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

ANNUAL REPORT
1983

10 Burlington Road, Dublin 4

Pl.2742

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 1983

Pl.2742

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 1983

School of Celtic Studies

The year 1983 passed without any relaxation of the embargo on the filling of the three vacancies on the academic staff, one at the level of Senior Professor and two at that of Junior Research Assistant. As a result some research activities have been curtailed and the initiation of some new research projects has been postponed. Otherwise the usual activities in research, editing, training of scholars, and publication continued.

Five new volumes and seven reprints were published, and an up-to-date catalogue of publications - now numbering almost two hundred - was issued. Outside publications by members of the School in periodicals etc. numbered fifteen.

Eight scholars studied in the School during the year, three of these having begun tenure of scholarship in October 1983. In addition Professor Frederik Otto Lindeman of the University of Oslo spent from October to December in the School as a visitor and took part in such School activities as seminars.

Seminars were held by Professors Brian Ó Cuív and James Carney and Mr. Fergus Kelly. In addition Professor Ó Cuív gave two seminars in University College, Cork. The usual symposium, at which eleven papers were presented, was held in March and was attended by scholars from universities and other institutions. The Statutory Public Lecture was given in TCD by Mrs. Nessa Doran whose subject was "Translations and Adaptations".

The seventh of the series of International Congresses of Celtic Studies, inaugurated in Dublin in 1959, was held in Oxford and was attended by several members of the School, including the Director, Professor Ó Cuív who has acted as Permanent Co-ordinating Secretary since 1959. Arrangements were made for the next Congress to be held in Swansea in 1987.

School of Theoretical Physics

A special Symposium was held in the School from 6-7 October under the patronage of H.E. the Austrian Ambassador to Ireland, Dr. Gerard Rainer, to mark the 50th anniversary of the award of the Nobel Prize to Erwin Schrodinger, to commemorate his scientific achievements, and to recollect his 16 years as Senior Professor of the School; the attendance was 82.

In addition to the use made by Staff, Scholars, and Fellow of the School in their primary research activities, much use was made also by visitors and research associates of the School's facilities for research. Twenty-seven research workers from universities and other institutes of research or higher education were admitted as research associates of the School; thirty-six 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 3 for final-year under-graduates (or first year graduates) from the Dublin area, were given at DIAS; three seminars/talks were given at UCD, one at the British Radiofrequency Spectroscopy Group Conference at TCD, one at the DU Mathematical Society Research Symposium at TCD, one at the Institute of Physics (Irish Branch) Meeting at Bantry, and a series of three at the Second Dublin Summer School in Physics. The Statutory Public Lecture was given at UCD by Visiting Professor D. Williams; his subject was 'The mathematics of probability'.

The School continued its research. The primary areas of research were theoretical particle physics, classical statistical mechanics, quantum statistical mechanics, theory of wave propagation, lasers, and general relativity and gravitation; secondary areas were applied mathematics, and pure mathematics. Communication of the Dublin Institute for Advanced Studies Series A (Theoretical Physics) no. 27, and forty-two contributions to journals or scientific proceedings were published.

Members of the School attended 11 conferences abroad, and gave seminars at 2 of these. They also gave 28 seminars/lectures, 4 courses, and 2 poster sessions abroad.

School of Cosmic Physics

Astronomy Section:

The completion of data on cepheid variables, including an analysis of period changes, represented the final stages of observations carried

out in 1966-67. A substantial collection of data on these variable stars in the Magellanic Clouds has been presented in the course of this work. Other work is in preparation for new facilities to become available in 1984.

Interpretation of cosmological data in conjunction with visiting astronomers from China has produced evidence to support an original suggestion. Co-operation established during the year in development of instrumental and computational facilities with other institutions represents a new and promising venture for the Section.

The Statutory Public Lecture for the School was given in UCD by Professor A. Blaauw (University of Groningen, Netherlands) on "Star Formation and Interstellar Clouds".

Cosmic Ray Section:

The principal effort during the year was directed towards the final preparation of the modules to be used in the Ultra Heavy Cosmic Ray Experiment to be launched into orbit by the Space Shuttle in April 1984. It was possible to calibrate the modules with Uranium and Iron ions at Berkeley and work was also done on the problem of the effect of temperature on calibration.

Co-operation with other institutions on the preparation of the electronic particle detection experiment (Epona) on the Comet Halley Mission GIOTTO was continued actively during the year.

Geophysics Section:

Analysis of the gravity field in certain areas from Mullingar to Gort where it is low indicates that the cause is most likely a granitic body and not a thick sedimentary formation. This study was extended to other parts of the country and there is a distinct correlation between the postulated granites and base metal deposits.

During a "site investigation" in the Boyne valley at Drogheda, just east of the railway viaduct, the contractors encountered dioritic granite where the underlying rock was considered to be Caboniferous limestone and mapped as such. This unusual occurrence confirmed a postulation made in our Memoir No. 2 published in 1952.

A magnetic survey of the western part of Galway Bay was undertaken in collaboration with the Applied Geophysics Department of University College Galway using the R.V. Lough Beltra. Preliminary analysis shows a sharp change in magnetic character along a northwest-southeast line which extends a similar marked feature in Co. Clare. This seems to mark a major boundary.

Palaeomagnetic studies were continued on Lough Doo (Co. Mayo) and Danish lake sediment cores. The measurements of the samples were performed at the Department of Geophysics, University of Edinburgh using a SQUID magnetometer. Alternating field demagnetization studies on the Lough Doo samples show the magnetization direction is quite stable. The variations of declination and inclination with depth in the cores show certain similarities with records from the U.K. Rock magnetic measurements e.g. acquisition and demagnetization of anhysteretic and isothermal remanences suggest that the main magnetic mineral is fine grained magnetite.

The results to date of the Irish Caledonian Suture Seismic Project (ICSSP) carried out in 1982 are briefly: The crustal velocities in eastern Ireland rise quite rapidly with depth to 6.3 - 6.5 km/s but in the western part of the profile lower velocities between 6.0 and 6.3 km/s were recorded. Two reflected phases from a mid-crustal boundary and the Moho were found. The Moho, around 32 km at its deepest, shallows towards the sea at both ends of the line. It is a sharp discontinuity under western Ireland but a transition zone of 3-4 km thickness in the east.

