the motion of the sources of some Robinson-Trautman fields. *J. Phys. A: Math. Gen.* 12 (1979), 1071-1074.

P. A. Hogan & G. M. O'Brien:

On the motion of rotating bodies in linearized gravity. *Phys. Lett.* 72A (1979), 395-397.

G. M. O'Brien:

- * Orbital equations in the relativistic two-body problem. *Gen. Rel. Grav.* 10 (1979), 129-148.

Equations of motion in linearized gravity: III Rotating sources. *J. Phys. A: Math. Gen.* 12 (1979), 1771-1779.

J. D. McCrea & G. M. O'Brien:

- * Spin precession in the relativistic two-body problem. *Gen. Rel. Grav.* 9 (1978), 1101-1118.
- * Synge's equations of motion applied to a perfect fluid. *J. Phys. A: Math. Gen.* 12 (1979), 503-516.

D. H. Tchrakian:

- * On the possibility of spin-5/2 supergravity. *Nuovo Cim. Lett.* 24 (1979), 18-22.

W. Mecklenburg & D. P. O'Brien:

- * Gauge field masses and degenerate potentials. *Nuovo Cim. Lett.* 23 (1978), 566-570.

N. S. Baaklini:

- * $SL(2,C)$ exterior forms and quantum gravity. *Phys. Rev.* 19D (1979), 467-470.

Nonlinear deSitter symmetry and restricted space time regions in gravity and supergravity. *Gen. Rel. Grav.* 10 (1979), 365-376.

Is supergravity the fundamental supergeometric theory of the hadron? *Hadronic J.* 2 (1979), 135-158.

N. S. Baaklini & M. Tuite:

Dirac quantization of spin 2 field. *J. Phys. A: Math. Gen* 12 (1979), L13-L15.

M. Tuite:

Derivation of effective potential for quantum electrodynamics. *J. Phys. A: Math. Gen.* 12 (1979), 135-143.

P. Houston & D. Pottinger:

Gluon condensation and QCD. *Zeit.f. Phys. C* 3 (1979), 83-87.

B. Goldsmith:

- * Endomorphism rings of torsion-free modules over a complete discrete valuation ring. *J. Lond. Math. Soc.* 18, (1978), 464-471.

A. O. Barut & Raj Wilson:

- * K_{ℓ_3} form factors. *Phys. Rev.* 19D (1979), 260-267.

A. O. Barut, C. K. E. Schneider & Raj Wilson:

- * Quantum theory of infinite component fields. *J. Math. Phys.* 20 (1979), 2244-2256.

In the press

J. L. Synge:

Status report on general relativity. (Letter, to be published in special issue of Vijnana Karnataka (Mysore)).

J. T. Lewis & M. Winnick:

The Ising model phase-transition and the index of states on the Clifford algebra. Proc. Conf. Rigorous Results in Statistical Mechanics and Quantum Field Theory, Esztergom, (Hungary), 1979.

R. Flood & W. Sullivan:

Consistency of random field specifications. Z. Wahrscheinlichkeitstheorie und Verw. Gebiete.

Path Specification for interacting jump processes. Proc. Conf. Rigorous Results in Statistical Mechanics and Quantum Field Theory, Esztergom (Hungary), 1979.

J. V. Pulè:

A unified approach to classical and quantum KMS theory. Rep. Math. Phys.

A. Frigerio, V. Gorini & J. V. Pulè:

Open quasi-free systems. J. Statist. Phys.

L. O'Raifeartaigh:

Remarks on the algebraic structure of spontaneous symmetry breaking in unified gauge theories. Symmetries in Science (Einstein Commemoration Symposium, Carbondale 1979), Plenum Press.

P. Houston & L. O'Raifeartaigh:

On monopoles with axial and mirror symmetry. Proceedings, Seminar on "Group Theoretical Methods in Physics", Zvenigorod, Moscow, 1979.

P. Houston & J. Kennedy:

Vector-meson contributions to the isovector magnetic nucleon form factor. J. Phys. G.

Y. Fujimoto:

The renormalization effects in SU(6), SO(10) and E(6) models. Phys. Lett. B.

J. M. Golden:

Percolation theory and unsaturated flow through porous media. Water Resources Res.

Hysteresis and lubricated rubber friction. Wear.

D. H. Tchrakian:

N-dimensional instantons and monopoles. J. Math. Phys.

't Hooft electromagnetic tensor for Higgs fields of arbitrary isospin. Phys. Rev. D.

Self-dual solutions to gauge field equations on N-dimensional manifolds. Proceedings Coll. on Mathematical Physics, Trapizon/Istanbul, 1979.

A. I. Solomon:

The general Bogoliubov transformation. Proc. 8th Coll. on Group Theor. Methods, Israel, 1979. Springer.

Group theory and superfluid systems. Proc. 3rd Internat. Conf. on Collective Phenomena, Moscow, 1978. New York Acad. Sci.

P. S. Florides:

The Robertson-Walker metrics expressible in static form. II. Gen. Rel. Grav.

P. A. Hogan:

Plane gravitational waves. Proc. RIA, Sect. A.

Equations of motion in linearized gravity: Radiation of 4-momentum. J. Phys. A.

G. O'Brien:

Equations of motion in linearized gravity: Charged rotating sources. J. Phys. A.

A. P. Fordy & J. Gibbons:

Some remarkable non-linear transformations. Phys. Lett. A.

Factorization of operators I. Miura transformations. J. Math. Phys.

L. A. de Moraes:

Holomorphic functions on strict inductive limits. Resultate der Mat.

Theorems of the Cartan-Thullen type and θ -envelope of holomorphy for every holomorphy type θ . Rend. Accad. Naz. Lincei.

Envelopes for types of holomorphy. Advances in Functional Analysis. Holomorphy and Approximation Theory. Springer LNM.

12 LIBRARY

Approximately 250 new titles were added to the library stock during the year; approximately 200 current periodicals were taken, of which almost half were received by gift or under exchange arrangements. The holdings of subscription periodicals were regularly scrutinized with regard to greatest needs, cost, and availability elsewhere in Dublin; a small number of subscriptions was dropped, and a small number of essential new subscriptions taken up. As an experiment, to help minimize cost and use of storage space, a small number of journals was taken by 'Contents Lists' only, under the British Library Contents Pages Scheme. The RIA 'permanent loan' scheme was continued, and runs of 22 series are now 'on permanent loan' from the RIA on our shelves. Cooperation with the Library of the RIA, the Department of Mathematics and Mathematical Physics at UCD, the School of Mathematics at TCD, and the Faculty of Science at St. Patrick's College, Maynooth, and with other research libraries in Ireland continued.

