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

ANNUAL REPORT
1981

10 Burlington Road, Dublin 4

Pl.1071

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 1981

Pl.1071

INSTITIÚID ARD-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 1981

School of Celtic Studies

The death of Professor David Greene on 13 June was a great loss to the School of Celtic Studies; its immediate consequence was a disruption of plans for the forthcoming Summer School. Professors D. A. Binchy and E. G. Quin took over the courses that were to be given by Professor Greene, and the Summer School took place as scheduled with an excellent attendance from a very wide area of the world.

During the year the publication pattern was excellent.

The staffing position, already difficult, has been acerbated by the death of Professor Greene.

School of Theoretical Physics

The use of the School's facilities for research continued to increase; twenty-eight research workers from the universities and other institutes of higher education and/or research were admitted to research associateships with the School. Twenty-nine scientists from abroad visited the School during the year.

The Easter and Christmas Symposia were held as in previous years; seminars at DIAS and joint seminars (with UCD, TCD, Maynooth) in special subject areas were continued. Four courses, including two for final year undergraduates (and first year graduates) from the Dublin area, were given at DIAS; five seminars/talks were given at UCD. The Statutory Public Lecture was given at UCD on 17 December by Visiting Professor Winnink; his subject was 'The Interplay of Algebra and Theoretical Physics'.

The School continued its research. The prime areas of research were theoretical particle physics, classical statistical mechanics, quantum statistical mechanics, theory of wave propagation, and lasers; secondary areas were general relativity and gravitation, applied mathematics, and pure mathematics. Thirty-three contributions to journals or scientific proceedings were published.

Members of the School attended twenty-six conferences abroad, and gave courses or seminars at thirteen of these. They gave eighteen other courses or seminars abroad.

School of Cosmic Physics

Astronomy Section:

Programmes of recording brightness profiles of galaxies and comparison with X-Ray brightness have been carried out in association with the Section. Research on the evidence for a value to be attributed to the deceleration parameter in cosmology has been a principal further investigation, and other work concerning the stability of asteroid orbits and the Cepheid population of the Magellanic Clouds has continued.

Cosmic Ray Section:

Development and implementation of the LDEF Ultra Heavy Cosmic Ray Experiment continued with particular emphasis on the temperature control systems. The NASA space shuttle launch of this experiment has been brought forward to October 1983. During the year, the European Space Agency selected the proposed EPONA experiment for inclusion in its Giotto mission to Halley's Comet in 1985/6. This is a collaboration involving St. Patrick's College (Maynooth), the Dublin Institute for Advanced Studies, the Max Planck Institut für Aeronomie (Lindau, Germany), the European Space Research and Technology Centre (Noordwijk, the Netherlands) and the University of Sydney, Australia. A parallel proposal from SPCM and DIAS to the National Board for Science and Technology requesting a grant of £46,200 towards the cost of EPONA hardware was also successful. Various studies of cosmic ray iron group spectra and of the ionisation response in solid state nuclear track detectors yielded some very significant results constituting major advances in the field.

Geophysics Section:

The gravity data have been transferred to magnetic discs and various computer software developed so that they can be plotted and contoured at selected scales on various projections for selected sites. The resulting maps have been provided to mining, exploration and scientific interests on request.

The problems associated with diurnal magnetic recordings in conjunction with magnetic surveying were investigated.

The low temperature magnetic properties of titanomagnetites were investigated in collaboration with E. Schmidbauer of the University of Munich.

Palaeomagnetic work on sediments from Lough Doo has been started in collaboration with M. O'Connell, UCG and A. Hamilton of the New University of Ulster. The palaeomagnetism of certain Danish lake sediments, spanning the time interval 3-4000 B.P., were measured at Edinburgh University.

A seismic network based in Carnsore was developed and two earthquakes in their vicinity were recorded, one in Co. Wexford and one in Co. Cork. Both were felt locally and microseismic data was collected. Other events just offshore were also recorded.

The seismic study using quarry blasts was continued and the analysis of Rayleigh wave phase velocities shows a considerable range which is encouraging for the crustal studies.

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 1981

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 1981.

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 1981.

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 1981.

1 THE COUNCIL OF THE INSTITUTE

Chairman

Senator T. K. Whitaker, D.Econ.Sc.

Ex-Officio Members

T. Murphy, M.D., D.P.H., B.Sc.Pub.H., President, University College, Dublin; W. A. Watts, M.A., Sc.D., Provost, Trinity College, Dublin; P. MacCana, M.A., Ph.D., President, Royal Irish Academy.

Members appointed by the Governing Boards of Constituent Schools

J. P. Carney, B.A., Fil.Dr., D.Litt.; P. MacCana, M.A., Ph.D.; J. T. Lewis, B.Sc., Ph.D.; A. J. McConnell, M.A., M.Sc., Sc.D., F.T.C.D.; C. Ó Ceallaigh, M.Sc., Ph.D.; E. F. Fahy, M.Sc., Ph.D.

2 GOVERNING BOARD OF THE SCHOOL OF CELTIC STUDIES

Chairman

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

Senior Professors

J. P. Carney, B.A., Fil.Dr., D.Litt.; B. Ó Cuív, M.A., D.Litt.

Appointed Members

T. de Bhaldraithe, M.A., Ph.D., D.Litt.; G. Mac Eoin, M.A., Ph.D.; S. Ó Tuama, M.A., Ph.D.; E. G. Quin, M.A., F.T.C.D.; G. Victory, B.A., Mus.D.; T. K. M. Whitaker, D.Econ.Sc.

3 GOVERNING BOARD OF THE SCHOOL OF THEORETICAL PHYSICS

Chairman

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

Senior Professors

J. T. Lewis, B.Sc., Ph.D.; J. R. McConnell, M.A., D.Sc.; L. O Raifeartaigh, M.Sc., Ph.D.

Appointed Members

J. N. Flavin, M.Sc., Ph.D.; M. A. Hayes, M.Sc., Ph.D.; P. Quinlan, B.E., D.Sc., Ph.D.; T. D. Spearman, M.A., Ph.D. (Cantab.); S. S. Tóibín, M.Sc., Ph.D.; W. 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

E. F. Fahy, M.Sc., Ph.D.

Senior Professors

C. Ó Ceallaigh, M.Sc., Ph.D.; T. Murphy, D.Sc.,; P. A. Wayman, Ph.D.

Appointed Members

P. K. Carroll, M.Sc., Ph.D.; M. de Groot, Ph.D.; B. Henderson, B.Sc., M.A., Ph.D., F.I.P.; G. F. Imbusch, Ph.D., D.Sc.; T. P. G. McGreevy, M.Sc., Ph.D.; P. Nolan, Ph.D., D.Sc.; N. A. Porter, Ph.D.; E. T. S. Walton, M.A., M.Sc., Ph.D., D.Sc., F.T.C.D.

5 ADMINISTRATIVE STAFF

Registrar

Lt. Col. J. P. Duggan, B.A., H.Dip.Ed., M.Litt., MIL.

Senior Clerk

Maura Devoy, B.A.

Accounts Clerk

Mary A. O'Rourke, B.A.

Clerks

Angela Stubbs; Noreen Cranahan; Geraldine Esmonde; Desmond Pender.

II - Annual Report of the Governing Board of the School of Celtic Studies for the year ended 31 December 1981 adopted at its meeting on 30 April, 1982.

1 STAFF AND SCHOLARS

Professor Emeritus:

D. A. Binchy

Senior Professors:

David Greene, Director of the School until his death on 13 June 1981; James Carney, Director from 10 July 1981; Brian Ó Cuív.

Professor:

Heinrich Wagner

Assistant Professors:

Pádraig de Brún; Fergus Kelly; Rolf Baumgarten; Micheál Ó Siadhail.

Research Assistant:

Malachy McKenna.

Assistants (Part-time):

Mrs. Nessa Doran; Mrs. Anne O'Sullivan.

Assistant Librarian/Clerk:

Máire Breatnach.

Secretary/Publications Officer:

Máire Uí Chinnseala.

Clerical Staff:

Patricia Dunne.

Scholars:

Muireann Ní Bhrolcháin, John Carey, Johan Corthals (to 30 September); Diarmuid Ó Sé, Ian Hughes, George Broderick, Mark Scowcroft, Máire Bhreatnach (from 1 October).

The sudden death of Professor Greene on 13 June on his return from a Minority Languages Conference in the Faroe Islands caused considerable disruption to the work of the School. The Summer School took place as scheduled, with Professors D. A. Binchy and E. G. Quin taking over the course which had been planned for Professor Greene. During the period June-December the loss of Professor Greene has been an acerbation of an already difficult staffing position. (See last year's report.)

2 RESEARCH AND EDITING

Professor D. A. Binchy delivered the inaugural address at the International Medieval Congress which was held at University College, Dublin, in May. At a meeting of the Solicitors' Society Fasach held in May he lectured on 'Early Irish Law'. See also §6.

Professor David Greene continued his work on an edition of Saltair na Rann up to the time of his unexpected death on 13 June. He had checked some proofs of his contribution to the Irish language section of The Celtic Languages edited by Donald MacAulay and published by Cambridge University Press.

Professor James Carney, who was appointed Director of the School from 10 July, continued his work on early Irish poetry. An article entitled 'A maccucáin sruith in tíag' was accepted for publication in the O'Rahilly Memorial volume of Celtica (Vol. xv).

Professor Brian Ó Cuív continued work on a catalogue of Irish manuscripts in the Bodleian Library in Oxford; prepared Celtica xiv for the printer and corrected proofs, and also prepared some material for Celtica xv; finalised the text of the section on 'Irish language and literature c. 1700-1845' for Vol. IV of A New History of Ireland; worked on linguistic and onomastic topics and on the editing of texts of Old, Middle and Early Modern Irish periods; completed the following for publication: (i) 'An Irish Poet at the Roman Curia' (Celtica); (ii) 'A Fragment of Irish Annals' (ibid.); (iii) 'Sicíní Circe Sheáin Chláraigh' (ibid.); (iv) 'Acallam na Senórach' (Dictionary of the Middle Ages); (v) 'Vogues in Personal Names: Some Irish Experiences' (Proc. XIVth International Congress of Onomastic Sciences). See also §§ 3, 4, 6, 7, 8.

Professor Heinrich Wagner worked on (i) 'Comparative Celtic Grammar'; (ii) the completion of Oral Literature from Dunquin, Co. Kerry for publication; (iii) an analysis of late Manx Texts (with G. Broderick) and supervised G. Broderick's doctoral thesis on Late Manx Grammar; (iv) preparation of an Index for inclusion in the reprint of Volume I of the Linguistic Atlas; (v) editing Zeitschrift für Celtische Philologie 38. The following articles were accepted for publication in ZCP 39: (i) 'Old Irish -bria, subjunctive of bronnaid 'injures'; (ii) 'A syntactical feature of archaic Old Irish'; (iii) 'Studies in the History of Irish Dialects, Part I. An article entitled 'The name Eithne and the tale Esnada Tige Buchet' was accepted for inclusion in the Tomás Ó Máille Festschrift. See also §§ 6, 8.

Dr. Pádraig de Brún edited (with S. Ó Coileáin and P. Ó Riain) Folia Gadelica (a festschrift for R. A. Breatnach to be published by Cork University Press) and contributed an article entitled 'Scriptural Instruction in Irish: a controversy of 1830-31'. The cataloguing of Irish manuscripts in TCD (with Mrs. A. O'Sullivan) continued as did the collection of material relating to Irish Scripture readers and teachers and the later scribal tradition. The following articles were accepted for publication: (i) Rev. Forster Archer's account of Kerry in 1801; (ii) Caoineadh ar an Easpag Ó Síochfhradha in The Kerry Archaeological and Historical Society Journal; (iii) 'A Schoolmaster's Advertisement' in Seanchas Cairbre. See also §8.

Mr. Fergus Kelly completed the preparation of an edition of Bechbretha; acted as Director of the Summer School held from 13-31 July; was Visiting Lecturer at the University of Toronto from 14 September until 7 December. See also §§ 6, 7, 8.

Mr. Rolf Baumgarten completed the printer's copy of the body of the Bibliography of Irish Linguistics and Literature and worked on the Indexes to the same.

Mícheál Ó Siadhail continued work on aspects of the grammar of Modern Irish Dialects and revised and re-checked Learning Irish for two reprints. An article entitled 'The Cardinal Numbers in Modern Irish Dialects' was accepted for publication in Ériu. See also §§ 6, 7, 8.

Dr. Malachy McKenna prepared two courses for the Summer School (a) Introduction to Modern Breton and (b) Irish Literature from 1600 to the present day; read proofs of final article on Breton of Guémené (ZCP 38); compiled index to series of articles on Breton of Guémené in ZCP 35-38. The following articles were accepted for publication in Celtica: (i) 'Initial stress in the Breton of Guémené-sur-Scorff'; (ii) 'A Note on a Feature of Omeath Irish'; (iii) 'Le Breton Parlé à St. Pol-de-Léon'.

Mrs. Nessa Doran worked on the Printer's copy of Fasc. VII (Mss. G258-G330) of Catalogue of Irish MSS in the National Library of Ireland which was sent to press on 11 December. Work progressed on Mss. G331-G348 for inclusion in Fasc. VIII of the Catalogue.

Dr. Muireann Ní Bhrolcháin began work on an edition of 'Éri og inis na Naém' by Gilla Mo-Dutu Ó Caiside; collected, for the purpose of examination all the female names in extant copies of the annals; researched the marriage patterns which emerge from the evidence of the annals and the prose Banshenchas between the years 1022 and 1170. The following articles were accepted for publication: 'An Bansheanchas' Léachtaí Cholm Cille, Ma Nuad; 'A Possible Source for Keating's Forus Feasa ar Éirinn' (Eigse). See also §7.

Mrs. Anne O'Sullivan completed the preparation of the Printer's copy of her edition of The Book of Leinster Vol. VI; re-cataloguing of

mediaeval Irish manuscripts in the Library of Trinity College, Dublin continued. An article 'St. Breccán of Clare' was accepted for publication in Celtica.