The seismic networks (DNET and ENET) continued to operate during 1983.

The most interesting local seismic event happened near Enfield, Co. Meath on Sunday 11 September. It was a very small event (M_L = 0.8) but it was very shallow and reached unusually high intensity over a small area.

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 1983

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 1983.

The report is presented under the following principal heads;-

I - Constitution of the Council of the Institute and of the Govering Boards of the three Constituent Schools on the 31 December 1983.

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 1983.

1 THE COUNCIL OF THE INSTITUTE

Chairman

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 and President, Royal Irish Academy.

Members appointed by the Governing Boards of Constituent Schools

J. P. Carney, B.A., Fil.Dr., D.Litt.; P. Mac Cana, 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.; T. Ó Floinn, M.A.; S. Ó Tuama, M.A., Ph.D.; E.G. Quin, M.A., F.T.C.D.; G. Victory, B.A., Mus.D.; T.K. 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

A. Brock, M.A., Ph.D., F.R.A.S., F.Inst.P.; D.J. Bradley, Ph.D., F.R.S.; P. K. Carroll, M.Sc., Ph.D.; M. de Groot, Ph.D.; G. F. Imbusch, Ph.D., D.Sc.; D. L. Linehan, B.Sc., B.E.; 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 Granahan; Geraldine Esmonde; Desmond Pender.

II - Annual Report of the Governing Board of the School of Celtic Studies for the year ended 31 December 1983, adopted at its meeting on 25 May 1984.

1. STAFF AND SCHOLARS

Professor Emeritus:

D. A. Binchy.

Senior Professors:

James Carney, Director (to 28 February 1983); Brian Ó Cuív, (Director (from 1 March 1983).

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 (retired 31 December 1983).

Assistant Librarian/Clerk:

Máire Breatnach.

Secretary/Publications Officer:

Máire Uí Chinnseala.

Clerical Staff:

Patricia Dunne.

Scholars:

George Broderick (to September 1983); Máire Bhreathnach, Aoife Nic Ghiollamhaith, David Johnston; Anthony Harvey, Neil McLeod, David Sproule, Frederick Biggs (from 1 October 1983).

Visitor:

Professor Fredrik Otto Lindeman, University of Oslo (October - December).

In so far as the government embargo on appointments to the academic staff since July 1981 allowed, the School continued to be very active in the areas of research, teaching and publishing. With the cooperation of staff members in universities in Ireland and Scotland it was able to proceed with its plans for its next triennial Summer School of Celtic Studies due to be held in July 1984.

2. RESEARCH AND EDITING

Professor D. A. Binchy prepared an article for publication in Celtica xvi and read proofs of his article 'Corpus Iuris Hibernici - Incipit or Finit Amen?' for Proceedings of the Sixth International Congress of Celtic Studies.

Professor Brian Ó Cuív saw Celtica xv through its final stages and read and edited several articles for Celtica xvi; he checked proofs of Vol. I of the Annals of Ulster and examined works submitted for publication in the series Scriptores Latini Hiberniae and in the Mediaeval and Modern Welsh Series; he checked with the manuscripts the typescript draft of his catalogue of the most recently acquired Irish manuscripts in the Bodleian Library in Oxford. Among work he completed for publication is a survey of 'Sandhi Phenomena in Irish' which is to appear in a volume to be published by Gunter Narr Verlag, Tübingen. See also Sections 4, 5, 6, 7, 8.

Professor James Carney did some general work on Early Irish Poetry and supervised the work of Máire Bhreathnach, Anthony Harvey and Frederick Biggs. See also Sections 4, 8.

Professor Heinrich Wagner worked on comparative Celtic Grammar, from which material for two major preliminary articles has emerged: (i) Relationship between Celtic and Germanic; (ii) on the position of Hittite within Indo-European. Editing of ZCP 40 progressed throughout the year. Professor Wagner supervised and assisted George Broderick in preparing 'A Handbook of Late Spoken Manx' which will be issued in two volumes.

Dr. Pádraig de Brún continued to catalogue the Irish manuscripts in T.C.D. (with Mrs. Anne O'Sullivan and Máire Bhreatnach); he annotated the list of Irish Society's Bible teachers, 1818-27. The following articles were accepted for publication in Eigse: (i) Further additions to the Franciscan collection; (ii) The Irish Society's Bible teachers, 1818-27, II. See also Sections 7, 8.

Fergus Kelly saw Bechbretha through the final stages of printing before its publication in June; work continued on his edition of The Triads of Ireland and on a forthcoming volume on Early Irish Justice. He prepared reviews (for publication in Celtica) of: Folia Gadelica; The Welsh Law of Women; Wales in the Early Middle Ages. See also Sections 4, 5, 6, 8.

Rolf Baumgarten completed work on the 4 Indexes of Bibliography of Irish Linguistics and Literature; the body of the work (1156 ff.) was sent to press in November and first proofs were received in December. A memorandum on the history and trend of the School was prepared. See also Section 8.

Micheál Ó Siadhail continued work on aspects of Modern Irish syntax; worked (in co-operation with Dr. Arndt Wigger) on a German version of Learning Irish which is due for publication in 1984; checked typescript of first half of the French translation of Learning Irish; gave lessons in Modern Irish to Anthony Harvey. The following articles were accepted for publication: (i) 'A Note on Gender and Pronoun Substitution in Modern Irish Dialects' (Ériu xxxv); (ii) Review of Progress in Language Planning (Celtica xvi). See also Section 8.

Dr. Malachy McKenna continued work on his edition of the Co. Louth text 'The Spiritual Rose'; prepared the text of the Statutory Lecture on 'Breton Literary Tradition' for publication; presented a report to the Publications Committee on R. Hemon's edition of 'Le Dernier Judgement'; read an article submitted by P.-Y. Lambert with a view to publication in Celtica; on a field-trip continued survey of the Dialect of S. E. Cornuaille. The following articles were accepted for publication (i) The Breton Literary Tradition (Celtica); (ii) Étude Phonologiques sur le Breton Sud-Bigouden reviewed for ZCP.

Mrs. Nessa Doran checked the typescript (MSS. G350-373) of Fasc. VIII of Catalogue of Irish MSS in the National Library of Ireland which was sent to press in November. First proofs were received in December. Preparation of Fasc. IX (MSS. G374-391) was completed. See also Sections 3, 7, 8.