A substantial gift of mathematical material was received from the Jesuit Community during the year; much of this material predates the foundation of DIAS. The Jesuit Community wished that their gift be associated with the memories of the late Professor Michael Egan, S.J., and the late Professor Richard Ingram, S.J., and of their Jesuit predecessors at Royal University, and University College, Dublin; we are very glad to place this association on record.

Offprints and preprints were received from many scientific institutes and university departments all over the world, either directly or in response to requests.

Other gifts of books and journals, in addition to those received under exchange arrangements, were received from: Professors Synge, McConnell, O'Riifeartaigh and Lewis, Dr. Scheunert, Dr. U. H. Gerlach, Dr. O. M. Pisello, the Economic and Social Research Institute, the National Board for Science and Technology, the Mathematisch Centrum (Amsterdam), the Slovak Academy of Science (Bratislava), the French Government, CNRS (Marseilles), ICPT (Trieste), NORDITA (Copenhagen), the Centre for Research and Advanced Studies (Mexico), RIFP (Kyoto), Hiroshima University, the Science Council of Japan, and Seoul National University (in memory of B. W. Lee).

III - Annual Report of the Governing Board of the School of Cosmic Physics for the year ended 31 December 1979, adopted at its meeting on the 27 May 1980

A ASTRONOMY SECTION

1 STAFF AND SCHOLARS

Senior Professor

P. A. Wayman

Professor

T. Kiang

Research Assistant

I. Elliott

Experimental Officer

B. D. Jordan

Research Associate

C. J. Butler (Armagh Observatory)

Technical and Clerical Staff

A. M. Callanan, W. M. Dumbleton, R. P. Murphy, G. Tynan (from 1 January 1979)

Scholars

C. M. Sharp (to 31 December 1979), P.P. Murphy.

Professor Wayman was elected General Secretary of the International Astronomical Union at its 17th General Assembly in Montreal in August, having served as Assistant General Secretary since August 1976. He was granted leave of absence in Paris from 6 October to 28 November in connection with this work.

Professor Wayman served as Chairman of the National Committee for Astronomy during 1979, as a member of Council and Vice President of the Royal Irish Academy up to March 1979, and as a member of the Library and Space Research committees of the Academy during the year.

Dr. Elliott continued as Secretary of the National Committee for Astronomy, as an Associate Editor of the Irish Astronomical Journal, and as Observer for Ireland in the Joint Organisation for Solar Observations.

Dr. M. J. Stift worked in the Section as a Visiting Scientist during the month of June.

Dr. Elliott and Mr. Dumbleton participated in site verification on La Palma for the Deutsches Forschungsgemeinschaft from 10 April to 29 May.

2 RESEARCH WORK

Cepheid Photometry: P. A. Wayman, with C. J. Butler and M. J. Stift

Work in this area included the re-consideration of the methods used for deriving light-curve parameters. Discrepancies in the derived Period-Luminosity, Period-Colour and Period-Luminosity-Colour relations were traced to the method of fitting Fourier curves to the observations of light curves. Asymmetrical forms with large amplitude required particular attention. The results obtained for the description of the light curves by numerical parameters are considerably improved and re-analysis of the empirical relationships permits a significant improvement to be obtained by reducing the observed scatter from the mean relationships.

Solar Research: I. Elliott, W. Dumbleton

The technique of combining a pair of filtergrams of the solar surface taken in the two wings of an absorption line enables the intensity field to be derived from the sum of the pair and the velocity field from the difference. The graphics system of the Nova/Apple II computer system has been adapted to provide an interactive mode for displaying these data side by side in a 74 x 62 picture element format. Direct comparison of the intensity and velocity fields shows, for the frames so far prepared, that the velocity fields have a characteristically larger size than the intensity variations. This property is being investigated by evaluation of the two-dimensional Fourier transforms.

For a period of six weeks seeing conditions at the Roque de los Muchachos on La Palma (Spain) were monitored for comparison with those at the existing observatory Izana on Tenerife. Measurements of sharpness of the image of the solar limb were made at hourly intervals using the 45cm vacuum telescope of the German FGS. Tests were also made of white-light cameras in preparation for monitoring of solar activity during the Solar Maximum Mission of 1980. The results of these tests are being assimilated by the German authorities responsible for the survey.

Dynamical Astronomy: T. Kiang

The stability of asteroid orbits and the relation between the Kirkwood Gaps and the existence of the so-called "hyperperiods" in the three-body problem has been further analysed. A different

method of evaluating and averaging the Hamiltonian of the motion was developed and the relation between the theory and the observed features at the 2/1 and 3/2 resonances (respectively the Hecuba Gap and the Hilda group in the distribution of asteroid orbital periods) has been markedly improved. Also, a numerical solution of Hill's equation, based on formulae given by Goursat, is found to be more effective than Hill's method since it is practically free of convergence difficulties. A paper giving these results is prepared for publication.

Stellar Atmospheres: C. M. Sharp

A numerical investigation into methods of representing absorption spectra of a large number of spectral lines by dividing the spectrum into many 'bins', each bin receiving a contribution from many lines, was completed. For triatomic molecules, a method was devised by which the approximate vibration-rotation spectrum could be calculated *ab initio* for an asymmetrical molecule such as H₂O, in a way compatible with the bin method, and hence to a calculation of the contribution to the Rosseland mean opacity. Also, calculations on bound-free and free-free continuum absorption and pressure-induced opacity of molecular hydrogen in the continuum were completed.

Galaxy Profiles: P. P. Murphy

Calculations of luminosity distributions were made to determine whether some effects visible in photographs of elliptical galaxies are accounted for to any extent by adopting a simple triaxial model. It was found not to be feasible to seek an analytical solution to this relatively simple problem and numerical methods were used. The particular features studied were the orientation and ellipticity of elliptical isophotes to a galaxy. Over 100 representative arrays were generated and 80 were analysed, isophotes plotted and measured parameters compared.

The ratios of computer time for producing the arrays on three computers, Nova 2/10, Eclipse and DEC-20, were found to be 20:1:0.12. Preliminary results of this work show that any variations outward from the centre in the orientation and ellipticity of isophotes of elliptical galaxies cannot reasonably be accounted for by assuming a triaxial distribution. This is contrary to some statements in the literature of the subject.