Diarmuid Ó Sé continued work on his Ph.D. thesis, completing the sections dealing with nouns, adjectives, verbs and the copula. The chapter on stress was enlarged and re-written; eight weeks were spent on field work in the Dún Chaoin area; the use of colour-terms in that dialect was studied. See also §5.

Mr. Ian Hughes completed work on his Ph.D. thesis, an edition of the Irish 'Gospel of Nicodemus' which includes introduction, text, translation, comparison with the Latin original and linguistic notes.

Dr. George Broderick prepared for publication, in association with Professor Wagner, a grammar of Late Manx with notes on comparative phonology; edited and prepared for publication song texts or texts of poems in Manx Gaelic. The degree of Ph.D. was awarded in December for his thesis on native Manx speech. The following articles were accepted for publication: 'Translation and Notes to "Manx Stories and Reminiscences of Ned Beg Hom Ruy"' (ZCP xxxix); 'Manx Traditional Songs and Song-fragments II' (Béaloideas 50); 'Baase Illiam Dhone' (Celtica xiv); 'Manx Possessions of Bangor and Sabhal' (Proc. of the Ulster Place-names Society, Ser. 2 Vol. 4). See also §8.

Mr. John Carey continued work on the editing and translating of the first recension of Leabhar Gabhála Éireann which is to be submitted as a doctoral thesis at Harvard University. The following articles were accepted for publication: 'The Location of the Otherworld in Irish Tradition' (Éigse); 'Irish Parallels to the Myth of Ó Finn's Eye' (Folklore); 'Where is Hell?' (Béaloideas). See also §8.

Dr. Johan Corthals continued work on an edition of Táin Bó Regamna. An article entitled 'On a use of gaibid' was accepted for publication in Celtica. See also §5.

Mr. R. Mark Scowcroft completed work on 'The Hand and the Child: Studies of Celtic Tradition in European Literature', a doctoral dissertation which was submitted to Cornell University in December; work began on an edition of Leabhar Gabhála as found in MSS. Rawl. B 512 and TCD E.3.5 2, on the ms. relations of the text and the nature and development of its contents; prepared a review of Éigse xviii for publication in Cambridge Mediaeval Celtic Studies. See also §§ 5, 7.

Máire M. Bhreathnach worked on a new edition of Tógáil Bruidne Da Derga for a Ph.D. thesis; texts, translations and critical analysis of the three main recensions (23 N 10, The Yellow Book of Lecan, Egerton 1782 and their related manuscripts) are being completed. An article entitled 'A new edition of Tochmorc Becfola' has been revised with a view to publication; an edition of the metrical Cáin Domnaig is also in progress. The following

were accepted for publication in ZCP: (i) 'The Sovereignty Goddess as Goddess of Death'; (ii) review of P. L. Henry, Saoithiúlacht na Sean-Ghaeilge.

3 STATUTORY PUBLIC LECTURE

A Statutory Lecture entitled 'Ireland's Manuscript Heritage' was delivered by Professor Brian Ó Cuív at Trinity College, Dublin on 4 December 1981.

4 SEMINARS

Dr. Donncha Ó hAodha, University College, Galway, who was a Visitor to the School, conducted a seminar on Do chórus bard cona mbardni (Mittelirische Verslehre I) during Hilary term.

Professor Brian Ó Cuív held a seminar on The Rule of Mo Chuta during Michaelmas term.

5 SYMPOSIUM

On 20-21 March 1981 a symposium was held for university and college staff and research workers. The following papers were read:-

Deirdre Ní Cheallaigh	:	Beach/Meach revisited
Noel Hamilton	:	I/in plus possessives in Modern Irish
Diarmuid Ó Sé	:	Cailiuint -r sa Chopail agus sna Mireanna Briathardha i gCanúint Mhuimhneach
Dónall Ó Baoill	:	Ord na bhFocal sa Nua-Ghaeilge
Ruairí Ó hUiginn	:	The Old Irish Figura Etymologica
Johan Corthals	:	On the use of ní after co n-accae and co cúalae
Dáibhí Ó Cróinín	:	Mo-Sinu maccu Min and the Bangor Computus
Mark Scowcroft	:	Damhoctor in Nennius
Donnchadh Ó Corráin	:	Some Old Irish legal terms
Micheál Mac Craith, OFM	:	Ovid, Éilis agus Dánta Grá na Gaeilge

6 SUMMER SCHOOL

An International Summer School in Celtic Studies was held from 13-31 July under the direction of Mr. Fergus Kelly. The School was attended by 90 students representing Australia, Canada, Denmark, England, Germany, Holland, Ireland, Italy, Japan, Jugoslavia, Scotland, Sweden, Switzerland, United States of America, Wales.

The following courses were offered:- (1) Elementary Modern Irish (Mícheal Ó Siadhail); (2) Modern Irish Dialects (Heinrich Wagner); (3) Elementary Old Irish (Fergus Kelly); (4) The History of the Irish Verbal System (E. G. Quin) and Insular Celtic Institutions (D. A. Binchy); (5) Irish Literature (James Carney, Brian Ó Cuív, Nessa Doran, Malachy McKenna); (6) Elementary Modern Breton (Malachy McKenna); (7) Mediaeval and Early Modern Irish (Brian Ó Cuív); (8) From Indo-European to Old Irish (Calvert Watkins, Harvard University). Course (4) was substituted for that planned by the late Professor Greene on the Historical Development of Irish.

Study Grants, from funds provided by the Department of Education, were awarded to 22 overseas students and ranged in value from £100 - £250.

Excursions were organised to the Boyne Valley on Saturday 8 July and to Glendalough and Craiguenamanagh on 15 July. The majority of students took part in both excursions.

7 EXTERNAL ACTIVITIES

Professor Brian Ó Cuív lectured on 'Some Aspects of Irish Personal Names' in Queen's University, Belfast, on 25 February; attended a seminar in Queen's University,Belfast, 26-27 February, and read a paper on 'Irish Personal Names: Some Territorial Correlations'; attended the 13th Conference of the Council for Names Studies in Great Britain and Ireland in Hull, 27-30 March; attended XIVth International Congress of Onomastic Sciences, Ann Arbor, 23-30 August and read a paper on 'Vogues in Personal Names - Some Irish Experiences'; visited Chatsworth (Derbyshire) and examined the Book of Lismore and collated a transcript of a poem with it; visited Stonyhurst College (Lancashire) and examined the Irish manuscripts there.

Mr. Fergus Kelly, while Visiting Lecturer at the University of Toronto from 14 September to 7 December, delivered 48 lectures on 'Early Irish Literature and Society'; at the Pontifical Institute for Mediaeval Studies, Toronto, on 13 November he lectured on 'Early Irish Justice'; at Harvard University on 3 December he lectured on 'The Terminology of the Early Irish Currency System'.

Micheál Ó Siadhail was Visiting Lecturer at the University of Iceland during the Autumn term where he held a course on Modern Irish.

Muireann Ní Bhrolcháin held a Seminar at Trinity College, Dublin, in March and lectured on 'An Bansheanchas' at St. Patrick's College, Maynooth.

8 PUBLICATIONS

(a) Works in course of printing

The Annals of Ulster edited by S. Mac Airt/G. Mac Niocaill: revised page proofs (579 pp.) of Text, Translation and Notes were checked by G. Mac Niocaill throughout the year.

Celtica XIV edited by B. Ó Cuív: final proofs (187 pp.) were checked by the Editor.

Catalogue of Irish MSS. in NLI Fasc. VII compiled by Nessa Ní Shéaghdha: sent to press in December.

(b) Books published by the Institute

Dán na mBráthar Mionúr Cuid II	Cuthbert Mhag Craith OFM. viii + 440 pp.	£18.00
Learning Irish	Micheál Ó Siadhail. 331 pp.	£5.00
Catalogue of Irish MSS. in National Library of Ireland Fasc. VI	Nessa Ní Shéaghdha 83 pp.	£4.80
Pairlement Chloinne Tomáis	N. J. A. Williams lxvi + 198 pp.	£7.20
Iohannis Scotti Erivgenae: Periphyseon Liber III (S.L.H. Vol. XI)	Ed. I. P. Sheldon-Williams. vii + 324 pp.	£30.00
Lexique Étymologique de l'Irlandais Ancien: Lettre B.	J. Vendryes xiv + 119 pp.	£10.00

(c) Reprints

1 Old Irish Reader
2 Irish Syllabic Poetry
3 Trois Poèmes en Moyen Breton
4 Táin Bó Cuailnge: Maynooth MS.
5 Aided Muirchertaig Meic Erca
6 Pwyll Pendeuic Dyuet
7 Catalogue of Publications of the School of Celtic Studies

8 Lexique Étymologique de l'Irlandais Ancien - Lettre A
9 The Two Patricks
10 The Gaelic of Kintyre
11 Nua-Dhuanaire III
12 Linguistic Atlas and Survey of Irish Dialects Vol. I

(d) Contributions to periodicals and other publications

D. A. Binchy		
Bergin's Law.	Studia Celtica xiv/xv.	34-53
James Carney:		
Linking Alliteration ('Fidrad Freccomail')	Éigse xviii.	251-62
Brian Ó Cuív:		
Topographical Elements in Irish Personal Names.	Bulletin of the Ulster Place-name Society, Series 2, Vol. 3.	8-12
Two Notes.	Éigse xviii.	285-8
A Poem on the Second Earl of Antrim.	Scottish Gaelic Studies xiii.	302-5
A Middle-Irish Poem on Leinster Dynasties.	Études Celtiques xiii.	141-50.
Mediaeval Irish Scholars and Classical Latin Literature.	Proceedings of the Royal Irish Academy, 81 C 9.	
Heinrich Wagner:		
Origins of Pagan Irish Religion.	Zeitschrift für Celtische Philologie 38.	1-28
Near Eastern and African Connections with the Celtic World.	The Celtic Consciousness (ed. Robert O'Driscoll).	51-67
Pádraig de Brún:		
Kildare Place Society in Kerry: II. Schools and Lending Libraries, Kells-Waterville.	Kerry Archaeological and Historical Society Journal 13.	82-142
A Ventry Convert Group, 1842.	ibid.	143-8.

Amhráin a thiomsaigh Eoghan Ó Comhraí.	Ceol 4/4.	115-26
Hugh Beirne, Piper.	ibid. 5/1.	25.
Some Cavan Schools and Teachers, 1814 to 1831.	Breifne.	407-431

Fergus Kelly:

Review of Zeitschrift für Celtische Philologie 36.	Éigse xviii	326-329

Micheál Ó Siadhail:

Standard Irish Orthography - An Assessment.	The Crane Bag Vol. 5, No. 2	

George Broderick:

Arddae Huimmonn - A Manx Place-name?	Proceedings of the Ulster Place-names Society, Series 2, Vol. 3.	13-15
Secular Settlement Terms in Manx Place-names.	ibid.	40-41
Manx Stories and Reminiscences of Ned Beg Nom Ruy.	Zeitschrift für Celtische Philologie 38.	113-78
Manx Traditional Songs and Song-fragments.	Béaloideas 48/49.	9-29

John Carey:

The Name 'Tuatha Dé Danann'.	Éigse xviii.	291-4

III - Annual Report of the Governing Board of the School of Theoretical Physics for the year 1981 adopted at its meeting on 21 May 1982.

1 STAFF, SCHOLARS, FELLOW, RESEARCH ASSOCIATES, VISITING SCIENTISTS

Emeritus Professor:

John L. Synge

Senior Professors

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

Visiting Scientists

F. Ando (Shinshu Univ., Japan), 20-23 July; M. van den Berg (Groningen), 27 April - 14 May, 2-21 June, and 21-28 August; C. Brot (Nice), 4-9 May; S. Deser (Brandeis & CERN), 25-27 May; D. E. Evans (Warwick), 1-7 June, and 29 December - 10 January 1982; H. Ezawa (Tokyo), 16-22 September; G. W. Ford (Michigan, Ann Arbor), 29 June - 1 August; D. G. Frood (Lakehead, Ont.), 6 July - 28 August; R. Fulton (Florida State, Tallahassee), 1 December - 31 January 1982; L. Halpern (Florida State), 23 July; F. Hehl (Cologne), 17-25 November; P. Houston (IHES, Bures-sur-Yvette), 5-26 August; D. Husemoller (Haverford Coll. PA), 20 February; E. Kluk (Slaski Univ., Katowice), 21 July - 20 August; W. Kosinski (Polish Acad. Sci.), 14-19 April; H. Maassen (Groningen), 30 September - 30 October; R. F. O'Connell (Louisiana State, Baton Rouge), part time from 1 June to 20 August; A. J. O'Connor (Oxford & Brisbane), 6-9 January; P. Olver (Minnesota & Edinburgh), 29 June - 2 July; H. Osborn (Cambridge), 29-30 October; G. Parravicini (Milan), 22 April - 6 May, and 30 December - 6 January 1982; R. Rivers (Imperial Coll., London), 27-30 April; N. C. Sil (Calcutta), 8-11 February; V. Soucek (Charles Univ., Prague), 16-27 March; P. Vanheuverzwijn (Leuven), 5-30 January, and 28 October - 6 November; M. Winnink(Groningen), 19 November - 2 December, and 15-20 December.

Assistant Professor:

S. Ciulli

Research Associates:

UCD: S. Dineen, R. Gow, P. A. Hogan, D. J. Judge, J. D. McCrea, J. V. Pulè, W. Sullivan;
TCD; R. K. Dodd, P.S. Florides, H. C. Morris, B. K. P. Scaife, R. Ward;

St. Patrick's College, Maynooth: C. Nash, A. O'Farrell, J. Spelman, D. H. Tchrakian;
An Foras Forbartha: J. M. Golden;
DIT, Kevin Street: T. Garavaglia, B. Goldsmith;
UCG: M. J. Conneely, M. J. Newell, R. A. Ryan, T. N. Sherry;
NIHED: R. Flood (new appointment from 1 January);
NUU: J. Adam, P. McGill;
Open Univ.: A. I. Solomon;
Imperial College, London: J. D. Gibbon.

All these Research Associate appointments ran to 31 December.