Mrs. Anne O'Sullivan checked proofs of The Book of Leinster Vol. VI which was published in September: preparation of catalogue of medieval Irish MSS. in TCD Library progressed. See also Sections 6, 7, 8.

Dr. George Broderick completed the preparation of A Handbook of Late Spoken Manx which is to be published in two volumes by Max Niemeyer Verlag, Tübingen. The following articles were accepted for publication in ZCP (i)'Berrey Dhone: A Manx Caillech Bérri?'; (ii) 'Ec ny Fiddleryn'. See also Section 8.

Máire Bhreathnach continued work on an edition of Togail Bruidne Da Derga, Recensions I, II, III; commenced cataloguing the Irish MSS. in TCD Library in October; two MSS. have been completed. The following articles have been accepted for publication: (i) 'A New Edition of Tochmarc Becfhola' (Ériu); (ii) Reviews of A. Bammesberger: A Handbook of Irish and A Grammar of Modern Irish. See also Sections 6, 7.

Aoife Nic Ghiollamhaith continued to research the history of the Dál Cais in Munster with particular emphasis on their genealogical records and on the earliest history of the dynasty. See also Section 6.

David R. Johnston completed an edition of the work of the Welsh poet Iolo Goch. The edition consists of an introduction analysing the style and content of the poetry, text with variant readings, textual notes and vocabulary. An article in Welsh on Iolo Goch was accepted for publication in Ysgrifau Beirniadol and reviews of A. O. H. Jarman's Llyfr du Caerfyrddin and E. G. Bowen's St. David were accepted for Celtica. See also Sections 6, 8.

Frederick M. Biggs worked on an edition of 'Dúan in choícat' which was first edited by Kuno Meyer and published in ZCP 4. A second version of the poem in the NLI MS. G.3 is being considered and the traditional material which underlies the questions and answers in the text is being investigated. An article entitled 'Aungeles peeris: Piers Plowman B 16.67-72 and C 16.67-72' was accepted for publication in Anglia.

Neil McLeod worked on an Early Irish Law text Do Asta Cor and on a collection of the extant legal materials dealing with Early Irish Fosterage. See also Section 8.

David Sproule studied some texts dealing with the dynastic ancestors of Early Ireland. An article entitled 'The Origins of the Éoganachta' was accepted for publication in Ériu xxxv.

Anthony Harvey worked on (i) St. Patrick's other name, Cothraige and its variants; (ii) the structure of nasalization and consonantal and assimilation in the Celtic languages; (iii) the linguistic implications of the ogam inscriptions.

3. STATUTORY PUBLIC LECTURE

A Statutory Lecture entitled 'Translations and Adaptations' was delivered by Nessa Ní Shéaghdha (Mrs. Nessa Doran) at Trinity College, Dublin on 11 November 1983.

4. SEMINARS

Professor Brian Ó Cuív continued his seminar on The Rule of Mo Chuta in the Hilary term; he held a class on manuscript reading and textual editing in the Hilary, Trinity and Michaelmas terms.

Professor James Carney conducted a seminar on certain Old and Middle Irish poems during the Michaelmas term.

Mr. Fergus Kelly read the legal Heptads at an informal seminar held during the Michaelmas term.

5. SYMPOSIUM

On 18-19 March 1983 a symposium was held for university and college staff and research workers. The following papers were read:-

Tomás Ó Concheanainn	: Príomhshliocht Leabhar na hUidhre
Brian Ó Cuív	: Irish versions of Expugnatio Hibernica
Colm Ó Baoill	: Trí rainn agus amhrán
Heinrich Wagner	: On the relationship between Celtic and Western Germanic
Tomás Ó Cathasaigh	: Déise and Dyfed
Francis J. Bryne	: The Additamenta in the Book of Armagh
Kim McCone	: The Würzburg and Milan Glosses: our earliest sources of 'Middle Irish'
Erich Poppe	: The concept of 'Celtic' in the pre-nineteenth-century linguistics
Fergus Kelly	: Audacht Morainn Sections 12-21: some suggestions and retractions
James Carney	: Iasconius
Tadhg Ó Dúshláine	: Mac Raicín

6. EXTERNAL ACTIVITIES

Professor Brian Ó Cuív attended (i) the Conference and Meeting of the Council for Names Studies in Great Britain and Ireland, Cork, 24-27 March, (ii) Seventh International Congress of Celtic Studies,

Oxford, 10-15 July; he gave two seminars on editing Irish poetry in University College, Cork, on 11 May. At the request of the organisers of a work-shop on 'Sandhi Phenomena in the languages of Europe', held during the Tenth International Congress of Phonetic Sciences in Utrecht, 1-6 August, he provided a survey of sandhi phenomena in Irish. At the request of the Office of Public Works he provided material for a press release on the occasion of the inauguration of the exhibition of the Bodleian manuscript of the Annals of Inisfallen in Muckross House in Killarney.

Fergus Kelly attended the Celtic Congress held at Oxford in July and the Welsh Law Colloquium held at Gregynog from 18-20 September.

Mrs. Anne O'Sullivan attended the International Congress of Celtic Studies in Oxford in July and the Welsh Law Colloquium at Gregynog in September.

Mr. George Broderick attended the International Congress of Celtic Studies in Oxford in July.

Máire Bhreathnach lectured to visiting American College students on 'Early Irish History' and 'Mythology of the Early Irish' at the Gresham Hotel, Dublin in September.

Aoife Nic Ghiollamhaith attended: (i) the Conference of the Association of Young Irish Archaeologists in February; (ii) Irish Conference of Historians, held at Maynooth in June; (iii) the International Congress of Celtic Studies at Oxford in July.

David Johnston attended the International Congress of Celtic Studies at Oxford in July where he read a paper on 'Iolo Goch'.

7. CATALOGUING OF IRISH MANUSCRIPTS

Mrs. N. Doran's work on cataloguing the Irish manuscripts in the National Library of Ireland has continued steadily and she has reached MS. G391 by the end of the year. Fasciculus VIII, containing descriptions of MSS. G350 - G373 was in course of printing.