Historical Astronomy: T. Kiang

Chinese records of occultations of planets and stars over a period of 2,000 years were examined for identification with reconstructible occultations. Out of 600 such records 113 were identified with events that took place in the second half of the night. From the dates assigned in the Chinese records it appears that the 'new' date applies mostly from 0300 local time onwards but the 'old' date prior to that hour. This is a useful inference for the purpose of eliminating a one-day uncertainty in records of, inter alia, Comet Halley.

In conjunction with K. Imaeda, Cosmic Ray Section, a note on the nova of 1408, seen also in Japan, has been prepared. The duration over which this 'guest star' was seen is extended to 102 days, giving evidence of its being a supernova explosion. The position is close to the X-ray source Cygnus X-1, but identification with the guest star is not certain.

3 ELECTRONICS LABORATORY B. D. Jordan

Circuit cards for a microprocessor control unit destined for use with the UK Science Research Council 2.5m telescope at La Palma were completed. Printed circuit versions were produced under SRC contract, the wiring schedule was designed for the telescope, and the system tested prior to despatch to the firm renovating the telescope. Some of this work was carried out at the Royal Greenwich Observatory, Sussex, U.K.

4 CONFERENCES, LECTURES, ETC.

International Astronomical Union (IAU)

Correspondence on ten IAU Symposia and Colloquia and one IAU Regional Meeting during 1979 was maintained by P. A. Wayman as IAU Assistant General Secretary; he attended IAU Colloquium No. 53 "White Dwarfs and Variable Degenerate Stars" in Rochester N.Y., 30 July - 3 August and the XVIIth General Assembly of the IAU in Montreal, 14-23 August. Following his election as General Secretary of the IAU on 23 August, a new secretariat for the Union was established at l'Observatoire de Paris during the period 3 October to 29 November.

T. Kiang also attended the Montreal General Assembly where he reported on Chinese historical research in Astronomy and on statistical analyses of quasars with resolved components.

During April and May, P. A. Wayman visited China at the invitation of the Academia Sinica of Peking. He addressed astronomers in Peking, Nanking, Shanghai and Hong Kong on his work on Cepheid variable stars and on the ESA astrometry satellite.

Lectures

The following colloquium lectures were given during the year in the Section:

20 February	J. W. Pel (Roden):	Optical data on Cepheid Variable Stars
30 March	U. Haug (Hamburg):	Interstellar Absorption from B-Star Observations
23 July	O. Gingerich (Harvard):	Unravelling the authorship of comments on De Revolutionibus.

21 December Fang Li-zhi (Hofei, China): Statistical work on quasars with resolved components.

Other visitors to Dunsink Observatory during the year included P. Grubb, K. Kobacs (Germany) and J. Horgan, T.D.

P. A. Wayman spoke on the ESA Astrometry Satellite at Armagh Observatory on 30 January and at Trinity College Dublin Physics Seminar, on 23 February. I. Elliott spoke on the La Palma proposals at Armagh Observatory on 4 October and to four amateur societies similarly. Other talks to amateur societies and teachers' groups were given by P. A. Wayman, T. Kiang, C. Sharp and W. Dumbleton. The usual fourteen Public Open Nights were held at Dunsink Observatory and a few special visits were arranged.

Attendance at meetings included P. A. Wayman to the Royal Society on "Galaxies" (14 February), to the Royal Astronomical Society in Durham (9-11 April), and a visit to Royal Observatory, Edinburgh with P.P. Murphy (2-5 July). At the Astronomical Science Group meeting at the New University of Ulster, Coleraine, on 23 May, P.A. Wayman spoke on "An Astronomer's visit to China" and at the Group Meeting at University College, Dublin, on 20 December, he spoke on "The Chinese Photoelectric Astrolabe".

5 PUBLICATIONS

Editorships: I. Elliott: Irish Astronomical Journal
(Associate Editor)
T. Kiang: Chinese Astronomy (Translator)
P. A. Wayman: IAU Information Bulletin
Highlights of Astronomy, Vol 5
IAU Transactions Vol. 17B

Journals, etc.

T. Kiang:

"Hyperperiods, Orbital Stability and the Solution of the Problem of the Kirkwood Gaps", IAU Symposium No. 81, 227-230
(D. Reidel, 1979).

"Long Propagation Periods of Residuals in the Motion of a Comet",
ibid., 303-306.

"Cygnus χ -1 and the Supernova of AD 1408", Sky and Telescope,
October 1979, p.323.

"Hyperperiods and Kirkwood Gaps", Vistas in Astronomy (in press).

A. E. Lynas-Gray (with P. W. Hill):

HB Photometry of Early-Type Stars and Galactic Structure",
Monthly Notices Royal Astronomical Society, 189, 777-790, 1979.
(Contributions from Dunsink Observatory, No. 15).

P. A. Wayman:

Dunsink Observatory Fire. Irish Astronomical Journ. 13, 156,
1978.

A. D. Thackeray (obituary), ibid., 215.

In the Centre of Immensities (Book Review), Hibernia.

The Chinese Photoelectric Astrolabe, Ir. Astr. Jour. (in press).

I. Elliott:

A History of Ancient Mathematical Astronomy (Book Review),
Ir. Astr. Jour. (in press)

The Star of Bethlehem Mystery (Book Review), Ir. Astr. Jour.
(in press).

6 MISCELLANEOUS

An agreement for joint ownership and operation of a 1-metre reflecting telescope at the Spanish International Observatory on La Palma, Canary Islands, was signed on 19 October 1979, the parties to the agreement being

The Science Research Council of the United Kingdom;
The National Board of Science and Technology of Ireland;
The Dublin Institute for Advanced Studies.

The telescope has been constructed by Sir Howard Grubb, Parsons and Co. of Newcastle, UK (formerly Grubb, Dublin) and completion on site during the first quarter of 1982 is planned. The agreement provides that 10% of observing time shall be available to Irish scientists and that all site facilities be administered by SRC and by the Observatory Council. An advisory committee of the Governing Board, with representatives of NBST and the National Committee for Astronomy, has been set up to assist administration as a national facility.

Progress on fire-damage restoration, etc., at Dunsink Observatory included:

Rebuilding of the Meridian Room, including provision of
facsimile shutters with one bay of supporting ironwork.
Re-slating of Observatory House roof.
Repairs to chimney stacks.
Basement replastering and renewal of floor.
Provision of heating installation.
Renewal of electric wiring.
Provision of new telephone PABX exchange.
Storm water drainage system altered.
Provision of street lighting in grounds and underground
services.
Mobile metal library shelving installed.
Fire alarm system installed.