Scholars

A. Fordy (UK), J. Gibbons (UK), to 30 September; L. P. Singh (India), S. Rouhani (Iran); D. Heffernan (Ireland), from 1 June; T. Murphy (USA), L. Papiez (Poland), J. Rayski (Poland), from 1 October.

NBST Research Fellow:

B. Lenoach (Ireland)

Librarian - Executive:

Evelyn R. Wills

Secretaries:

M. Farrelly, to 19 August; M. Matthews, from 28 September.

2 GENERAL

An informal reception was held at DIAS on 30 March to mark the publication of a new book by Professor McConnell, Rotational Brownian Motion and Dielectric Theory, by Academic Press (see the previous report).

In continuing fulfilment of the School's statutory function "to train advanced students in the methods of original research", post-doctoral scholarships (up to six with stipend at any one time) were awarded to D. Heffernan, T. Murphy, L. Papiez and J. Rayski, and the scholarships of L. P. Singh and S. Rouhani were renewed for a further year; scholarships already held by A. Fordy (3 years), and J. Gibbons (2 years), ended on 30 September. NBST continued its award of a postgraduate research fellowship to B. Lenoach in connection with the collaborative UCD/DIAS research on random media.

In addition to the use made by the Staff, Scholars, and Fellow of the School in their primary research activities, much use was made also by visitors and research associates, particularly during the

summer months, of the School's facilities for research - especially of the opportunities for informal discussions, and the library resources. Twentyeight research workers from universities and other institutes of research or higher education were admitted to research associateships with the School. For details of Visitors to the School see §7.

3 RESEARCH AND STUDY

Primary areas -

a) Theoretical Particle Physics

Gauge Theories, Monopoles

Professor O'Raifeartaigh collaborated with Dr. Rouhani and Dr. Singh on a study of explicit solutions of the field equations for finite energy monopoles in the zero-potential limit, following the construction of Ward. He completed work in collaboration with C. Parravicini and Y. Fujimoto on effective potentials (reported on in previous years). The problem of complex effective potentials was solved by the use of interpolated loop expansions, and the results were applied to spontaneously broken and supersymmetric potentials. Dr. Rayski began a study of composite models for quarks and leptons. Dr. Murphy worked on a calculation of the effective action, using position-dependent Green's functions; he also studied new methods for calculating the effective potential and associated renormalization group equations. Dr. Tchrakian worked on three projects: (1) Monopole flux of 3-dimensional "gravity" with torsion; (2) Yang R-gauge for SU(3), and further applications to the monopole problem (in collaboration with Dr. Singh), and (3) Instantons and monopoles on higher dimensional manifolds; a search for exact solutions, and the construction of physical models (in collaboration with Dr. Sherry).

Scattering Theory

Professor Ciulli collaborated with Professor Spearman in work on functional methods used to infer the structure of the spectral function from data inside the holomorphy domain. He collaborated with Professor Spearman and with J. Fischer (Prague) on a method for extracting non-perturbative effects from perturbative series, to obtain a soluble model. Dr. Garavaglia studied the properties of interacting oscillating neutrinos within gauge theories of electro-weak forces; he also studied composite modelling of fermions and bosons, and quantum field theories for composite systems.

b) Classical Statistical Mechanics

Brownian Motion and Dielectric Phenomena

Professor McConnell continued his investigations of far infrared absorption, collaborating with Professors C. Brot, D. Frood, B. K. P.

Scaife, and Dr. E. Kluk. He developed an analytical method for the study of nuclear magnetic resonance relaxation, especially by spin-rotational interactions, and successfully applied it to spherical, symmetric top, and linear rotator molecular models. Professor Fulton completed some work on the application of a general theory of non-linear dielectric phenomena to fluids composed of polar, polarizable particles; he obtained results which are at variance with previous proposals. He also made progress on the application of the theory to time-dependent phenomena.

Phase Transitions in Lattice Systems

Considerable progress has been made on the Clifford algebra formulation of the two-dimensional Ising model but many puzzling features remain. Professor Lewis, in collaboration with M. Winnink and R. Kuik (Groningen), has obtained the central decomposition of the equilibrium state of the infinite system which arises from periodic boundary conditions on finite lattices, and verified that its components are the states which arise from 'plus' boundary conditions and 'minus' boundary conditions; with D. E. Evans (Warwick) he has investigated the n-particle structure of the representation space with a view to finding the spectral decomposition of the infinite-volume transfer matrix.

Dr. Solomon commenced a programme of research into the problem of co-existence of phases in multi-phase systems, in collaboration with J. Birman (New York). Using the methods of dynamical Lie groups, the first system studied was that of a material exhibiting charge-density waves (the Peierl's transition) and superconductivity (the BCS transition).

Drs. Sullivan and Flood continued their joint research on interacting particle systems.

c) Quantum Statistical Mechanics

Asymptotic Evolutions of Open Systems

Professor Lewis with G. W. Ford (Ann Arbor) continued his investigation of the Lamb shift of an oscillator coupled to a thermal radiation field, using the averaging method.

Boson Condensation

Dr. Pulè and Professor Lewis continued their collaboration on boson condensation. The main effort this year was directed towards the problem of the existence and nature of the Bose-Einstein phase transition in a gas of interacting bosons. As a first step a systematic study was made, together with M. van den Berg (Groningen), of the dependence of the phase-transition in a gas of non-interacting particles on the spectrum of the single-particle hamiltonian. This revealed a hitherto unsuspected complexity in possible structures for the condensate. A full report of this work is in course of preparation.

A second step was the development of a theory of first-order phase transitions which is sufficiently general to encompass the Bose-Einstein phase-transition in the non-interacting gas.

Quantum Stochastic Processes

Professor Lewis in collaboration with H. Maassen (Groningen) investigated the non-linear quantum Langevin equation and proved some of the results conjectured by Kac and Benguria.

Dr. Papiez worked on the application of stochastic control theory to quantum mechanics, using the Schrödinger equation, the Klein-Gordon equation, and Feynman integrals.

d) Theory of Wave Propagation

Heterogeneous Media

Professors Synge and Lewis extended their investigation of wave-propagation in a heterogeneous medium to waves in a three-dimensional space.

Mr. Lenoach continued his work on applying the averaging method to study the propagation of seismic waves in a random medium. This work is funded by the NBST, and is in a collaboration between the School and the Mathematical Physics Department of UCD, organized by Professor Hayes (UCD) and Professor Lewis.

Integrable Systems

Dr. Gibbons investigated the relationships between different integrable hierarchies, in particular relating the nonlinear Schrödinger equation to the derivative nonlinear Schrödinger equation, and the Calogero-Moser many-body system to the nonlinear Schrödinger equation. He solved the initial value problem of Benney's equations for some initial conditions. Dr. Fordy developed some techniques for 'closing off' free Lie algebras which occur in the context of Cartan prolongation of partial differential equations. He investigated the use of symmetric space classification in the description of Bäcklund transformation.

e) Lasers

Dr. Heffernan investigated the possibility of bistability, picosecond pulsing, and mode-locking in coupled semiconductor lasers, in collaboration with D. Bradley and D. Stallard (TCD). He investigated the process of four-wave mixing, amplified reflection, phase conjugation, and hologram recording in photo-refractive media, in collaboration with D. Bradley and C. M. Devine (TCD).

Secondary areas -

f) General Relativity and Gravitation

Dr. McCrea completed work with S. R. Jordan on shell sources for stationary cylindrically symmetric gravitational fields, and found a new cylindrically symmetric stationary solution to the Einstein-Maxwell equations. He constructed REDUCE computer programmes for the Poincaré gauge theory equations of F. Hehl. Dr. Hogan worked on the application of fibre bundles to gauge theory, and in particular on the solutions of the Yang-Mills equations arising naturally from connections on specific principal fibre bundles. Professor Florides completed work on the complete field of charged perfect fluid spheres and of other static spherically symmetric charged distributions. He completed work on hypersurfaces of constant curvature in Riemann manifolds, and is now investigating the relevance in general relativity of the metrics arising in the work.

g) Applied Mathematics

Dr. Golden studied contact problems for inhomogeneous media, and stress transmission through granular materials. Dr. Goldsmith studied non-linear differential equation models in biology.

h) Pure Mathematics

Professor McConnell continued his investigations with M. J. Newell on symmetric functions. Dr. Goldsmith studied endomorphism rings of modules over complete discrete valuation rings.

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 and circulated to a list of approximately 300 research institutes and university departments throughout the world. As far as available, copies of the preprints were supplied to research workers in response to requests. Many of the reports appeared later as publications or were in press at the end of the year (See §9).

DIAS-STP-81-02: S. CIULLI & T. D. SPEARMAN: Analytic continuation of the scattering amplitudes for a finite set of data points with unequal errors.

-03: L. O'RAIFEARTAIGH & S. ROUHANI: Recent developments in finite energy (topological) monopole theory.

-04 A. FRIGERIO, J. T. LEWIS & J. V. PULÈ: The averaging method for asymptotic evolutions II: Quantum open systems.

-05: A. I. SOLOMON: Dynamical group model of superfluid helium three.

DIAS-STP-81-06: J. GIBBONS: Related integrable hierarchies I: Two nonlinear Schrödinger equations.

-07: J. GIBBONS: Related integrable hierarchies II: Pole expansions.

-08: D. POTTINGER: Gluon condensation and QCD.

-09: J. M. GOLDEN: Approximate analytic treatment of the problem of a moving ellipsoidal punch on a visco-elastic half-space.

-10: J. M. GOLDEN: A model of wet road/tyre friction.

-11: J. T. LEWIS & J. V. PULÈ: The statistics of the grand canonical number density for interacting bosons.

-12: L. P. SINGH & D. H. TCHRAKIAN: On the Yang R-gauge for SU(3).

-13: D. H. TCHRAKIAN: A geometric formulation of the monopole problem.

-14: L. O'RAIFEARTAIGH & S. ROUHANI: Twisted axial symmetry and finitely separated monopoles.

-15: B. GOLDSMITH: Essentially indecomposable modules over a complete discrete valuation ring.

-16: J. R. McCONNELL: Stochastic differential equation study of nuclear magnetic relaxation by spin-rotational interactions.

-17: P. A. HOGAN: An embedding of some Stiefel bundles.

-18: M. van den BERG & J. T. LEWIS: On generalized condensation in the free boson gas.

-20: M. van den BERG: On boson condensation in an infinite number of low-lying levels.

-21: M. van den BERG: A uniform estimate for the partition function of the Laplacian with Dirichlet boundary conditions on a compact convex set.

-22: J. R. McCONNELL: Nuclear magnetic spin-rotational relaxation times for symmetric molecules.

DIAS-STP-81-23: J. R. McCONNELL: The stochastic rotation operator and nuclear magnetic relaxation processes.

-24: J. R. McCONNELL: Nuclear magnetic spin-rotational relaxation times for linear molecules.

-26: A. P. FORDY & R. K. DODD: Prolongation of quasi-polynomial flows.

-27: J. V. PULÈ: The free boson gas in a weak external potential.

-28: J. D. McCREA: The gravitational field of a rotating infinite cylindrical shell.

-29: S. CIULLI: Dynamical systems and microphysics: a wish; dedicated to the composer Aurel Stroe.

-30: J. D. McCREA: A stationary cylindrically symmetric electrovac space-time.

-31: L. O'RAIFEARTAIGH & S. ROUHANI: Rings of monopoles with discrete axial symmetry: explicit solution for n=3.

-32: L. PAPIEZ: Stochastic optimal control quantization of a free relativistic particle.

-33: L. O'RAIFEARTAIGH, S. ROUHANI & L. P. SINGH: Explicit solution of the Corrigan-Goddard conditions for N monopoles for small values of the parameters.

4 SEMINARS, REVIEW LECTURES, SERIES, COURSES

Seminar and review lectures, series and courses in specialized areas of physics and/or mathematics, were held at DIAS-STP throughout the year; as in previous years they were attended by members of staff and senior students from the universities and other third-level institutes in the Dublin area, and by members of the scientific schools of DIAS. Two courses were given at DIAS-STP by members of staff for graduate, or senior undergraduate, students from the Dublin area. Members of the School and Visiting Scientists took part in the Journals' Club meetings throughout the year, and four seminars were given at UCD.

a) Review and Seminar Lectures given at DIAS-STP by Visitors:

Prof. C. BROT (Nice):	The Onsager equation: A test of validity by numerical simulation. An extension of the Onsager model for anisometric molecules.
Prof. S. DESER (Brandeis & CERN):	Divergence cancellations in quantum gravity explained.
Prof. H. HEHL (Cologne):	Gravitation and gauge theory (2 lectures).
Prof. I. M. JAMES, FRS (Math. Inst. Oxford):	Lusternik-Schnirelmann category theory.
Prof. W. KOSINSKI (Polish Acad. Sci.):	On global evolution of states of deformable bodies.
Dr. A. J. O'CONNOR (Griffith Univ., Brisbane):	The Toda lattice again.
Prof. P. OLVER (Minnesota & Edinburgh):	Hamiltonian structure of water waves.
Dr. H. OSBORN (Cambridge):	Self-dual gauge fields and monopoles.
Dr. G. PARRAVICINI (Milan):	Reduced dynamics in Jahn-Teller systems for crystals.
Dr. R. RIVERS (Imperial Coll.London):	Aspects of non-renormalizable field theories.
Dr. V. SOUCEK (Charles Univ., Prague):	Quaternion analysis and twistor theories.
Dr. P. VANHEUVERZWIJN (Leuven):	Metastability.
Prof. M. WINNINK (Groningen):	Attempts to prove Gibbs' rule.

b) Review and Seminar Lectures given at DIAS-STP by members of the School:

Prof. J. R. McCONNELL:	The stochastic rotation operator and physical processes.
Prof. J. T. LEWIS:	Boson condensation.
Prof. S. CIULLI:	About Borel, Poggio-Quinn-Weinberg and other methods used to gather non-perturbative results from perturbative expansions.

c) Courses and Series given at DIAS-STP:

Professor O'RAIFEARTAIGH organized a DIAS Study Group on WARD CONSTRUCTION OF MONOPOLE SOLUTIONS in January, and a series of informal seminars on MONOPOLES commencing in September. He began a series of lectures on GROUP THEORY AND ITS APPLICATIONS TO PHYSICS, forming part of the M.Sc. course for universities in the Dublin Area, in November.