Mrs. A. O'Sullivan and Dr. Pádraig de Brún continued work on the Irish manuscripts in Trinity College. However, the retirement of Mrs. O'Sullivan at the end of December from her post as Assistant in the School will necessitate new arrangements to maintain the work of cataloguing at a satisfactory rate. So far some forty manuscripts have been catalogued.

Financial difficulties have prevented the publication by Cambridge University Library as planned in 1978 of the catalogue of Irish manuscripts in Cambridge completed by Dr. Pádraig de Brún and Máire Herbert in that year. However, negotiations with a view to

seeking another publisher continued.

Some further progress was made by Professor B. Ó Cuív in his work on the Irish manuscripts in the Bodleian Library in Oxford.

8. PUBLICATIONS

(a) Works in course of printing

The Annals of Ulster edited by S. Mac Airt and G. Mac Niocaill: final corrections were carried out and the work was printed off during the year.

Book of Leinster VI edited by Anne O'Sullivan: the work passed for press in June and published in September.

Bechbretha edited by Thomas Charles-Edwards and Fergus Kelly: first proofs were revised in March; the work was passed for press and published in June.

Celtica xv edited by Brian Ó Cuív: first proofs of reviews were checked; the work was passed for press in February and published in June.

Proceedings of the Sixth International Congress of Celtic Studies edited by G. Mac Eoin: the work consists of 11 articles first proofs of which were returned for revise in March; the work was published in August.

The Irish Sex Aetates Mundi edited by D. Ó Cróinín: first proofs were checked and revised; passed for press in August and published in November.

Corpus Genealogiarum Sanctorum Hiberniae edited by P. Ó Riain: first proofs (206 galleys) of Introduction and Text were checked throughout the year.

Catalogue of Irish MSS in NLI Fasc. VIII compiled by Nessa Ní Shéaghdha: the work was sent to press in October; first proofs of 86 galleys received in November.

Bibliography of Irish Linguistics and Literature 1942-71 compiled by R. Baumgarten: some material sent to press in November; first proofs (35 galleys) received in December.

(b) Books published by the Institute

Celtica xv
Ed. Brian Ó Cuív. 188 pp. £12.00

Bechbretha (Early Irish Law Series Vol. I)
Ed. Thomas Charles-Edwards and Fergus Kelly.
xii + 214 pp. £15.00

Proceedings of the Sixth International Congress of Celtic Studies
Ed. Gearóid Mac Eoin. xlvi + 164 pp. £9.00

The Book of Leinster Vol. VI
Ed. Anne O'Sullivan. xv + 382 pp. £30.00

The Irish Sex Aetates Mundi
Ed. Dáibhí Ó Cróinín. xi + 188 pp. £15.00

(c) Reprints

1. Linguistic Atlas and Survey of Irish Dialects Vols. II,III,IV.
2. The Impact of the Scandinavian Invasions on the Celtic-Speaking Peoples.
3. Córas Fuaimeanna na Gaeilge.
4. Learning Irish.
5. Lexique Étymologique de l'Irlandais Ancien MNOP.
6. The Place-Names of Co. Wicklow Parts II, III, IV, V, VII.
7. Celtica v.

(d) Contributions to periodicals and other publications:

D.A. Binchy:

Corpus Iuris Hibernici - Incipit or Finit Amen? Proceedings of the Sixth International Congress of Celtic Studies. 149-164.

Brian Ó Cuív:

A poem for Fínghin Mac Carthaigh Riabhach Celtica xv. 69-110.

Reviews of publications ibid. 170-6, 179-81.

A poem composed for Cathal Croibhdhearg Ó Conchubhair Ériu xxxiv. 157-74.

Observations on the Book of Lismore Proceedings of the Royal Irish Academy, 83 C 11.

James Carney:

The History of Early Irish Literature: The State of Research. Proceedings of the Sixth International Congress of Celtic Studies. 113-130.

Heinrich Wagner:

The Present State of the Celtic Languages: Irish. Proceedings of the Sixth International Congress of Celtic Studies. 107-112.

Pádraig de Brún:

Folia Gadelica: aistí ó iardhaltaí leis a bronnadh ar R.A. Breatnach, M.A., M.R.I.A., ed. with S. Ó Coileáin and P. Ó Riain (Cork UP, 1983).

Scriptural instruction in Irish: a controversy of 1830-31. Folia Gadelica. 134-59.

The Irish Society's Bible teachers, 1818-27. Éigse 19. 281-332.

A lost FitzMaurice duanaire: Kerry Archaeological and Historical Society Journal, 15-16. 58-60.

Some documents concerning Valentia Erasmus Smith school 1776-95. ibid. 70-82.

Kildare Place Society in Kerry: III Teachers. ibid. 112-56.

Fergus Kelly:

Varia V. Ériu xxxiv. 196.

Rolf Baumgarten:

A Hiberno-isidorian etymology. Peritia 2. 225-8.

David Greene: a bibliography. Ériu xxxiv. 11-19.

A Note on Táin bó Regamna. ibid. 189-93.

Micheál Ó Siadhail:

The Erosion of the Copula in Modern Irish Dialects. Celtica xv. 117-127.

Nessa Ní Shéaghdha:

Diomoladh Phádraigh Naofa. Celtica xv. 67-68.

Mrs. Anne O'Sullivan:

Saint Brecán of Clare. Celtica xv. 128-139.

George Broderick:

Baddagh yn Cooat Laaghagh - A Manx version of a fenian tale. Béaloideas 51. 1-11.

David Johnson:

The Seranade and the Image of the House in the Poems of Dafydd ap Gwilym. Cambridge Medieval Celtic Studies 5. 1-19.

A review of translations of Dafydd ap Gwilym by Bromwich and Loomis. Cambridge Medieval Celtic Studies 6. 97-8.

Neil McLeod:

The Concept of Law in Ancient Irish Jurisprudence. Irish Jurist 17. 356-367.

III - Annual Report of the Governing Board of the School of Theoretical Physics for the year 1983, adopted at its meeting on 12 October 1984:

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.

Assistant Professor:

M. van den Berg.

Librarian-Executive:

Evelyn R. Wills.

Secretary:

Margaret Matthews.