B COSMIC RAY SECTION

1 STAFF AND SCHOLARS

Senior Professor

C. O Ceallaigh

Professor

K. Imaeda

Assistant Professors

D. O'Sullivan and A. Thompson

Research Assistant

Vacant

Experimental Officer

J. Daly

Technical and Clerical Staff

Mrs. E. Clifton; Miss M. Cahill; Miss A. Grace; Miss B. Kinnane (to 2nd August); Miss G. Martin (from 17th August); Miss M. O'Boyle (to 16th March); Miss E. Rankin; Mrs. H. Sullivan (nee O'Donnell).

2 RESEARCH WORK

Ultra Heavy Cosmic Ray Nuclei: J. Daly, C. O Ceallaigh,
D. O'Sullivan, A. Thompson.

Work related to the LDEF Experiment was the main priority during 1979. The final space simulating environment tests on a prototype experiment tray were carried out successfully at ESTEC in time for the NASA Final Design Review Meeting. At this meeting, early in 1979, NASA formally agreed to the DIAS plans for the production phase of the project and the overall experiment design was frozen. Construction of the cosmic ray detector stacks and the Eccofoam (polyurethane isocyanate) enclosures then began in Dublin and production of the aluminium pressure vessels was started in ESTEC. A set of 200 detector stacks in 50 pressure vessels will be employed giving a total weight of 1,300 kg.

The NASA Space Shuttle development schedule was changed several times during the year. Consequently, the launch date of the LDEF has been put back to August 1982 and some of the DIAS/ESTEC experiment programmes have been rescheduled accordingly. In particular, more time was made available for the development of track detectors based

on CR-39 (allyl diglycol carbonate polymer). This resulted in improved CR-39 detectors which are being incorporated in the LDEF stacks.

Members of the group spent a period in July working at the Lawrence Berkeley Laboratory where they made twenty-six exposures to Iron and Argon beams (relativistic and low energy) at the Bevalac accelerator. The machine time was financed by NASA and the manager of the LDEF Project Office attended as an observer. The first set of pre-flight calibration exposures of LDEF Lexan detectors was carried out successfully. Lexan detectors under various environmental conditions and, in addition, batches of CR-39 detectors developed from new polymerisation cycles were also exposed. Work on the exposed material has continued for the remainder of the year.

Close co-operation between the Cosmic Ray Section and Pershore Mouldings Ltd. has resulted in CR-39 polymerisation cycles which yield improved track recording properties. Collaboration work with Bristol University in the field of CR-39 track response is continuing. In addition, a collaborative programme of CR-39 development with the Naval Research Laboratory, Washington DC was established during the year.

A new sequence of heavy ion exposures of various detectors was carried out at the Manchester Linac. This accelerator is scheduled to be closed down permanently in early 1980.

The study of the primary Cosmic Ray Transcobalt region has been extended further by the acquisition of a new set of exposed Lexan stacks ($= 10 \text{ m}^2$ days) from Bristol University. These stacks had been used for ultra heavy cosmic ray studies but contain an unexploited sample of events in the Transcobalt region. New information in this region is now being extracted by means of techniques developed by the Cosmic Ray Section.

The measurement and analysis of events from the first successful Transatlantic balloon flight (Trapani, Italy to Kentucky, USA) were completed during the year. The Dublin-Bristol track detector array (8 m^2 collecting area) was exposed for 84 hours at a mean atmospheric depth of 38 Kg m^{-2} and a total of twenty-one nuclei with $Z > 65$ were observed. The results were presented at the Sixteenth International Cosmic Ray Conference, Kyoto, Japan.

The Study of a new formulation of Classical Electrodynamics:

K. Imaeda

The work has been continued. By use of quaternions, a method of Fourier expansion has been developed for regular functions of a biquaternion variable and has been applied successfully to practical problems. In general, rigorous solutions of Maxwell's equations under initial boundary conditions, for example, the diffraction by a screen of an electromagnetic field are difficult to arrive at. The present method is a very powerful tool for the development of

quaternion theory and enables us to obtain an analytic function under given initial boundary conditions for an electromagnetic field. Using this method we are able to obtain rigorous solutions of Maxwell's equations.

The method has been applied with success to the problem of the diffraction of an electromagnetic field by a screen which has varying slits. New solutions for the diffraction problem have been explored through this Fourier method. Under certain conditions a systematic study of electromagnetic fields is now feasible. Further work is in progress.

The study of the formulation of Tachyons and Superluminal Transformations:

K. Imaeda.

Additional work has been carried out on the subject. Three further extensions of the theory of relativity which include the theory of tachyons have been elaborated which are consistent with the present theory of relativity.

The first is the same as that which has been extensively studied by several authors. Those authors have argued whether the introduction of a complex space time is necessary but no answer to the question was proffered. It was first pointed out in Imaeda's paper clearly that, in the first theory, the introduction of a complex space-time is inevitable; the theory was further developed using a complex space-time.

The second theory has been reported briefly for the first time in the paper. For tachyons, this theory is much simpler than the first. The theory adopts only one new axiom, namely that of the invariance of the quadratic metric of the space-time. The new axiom states that a transformation changes the overall sign of the quadratic metric of the space-time between the tachyon system and the ordinary system (brachyon system).

The third theory, instead of employing the real space-time of Minkowski, is founded upon a new axiom that the space-time coordinates should be complex. This theory should be much simpler and more suitable than existing theories to describe not only tachyons but also other phenomena in the subnuclear world. The detailed study of the nature of these theories is in progress.

The theories developed here are useful because they are consistent with the principle of relativity; they provide the basis for the present theory of phenomena which are not embraced in the present framework of space-time but which need a wider space-time frame.

The Study of the Japanese records of a guest star of AD 1408:

K. Imaeda and T. Kiang

A study of Japanese records of a guest star of AD 1408 has been made in collaboration with Professor T. Kiang, in the hope of obtaining detailed information on the supernova explosion which has resulted in

the creation of the Cygnus X-1 star. The basis of the identification of the guest star as the explosion of a supernova leading to Cygnus X-1 is the work of a Chinese scholar who has studied the historical records of Chinese astronomy. Japanese records of the star which Professor Kiang has reported, have been collected from the original manuscripts and analysed. The characteristic features of the supernova explosion of 1408 have emerged. This result will give valuable information on the creation of the Cygnus X-1 star.