Professor LEWIS began a course on STATISTICAL MECHANICS, for graduate or final-year undergraduate students, in October.

d) Contributions to the Journals' Club (Joint TCD-UCD-Maynooth-DIAS Particle Group, meeting in TCD):

Dr. D. H. TCHRAKIAN:	Geometrical formulations for monopoles.
Dr. S. ROUHANI:	Central charge in the supersymmetric CP^n model.
	Explicit solution of Corrigan-Goddard conditions for N monopoles.

e) Other Lectures or Seminars given in Ireland by members of DIAS-STP or Visiting Scientists:

Prof. W. KOSINSKI:	On admissable processes, stability, and uniqueness in dynamics of dissipative bodies. UCD, on 15 April.
Dr. M. van den BERG:	Bose-Einstein condensation. UCD, on 30 April.
Prof. S. DESER:	Supergravity: A new unification of fundamental interactions. Maynooth, Ciaran Ryan Memorial Lecture, 26 May.
Prof. J. R. McCONNELL:	Rotational Brownian motion and physico-chemical processes. UCD, on 7 December.
Prof. L. O'RAIFEARTAIGH:	Inaugural Talk, UCD Mathematical Society, on 8 May.

For lectures given outside Ireland by members of DIAS-STP, see §8.

5 STATUTORY PUBLIC LECTURE

A Statutory Public Lecture under the auspices of the School was delivered by Professor M. Winnink (Groningen) on 17 December in University College, Dublin. The title was 'The Interplay of Algebra and Theoretical Physics'.

6 SYMPOSIA

Two Mathematical Symposia were held during the year, 15-16 April, and 21-22 December. The attendances included professors, lecturers and graduate students from the Irish universities and other third-level institutions, and from institutions abroad, and members of the scientific schools of DIAS.

At a business meeting of the April Symposium a proposal put forward by the Governing Board of STP, to alter the format of future symposia, was agreed. Accordingly, starting from December 1981, the format of the mathematical symposia is: Two invited review lectures (one hour each), four invited lectures (40 minutes each), and eight short communications.

The lectures given in April and December were as follows:

APRIL:

Dr. P. K. CURRIE (Netherlands): Stress-transmitting static layers in liquid crystals.

Dr. J. CIBBONS (DIAS): Exactly soluble Vlasov equations.

Dr. P. O'LEARY (UCG): Viscoelastic Rayleigh waves for constant Poisson's ratio.

Dr. R. FLOOD (NIHE Dublin & DIAS): Ensembles for random fields.

Dr. J. McDERMOTT (UCG): Groups of homomorphisms on Cantor-like spaces.

Dr. R. BATES (Met. Service): Conditions for resonance of forced stationary waves in the atmosphere.

DECEMBER:

Review Lectures:

Prof. D. J. SIMMS (TCD): Integrable Hamiltonian equations and Lie Groups.

Prof. M. L. NEWELL (UCG): Review of soluble groups.

Lectures:

Dr. A. I. SOLOMON (Open Univ. and DIAS): Applications of Lie algebras to many-body problems.

Dr. D. J. McCREA (UCD & DIAS): The structure of singularities in space-time.

Prof. A. G. O'FARRELL (Maynooth & DIAS): The approximation of functions of two variables by sums of functions of one variable.

Dr. R. S. WARD (TCD & DIAS): PDE's and geometry: Weierstrass, Whittaker, and Yang-Mills monopoles.

Short Communications:

Mr. PETER LYNCH (Met. Office): "Normal modes in the atmosphere".

Dr. T. C. HURLEY (UCG): Bases for groups and Lie Algebras.

Prof. F. HOLLAND (UCC): Some aspects of a non-linear functional equation.

Dr. P. DOLAN (I.C. London): The time-dependent harmonic oscillator in n dimension.

Dr. N. O MURCHADHA (UCC): The Yang-Mills constraint.

Dr. D. REYNOLDS (UCD): Singular linear Volterra integral equations.

Prof. J. N. FLAVIN (UCG): Results connected with Saint-Venants problem in elasticity.

Mr. T. COX (UCC): On a differential-difference equation arising in non linear wave propagation.

7 VISITORS

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

As in previous years, visitors, mainly from abroad, came to the School for long or short periods, for discussions with School members, to give seminars, and to avail of the School's library resources for their research work.

Short visits (up to five days) were made by

A. J. O'Connor (Oxford & Brisbane), 6-9 January;
N. C. Sil (Calcutta), 8-11 February;
N. Symonds (Sussex Univ., Brighton), 13 February;
D. Husemoller (Haverford Coll., PA), 20 February;
R. Rivers (Imperial Coll., London), 27-30 April;
S. Deser (Brandeis & CERN), 25-27 May;
P. Olver (Minnesota & Edinburgh), 29 June - 2 July;
F. Ando (Shinshu Univ., Japan), 20-23 July;
L. Halpern (Florida State Univ., Tallahassee), 23 July;
I. M. James, FRS (Math. Inst. Oxford), 9 October;
H. Osborn (Cambridge Univ.), 29-30 October;
J. Fischer (Prague), 18 November;
M. L. Newell (UCG), 21-22 December.

Longer visits were made by

P. Vanheuverzwijn (Leuven), 5-30 January and 28 October - 6 November;
V. Soucek (Charles Univ., Prague), 16-27 March;
W. Kosinski (Polish Acad. Sci.), 14-19 April;
G. Parravicini (Milan), 22 April - 6 May and 30 December - 6 January 1982;
M. van den Berg (Groningen), 27 April - 14 May, 2-21 June and 21-28 August;
C. Brot (Nice), 4-9 May;
D. E. Evans (Warwick), 2-8 June and 29 December - 10 January 1982;
R. F. O'Connell (Louisiana State, Baton Rouge), part time from 1 June - 20 August;
G. W. Ford (Michigan, Ann Arbor), 29 June - 1 August;
D. G. Frood (Lakehead Univ. Ont.), 6 July - 28 August;
E. Kluk (Silesian Univ., Katowice), 21 July - 20 August;
P. Houston (IHES, Bures-sur-Yvette), 5-26 August;
H. Ezawa (Tokyo), 16-22 September;
H. Maassen (Groningen), 30 September - 30 October;
F. Hehl (Cologne), 17-25 November;
M. Winnink (Groningen), 19 November - 2 December and 15-20 December;
R. Fulton (Florida State, Tallahassee), 1 December - 31 January 1982.

Visits were made by Research Associates from outside the Dublin area as follows:

A. I. Solomon (Open Univ.), 14-26 April,25 May - 3 June and 21 December;

P. McGill (NUU), 30 June - 10 July;

T. N. Sherry (UCG), 10-28 August and 20-23 December.

8 ACTIVITIES ABROAD

Professor McConnell visited King's College, London, on 6 April, in order to have discussions with Professor G. R. Wilkinson on nuclear magnetic relaxation, and attended the Conference on Dielectric Solids at Oxford, 7-9 April. He spent one week of June and two weeks of November at the University of Salford as Visiting Professor. He took part in a meeting at the National Physical Laboratory, Teddington, on 19 June, at which the European Molecular Liquids Group was established; he was appointed a member of its International Executive Committee. He attended the European Physical Society Conference on Trends in Physics at Istanbul, 7-11 September, and its General Assembly. On 23 September he visited the University of Kent, Canterbury, and on 24 September he attended the Conference on Models for Molecular Rotation in Dense Fluids, at the National Physical Laboratory.

Professor Lewis visited the University of Nottingham on 17 February; from 19 February to 6 March he visited the Rijksuniversiteit Groningen, for discussions on his work in collaboration with Dr. van den Berg and Dr. H. Maassen. With Drs. Flood and Goldsmith he attended the British Mathematical Colloquium Oxford, 31 March to 3 April; he attended the Workshop on Stochastic Differential Equations, Warwick, 6-10 April, the Statistical Mechanics Symposium, Bedford College, London, 15 May, and the International Association of Mathematical Physics Congress, Berlin, 10-19 August. He visited Edinburgh University on 2 November, and Herriot-Watt University, Edinburgh, 3-5 November; and he attended the Conference on Statistical Mechanics, Open University, 11 December. He was elected to the Executive Committee of the International Association of Mathematical Physics on 19 October.

Professor O'Raifeartaigh attended the 20th International University Week for Nuclear Physics (University of Graz), held at Schladming, 17-26 February, the Conference on Differential Geometrical Methods in Physics, held at ICTP, Trieste, 30 June - 3 July, the Symposium on Particle Physics held at Visegrad (Hungary), 1-4 September, and the 50th Anniversary Meeting on Magnetic Monopoles in Quantum Field Theory at ICTP, Trieste, 10-15 December. He visited the Universities of Edinburgh (9 March), Glasgow (10 March), Durham (11 March), and Bern (14-28 June); he had discussions with Drs. Fujimoto and Parravicini at ICTP, Trieste, on 4-5 July. He visited the University of Geneva from 24 July - 13 August, and the University of Milan from 26 September - 9 October, and from 8-11 December. He gave a 10-minute interview to Austrian National Radio on 21 February.

Professor Ciulli visited the Inst. Th. Kernphys., University of Karlsruhe, in April, for discussions on his work, and in May he visited the University of Bern and the Institut Pierre et Marie Curie, Orsay, Paris. In August he visited ICTP, Trieste, for discussions, and from 1-11 September he attended the 2nd International Seminar on the Mathematical Theory of Dynamical Systems, at Udine. With Drs. Rayski and Murphy he attended the Rutherford Theoretical Physics Meeting, 16-23 December.

Dr. Tchrakian visited the Universities of Kaiserslautern and Heidelberg during July; he attended the Conference on Differential Geometrical Methods in Physics during July, and the Workshop on Quantum Gravity during August - both held at ICTP, Trieste.

Dr. Rouhani attended the Conference on Differential Geometric Methods held at ICTP, Trieste, 30 June - 3 July, the NATO Summer Institute on Structural Elements in Statistical Physics and Field Theory, held at Freiburg, 31 August to 11 September, and the Conference on Magnetic Monopoles in Quantum Field Theory, held at ICTP, 10-15 December.

Dr. Hogan visited the Institute for Theoretical Physics, University of Warsaw, 20-26 September, for discussions with Professor Trautman on their current research.

Dr. McCrea attended a Workshop on Approximation Methods in General Relativity, at the Max-Planck Institute, Munich, 22-26 March.

Dr. Solomon attended the Paris Rencontres I Meeting, 15-16 January, and the Statistical Mechanics Symposium at Bedford College, London, on 15 May. He visited Bures (Paris), 11-18 January, and Oxford in June/July, for discussions and collaboration.

Drs. Fordy and Gibbons attended the Workshop on Nonlinear Equations, Solitons and Spectral Methods, held at ICTP, Trieste, 24-29 August.

Seminars and Courses Given Abroad

Professor McCONNELL -

University of Salford - Seminar - Rotational Brownian Motion - 25 November.

National Physical Laboratory, Teddington - Seminar - The Poley Absorption Problem - 23 September.

Professor LEWIS -

University of Nottingham - Seminar - Boson condensation - 17 February.

University of Utrecht - Seminar - Boson condensation: A Review - 4 March.

Edinburgh University - Seminar - Quantum Stochastic Differential Equations - 2 November.

Heriot-Watt University - Three Lectures - Boson Condensation - 3-5 November.

British Mathematical Colloquium, Oxford - Lecture - Non-Commutative Stochastic Processes.

IAMP Congress, Berlin - Lecture - Irreversible Evolutions in the Algebraic setting.

Conference on Statistical Mechanics, Open University - Lecture - Quantum Stochastic Differential Equations.

Bedford College, London, Statistical Mechanics Symposium - Lecture - Boson Condensation since 1971.

Professor O'RAIFEARTAIGH -

Seminar on Effective Potentials - given at Edinburgh University (9 March), Glasgow University (10 March), and University of Bern (19 June).

Seminar on Magnetic Monopoles - given at University of Durham (11 March), and University of Milan (16 December).

Conference on Differential Geometrical Methods in Physics, Trieste - Lecture - On Magnetic Monopoles.

Symposium on Particle Physics, Visegrad - Review - Finite Energy Monopole Theory.

50th Anniversary Meeting on Magnetic Monopoles in Quantum Field Theory - Trieste - Summary Lecture.

University of Milan - Course (10 Lectures) - On Spontaneous Symmetry Breaking - 26 September - 9 October.

20th International University Week for Nuclear Physics, Schladming - Course (4 Lectures) - On Magnetic Monopoles - 17-26 February.

Professor CIULLI -

University of Bern - Seminar - Non-perturbative Methods in Field Theory: Borel and Beyond Borel - April.

Institut Pierre et Marie Curie, Orsay - Seminar - Optimal Analytic Continuation of the Scattering Amplitude from Negative to Positive Energies - 10 May.

2nd International Seminar on the Mathematical Theory of Dynamical Systems, Udine - Lecture - Dynamical Systems and Microphysics.

Dr. TCHRAKIAN -

University of Kaiserslautern - 2 Seminars - (1) Geometric Monopoles, (2) Yang R-gauge in SU(3) - July.

University of Heidelberg - Seminar - Geometric Monopoles - July.

Workshop on Quantum Gravity, Trieste - Seminar - Geometric Monopoles.

Dr. HOGAN -

University of Warsaw - Seminar - Embedding of some Stiefel Bundles - 21 September.

Dr. SOLOMON -

Paris Rencontres I Meeting - Short Talk - Statistical Mechanics.

Dr. ROUHANI -

50th Anniversary Meeting on Magnetic Monopoles in Quantum Field Theory, Trieste - Lecture - Explicit Solution of Corrigan-Goddard Conditions for N Monopoles and Small Values of the Parameters.

Dr. GIBBONS -

Workshop on Nonlinear Evolution Equations, Solitons and Spectral Methods, Trieste - Lecture - Related Integrable Hierarchies.