Scholars:

L. Papiez (Poland) to 30 September; T. Murphy (USA); J. M. Rayski (Poland) to 30 September; G. Prince (Australia) to 31 August; Y. Fujimoto (Japan) 1-28 February; J. Burzlaff (Fed. German Rep.); H. Maassen (Netherlands) from 1 January; F. Marchesoni (Italy) from 1 October; B. Lenoach (Ireland) 1-31 October.

NBST Research Fellow:

B. Lenoach (Ireland) to 30 September.

Research Associates (all appointments to 31 December 1984):

TCD: D. J. Bradley, R. K. Dodd, P. S. Florides, H. C. Morris, B. K. P. Scaife, R. S. Ward.
UCD: S. Dineen, P. A. Hogan, D. J. Judge, J. D. McCrea, J. V. Pulè, W. Sullivan, D. Weaire.
St. Patrick's College, Maynooth: C. Nash, A. O'Farrell, J. Spelman, D. H. Tchrakian.
UCG: M. J. Conneely, T. N. Sherry.
DIT Kevin Street: T. Garavaglia, B. Goldsmith.

DIT Rathmines: M. Tuite.
NIHED: R. C. Flood
NIHEL: J. Kinsella.
An Foras Forbartha: J. M. Golden.
NUU: P. McGill.
Open University: A. I. Solomon.

Visiting Scientists:

C. Bernard (UCLA) 23 July - 7 August; K. Bowler (Edinburgh) 5-7 May; D. J. E. Callaway (UCSB and CERN) 30 June - 3 July; A. Chodos (Yale) 28 June - 1 July; J. Conlon (Missouri) 29-30 August; E. B. Davies (KC, London) 14 October; A. van Enter (Heidelberg) 15-23 July; D. E. Evans (Warwick) 25-31 May; G. W. Ford (Michigan) 20 June - 23 July; J. Gibbons (Rome) 11-14 April; K. C. Hannabuss (Oxford) 10 May - 7 June; D. Heffernan (DIT, Kevin Street) 1 January - 31 December; C. Itzykson (Saclay) 5-7 May; M. Lindsay (Bedford Coll., London) 1-6 October; M. Lunn (Oxford) 22-26 November; J. McCabe (Ohio State) 3-26 July; P. Martin (Lausanne) 22-27 November; E. Mognaschi (Pavia) 24-26 October; E. Müller (ETH, Zurich) 28-30 June; A. Nakazawa (Kyoto) 10 December 1982 - 27 January 1983; R. F. O'Connell (Louisiana State, Baton Rouge) 7-29 June; D. Pottinger (Glasgow) 4-30 July; J. Rayski (Krakow) 9 September - 17 October; A. Savini (Pavia) 7-12 June; P. de Smedt (Leuven) 9 March - 6 April; L. Tzafriri (Jerusalem and Cambridge) 30-31 March; P. Vanheuverzwijn (Leuven) 10 January - 5 February); M. Vandyck (Louvain-la-Neuve) October; J. Weyers (Louvain-la-Neuve) 6-10 June; D. Williams (Swansea) 28-29 November; M. Yamada (Ibaraki Univ.) 2 March - 6 December.

2 GENERAL

A special Symposium was held in the School from 6-7 October under the patronage of H.E. the Austrian Ambassador to Ireland, Dr. Gerhard Rainer, to mark the 50th anniversary of the award of the Nobel Prize to Erwin Schrödinger, to commemorate his scientific achievements, and to recollect his 16 years as Senior Professor of the School. The attendance was 82, and there were 7 invited speakers. A reception was given by H.E. the Austrian Ambassador for all the participants on the first day, and the invited speakers were entertained to dinner at the Austrian Embassy on the 2nd day.

In addition to the use made by 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 the opportunities for informal discussions, and the library resources. Twenty-seven research workers from universities and other institutes

of research or higher education were admitted as research associates of the School. For details of Visitors to the School see Section 9.

3 RESEARCH AND STUDY

Primary areas -

(a) Theoretical Particle Physics

Professor O'Raifeartaigh studied spontaneous breakdown patterns in unified gauge theory, and the behaviour of such patterns with respect to the renormalization group. He also worked on the preparation for publication of a monograph on Group Theory of Unified Gauge Theories.

Dr. Burzlaff studied classical solutions of gauge theories, in order to understand some aspects of the corresponding quantum field theory. In particular he reviewed recent progress on the construction of magnetic poles, established the existence of a new saddle point, studied vortex solutions in the context of dimensional reduction, and established the global existence of a class of time-dependent vortex solutions.

Dr. Tchrakian collaborated with Dr. Burzlaff in work on dimensional reduction of pure Yang-Mills theory from four dimensions down to two dimensions with Higgs fields, and in work on the vortex model. He collaborated with Dr. Sherry in dimensional reduction of pure Yang-Mills on arbitrary even dimensions, down to three dimensions with Higgs fields, with application to monopoles. He collaborated with D. O. Sé (Maynooth) in a study of the properties of pure gauge field theory, and its dimensional reduction to physical dimensions; and he collaborated with Dr. G. M. O'Brien in work on self-duality in Euclidean supergravity.

Dr. Murphy's research centred around the phenomenon of spontaneous symmetry breakdown; he sought the correct formulation in Minkowski space of theories with metastable vacua and vacuum tunnelling; he then moved to the determination of the exact symmetry breaking patterns and mass spectrum in gauge theories with scalars either in the adjoint representation of SU(n) or in both the adjoint and fundamental representations, and considered the effect of one-loop radiative corrections in these models. Other problems which he studied included monopole-induced proton decay, the Nicolai mapping and its implications for the triviality of supersymmetry, and the Inflationary Universe scenario.

Dr. Yamada studied SU(n) Higgs system and the renormalization effects.

Dr. Garavagalia was concerned with the field theory of composite models, the properties of phase diagrams for temperature effects in quantum field theories, and the electro-weak interactions of massive neutrinos.

Dr. Tuite studied supersymmetric models in particle physics, in particular models coupled to N=1 supergravity, and also the application of concepts of modern differential geometry to gauge theories.

(b) Classical Statistical Mechanics

(i) Brownian Motion and Relaxation Phenomena

Professor McConnell completed his collaboration with Dr. H. Block (Liverpool), Dr. E. Kluk (Tulane Univ., New Orelans), and Professor Scaife on the theory of polarization in rotating dielectric bodies. He continued his investigations on the theory of nuclear magnetic relaxation, especially for the case of molecular liquids. He formulated a convenient method based on the Redfield theory and the stochastic rotation operator for the calculation of relaxation times, and applied it to the study of anisotropic chemical shift. He also proposed a logical procedure to deduce Brownian motion results in the diffusion limit from those already known in inertial theory.