In addition, all the records of the guest stars appearing from 600 to 1500 AD and observed in Japan, China and Korea have been collected and studied.

3 WORKSHOP - J. Daly

Following the successful test of the prototype tray in December 1978 and the Critical Design Review in January 1979, work had started on the main payload which was scheduled to be ready by August 1979. In consequence of the delay of the Shuttle launch and because of problems in obtaining materials at ESTEC for their part of the work, the date of delivery of the payload to ESTEC was changed from August 1979 to March 1980. Work on the detector stacks stopped in May 1979 and recommenced at the end of August 1979, so as to allow for any new developments of detectors to be incorporated in the remaining stacks. This left the minimum time for completion.

It was further decided to leave one cylinder aside and its complement of four stacks to be prepared nearer to the date of despatch of the payload from ESTEC to the USA.

Thanks are due to the Technical Assistants who were again involved in the initial cutting and the very important task of numbering the many detectors needed for this project.

Between May and August, efforts were made to catch up on the general maintenance of the equipment in the laboratory which had fallen behind during the major LDEF work.

4 EXTERNAL ACTIVITIES

During the year short working visits in furtherance of the LDEF experiment and other research programmes were made by D. O'Sullivan and A. Thompson as follows:

Bristol University/Pershore Ltd. (26 February - 2 March);
Manchester University (9 May - 10 May);
Bristol University (16 May - 20 May);
ESTEC (17 June - 21 June);
NASA Headquarters, Washington DC (23 July - 25 July);
Lawrence Berkeley Laboratory (26 July - 4 August);
Bristol University/Pershore Ltd. (12 November - 17 November).

In addition, J. Daly and D. O'Sullivan attended the LDEF Final Design Review Meeting with NASA officials at Langley Research Centre, Washington (January 13 - January 19).

D. O'Sullivan and A. Thompson attended the 10th International Conference on Solid State nuclear Track Detectors, Lyon, France (1 July - 7 July). Recent results of the Cosmic Ray Section's work were presented.

A. Thompson attended the Sixteenth International Cosmic Ray Conference, Kyoto, Japan (5 August - 18 August). Recent results of the Cosmic Ray Section's work were presented.

As a member of the Space Science Standing Committee of the European Scientific Foundation, C. O Ceallaigh attended a meeting in Strasbourg (19 January - 20 January).

5 LECTURES

D. O'Sullivan delivered a series of 16 lectures on Nuclear and High Energy Physics to final year physics students at University College, Galway and presented a paper entitled "The Present Status of Research on Ultra-Heavy Nuclei" at the meeting of the Irish Astronomical Science Group held at University College, Dublin in December.

6 MISCELLANEOUS

The Boyle Medal, for scientific research of exceptional merit carried out in Ireland, was presented to Professor Cormac O Ceallaigh in a special ceremony at the Royal Dublin Society on Wednesday 19 December, 1979.

7 PUBLICATIONS

D. O'Sullivan, A. Thompson, J. Daly and C. O Ceallaigh:

A Solid State Track Detector Array for the Study of Ultra Heavy Cosmic Ray Nuclei in Earth Orbit.
Proceedings of the tenth International Conference on Solid State Nuclear Track Detectors, Lyon, France, 1979.

A. Thompson, D. O'Sullivan and C. O Ceallaigh

Development studies of CR-39 for Cosmic Ray work.
Proceedings of the tenth International Conference on Solid State Nuclear Track Detectors, Lyon, France, 1979.

D. O'Sullivan and A. Thompson

The effect of temperature-time cycles in the Polymerisation of CR-39 on the uniformity of track response.
Proceedings of the tenth International Conference on Solid State Nuclear Track Detectors, Lyon, France, 1979.

A. Thompson, D. O'Sullivan, J. Daly and C. O Ceallaigh

A High Resolution Study of Ultra Heavy Cosmic Ray Nuclei using the Long Duration Exposure Facility. Proceedings of the sixteenth International Cosmic Ray Conference, Kyoto, Japan, 1979.

A. Thompson and D. O'Sullivan

Ultra Heavy Cosmic Ray Nuclei from the first transatlantic Balloon flight. Proceedings of the sixteenth International Cosmic Ray Conference, Kyoto, Japan, 1979.

K. Imaeda

Quaternionic Formulation of Tachyons, Superluminal Transformations and a Complex Space-time. Nuovo Cimento, 50B, 271 (1979).

In the press:

K. Imaeda and T. Kiang

Japanese record of the Guest Star of 1408. Journal for the History of Astronomy.

D. O'Sullivan, A. Thompson and C. O Ceallaigh

Ultra Heavy Cosmic Ray Nuclei. NASA Report Number A0178 (1979).