9 PUBLICATIONS

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

Contributions to periodicals and other publications:

J. L. Synge:

* On the vibrations of a heterogeneous string. Q. appl.Math. 39 (1981), 292-297.

J. R. McConnell:

* Modified Rocard relation for complex permittivity. Physica 105A (1981), 593-600.

J. T. Lewis:

* The heterogeneous string: coupled helices in Hilbert space. Q. appl. Math. 38 (1981), 461-467.

J. T. Lewis & M. Winnink:

* The Ising model phase-transition and the index of states on the Clifford algebra. Coll. Mat. Soc. Janos Bolyai, Esztergom (Hungary) 1979, 671-679.

A. Frigerio, J. T. Lewis & J. V. Pulè:

* The averaging method for asymptotic evolutions. I. Stochastic differential equations. Adv. appl. Math. 2 (1981), 456-481.

M. van den Berg & J. T. Lewis:

* On the free boson gas in a weak external potential. Communs. math. Phys. 81 (1981), 475-494.

P. Houston & L. O'Raifeartaigh:

* On axially-symmetric finite-energy monopole configurations. Z. Phys. C 8 (1981), 175-187.

L. O'Raifeartaigh & S. Rouhani:

Twisted axial symmetry and finitely separated monopoles. Phys. Lett. 105B (1981), 177-181.

Recent developments in finite energy (topological) monopole theory. Acta phys. Austriaca Supp. 23 (1981), 525-575.

Y. Fujimoto:

SU(8) grand unified theory. A consequence of introducing a horizontal symmetry. Nucl. Phys. B182 (1981), 242-260.

D. Pottinger:

* Gluon condensation and QCD. Proc. Bielefeld, 1980, Statistical Mechanics and Hadrons, ed. H. Satz. North-Holland 1981, pp. 339-348.

D. H. Tchrakian:

* A derivation of the Prasad-Sommerfield solution. J. Phys. A Math. Gen. 14 (1981), 1439-1441.

L. P. Singh & D. H. Tchrakian:

On the Yang R-gauge for SU(3). Phys. Lett. 104B (1981), 463-466.

M. Wellner:

Manifest gauge and Poincaré covariance. Ann. Phys. 135 (1981), 211-221.

T. Garavaglia & J. Comatam:

Exact solutions of the Schrödinger equation in biconical coordinates. Acta phys. Austriaca 53 (1981), 237-247.

J. Kinsella:

Sum rules for partial waves in production processes. Phys. Rev. 24D (1981), 2963-2970.

J. Gibbons:

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J. M. Golden:

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K. McFarlane & K. K. Wan:

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L. A. de Moraes:

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* Envelopes for types of holomorphy. Advances in Functional Analysis Holomorphy and Approximation Theory, Springer 1981, LNM 843, 488-499.

* Holomorphic functions on strict inductive limits. Resultate der Mat. 4 (1981), 201-212.

In the press:

J. R. McConnell:

Stochastic differential equations. Study of nuclear magnetic relaxation by spin-rotational interactions. Physica A.

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L. Accardi, A. Frigerio & J. T. Lewis:

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M. van den Berg & J. T. Lewis:

On generalized condensation in the free boson gas. Physica A.

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L. O'Raifeartaigh & S. Rouhani:

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S. Ciulli:

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S. Ciulli & T. D. Spearman:

Analytic continuation from data points with unequal errors. J. math. Phys.

D. Heffernan & R. L. Liboff:

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Kinetic theory for a short wavelength lasing plasma. J. Plasma Phys.

Induced two-photon decay of positronium. Inter. J. theor. Phys.

P. Hogan:

An embedding of some Stiefel bundles. J. math. Phys.

D. McCrea:

A stationary cylindrically symmetric electrovac space time. J. Phys. A.

D. McCrea & S. R. Jordan:

The gravitational field of a rotating infinite cylindrical shell. J. Phys. A.

J. M. Golden:

Displacement-traction relationships for elastic and visco-elastic layers. Acta Mechanica.

10 LIBRARY

Approximately 350 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 was taken up. In line with the subscription to the Science Citation Index commenced last year, subscriptions were taken out to two Current Contents series (Physics, Chemistry and Earth Sciences: CompuMath), with effect from January 1982, and the selected contents lists (British Library) was discontinued.

The RIA "permanent loan" scheme was continued, as were other forms of cooperation with research libraries at home and abroad. The list of current holdings of serials was computerised during the year.

Offprints and preprints were received from many scientific institutes and university departments at home and abroad, either directly or in response to requests.

Gifts of books and journals, in addition to material received under exchange arrangements, were received from: Professors Synge, McConnell and Lewis, Dr. Tchrakian, Dr. T. T. West, Dr. McFarlane, and Professor Kluk; also from Dunsink Observatory, NBST, the French Government, Math. Cent. Amsterdam, Rijksunivs. Groningen, the Korean Physical Society and Korean Science and Engineering Foundation, Syracuse University, California Institute of Technology and Univ. Tech. Est. Chile. A microfilm copy of Film 46 from "Archive for the History of Quantum Physics" was presented to the School by the American Philosophical Society; a drawing was presented by Thomas Ryan, RHA.

III - Annual Report of the Governing Board of the School of Cosmic Physics for the year ended 31 December 1981 adopted at its meeting on 31 May, 1982.

A ASTRONOMY SECTION

1 STAFF AND SCHOLARS

Senior Professor

P. A. Wayman

Professor

T. Kiang

Research Assistant

I. Elliott

Experimental Officer

B. D. Jordan

Technical and Clerical Staff

A. M. Callanan, W. M. Dumpleton, G. McMorrow (from 1 August 1981), P. Murphy.

Scholars

H. P. Murphy (to 31 December 1981), F. H. Cheng.

Professor Wayman served as General Secretary of the International Astronomical Union throughout the year. About 90 days were spent at the IAU Secretariat in Paris or out of Ireland on IAU business.

Professor Wayman and Dr. Elliott (Secretary) continued on the Irish National Committee for Astronomy through the year and as members of the Editorial Committee of the Irish Astronomical Journal. Dr. Elliott continued as Irish observer with JOSO and became a committee member for the RAS Meeting scheduled for Dublin in April 1982 and for IAU Colloquium 73 scheduled to be held in University College, Dublin, in August 1982. Professor Wayman served on a committee of the European Space Agency that produced Announcements of Opportunity for Hipparcos, the Astrometry Satellite, and took part in the work of an advisory committee for Phase B of that project on behalf of Rutherford Laboratory, U.K.

B. Feeney (UCD) worked as a Vacation Student in the Astronomy Section, 22 June - 14 August. H. P. Murphy, Scholar, was granted leave of absence to work at the F. L. Whipple Observatory, Arizona (formerly Mount Hopkins Observatory), at the invitation of the Smithsonian Institution, from 20 May to 31 December.

2 RESEARCH WORK

General

Without direct access to modern observing instruments, the programmes that have featured observational work in previous annual reports are in their concluding phases and the only work carried out during 1981 that has used observing equipment has been executed by H. P. Murphy in Arizona, USA, working as a Scholar on Leave of Absence. T. Kiang and F. H. Cheng worked on programmes that relate physical observations of the spectra of quasars to an inferred value of the deceleration parameter of the observed universe. T. Kiang carried out computational work relating to asteroids and P. A. Wayman with M. J. Stift (Vienna) interpreted cepheid observations in terms of intrinsic width of the instability strip.

An account of each field of work follows, with a fuller review of the topic than has been customary in former annual reports.

Photometry of Clusters of Galaxies: H. P. Murphy

A relatively new field of instrumental technique has been employed to discuss the photometric properties of members of some 35 clusters of galaxies. The telescope used is the 0.6 metre reflector at Mount Hopkins Observatory, with occasional other work on the large multi-mirror telescope. The detector is the Smithsonian CCD (Charge-Coupled device) by RCA and the 2-dimensional (500 x 500) image-readings so obtained have been handled by the Astronomy Section Nova 2 computer, by the DEC 20/60 computer in University College, Dublin, and with the Smithsonian Observatory Nova computers in Tucson.

Instrumental work with the CCD detectors at Tucson included dewar testing, re-calibration of the apertures used and determination of filter transmission curves. Flat-fielding computer programmes were developed to operate interactively at Tucson.

During the first part of the year the data reduction of measurements on the brightest cluster members for 35 rich Abell clusters of galaxies was completed. All the galaxies in the sample were either known to be or were suspected to be X-ray sources and comparison of optical (R-band) and X-ray properties was a principal purpose of the survey. Calibration with stellar magnitudes in M67 to Johnson R with a colour term -0.362 (V-R) resulted in r.m.s. deviations ± 0.04 magnitude.

The surface brightness profiles of the galaxies measured were fitted to the "Hubble law": $I = I_o(1 + r/B)^{-2}$ and absolute magnitudes inferred from known z-values. There was found to be a relatively small spread in the absolute magnitudes of the brightest cluster members. Due to the limited size of the CCD fields no reliable estimates of tidal radius could be made. The data were used to define

the cD galaxies in the sample and to compare with the X-ray measurements on the clusters. Although there was a correlation between X-ray luminosity and the intrinsic optical brightness of the brightest cluster member, it was evident that detailed X-ray and optical studies of the whole cluster would be needed to examine such correlations more closely. In October and November satisfactory further coverage of seven clusters in two colours (J, F) was obtained with revised CCD equipment at Mount Hopkins.

Observational Cosmology: T. Kiang, F. H. Cheng

A review of the current status of the cosmological deceleration parameter q_o was written jointly with L. Z. Fang and submitted for publication. Over 120 papers were consulted. Determinations of q_o, whose value is so defined that it is greater or less than 0.5 according as the universe is closed or open, fall into three groups - (1) from an evaluation of the mean density of the universe, (2) from the angular-diameter dependence on redshift for objects of presumably the same size, and (3) from the magnitude-redshift relation for objects of presumably the same intrinsic luminosity. The results of Group (2) being indecisive, there are contradictory results from Groups (1) and (3). The latter indicate $q_o > 0.5$. The work carried out on q_o determination has been to establish definite statistical indications that $\log q_o = 0.27 \pm 0.135$. Reconciling this result with information on the mean density of the universe (methods of Group 1) requires *either* (a) that high values of q_o are obtained because luminosity evolution with cosmic age causes a substantial systematic error, where quasars are now less actively luminous than those seen at high redshift-values, *or* (b) that the universe is closed and an undetectable mass-density has not been taken into account by Group I methods. It has been found that the mean density deduced from dynamical data has consistently increasing values for increasing size of the system studied, even up to 50% of the critical density for the scale of large supergalaxies. Also, while baryon density may be low, mass could be contributed by neutrinos, if a non-zero mass for neutrinos is confirmed.

Dynamical Astronomy: T. Kiang

Work on the stability of asteroid orbits in resonant motion with Jupiter has concerned the real asteroids. Calculation of the "Stability parameter f" ($-z < f < 0$ corresponds to stability), was found to require very fine integration steps in the parametric 'orbits' for the librators, which are objects that swing about resonance, rather than keep to one side of it in the Schubart diagram. It was found difficult to obtain numerical convergence in all such cases. The 3 known librators of the Hecuba Gap at the 2 : 1 resonance and the 7 of the Hilda Group at the 3 : 2 resonance have been examined. The results concerning stability and instability on a time scale of 100,000 years are:

	Hecuba	Hilda
Stable	1	7
Unstable	2	0

This result goes some way to supporting previous work but what is required is a direct complete integration of the equations of the three-body problem with possible non-Newtonian perturbation. Alfven's theory of the formation of asteroids from plasma material and computational work that may be carried out at La Jolla are under consideration as a future co-operative project.

Cepheid Variable Stars: P. A. Wayman, with M. J. Stift (Vienna)

A stellar population can be characterised to some extent by the properties of the variable stars it contains. The work on cepheid variable stars has been brought to the stage where the distribution of occupation of the Hertzsprung-Russell and the Period-Luminosity diagrams for the Magellanic Clouds shows characteristic differences between the two Clouds and between the Clouds and the Galaxy. During the year an analysis was made to examine the extent to which spurious differences may affect the apparent population of the three-dimensional space Period-luminosity-colour (PLC), as represented by log P,V and B-V for Magellanic Cloud cepheids. It was found that such analyses were particularly prone to hidden errors in data such as might be caused by inability to correct individual stars for reddening and the necessity to assume an overall reddening value. Evidence has been found that the intrinsic width, expressed in $\delta(\log T_e)$, for the instability strip in the hypothetical PLC diagram could be much smaller than is customarily assumed, that intercomparisons of PLC diagrams are of very limited value, and hence that the first-order arguments that led to the original postulation of occupation of this diagram may be seriously in error. Straightforward Period-colour and Period-luminosity diagrams are much less prone to error.

3 ELECTRONICS LABORATORY AND WORKSHOP: B. D. Jordan, P. Murphy.

The control electronics of the Acquisition and Guiding Box for the SRC 2.5-m telescope at La Palma was accepted at Grubb Parsons, Newcastle-upon-Tyne, during March.

During April, the Nova 2/10 computer was removed to the NE ground floor room of Dunsink House and the electronics laboratory re-established in the similar first floor room. The temporary accommodation used since 1978 was thus vacated and removed from the site.

A secondhand Nova 2/10 was purchased for adaptation to measuring machine work and access via Camac interface modules. Both computers were fitted with variable baud-rate generators on primary and secondary ports.

The co-ordinate measuring machine (Coradograph) and video digitizer were largely completed during the year and the assembly was mounted on a cast iron base plate with an integrating sphere for illumination. Data from Sony digitizers for x and y co-ordinates and video data are being handled by the computer via the Camac modules.

4 CONFERENCES, LECTURES, ETC.

International Astronomical Union (IAU)

P. A. Wayman represented the IAU at the General Committee meeting of ICSU in Dubrovnik in September and, as General Secretary, handled the business of the 48th IAU Executive Committee meeting in Abastumani, Georgia, USSR, in July. He visited the Byurakan (Armenia) and Zelenchuk (North Caucasus) observatories and the Moscow Astronomical Council of the USSR Academy of Sciences as part of the visit of the Executive Committee to the Soviet Union. The work of the Union required twelve visits to the Paris Secretariat during the year and one visit to Greece, the location of the next IAU General Assembly in August 1982.