Professor Lewis collaborated with Professor D. Williams (Swansea) on a new method of solving certain Markov chain problems such as the Ehrenfest model; and he began a collaboration with Professor A. Truman (Swansea) on Stochastic Mechanics.

(ii) Phase Transitions in Lattice Systems

Professor Lewis and Dr. D. E. Evans (Warwick) investigated the Kramers-Wannier duality in the C^*-algebra version of the Ising model.

Dr. Sullivan continued his work on Gibbs states (in collaboration with Dr. Flood) and canonical Gibbs states (in collaboration with Dr. Vanheuverzwijn) and his study of spectral properties of stochastic processes which are generalized random walks.

Dr. Solomon continued his collaboration with Professor J. L. Birman (City Coll., New York) in the investigation into many-electron systems exhibiting several phases.

(c) Quantum Statistical Mechanics

(i) Boson Condensation

The present phase of the collaboration between Professor Lewis and Dr. Pulè on Boson condensation, involving Dr. E. Buffet (UCD), Dr. M. Lunn (Oxford), Dr. P. de Smedt (Leuven) and Professor van den Berg was completed and is being written up for publication.

(ii) Quantum Stochastic Processes

Professor Lewis continued his work on quantum stochastic processes in collaboration with Professor G. W. Ford (Ann Arbor, Mich.).

Dr. Maassen studied stochastic differential equations in physics.

Dr. Papiez continued his study of stochastic optimal control in quantum mechanics; he began a study of the asymptotic theory of stochastic multiplicative equations as an approach to Liouville equations in statistical physics, with nuclear magnetic relaxation taken as an example.

(d) Theory of Wave Propagation

Dr. Lenoach continued his work on applications of asymptotic analysis of stochastic differential equations, in particular applications to surface waves in a random medium.

(e) Lasers

Dr. Heffernan continued his investigations in collaboration with Professor Bradley into bistability, picosecond pulsing, mode-locking in coupled semiconductor lasers, the process of four-wave-mixing, amplified reflection, phase conjugation, hologram recording in photo-refractive media, and amorphous semiconductors using phase conjugate optics.

(f) General Relativity and Gravitation

Dr. Prince studied four main areas: Lagrangian structure of space-time, classification of symmetries in Lagrangian mechanics, tangent bundle geometry (in collaboration with Dr. Crampin, Open Univ.), and algebraic computing in general relativity.

Dr. Hogan began a study of Kaluza-Klein theory from the point of view of Riemannian submersions; he investigated solutions of the Yang-Mills equations on 2-surfaces of constant curvature which are

analogous to the Robinson-Trautman solutions of Einstein's equations; and he began a study in collaboration with Professor Trautman (Warsaw) of gravitational radiation from bounded sources.

Secondary areas -

(g) Applied Mathematics

Dr. Marchesoni studied adiabatic elimination procedures for a number of stochastic systems, and prepared a number of articles on this topic.

Dr. Goldsmith continued his basic work in the area of mathematical biology.

(h) Pure Mathematics

Professor van den Berg studied spectral properties of the Dirichlet Laplacian for various domains; he collaborated with Dr. Lang (Heidelberg) in a study of Schrödinger operators with potentials which are unbounded from below, in studies of Harnack inequalities, and in studies of possible applications of Brownian motion local times (in one dimension).

Dr. Goldsmith worked mainly in the area of abelian group/module theory; he applied techniques from endomorphism rings to problems involving the existence of proper classes of essentially semi-rigid modules, and to problems relating to mixed modules.

Professor Synge continued to discuss his results on geometry with Professor Lewis.

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 mailing 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 Section 11).

DIAS-STP-83-01: J. McCONNELL: Series expansion of the stochastic rotation operator.

02: R. FLOOD: Gibbs states for path specifications of interacting particle systems.

DIAS-STP-83-05: H. NAKAZAWA: Wiener-Îto decomposition of polynomial operators, on a class of quasi-free fields.

-06: L. PAPIEZ: Stochastic formulation of Feynman path integrals from the least action point of view.

-07: H. MAASSEN: Return to thermal equilibrium by the solution of a quantum Langevin equation.

-08: S. AOYAMA & Y. FUJIMOTO: Fermion coupled with vortex with dyon excitation.

-09: M. van den BERG: On condensation in the free boson gas and the spectrum of the Laplacian.

-10: M. van den BERG: On finite volume corrections to the equation of state of a free Bose gas.

-11: W. SULLIVAN & P. VANHEUVERZWIJN: On the canonical Gibbs states associated with certain Markov chains.

-12: W. SULLIVAN: The L^Z spectral gap of certain positive recurrent random walks.

-13: J. BURZLAFF: A classical lump in SU(2) gauge theory with a Higgs doublet.

-14: G. PRINCE: Homothetic Killing tensors.

-15: G. PRINCE & M. CRAMPIN: Projective differential geometry and geodesic conservation laws in general relativity.

-17: L. PAPIEZ: The limit diffusion mechanism of relaxation for spin systems.

-18: J. L. BIRMAN & A. I. SOLOMON: Dynamical groups and coexistence of superconductivity charge density waves and magnetism.

-19: B. LENOACH: Averaging methods for stochastic scalar wave propagation.

-20: D. TCHRAKIAN: On SU(3) monopoles on the Yang R-gauge.

-21: T. MURPHY & L. O'RAIFEARTAIGH: Effect of the renormalization group on the symmetry breaking patterns of the SU(n) Higgs potentials.

DIAS-STP-83-22: J. BURZLAFF: Uniqueness of the Boguta solution.

-23: M. van den BERG: A uniform bound on trace $(e^{t\Delta})$ for convex regions in R^N with smooth boundaries.

-24: G. PRINCE: The "symmetry-conservation law" duality in general relativity via a new approach to projective differential geometry.

-25: M. CRAMPIN & G. PRINCE: The geodesic spray, the vertical projection, and Raychaudhuri's equation.

-26: J. BURZLAFF: Magnetic poles in gauge field theories.