C GEOPHYSICS SECTION

1 STAFF AND SCHOLARS

Senior Professor

T. Murphy

Professor

A. W. B. Jacob

Research Assistant

Vacant

Experimental Officer

J. C. Davies

Technical and Clerical Staff

K. Bolster; Miss A. Byrne; Miss E. Ryan; Miss V. Ward;
G. Wallace.

M. Henderson (Oxford) worked as a summer student for a period of eight weeks.

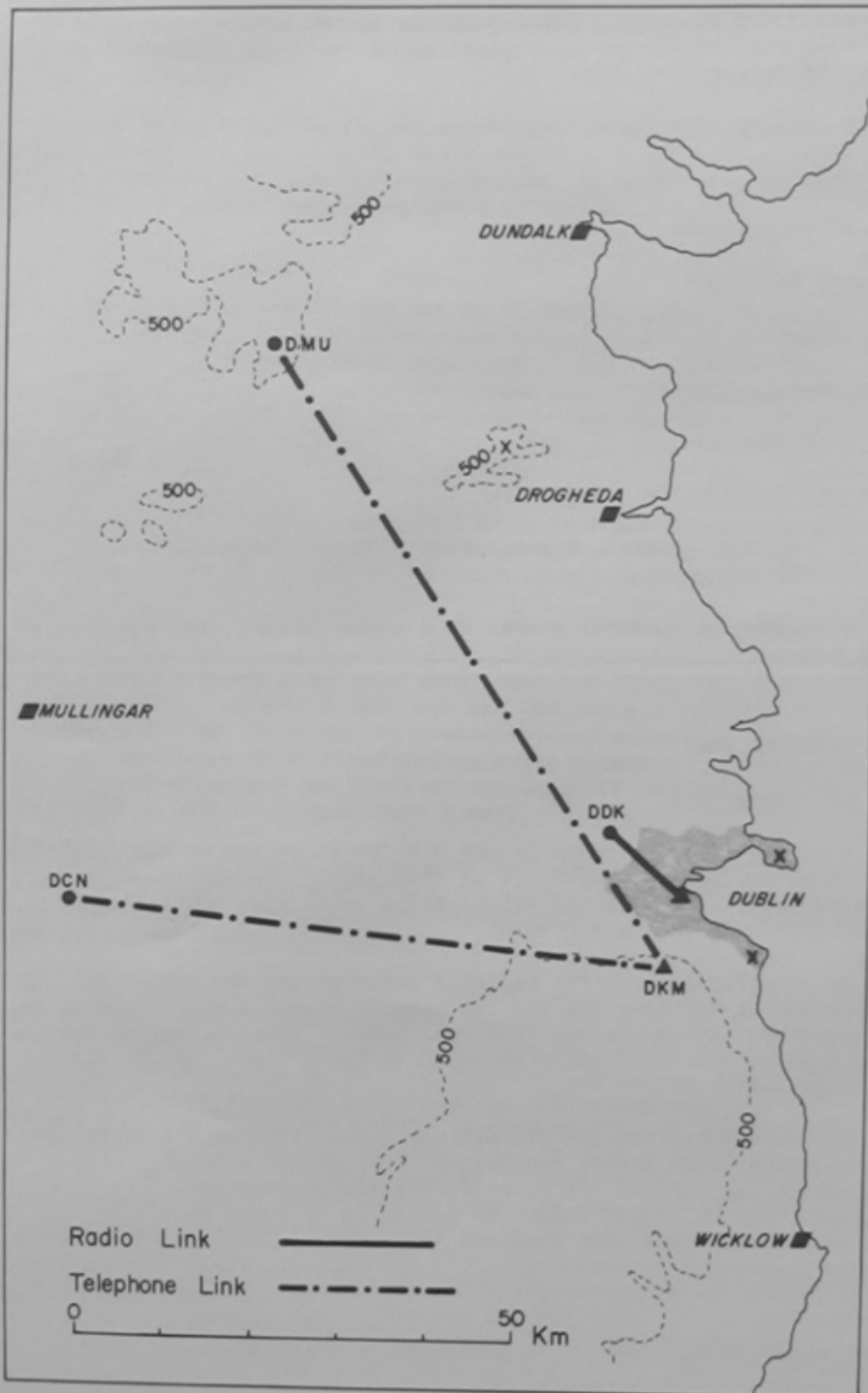
2 RESEARCH WORK

a) Magnetics

A cruise was undertaken in the R.V. Lough Beltra in the Irish Sea continuing the magnetic coverage of that area. As mentioned in previous reports, navigation difficulties still give problems and necessitate much additional work.

An investigation of the magnetic influence of the vessel was carried out in Killiney Bay and the results enable a correction to be estimated and applied to the readings taken. This correction proved to be greater than what could be expected for a vessel of the size of the Lough Beltra.

The correction for the diurnal variation is in practice obtained from readings taken ashore and further work on the problem of its application was carried out by retracing earlier traverses. It is concluded that on 'quiet days' the method is accurate enough but on 'disturbed days' even when moderate it is not. Thus for satisfactory results repetition is the only way. The magnetic field (total) over the Irish Sea out to the Median line with the U.K. has now been surveyed between latitude 52° and $53^{\circ} 31'$. The results have been drawn in manuscript form to be published later.



b) Meteorology

Routine observations of the meteorological elements were continued throughout the year, autographic records tabulated and the results published.

When the Meteorological Office moved their headquarters from O'Connell Street the observations there ceased. A request had been made to continue ours, taken on Leinster Lawn, as these are now the only ones of a standard station in the city centre.

c) Gravity

A gravity survey was carried out at Pipemakers Gorse, south of Birr, to delimit the extent of a clay pit being investigated by a member of Trinity College Geology Department. The occurrence of similar pocket deposits in the carboniferous limestone has been postulated from the gravity survey results. Samples taken from the locality have been investigated with the object of ascertaining their origin and possible economic importance.

This site is of historic interest as it is reported to have been the source for the refractory material used by Lord Rosse in the construction of the blanks for the mirrors of his telescope.

d) Seismology

The 4 station seismic network (DNET) had its first full year of operation in 1979. Stations DMU, DCN and DKM are all recorded on tape at DKM while DDK (Dunsink) is transmitted by telephone line to Merrion Square, where it is displayed on a pen recorder. This allows continuous monitoring and immediate measurements if necessary. The magnetic tape at DKM is changed once a week.

At intervals the tapes, by the kind permission of IGS Edinburgh, are taken to Edinburgh and events are (a) transcribed onto analogue library tapes and (b) digitized and written to digital tapes suitable for processing on the Eclipse computer.

Readings from teleseismic and regional sources (mainly earthquakes) are sent on a regular basis to centres in the U.S. (N.E.I.S), Strasbourg, (CSEM - the European seismic data centre) and the International Seismological Centre in Newbury, U.K. Data are also exchanged with other networks and enquiries concerning specific events are dealt with as they arise. A good example of the latter is the Carlisle earthquake series which started with a magnitude 5 event in the early hours of 26th December. Good recordings on the network, supplemented by those from a temporary station at Malin Head, have made an important contribution to the study of this series as they provide good evidence that the major event was a double shock. A magnitude 4.5 earthquake was followed 6 seconds later by a magnitude 5 event. Most of the UK stations were so close that the first event overloaded their recording systems and prevented identification and measurements of the larger second event.

The Malin Station, established with the permission of the Meteorological Service, whose staff also assisted us greatly by changing tapes, etc. is intended to be part of a long-term project to measure delay terms, relative to the Dublin network, at sites throughout the country.

The seismic vault at Carnsore Point was only completed at the very end of 1979 and recordings should start in 1980.

All signals from Irish sources are being monitored on DNET and the source positions and times are logged. Though the system gain is very high and the threshold magnitude thus very low, no Irish earthquakes have been definitely identified in the year. Epicentres of small events have been observed in the Anglesea area of the Irish Sea.

Many quarry blasts have been observed and the quality of the short period surface waves which some of them generate has led us to start a project. This is being undertaken by N. Murphy, who will be using these waves to determine upper crustal structures in an area to the North and West of Dublin.

e) Anisotropy in the Earth's lithosphere

B. Jacob completed his collection of data during a second visit to the U.S. Geological Survey at Menlo Park, California. The very extensive processing and plotting of the data is under way.