Lectures, Visits, etc.

The following colloquium lectures were given during the year:

23 April: J. Sahade (Buenos Aires) - Wolf-Rayet Stars

14 August: P. A. Wayman - Three USSR Observatories

P. A. Wayman spoke to the Dublin Centre, Irish Astronomical Society, on the Hipparcos satellite, on 16 November, at the Inaugural Meeting of the UCD Astronomical Society, on Optical Images, on 23rd April, and to a special Public Meeting of the Clondalkin Astronomical Society in the premises of the Royal Dublin Society, on 14 August. P. A. Wayman and T. Kiang attended the IAU Colloquium No. 60 "Uranus and the outer solar system", at Bath, England, in April and T. Kiang and I. Elliott attended the VIth European Regional Astronomy Meeting in Dubrovnik, Yugoslavia in October. T. Kiang spoke on Resonant Asteroid Orbits in Dubrovnik. I.Elliott addressed the Dublin Centre, Irish Astronomical Society, on 'Waves in Space - Radio Astronomy' on 19 January. B. D. Jordan attended a conference on Solid State Image Devices in Astronomy at Harvard College, Massachusetts, in June.

Visitors to Dunsink Observatory during the year included R. Wolsey (N. Ireland Tourist Board), T. P. Hardiman, M. A. Hoskin, J. A. Bennett, J. Sahade, the Ambassador of China to Ireland (Mme. Gong Pusheng), L. Rodono, D. A. Quadling and T. K. Whitaker. Groups visiting included the Irish Science Teachers Astronomy Group, the Irish Antiquarian Horological Society, the Dublin Centre of the Irish Astronomical Society and the Irish Branch of the Royal Aeronautical Society.

F. H. Cheng attended the IAU-UNESCO International School for Young Astronomers, Cairo, Egypt, 22 August - 9 September, and contributed a paper on the determination of the deceleration parameter. G. McMorrow attended a course at Softec Ltd., Dublin, on word processing with Apple II.

5 PUBLICATIONS

Irish Astronomical Journal (published under the joint auspices of Armagh Observatory and Dunsink Observatory.)

The Irish Astronomical Journal has a revised Publication Committee from June 1981:

Chairman:	P. A. Wayman (Dunsink Observatory)
Chief Editor:	M. de Groot (Armagh Observatory)
Managing Editor:	S. Grew (Armagh Observatory)
Technical Editor:	P. B. Byrne (Armagh Observatory)
Associate Editors:	I. Elliott (Dunsink Observatory)
	D. J. Mullan (Bartol Foundation, Newark, Delaware, USA)
	E. J. Opik (Armagh Observatory).

Other Editorships

T. Kiang is Chief Translation Editor of Chinese Astronomy and Astrophysics in succession to Chinese Astronomy (published by Pergamon Press, England).

P. A. Wayman is editor of IAU Publications.

Published 1981:

Irish Astronomical Journal Vol. 14, No. 3/4
Vol. 14, No. 5/6

Chinese Astronomy Vol. 4, No. 4

Chinese Astronomy and Astrophysics, Vol. 5, Nos.1,2,3.

IAU Information Bulletin, Nos. 45, 46.

Journals, etc.

T. C. Weekes, H. P. Murphy, R. Schild, H. Gursky, J. Geary and T. Stephenson:
"More Absorption Toward Cygnus X-3".
Publ. Astron. Soc. Pacific 93, 474-476, 1981.

H. P. Murphy, R. Schild and T. C. Weekes:
"CCD Camera Observations of Nearby Rich Clusters. IR Photometry of Brightest Galaxies."
Mon. Not. R. Astr. Soc. (in press).

D. K. Yeomans and T. Kiang:
"The Long-term Motion of Comet Halley".
Mon. Not. R. Astr. Soc. 197, 633-646, 1980.

T. Kiang and K. Imaeda:
"A Possible Identification of Cygnus X-1 with a guest-star observed in China and Japan in 1408".
Irish Astron. Journ. 14, 138-141, 1980.

F. H. Cheng, T. Kiang and L. Z. Fang:
"The Deceleration Parameter based on a Statistical Analysis of Various Quasar Subsets".
Acta Astron. Sinica, 22, 357, 1981.

L. Z. Fang, T. Kiang, F. H. Cheng and F. X. Hu:
"Determinations of the Deceleration Parameter q_o".
Submitted to Quarterly Journ. Roy. Astr. Soc.

T. Kiang:
"Stability of real Hecuba and Hilda Asteroids".
Proceedings of the Sixth European Regional Meeting in Astronomy, Dubrovnik (in press).

P. A. Wayman:
"An Astronomer's Visit to China".
Irish Astr. Journ. 14, 65-68, 1979.

P. A. Wayman:
"The Chinese Photoelectric Astrolabe".
Irish Astr. Journ. 14, 142-146, 1980.

P. A. Wayman and M. de Groot:
"The Astronomical Science Group of Ireland, 1974-1980".
Irish Astr. Journ. 14, 111-113, 1980.

F. H. Cheng:
"The determination of the Deceleration Parameter q_o using Quasar Data".
Irish Astr. Journ. 14, 1980.

P. A. Wayman:
"Dunsink Observatory, Chinese Astronomy and the IAU".
Irish Astr. Journ. (in press).

P. A. Wayman:
"Irish Participation in the Spanish International Astrophysical Observatory of the Canary Islands".
Irish Astr. Journ. (in press).

I. Elliott:
News and Comments, Irish Astronomical Journal:

Starlink, 14, 197, 1980.
The Fireball of 1981 July 30, 14, 241, 1980.
Light Pollution, 15.
A Search for Quasars in the Direction of the Virgo Cluster, 15.
R. Aquarii and SS433, 15.

A4 Documents, Reviews, etc.

F. H. Cheng: M.Sc. Thesis, University of Dublin, 1981, "Observational Determination of the Deceleration Parameter q_o".

I. Elliott: "History of Mathematical Astronomy", IAJ, 14, 102, 1980.
"The Star of Bethlehem Mystery", IAJ, 14, 107, 1980.
"Astrophotography near city lights", IAJ, 14.
"The Practical Astronomer", IAJ.
"The Daytime Stars", IAJ.

P. A. Wayman: "Sir William Rowan Hamilton", IAJ, 14, 193, 1980.

Advisory Board, La Palma Project, Information Sheets No. 2 (Dec. 1980), No. 3 (June 1981), No. 4 (Dec. 1981).

I. Elliott assisted in the production of a working proposal document on LEST by Swedish Academy of Sciences.

6 MISCELLANEOUS

La Palma Observatory

Consideration was given during the year to participation in the instrument development programme of the UK Science Research Council with a view to providing common user instruments at the La Palma Observatory, either for the 2.5-m/1.0-m telescope systems or for the 4.2-m telescope. Provision of a CCD camera jointly with UCD Physics Department (Dr. B. McBreen) has been actively followed up.

P. A. Wayman visited the Observatory of the Roque de los Muchachos in November. Progress in provision of the building and installing the 1.0 metre telescope is as anticipated in the Report for 1980.

Buildings and Grounds, Dunsink Observatory

The Workpac temporary building was sold and removed during September. Re-wiring of Observatory House in March completed the current work of renovation of the main building.

Computer Installation, Astronomy Section (I. Elliott)

NOVA Computers: A secondhand NOVA 2/10 with 32K word memory and four disk drives was purchased. This equipment was used to provide two separate but similar NOVA systems for general use and for special applications:

SYSTEM A - NOVA 2/10, 32K-word memory
2 Moving-head 2.5MB disk drives
1 Magnetic tape drive (9 track, 800 BPI)
1 Calcomp Plotter Model 81
1 Matrix Printer (Teletype)
1 ADDS - 580 VDU

SYSTEM B - NOVA 2/10, 32K-word memory
2 moving-head 2.5 MB disk drives
1 Centronics matrix printer
1 ADDS - 580 VDU
CAMAC Interface

Apple II Computer:

Word processing facilities were added by provision of the appropriate software and an 80-column interface card.

Software development:

Interactive plotting programmes
Data transfer between NOVA 2 and Apple II
String manipulation in large data files
Access to Starlink was considered.

B COSMIC RAY SECTION

1 STAFF AND SCHOLARS

Senior Professor:

C. Ó Ceallaigh

Professor:

Vacant

Assistant Professors:

D. O'Sullivan and A. Thompson

Research Assistant:

Vacant

Experimental Officer:

J. Daly

Vacation Student:

B. Espey

Technical and Clerical Staff:

Mrs. E. Clifton, Mrs. E. Rankin-Brady (temporary part-time as required), Mrs. H. Sullivan, Miss A. Grace, Miss G. Broderick, Miss A. Larkin, Miss E. Ryan, Miss S. Ledwidge (from 7 September).

2 RESEARCH WORK

(a) LDEF Project

Work on the preparation of the DIAS-ESTEC ultra heavy cosmic ray experiment (UHCRE) continued during 1981. The main emphasis was on the thermal aspects of the experiment which have acquired a new significance in view of the recent discovery by the DIAS group of the temperature dependence of track registration. Thermal coating of the experiment hardware was completed, but a decision on the type of thermal tray cover to use was postponed, pending the results of the final thermal model calculations promised by NASA in 1982.

The LDEF Investigator Working Group Meeting held at Langley Research Centre in September was attended by D. O'Sullivan, A. Thompson and J. Daly. The scientific objectives and the state of development of the UHCRE were presented by D. O'Sullivan and A. Thompson during the three-day meeting. The occasion proved extremely valuable for exchanging information with other LDEF experimenters and examining areas of mutual interest. For instance, the possibility of using the UHCRE thermal covers as micrometeorite detectors was suggested at one of the splinter sessions and sufficient interest was generated to make further studies worthwhile. Among the successful resolutions proposed and supported by the DIAS group were recommendations for a mission duration of not less than one year and that flight readiness be moved forward to

1st October 1983 in order to optimise launch date in the 1st October to 15th November period. A request for an active system to monitor the LDEF interior temperature, attitude and particle radiation environments is being considered by the LDEF Project Office.

(b) Giotto Mission

During the year a joint proposal for an energetic particle detector system to be flown on the Giotto Mission to Comet Halley was accepted by the European Space Agency. The proposed experiment, code named EPONA, is the first Irish scientific project to be accepted for a European spacecraft. The institutions involved are the DIAS (A. Thompson and D. O'Sullivan), SPCM (S. McKenna-Lawlor), ESTEC (K.-P. Wenzel), the Max Planck Institut für Aeronomie, Katlenburg-Lindau, Germany (E. Kirsch) and the University of Sydney, Australia (D.B.Melrose).

The EPONA detector system is basically a semiconductor particle telescope incorporating three totally depleted silicon surface barrier elements and the primary scientific objective is to obtain in-situ measurements of Comet Halley's particle environment. Electrons, protons and particles with $Z \geq 2$ will be measured in four sectors and twelve energy channels with one second time resolution. Data acquisition will continue for a period of four hours during the encounter between the spacecraft and the comet. In addition, it is planned to study solar cosmic rays during the eight month cruise phase of the mission between the launch in July 1985 and the Halley encounter on 13th March 1986. It has now been confirmed that EPONA will be provided for this purpose with power and telemetry during the cruise phase.

An application for a research grant of £46,200 to provide financial support for EPONA hardware and materials was submitted to the National Board for Science and Technology jointly by S. McKenna-Lawlor, A. Thompson and D. O'Sullivan. The application was successful and the requested financial support was granted in toto. The Max Planck Institut für Aeronomie agreed to cover the balance of the estimated costs involved in development and testing.

It is intended to submit a proposal for an upgraded version of the EPONA experiment to the European Space Agency before the Final Design Review of 1982. The new version will employ a triple telescope design and will measure particles in sixteen sectors with 0.5 seconds time resolution. The energy channels will extend down to 15 keV and up to 20 MeV.

(c) Cosmic Ray Iron Group Spectra

Collaboration between DIAS (A. Thompson and D. O'Sullivan) and the Naval Research Laboratory, Washington, D.C. (J. Adams and B. Stiller) on a project to study the iron peak during solar maximum (code named ISIS) continued during the year. A very successful joint balloon flight in September 1980, financed by the U.S. Navy, was used to expose a large array of solid state nuclear track detectors (see last year's

Annual Report). Processing, scanning, measurement and analysis of the Lexan component of the detector stacks was carried out in 1981. Further measurement and analysis is scheduled for 1982.

To date a total of 54 square metres of 125 μm Lexan film has been processed by standard etching techniques. This material has been ammonia scanned yielding a total of 3,000 events. Measurement and analysis of these events to provide initial identification has been completed. The second stage of the work involves extensive local calibration of the CR-39 component of the detector stacks (43 square metres of 500 μm castings) with Fe beams at the Berkeley BEVALAC. Because of serious technical problems, the BEVALAC was unable to produce the required Fe beams before the scheduled close-down for machine rebuilding in June 1981. Consequently this phase of the project will be delayed until the new BEVALAC is operational, probably in the second half of 1982.

In addition to the 125 μm Lexan film discussed above, the detector array contained 22 square metres of 250 μm Lexan. This material was processed using a high precision etching technique and was then ammonia scanned, yielding about 500 events. High precision and extensive measurement of these events has begun, along with the associated analysis.

During 1981, a separate project to study the iron peak at very low energies was begun. The experimental approach was based on the exposure of a CR-39 detector array by means of a balloon flight at very high latitude and hence in a region of low geomagnetic cut-off. The flight, which was financed by the U.S. Air Force, was launched from Fairbanks, Alaska and was completely successful. This work is being carried out in collaboration with the Air Force Geophysical Laboratory, Massachusetts, USA.

(d) Nuclear Track Detector Development

Solid state track detector development programmes and response studies continued during the year. This work was carried out on several fronts by DIAS alone, by the DIAS/Bristol collaboration, the DIAS/Washington collaboration and the DIAS/Berkeley collaboration.