-28: J. T. LEWIS & H. MAASSEN: Hamiltonian models of quantum stochastic processes.

-29: J. BURZLAFF & D. H. TCHRAKIAN: Vortex solutions in Yang's R-gauge.

-30: J. McCONNELL: Analytical approach to the study of molecular rotation in liquids.

-31: E. BUFFET, P. de SMEDT, & J. PULÈ: The condensate equation for some Bose systems.

-32: E. BUFFET, P. de SMEDT, & J. PULÈ: On the dynamics of the open Bose gas.

-33: J. McCONNELL: Debye limit of the stochastic rotation operator.

-34: J. McCONNELL: Theory of nuclear magnetic relaxation by anisotropic chemical shift.

-35: T. N. SHERRY & D. H. TCHRAKIAN: Dimensional reduction and higher order topological invariants.

-36: J. T. LEWIS, J. V. PULÈ, & P. de SMEDT: The super-stability of pair-potentials of positive-type.

-37: M. van den BERG, J. T. LEWIS, & P. de SMEDT: Condensation in the imperfect boson gas.

-38: B. LENOACH, & H. MAASSEN: A criterion for the sample differentiability of random fields.

-39: D. H. TCHRAKIAN: A formulation of massless fields with half-integer spin.

DIAS-STP-83-40: G. W. FORD, J. T. LEWIS, & R. F. O'CONNELL: Stark shifts due to blackbody radiation.

-41: T. GARAVAGLIA: Dirac and Majorana neutrino mass effects in neutrino-electron elastic scattering.

-42: J. T. LEWIS & M. SCHREIBER: On a theorem of Weyl.

-43: M. van den BERG, & J. L. van HEMMEN: On a neutral plasma with quadratic interactions.

-44: J. McCONNELL: Theory of nuclear magnetic relaxation.

-45: M. van den BERG: On the spectrum of the Dirichlet Laplacian for horn-shaped regions in R^n with infinite volume.

-46: J. T. LEWIS, & J. V. PULÈ: On the equivalence of ensembles in statistical mechanics.

-47: J. BURZLAFF: Radially separated classical jumps in non-Abelian gauge models.

-48: J. T. LEWIS, J.V. PULÈ, & P. de SMEDT: Boson condensation in the van der Waals limit in a gas of interacting bosons.

-49: M. CRAMPIN, G. E. PRINCE, & G. THOMPSON: A geometrical version of the Helmholtz conditions in time-dependent Lagrangian dynamics.

-50: Y. FUJIMOTO & T. GARAVAGLIA: Phase diagrams in scalar QED.

-51: D. M. HEFFERNAN & R. L. LIBOFF: A model for the diffuse γ-ray spectrum.

-52: D. M. HEFFERNAN: Long switching times in absorptive bistable systems.

-53: P. A. HOGAN: Kaluza-Klein theory derived from a Riemannian submersion.

-55: B. FRANZEN & B. GOLDSMITH: On endomorphism algebras of mixed modules.

-56: D. M. HEFFERNAN: Transient degenerate four wave mixing in saturable absorbers.

DIAS-STP-83-57: G. M. O'BRIEN & D.H. TCHRAKIAN: Self-duality in Euclidean gravity.

4 SEMINARS, REVIEW LECTURES, SERIES, COURSES

Review and seminar lectures, series and courses in specialized areas of physics and/or mathematics were held throughout the year, and as in previous years were attended by members of staff and students from the universities and other third-level institutes in the Dublin area, and by members of the scientific schools of DIAS.

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

Prof. C. Bernard (UCLA):	Spontaneous compactification in the Liouville model - a Monte Carlo investigation.
Dr. K. BOWLER (Edinburgh):	Lattice gauge theory.
Prof. D. J. E. CALLAWAY (UCSB):	Nonperturbative structure of the effective potential.
Dr. A. CHODOS (Yale):	Casimir forces in Kaluza-Klein theories.
Prof. J. CONLON (Missouri):	The Thomas-Fermi exchange energy problem.
Dr. E. B. DAVIES (King's Coll., London):	Pointwise bounds on eigenfunctions.
Dr. A. C. van ENTER (Heidelberg):	The thermodynamic limit for long range random systems.
Dr. D. E. EVANS (Warwick):	The C^*-algebra of the Ising model.
Dr. K. C. HANNABUSS (Oxford):	How fast does the wave packet collapse? Segal on strings.
Prof. C. ITZYKSON (Saclay):	Field theory on a random lattice.
Prof. E. M. LIEB (Princeton):	Chandrasekhar's theory of gravitational collapse.
Mr. M. LINDSAY (Bedford Coll. London):	Quantum stochastic differential equations.

Dr. M. LUNN (Oxford):	The states of the free boson gas.
Dr. J. F. McCABE (Ohio State Univ.):	Introduction to string theory.
Dr. H. MAASSEN:	The Lamb model.
Prof. P. MARTIN (Lausanne):	Equipartition of energy in quantum statistical mechanics.
	The statistical mechanics of charged systems.
Dr. T. MURPHY:	Monopole-induced proton decay.
Dr. D. POTTINGER (Glasgow):	The Nicolai transformation (two lectures).
Prof. J. RAYSKI (Jagellionian Univ., Krakow):	Towards a universal Lagrangian.
Dr. W. SULLIVAN:	Dynkin on lattice field theory.
Prof. J. WEYERS (Louvain-la-Neuve):	Supersymmetric preons.
Prof. D. WILLIAMS (Swansea):	Some Wiener-Hopf problems.

(b) Courses and Series given at DIAS-STP:

Professor LEWIS completed the course on STOCHASTIC DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS, for graduate or final year undergraduate students, begun the previous year; he began a new course on STATISTICAL MECHANICS in October. Dr. PULÈ organized a course on THOMAS-FERMI THEORY in the Autumn.

Professor O'RAIFEARTAIGH completed the series of lectures on GROUP THEORY AND ITS APPLICATIONS TO PHYSICS, forming part of the M.Sc. course for universities in the Dublin area, begun the previous year.

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

Dr. K. BOWLER (Edinburgh):	Hadron mass calculations in LGT.