Rathfarnham Castle Seismograph

The unique trifilar seismograph sometimes known as the 'Large O'Leary' was taken to pieces and the heavy parts transported to the Maynooth Museum. The construction exhibited such a high class of instrument construction that an investigation was instigated as to its history. This is still being pursued but it is quite obvious that the legend that it was constructed by Fr. O'Leary is not correct. Furthermore, evidence has now been obtained that it is the last and largest of a series; the others were at one time in Mungret College, Limerick. Among the rubbish taken from the damaged Observatory buildings parts of another, presumably never assembled, were identified. The constructor is thought (T.M.) to have been GRUBB of Dublin, but so far there is no confirmation of this.

On measuring the pieces of the 'Large O'Leary' it would appear that the theory of the instrument as given by Ingram and Timoney in their Bulletin does not yield the correct value for the periodic time. It is hoped that this problem will be taken up in the future.

3 STATUTORY PUBLIC LECTURE

The Statutory Public Lecture was delivered by Professor T. Murphy on 28 November at University College, Belfield, entitled "Geophysics and Ireland".

4 EXTERNAL ACTIVITIES

B. Jacob and T. Murphy attended the United Kingdom Geophysical Assembly at Southampton in April, and B. Jacob the Royal Society Working Group on Explosion Seismology which followed.

B. Jacob and T. Murphy attended the European Geophysical Society meeting at Vienna in September.

5 PUBLICATIONS

T. Murphy: On explosion seismology investigation of the continental margin west of the Hebrides, Scotland, at 58° N. Tectonophysics, 59, 217-231 (with Bott, Armour, Himsworth and Wylie).

D. Howard: Preliminary results of a seismic refraction study in the Meriadzek-Trevelyan Area, Bay of Biscay. Initial Reports of the Deep Sea Drilling Project, 48, 1015-1023 (with F. Avedik).

6 MISCELLANEOUS

Undergraduate students, A. Rowland and D. Mullen of Trinity College carried out research projects from the Irish Sea Magnetic Data as part of their course for degrees in Geology.

D COMPUTER INSTALLATIONS

J. C. Davies	(Geophysics)
I. Elliott	(Astronomy)
B. D. Jordan	(Astronomy)

Installations: (a) Data General Eclipse S/130 (5 Merrion Square)
(b) Data General Nova 2/10 (Dunsink Observatory)

With the installation during the year of an EMI SE 8000 magnetic tape deck (9 track, 800 b.p.i.) at Dunsink, establishment of a link between (a) and (b) was discontinued. Compatibility of software in the two systems was incorporated during the year. Both systems were fully utilised.

Several major hardware additions were made to the Eclipse computer, with corresponding software additions. A CalComp Model 1037A drum plotter, with Model 906 controller was installed, first as an alternative to the Dasher printer through the secondary port (at 600 baud) but later with an asynchronous line multiplexor (Data General ULM-5) at 9600 baud. The core memory was increased from 64KB to 128KB, effectively trebling available memory.

An ADDS Regent 25 replaced the earlier VDU at the Eclipse and the ADDS Consul 580 was transferred to the Nova system as a spare terminal, or, if required, as a replacement of the mechanical teletype of the earlier Nova 1220. A new switching network was constructed for the secondary port of the Nova 2/10.

A Motorola M6800 cross-compiler was modified for the Nova 2/10 and the Nova operating system updated for use of the magnetic tape deck. Eclipse system software was updated for plotting routines and the Data General (US) User's Group Program Library was obtained on magnetic tape. Programmes were written to permit transfer of data to other computers (IBM 360/370, CDC, DEC-20 and PDP-11) so that gravity data from Ireland and seismic data from elsewhere could be read and processed.

The plotter software was installed by CalComp Ltd. in FORTRAN IV; corrections were necessary for programme errors and eventually all packages were transferred in-house to FORTRAN 5, including the World Map Plotting software.

Means for transferring data on tapes originating from International Ultraviolet Explorer to a 5MB disk were provided for Dr. P. B. Byrne of Armagh Observatory.

INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH

Report on the Comptroller and Auditor General

I have examined the foregoing Income and Expenditure Account and Balance Sheet which, as required by Acht um Institiúid Ard-Léinn 1940, are in the form approved by the Minister for Education with the concurrence of the Minister for Finance. I have obtained all the information and explanations which I have considered necessary for the purpose of my audit.

In my opinion:-

- (a) proper books of account have been kept by An Institiúid and the Income and Expenditure Account and Balance Sheet are in agreement with them, and
- (b) the Income and Expenditure Account and Balance Sheet, together with notes 1 to 14, give, respectively, a true and fair view of the transactions of An Institiúid for the year ended 31 December 1979 and of the state of its affairs on that date.

SEÁN Mac GEARAILT
Comptroller and Auditor General

3 Samhain 1980.

INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

NOTES TO THE ACCOUNTS

14. Outstanding Commitments

The estimated cost of commitments outstanding at 31 December 1979, exclusive of Current Liabilities shown on the Balance Sheet, is as follows:

<u>31/12/78</u>		£
£		£
48,949	Administration	38,000
14,649	School of Celtic Studies	51,000
1,380	School of Theoretical Physics	750
<u>47,604</u>	School of Cosmic Physics	<u>37,000</u>
<u>112,582</u>		<u>126,750</u>

INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

NOTES TO THE ACCOUNTS

9. <u>Surplus/Deficit Position</u>	Balance 1/1/79	Year to 31/12/79	Balance 31/12/79
Administration	49,443	(12,167)	37,276
School of Celtic Studies	16,657	31,688	48,345
School of Theoretical Physics	2,995	(2,670)	325
School of Cosmic Physics	38,398	(5,075)	33,323
Adaptation of Premises	<u>199</u>	<u>(75)</u>	<u>124</u>
	107,692	11,701	119,393

This surplus is available towards meeting the Institute's expenditure on commitments outstanding at 31 December 1979 (see Note 14).

1978

£	10. <u>General Administration Expenses</u>	£	£
36,496	Rent, Rates & Insurance	39,387	
25,482	Premises Maintenance	36,189	
10,027	Postage & Telephones	13,070	
11,435	Fuel, Light & Power	14,149	
<u>1,378</u>	Sundry Supplies	<u>2,122</u>	<u>104,917</u>
84,818			

11. Special Commitments

La Palma Project - first of three annual contributions by the Dublin Institute for Advanced Studies towards capital cost of 1-metre Telescope to be erected at La Palma, Canary Islands, in joint agreement with the Science Research Council (UK) and the National Board of Science and Technology

10,331

12. Superannuation

Expenditure arising under superannuation schemes is met out of Oireachtas Grants-in-Aid in the year of payment.