D. O'Sullivan and A. Thompson presented a number of papers at the 11th International Conference on Solid State Nuclear Track Detectors covering their recent work in the field. Highlights of this work include the development of an improved CR-39 detector for cosmic ray work, the use of Tuffak polycarbonate as a new polymer track detector for cosmic ray work, the discovery of track registration in photo-resists and the discovery of the registration temperature effect in polymer track detectors.

The registration temperature effect and the photo-resist work were singled out in recent reviews as being the most significant new results presented to the conference.

(e) Statistical Study of Precipitation in Ireland (C. Ó Ceallaigh and K. Bolster)

A statistical study of the runs of wet and dry days has been completed. Observations from five stations - Valentia, Belmullet, Malin Head, Shannon Airport and Dublin (Leinster Lawn) have been analysed. With one exception, Dublin wet days ($\geq$ 1.0 mm), it was not possible to fit the observed runs by means of a pure geometrical distribution. This is in contrast to results of a similar analysis for the rainy season at Bari and also at Tel Aviv. The observations are very well fitted on the simple hypothesis that there are two types of wet and dry days, each associated with anticyclonic regimes and cyclonic regimes. The resultant distribution of runs is assumed to be a convolution of two independent geometric distributions having different parameters. The fitting was achieved by means of computer programmes designed to detect the minimum value of χ^2 for each case.

3 WORKSHOP - J. Daly

Due to the time involved in preparing the main payload for the LDEF experiment little maintenance of laboratory equipment was carried out during the past year. The backlog of essential work is now in process of being reduced.

J. Daly attended, in mid September 1981, a meeting of LDEF participants at Langley Research Center. During his visit to the USA he spent a period of ten days at Emmanuel College, Boston in consultation with Dr. R. V. Rao on various aspects of the collaboration with the DIAS Group. He set up the high-precision equipment for use in these experiments. He also had fruitful discussions with Dr. R. Filz and others at the U.S. Air Force Geophysical Laboratories as well as with Captain Sandbourne at the workshops of the Hanscom Air Force Base. The discussion covered the preparation of detectors and instrumentation for both balloon and satellite-borne cosmic ray experiments.

4 EXTERNAL ACTIVITIES

During the year short working visits in furtherance of the LDEF programme, the Giotto experiment and other research projects were made by members of the staff as follows:

ESTEC, Netherlands (15-17 February) - A. Thompson
Bristol University (23 February) - A. Thompson
ESTEC, Netherlands (20-21 March) - A. Thompson
ESTEC, Netherlands (26-29 April) - A. Thompson
MPAe, Germany (17-19 May) - A. Thompson
NASA/LaRC, USA (13-20 September) - J. Daly, D. O'Sullivan and A. Thompson
ESTEC, Netherlands (29 September - 3 October) - D. O'Sullivan and A. Thompson
ESTEC, Netherlands (18-21 November) - D. O'Sullivan and A. Thompson

In addition, D. O'Sullivan and A. Thompson attended the 17th International Cosmic Ray Conference, Paris (13-23 July) and the 11th International Conference on Solid State Nuclear Track Detectors, Bristol (6-10 September) presenting a number of papers.

As a member of the Space Science Standing Committee of the European Science Foundation, C. Ó Ceallaigh attended a meeting in London (25-26 November).

D. O'Sullivan was on leave of absence at the Physics Department and Space Science Laboratory, University of California, Berkeley, from 1st December 1980 to 31st May 1981. During this period he was granted several periods of beam time at the Bevalac and the LBL Synchrocyclotron for CR-39 nuclear track studies. By curing samples containing a range of phthalate dopants and exposing them to high energy Helium, Carbon, Neon and Argon ions it was demonstrated that the etch rate dependence of Z/β could be tailored to give optimal response for different applications in cosmic ray and nuclear particle studies.

Following discussions with Professor Price and Dr. C. G. Willson of IBM Research Laboratories, San Jose, he investigated the nuclear track potential of photoresist materials recently developed for use in the microelectronics industry. Various samples procured from IBM and from Professor Neureuther of the Electrical Engineering Department in Berkeley were spin coated onto a rugged transparent base and exposed to various heavy ions at the BEVALAC. Using several etching techniques it was found that high quality nuclear tracks were recorded and the sensitivity of these materials was related to their γ-ray scission efficiency. A positive resist (a poly-olefinsulphone) made by IBM, but not yet commercially available exhibited a sensitivity as high as that of CR-39, the most sensitive track recorder known.

One immediate application of these results was the development of a new concept in thin film dosimetry which will enable one to record low energy charged particles and neutrons with energies below 100 keV for which the University of California is considering patent rights. At present there is no satisfactory personnel dosimeter for neutrons in this energy region to which workers in most radiation environments are exposed. Following these experiments, further development of photoresists for particle identification is now being planned by several other research centres.

5 GENERAL

Professor A. Thompson presented the Statutory Public Lecture of the School of Cosmic Physics on 21 December in University College, Dublin; the title of the lecture was "Halley's Comet, Giotto and EPONA".

During the year Professor A. Thompson served as secretary of the National Committee for Physics, as a member of the Royal Irish Academy Committee for Space Research and as a member of the Scientific Committee for the International Solid State Nuclear Track Detector Conference.

Professor D. O'Sullivan served as secretary of the Irish Astronomical Science Group (from June 1st) which will be hosting an out-of-town meeting of the Royal Astronomical Society in Dublin in 1982.

Mr. B. Espey, a third year TCD mathematics and physics student, worked in the Cosmic Ray Section as a summer vacation student for a period of six weeks (2 June to 24 July). During that time he contributed to the iron group spectra experiments (collaboration with Naval Research Laboratory, Washington D.C.) carrying out etching, scanning, measurements, computer analysis and software development.

Working visits to the Cosmic Ray Section during the year were made by Dr. J. H. Adams, Naval Research Laboratory, Washington D.C. (August/September) and by Dr. A. Vidal-Quadras, University of Barcelona (September and December).

6 PUBLICATIONS

A. Thompson and D. O'Sullivan

An Energetic Particle Detector for Giotto and its Scientific Objectives.
Proceedings of the International Conference on the Scientific and Experimental Aspects of the Giotto Mission, Noordwijkerhout, The Netherlands, April 1981, pp. 39-44.
also
ESA Report SP-169.

D. O'Sullivan and A. Thompson

Tuffak Polycarbonate as a Track Detector.
Proceedings of the 11th International Conference on Solid State Nuclear Track Detectors, Bristol, September 1981, pp. 85-88.

A. Thompson and D. O'Sullivan

The Dependence of Track Response on Registration Temperature in Lexan and CR-39.
Proceedings of the 11th International Conference on Solid State Nuclear Track Detectors, Bristol, September 1981, pp. 171-174.

A. Thompson

A Study of Very Low Energy Cosmic Ray Iron Group Spectra using CR-39 Track Detectors.
In preparation.

D. O'Sullivan and A. Thompson

The Observation of a Sensitivity Dependence on Temperature during Registration in Solid State Nuclear Track Detectors.
Nuclear Tracks 4, 271-276 (1980).

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

A High Resolution Study of Ultra Heavy Cosmic Ray Nuclei.
Proceedings of the First LDEF Investigators Working Group Meeting (LDEF Integration, Operations and Experiments), Hampton, Virginia, September 1981, pp. 96-99.

A. Thompson and D. O'Sullivan

An Improved CR-39 Track Detector for Cosmic Ray Applications.
Proceedings of the 11th International Conference on Solid State Nuclear Track Detectors, Bristol, September 1981, pp. 149-153.

A. Thompson

A Method for Measuring the Isotopic Abundances of Cosmic Rays.
Proceedings of the 11th International Conference on Solid State Nuclear Track Detectors, Bristol, September 1981, pp. 867-870.

D. O'Sullivan and P. B. Price

Tailoring the response of CR-39 plastic Track Detectors with dopants.
Proceedings of the 11th International Conference on Solid State Nuclear Track Detectors, Bristol, September 1981, pp. 929-932.

D. O'Sullivan, P. B. Price, K. Kinoshita, C. G. Willson

Predicting the Radiation Sensitivity of Polymers.
Submitted to Journal of the Electrochemical Society, New York.

D. O'Sullivan, P. B. Price and S. P. Ahlen

Thin-film Dosimetry for Neutrons and Alpha Particles.
Proceedings of the 11th International Conference on Solid State Nuclear Track Detectors, Bristol, September 1981. Pergamon Press, pp. 925-928.

C GEOPHYSICS SECTION

1 STAFF AND SCHOLARS

Senior Professor

T. Murphy

Professor

A. W. B. Jacob

Research Assistant

P. W. Readman

Experimental Officer

J. C. Davies

Technical and Clerical Staff

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

Scholar

N. P. Murphy

Vacation Student

Gabor Belovari, Budapest University

2 RESEARCH WORK

(a) Gravity

The gravity data for selected areas corresponding to the Ordnance Sheets have been plotted, enabling various corrections to be made. These invariably arise in work of this nature due mainly to faulty transcriptions.

Enquiries from commercial interests for gravity data are now coming in and plots from the computer are being sold.

The gravity survey and analysis over the deposit at Pipemakers Gorse was completed and the results are in the process of publication.

The gravity and magnetic data of Co. Laois were analysed to form part of a projected handbook for the county.

Computer software was developed to plot gravity data at different scales and projections (e.g. 1 : 63 380, National Grid; 1 : 126 760, Airy; 1 : 250 000, UTM) to correspond to Ordnance Survey topographical

maps, etc. Several computer generated gravity maps were provided to mining and exploration companies in Ireland during the year.

The various methods of computer contouring three-dimensional data were investigated in depth with a view to determining a suitable package for Irish gravity data. Some simple contouring routines using gridded data were implemented on our computer system. The triangular network method of contouring was chosen as the most suitable for our data and minicomputer system. A collaborative project to publish 1 : 126 760 Bouguer Gravity Anomaly Maps corresponding to the OS ¼ inch sheets was initiated with Dr. Michael McCullagh of the University of Nottingham.

(b) Magnetics

A survey of Galway Bay was undertaken by M. A. Geoghegan of UCG under our supervision, using the University's vessel R.V. ONA II. The results were presented in a thesis for the M.Sc. degree.

As part of a contract the Recording Magnetometer was operated for a period during a magnetic survey in the Irish Sea carried out for a hydrocarbon prospecting company. During this operation difficulties were encountered due to electrical or magnetic interference. After considerable investigation at various sites and under different conditions the cause has been attributed to electrical interference caused by television receivers, the interference travelling via the mains leads to the recorder. A special section of the ESB which deals with such problems rendered assistance, lending recording apparatus etc. The problem had not been solved by the end of the year but based on the work carried out a solution is expected. Good records were achieved by operating the recorder on accumulators, not the mains.

The results of this survey have been supplied to us for analysis under contract. They confirm our experience that the magnetic diurnal effects as recorded on land cannot be applied, at times, to correct the records taken at sea. How often this is the case is not at present known.

The data collected last year off North Donegal were analysed by two students from Trinity College as part of their degree projects. As mentioned in last year's report the survey was incomplete but their results and conclusions will prove helpful in understanding the complex structure of the region.

(c) Meteorology

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

(d) Mineral Magnetism

Magnetic properties of titanomagnetites $Fe_{3-x}Ti_xO_4$ have been investigated in collaboration with Dr. E. Schmidbauer at the University of Munich. We have found that cooling in the presence of a high magnetic field produces a completely different magnetic behaviour below temperatures of ∿ 50 K which we suggest is due to some sort of crystallographic distortion of the cubic lattice at low temperature arising possibly from the Jahn-Teller effect of tetrahedral Fe^{2+} and spin lattice coupling by octahedral Fe^{2+}. Further work is planned together with an investigation of the effect of slight Mg^{2+} and AL^{3+} doping which result in compositions more similar to those occurring naturally.

(e) Palaeomagnetism

Sediment cores from Lough Doo (54° 3'N, 9° 5'W) in Co. Mayo were collected in collaboration with Dr. M. O'Connell from the Botany Department, University College, Galway, and Dr. A. Hamilton from the New University of Ulster at Coleraine using Mackereth corers from Coleraine. Unfortunately the 6-m corer malfunctioned but we succeeded in obtaining good 3-m cores and work has started on these. Preliminary results are promising and suggest that further work to obtain 6-m cores from Lough Doo and other lakes in the region would be profitable.

Some progress has been made with the Danish sediments. Most are too weakly magnetized to be measured with the Digico spinner magnetometer in Dublin but some have been measured on a very sensitive squid magnetometer during a visit to Edinburgh University. The secular variation pattern emerging from these sediments, at least for the last 3 ∿ 4,000 years appears to be similar in nature to that from Britain and central Europe although precise correlation must await more definite dating controls which are being undertaken in Denmark.

The interpretation of results from Greece was finalized (with Professor K. M. Creer of Edinburgh) and analysis of measurements in an attempt to derive geomagnetic palaeointensities has been started.

(f) Seismology

The five station radio-linked seismic network (DNET) recorded at Lyons Estate (DLE) continued to operate during the year. The roof was removed from the derelict cottage and the recording room now has its own roof. This will make it more secure as a base for the network. The Carnsore Point station (ECP) is being developed as the recording point for a small network too. An outstation, later to be linked by radio, was established at Carrickbyrne Hill (ECB), 35 km to the north-west, in February. This station was set up with equipment and

facilities supplied by the ESB on Department of Forestry lands. While the site was being tested the recorder was very kindly housed by Mr. Beasley who has a house on the edge of the wood. The third station of the network is to be on Tara Hill (ETA) and while the site has been surveyed the station is not yet operative. When it is, the network (ENET) will be able to locate events without reference to other stations. This will mean that we will be able to locate events even if one of the two network recorders breaks down.

The small earth tremor of 26th December 1980 was followed on the 26th January 1981 at 01 31 23.5 by a more substantial event. The magnitude was $M_L = 2$. Its epicentre was 7 km southwest of the first, and was nearer the surface. A macroseismic survey, insertion of notices in local newspapers and interviews etc., was carried out and the area over which it was felt was about 400 square kilometres. This is quite a large area for such an event and it indicates low attenuation. A seismic profile was run from a nearby quarry (Brownswood) to Carnsore Point and this has given us confidence in our locations. The coincidence between the epicentre and the maximum reported intensity was also encouraging.

The next earth tremor occurred in east Co. Cork (in the hills to the north of Midleton) at 03 15 55.1 on 24th November 1981. This was a slightly larger event and was recorded on stations in SW England as well as on our network and the Meteorological Office station at Valentia (VAL). Because of the time it happened there were fewer reports even after our newspaper notices of this one being felt. It may also have been deeper than the second Enniscorthy event. It was felt 25 km from the source which again indicates low attenuation.

Three days after this, on the 27th November, a temporary seismic station was installed at Kinsale. Dr. Maurice O'Keefe kindly provided a suitable site and housing for the recorder. There were no further events in east Co. Cork but two events did occur offshore SE of Youghal. The small one on the 3rd of December may have been an underwater explosion but the event further offshore on the 12th of December had features which indicate it was an earth tremor probably, like the 24th November event, at mid-crustal depth. The existence of the Kinsale station made the epicentre determination more exact. These two events increased our interest in three others seen in June and July. It had previously been assumed that they were small underwater explosions and this may still be true.

In early July Cambridge University continued their seismic programme in the North Sea. One of the shots fired was large enough to be recorded in Ireland and 6 temporary stations were put out. This filled in a gap in our long range data (400-700 km).

Field recording and timing of quarry blasts in east central Ireland continued through the year and was completed in October. In addition to those quarries used previously (Huntstown, Platin, Slane and Belgard), recordings of blasts from Arigna and Trading Services Ltd.

(Duleek) were also made. Two and three component recordings were made to study the short period surface waves generated by these quarry blasts.

The digitised records were plotted as profiles and showed that a P-wave velocity of 5.6 km/s is typical of the HUN-PLA region. A difficulty was encountered in the southern part of the area west of this line as there is very little outcrop and some recordings had to be made on boulders. The P-wave velocity found was again about 5.6 km/s. Initial Rayleigh phase velocity measurements made on filtered versions of the data showed higher velocities in the Lower Palaeozoic region near Platin (~2.8 - 2.9 km/s) than those found in the limestone further south (~2.5 - 2.6 km/s).

The Wexford data (see earlier) indicated high group velocities along the path to ECB through the volcanics (~2.6 - 2.9 km/s), much higher than those found for paths across the geological strike (~2.1 - 2.5 km/s).

A programme was carried out during the summer to locate local sources observed by DNET. These were mainly quarry blasts. Small distortions in the locations showed a pattern which should tell us something about the structure in and around DNET. The programme has also identified some sources which may be useful for seismic profiles in the future.

Historical records of Irish earthquakes are also being investigated. The main effort is being concentrated on the period since 1700. A few "new" events have been found and there is an interesting confirmation that the most active areas are in and around Co. Wexford and Co. Cork.

All the seismic data are still being transcribed and digitized, without charge, at the Institute of Geological Sciences, Edinburgh, to whom we are extremely grateful.

3 SEMINARS

October 21: A. W. B. Jacob "Seismic Sources in Ireland"

April 11: P. W. Readman "Palaeomagnetism of lake sediments"

4 EXTERNAL ACTIVITIES

Special lectures on geophysics were given by Professors Jacob and Murphy and Dr. Readman to undergraduate students from Cork.

J. C. Davies, A. W. B. Jacob, N. Murphy and T. Murphy attended the United Kingdom Geophysical Assembly at Cambridge in April.

A. W. B. Jacob and T. Murphy attended the European Geophysical Society at Uppsala in August.

P. W. Readman attended the 4th Scientific Assembly of the International Association of Geomagnetism and Aeronomy at Edinburgh in August.

A. W. B. Jacob attended meetings of the Royal Society Working Group on Explosion Seismology at Cambridge in April and London in October and the Council of Europe Meeting (CAHRT) at Strasbourg in December.

5 PUBLICATIONS

D. Howard:

An occurrence of Tertiary olivine-dolerite silts in Lower Carboniferous (Courceyan) rocks near Carrigallen, County Leitrim.
J. Earth Sci. R. Dubl. Soc. 4, 1981, 39-52 (with J. M. Morris, G. D. Sevastopulo and C. T. Williams).

T. Murphy:

Geophysical Evidence. Chap. 14, A Geology of Ireland.
Ed. C. H. Holland, Scot. Acad. Press, Edinburgh, 1981.

P. W. Readman:

Geomagnetic secular variations in Greece through the last 6,000 years obtained from lake sediment studies.
Geophysics J. R. Astr. Soc., (1981) 66, 193-219 with K. M. Creer and S. Papamarinopoulos).

Abstracts:

A. W. B. Jacob:

Magnitude determination for local events in the British Isles.
Geophys. J. R. Astr. Soc., 65, 1981, 250 (with G. Neilson).

P. W. Readman:

Plio-Pleistocene magnetostratigraphy in sediment cores from Italy.
I.A.G.A. Bulletin 45, 216 (with K. M. Creer).

P. W. Readman:

Low temperature magnetic properties of titanomagnetites.
I.A.G.A. Bulletin 45, 222 (with E. Schmidbauer).

6 MISCELLANEOUS

Undergraduate students K. P. Fox and T. O'Drisceoil of Trinity College carried out research projects using the marine magnetic data collected off North Donegal in 1980.

A number of enquiries concerning seismicity levels in various parts of the world were dealt with and seismic data were also supplied to research workers investigating particular events which occurred during the year. Other enquiries from commercial, mainly prospecting interests, ranged from the analysis of earth tide phenomena exhibited in wells, the use of gravity data in the exploration of hot springs and the analysis of marine magnetic data.

COMPUTER INSTALLATIONS

ECLIPSE S/130

The Data General System at 5 Merrion Square was moved from the old lecture room in the front of the building to a room at the rear previously used by the Cosmic Ray Section as the LDEF preparation room. For some time malfunction of the computer system in the lecture room had been experienced because of

(1) high temperatures in the summer due to the southerly aspect;
(2) low temperatures in winter due to inadequate heating compared to the large size of the room.

After investigating the costs of full air conditioning of the lecture room, it was decided that it was cheaper and more convenient to move to a smaller room with a northerly aspect. No repetition of previous temperature problems has occurred since the move.

There were two hardware additions to the system in 1981. The CalComp Model 1037A digital plotter was upgraded to a Model 1039. This increased plotting speed from a maximum of 2.8 in. per sec. to 6.3 in. per sec. A second ADDS Regent 25 v.d.u. was connected to the multiplexor to experiment with multiuser editing.

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

Income and Expenditure Account
for the year ended 31 December 1981

1980 £			NOTES	1981 £
	INCOME			
940,000		Oireachtas Grant-in-Aid	1(a), 2	1,193,000
23,181		Sales of Publications	3	70,996
---		Fire Insurance Compensation	4	74,130
1,778		Working Seminar		---
---		Celtic Studies Summer School: Fees		3,889
---		N.B.S.T. Project	5	5,401
26,614		Miscellaneous	6	33,011
991,573				1,380,427
	EXPENDITURE		7	
272,995		Administration		311,210
251,248		School of Celtic Studies		332,612
154,725		School of Theoretical Physics		182,260
374,199		School of Cosmic Physics		455,092
---		Adaptation of Premises		1,153
1,053,167				1,282,327
(61,594)	SURPLUS (DEFICIT) for year		8	98,100

Notes 1 to 14 form part of these accounts.

Signed: T. K. Whitaker

T. K. WHITAKER
CHAIRMAN - COUNCIL OF THE INSTITUTE

27th September, 1982.

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

Balance Sheet at 31 December 1981

1980			1981
£	CURRENT ASSETS	NOTES	£
86,472	Cash on hands and at Bank		82,182
28,443	Debtors and Prepayments		122,329
114,915			204,511
	Less		
	CURRENT LIABILITIES		
57,116	Creditors and accruals		48,612
57,799	NET CURRENT ASSETS		155,899
	Represented by	8	
57,799	INCOME and EXPENDITURE - Accumulated Surplus		155,899

Notes 1 to 14 form part of these accounts.

Signed: M. K. Whitaker

T. K. WHITAKER
CHAIRMAN - COUNCIL OF THE INSTITUTE

27th September, 1982.

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

NOTES TO THE ACCOUNTS

1. Accounting policies

(a) Oireachtas Grant-in-Aid: Income shown in the Accounts as Oireachtas Grant-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.

2. Oireachtas Grant-in-Aid

1980	Grant in Aid voted to the Institute has been allocated under the following headings:	£	£
£			
194,800	Administration	287,500	
231,550	School of Celtic Studies	277,450	
148,100	School of Theoretical Physics	182,300	
365,450	School of Cosmic Physics	444,750	
100	Adaptation of Premises	1,000	1,193,000
940,000			

3. Sales of Publications

22,815	School of Celtic Studies	70,845	
330	School of Theoretical Physics	44	
36	School of Cosmic Physics	107	
23,181			70,996

Sales of publications in the School of Celtic Studies were unusually high in 1981 (due to publication of Learning Irish). It is not expected that this volume of sales will be maintained in 1982 and future years.

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 the period 1 October 1977 to 31 December 1980 amounted to £41,243 and expenditure in 1981 was £8,333. The balance on hands at 31 December 1981, £3,942, is included in the balance of the School of Cosmic Physics.

/(b)

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

NOTES TO THE ACCOUNTS

(b) Buildings

The total cost to date of the reinstatement of buildings destroyed by fire in 1977 amounts to £96,858 (including £8,986 incurred in 1981). Compensation has been agreed with the insurers at £122,130 (including £74,130 reflected in these accounts). The balance (£25,272) is included in the Adaptation of Premises section of the Accounts (see Note 8).

5. NBST support for School of Theoretical Physics Project

At 31 December 1981 there was a balance of £179 of NBST funds on hands and this amount is included in the balance for the School of Theoretical Physics.

6. Miscellaneous Income

1980		
25,357	Administration	28,579
1,161	School of Celtic Studies	1,228
6	School of Theoretical Physics	7
90	School of Cosmic Physics	---
---	Sale of Temporary Building	3,197
26,614		33,011

7. Analysis of Expenditure

1980		Total	Administration	School of Celtic Studies	School of Theoretical Physics	School of Cosmic Physics
£		£	£	£	£	£
668,508	Salaries, Wages & Superannuation	803,745	151,976	210,026	118,554	323,189
42,109	Scholarships	49,859	-	17,243	23,882	8,734
1,113	Honoraria	750	-	700	50	-
34,715	Library	40,426	-	4,910	21,729	13,787
44,519	Publications (Note 1c)	82,438	954	80,515	461	508
24,014	Furniture & Equipment (Notes 1b & 13)	21,851	1,249	1,714	277	18,611
117,498	General Administration (Note 9)	139,200	139,200	-	-	-
26,683	Travel & Survey Expenses	42,399	451	4,739	5,481	31,728
6,902	Symposium & Seminar Expenses	9,732	-	8,785	947	-
15,678	Consumable Equipment (Note 13)	17,973	-	-	-	17,973
29,667	General Expenses	36,074	8,394	3,980	5,657	18,043
11,965	Special Commitments (Note 10)	14,186	-	-	-	14,186
	Fire Replacement:					
6,435	'Contents' (Note 4a)	8,333	-	-	-	8,333
23,361	Buildings (Note 4b)	8,986	8,986	-	-	-
-	NBST Project (Note 5)	5,222	-	-	5,222	-
1,053,167	Total:	1,281,174	311,210	332,612	182,260	455,092
NIL	Adaptation of Premises	1,153				
1,053,167	Total:	1,282,327				

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

NOTES TO THE ACCOUNTS

8. Surplus/Deficit Position

	Balance 1/1/81	Year to 31/12/81	Balance 31/12/81
Administration	(15,562)	53,727	38,165
School of Celtic Studies	52,623	20,800	73,423
School of Theoretical Physics	(4,186)	5,492	1,306
School of Cosmic Physics	24,700	(10,235)	14,465
Adaptation of Premises	224	28,316	28,540
	57,799	98,100	155,899

This surplus is available towards meeting the Institute's expenditure on commitments outstanding at 31 December 1981 (see Note 14).

9. General Administration Expenses

1980 £		£	£
42,105	Rent, Rates & Insurance	57,388	
34,658	Premises Maintenance	33,488	
17,133	Postage & Telephones	21,242	
21,343	Fuel, Light & Power	23,996	
2,259	Sundry Supplies	3,086	139,200
117,498			

10. Special Commitments

The expenditure under this heading consisted of the third contribution by DIAS towards the capital cost of a 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. 14,186

11. Superannuation

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

12. Vernam Hull Bequest

Included in the balance of the School of Celtic Studies (see Note 8) is an amount of £9,961 which is the value at 31 December 1981 of the Vernam Hull bequest to the School. The project to be financed by this bequest has not yet been decided on.

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

NOTES TO THE ACCOUNTS

13. Seismic Work at Carnsore

A payment of £3,400 was made to DIAS by the ESB in 1981. This amount covered the cost of equipment and sundry supplies purchased by DIAS for the supply, installation and commissioning of radio telemetry seismic links at Carnsore, as required by the ESB. The money received has been set off against expenditure under the headings 'Equipment' and 'Consumable Equipment' in the School of Cosmic Physics.

14. Outstanding Commitments

The estimated cost of commitments outstanding at 31 December 1981, exclusive of Current Liabilities shown on the Balance Sheet, is as follows:

31/12/80		
£		£
25,600	Administration	38,500
54,000	School of Celtic Studies	72,548
300	School of Theoretical Physics	3,479
24,000	School of Cosmic Physics	28,942
---	Adaptation of Premises	30,000
103,900		173,469

Institiúid Ard-Léinn Bhaile Átha Cliath

Report of the Comptroller and Auditor General

I have examined in accordance with approved auditing standards 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 a true and fair view of the transactions of An Institiúid for the year ended 31 December, 1981 and of the state of its affairs on that date.

P. L. McDONNELL
Comptroller and Auditor General

21 October 1982.