13. Vernam Hull Bequest

Project to be financed by this bequest has not yet been decided on. No money was expended from this fund in 1979 (value at 31 December 1979 was £7,732 - included in balance under School of Celtic Studies).

INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

NOTES TO THE ACCOUNTS

is expected that a final settlement will be reached before the end of 1980.

5. Grant from British Academy towards publication of The Patrician Texts in the Book of Armagh.

6. Included in this amount are fees from participants, grant of £150 from TCD and grant of £100 from UCD.

1978

£	7. <u>Income</u>	£	£
13,035	<u>Miscellaneous:</u> Administration	26,537	
639	School of Celtic Studies	906	
11	School of Theoretical Physics	16	
<u> </u>	School of Cosmic Physics	<u> </u>	<u>27,459</u>
13,685			

8. Analysis of Expenditure

1978	Total	Administration	School of Celtic Studies	School of Theoretical Physics	School of Cosmic Physics	
£	£	£	£	£	£	
438,052	Salaries, Wages & Superannuation	523,516	95,968	143,193	80,743	203,612
28,643	Scholarships	36,071	-	12,780	17,264	6,027
2,200	Honoraria	1,450	-	1,400	50	-
21,262	Library	24,367	-	3,467	11,648	9,252
57,436	Publications (Note 1c)	38,057	581	34,518	2,087	871
51,576	Furniture & Equipment (Note 1b)	59,942	5,344	3,310	5,456	45,832
84,818	General Administration (Note 10)	104,917	104,917	-	-	-
30,819	Travelling & Survey Expenses	25,329	412	1,757	2,283	20,877
5,646	Symposium & Seminar Expenses	4,656	-	76	4,580	-
12,968	Consumable Equipment	28,061	-	-	-	28,061
-	Special Commitments (Note 11)	10,331	-	-	-	10,331
21,305	General Expenses	24,235	3,972	2,995	4,638	12,630
	Fire Replacement:					
29,870	'Contents' (Note 4)	3,138	-	-	-	3,138
14,653	Buildings (Note 4)	46,109	46,109	-	-	-
799,248	Sub-Total	930,179	257,303	203,496	128,749	340,631
7,887	Adaptation of Premises	12,475				
807,135	Total	942,654				

INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

NOTES TO THE ACCOUNTS

1. Accounting policies

- (a) Oireachtas Grants-in-Aid: Income shown in the Accounts as Oireachtas Grants-in-Aid is the actual cash received in the period of the Account.
- (b) Furniture and Equipment: Expenditure on Furniture and Equipment is written off in the period in which it is incurred.
- (c) Publications: Expenditure on Publications is written off in the period in which it is incurred.

<u>1978</u>		£	£
£	2. <u>Oireachtas Grants-in-Aid</u>		
178,600	Administration	189,000*	
168,000	School of Celtic Studies	207,400	
100,000	School of Theoretical Physics	123,700	
255,600	School of Cosmic Physics	335,500	
4,000	Adaptation of Premises	12,400	868,000
706,200			

* £3,400 was transferred from Administration to Adaptation of Premises.

£	3. <u>Sales of Publications</u>	£	£
16,382	School of Celtic Studies	25,367	
124	School of Theoretical Physics	324	
29	School of Cosmic Physics	56	25,747
16,535			

4. Fire Insurance Compensation

(a) Contents

Insurers paid £53,518 to the Institiúid in 1978 in settlement of "contents" claim arising from a fire at Dunsink Observatory in 1977. Expenditure in 1979 by the Institiúid amounted to £3,138 and the balance on hands at 31/12/1979, £18,710, is included in the balance of the School of Cosmic Physics.

(b) Buildings

An interim payment of £48,000 was made by the Insurers in 1978 towards cost of re-instatement of the building destroyed by fire. The balance on hands at 1/1/79 was £29,599. Expenditure on the buildings in 1979 amounted to £46,109. Negotiations with Insurers are continuing and it

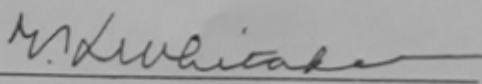
INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

Balance Sheet at 31 December 1979

<u>1978</u>		<u>1979</u>
£	<u>CURRENT ASSETS</u>	£
182,545	Cash on hands and at Bank	144,719
22,639	Debtors and Prepayments	32,820
<u>205,184</u>		<u>177,539</u>
	Less	
	<u>CURRENT LIABILITIES</u>	
97,492	Creditors and accruals	58,146
<u>107,692</u>	<u>NET CURRENT ASSETS</u>	<u>119,393</u>
	Represented by	
<u>107,692</u>	INCOME and EXPENDITURE - Accumulated Surplus	9 119,393

Notes 1 to 14 form part of these accounts

Signed: _____


T. K. WHITAKER
CHAIRMAN,
COUNCIL OF THE INSTITUTE

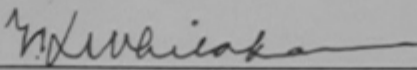
30th October, 1980.

INSTITIÚID ARD-LÉINN BHAILE ÁTHA CLIATH
(Dublin Institute for Advanced Studies)

Income and Expenditure Account
for the year ended 31 December 1979

<u>1978</u>			<u>1979</u>
£	<u>INCOME</u>	<u>NOTES</u>	£
706,200	Oireachtas Grants in Aid	1(a), 2	868,000
16,535	Sales of Publications	3	25,747
71,919	Fire Insurance Compensation	4	29,599
—	British Academy Grant	5	1,511
2,803	Summer School		—
—	Working Seminar	6	2,039
13,685	Miscellaneous	7	27,459
<u>811,142</u>			<u>954,355</u>
	<u>EXPENDITURE</u>	8	
183,109	Administration		257,303
197,519	School of Celtic Studies		203,496
100,323	School of Theoretical Physics		128,749
318,297	School of Cosmic Physics		340,631
7,887	Adaptation of Premises		12,475
<u>807,135</u>			<u>942,654</u>
4,007	<u>SURPLUS</u> for the year	9	11,701

Notes 1 to 14 form part of these accounts

Signed: 
CHAIRMAN, T. K. WHITAKER
COUNCIL OF THE INSTITUTE

30th October, 1980.