Dr. J. BURZLAFF:	A classical lump in SU(2) gauge theory with a Higgs doublet.
Dr. T. MURPHY:	New inflationary universe.
Prof. L. O'RAIFEARTAIGH:	Proton decay mechanisms.
Dr. L. PAPIEZ:	Stochastic processes and quantum mechanics.
Prof. J. WEYERS (Louvain-la-Neuve):	Exotic mesons for QCD sum rules.
Dr. T. GARAVAGLIA:	Report on composite models.

(d) Other lectures or seminars given in Ireland by members of DIAS-STP:

Prof. J. R. McCONNELL:	Theory of Nuclear Magnetic Relaxation. British Radio-frequency Spectroscopy Group Conf. on Nuclear Magnetic Resonances of Polymeric Materials, TCD, 21-23 September.
Prof. J. T. LEWIS:	Stochastic evolution equations. UCD, 6 January.
	How to do research in mathematical physics (with examples from work on boson condensation). DU Math. Soc. Research Symposium, 25-26 November.
Dr. B. LENOACH:	Differential equations with random coefficients. UCD, 19 May.
Dr. G. PRINCE:	A unified vector field approach to conserved quantitites in general relativity. UCD, 27 January.
Dr. D. HEFFERNAN:	Optical Bistability Semi-conductor Lasers. IOP (Irish Branch) Meeting, Bantry, 26-27 May.

5 STATUTORY PUBLIC LECTURE

A Statutory Public Lecture under the auspices of the School was delivered by Professor D. Williams (U.C. Swansea) on 28 November in University College Dublin. The title was 'The mathematics of probability'.

6 SYMPOSIA

Two mathematical Symposia were held during the year, 30-31 March, and 21-22 December. The attendances (44 in March, 51 in December) 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.

Lectures were given as follows:

MARCH:

Review Lectures:

Dr. L. TZAFRIRI (Jerusalem, Cambridge, and TCD):	Canonical isomorphisms between certain Banach spaces.
Dr. J. McDERMOTT (UCG):	Trees.

Lectures:

Prof. J. T. LEWIS (DIAS):	The Ehrenfest model revisited: A new method for Markov chains.
Dr. T. COX (UCC):	Resonant oscillations.
Dr. G. PRINCE (DIAS):	The Lagrangian structure of space-time.
DR. R. FLOOD (NIHED & DIAS):	Population biology of infectious diseases.

Short talks:

Prof. P. M. QUINLAN (UCC):	Two-dimensional crack problemsin a finite body.
Dr. C. THOMPSON (Southampton):	Examiners' meetings, stochastic processes, and dynamical systems.

Dr. P. DOLAN (Imperial College, London:	Hidden symmetry and geodesics.
Dr. M. STYNES (RTC Waterford):	Some necessary conditions in solving $f + f^{-1} = 2g$.
Dr. N. O MURCHADHA (UCC):	Asymptotic structure of gravitational instantons.
Prof. B. K. P. SCAIFE (TCD & DIAS):	The Paley-Wiener theorem - Help wanted.

DECEMBER:

Review Lectures:

Dr. N. O MURCHADHA (UCC):	Vectors and tensor decompositions.
Dr. J. HANNAH (UCG):	Putting coordinates on lattices.

Lectures:

Dr. E. BUFFET (UCD):	Boson condensation and semi-groups.
Dr. A. WOOD (NIHED):	Nonlinear differential equations n biology and medicine.
Prof. M. van den BERG (DIAS):	The spectrum of the Laplacian in a horn-shaped region.
Dr. D. O'DONOVAN (TCD):	Algebraic topology and C*-algebras.

Short talks:

Prof. D. J. SIMMS (TCD):	Geometrical aspects of ladder representations.
Dr. P. A. HOGAN (UCD & DIAS):	Yang-Mills fields on 2-surfaces of constant curvature.
Dr. A. I. SOLOMON (Open Univ.):	The dynamical group of a spin-density-wave system.
Prof. P. M. QUINLAN (UCC):	Cracks in elastostatics, using the edge function method.

Dr. R. BATES (Met. Service):	Efficient numerical methods for solving the equations of fluid dynamics as used in meteorology.
Dr. M. KLIMEK (UCD):	Geometric properties of the complex Monge-Ampère equations.

7 SCHRÖDINGER SYMPOSIUM

The Schrödinger Symposium to mark the 50th anniversary of the award of the Nobel Prize to Erwin Schrödinger, and to commemorate his achievements, was held in the School, under the patronage of H.E. The Austrian Ambassador to Ireland, Dr. Gerhard Rainer, on 6-7 October. It was appropriate that this Symposium should be held at DIAS-STP, since Professor Schrödinger spent 16 years (1940-1956) here, the longest period he spent at any scientific centre. The attendance was 82, and there were seven one-hour invited lectures, as follows:

Prof. G. F. IMBUSCH (UCG):	The impact of Schrödinger's wave mechanics on experimental physics.
Prof. E. M. LIEB (Princeton):	The significance of the Schrödinger equation for atoms and molecules.
Prof. J. T. LEWIS (DIAS):	Schrödinger's contribution to statistical mechanics.
Dr. H. URBANTKE (VIENNA):	Schrödinger's contribution to general relativity.
Prof. S. W. HAWKING (Cambridge):	Schrödinger's ideas about quantum mechanics and modern developments in general relativity and supergravity.
Prof. N. SYMONDS (Sussex):	The impact on biology of Schrödinger's book: What is Life?
Prof. W. THIRRING (Vienna):	Schrödinger's influence on science in the twentieth century.

8 DUBLIN SUMMER SCHOOL IN PHYSICS

The Second Dublin Summer School in Physics was organized by the School of Cosmic Physics in association with Trinity College, Dublin and University College, Dublin, and was held at DIAS from 26 June to

8 July. The topic was Astrophysics, and a contribution from this School was a series of 3 lectures given by Prof. L. O'RAIFEARTAIGH, on Cosmology and Unified Gauge Theory.

9 VISITORS

For lectures given by visitors see Sections 4, 5, 6, 7.

As in previous years, visitors, mainly from abroad, came to the School for short or long 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 2 weeks) were made by

L. Tzafriri (Jerusalem & Cambridge, 30-31 March.

J. Gibbons (Rome), 11-14 April.

C. Itzykson (Saclay), 5-7 May.

K. Bowler (Edinburgh), 5-7 May.

Dr. E. Evans (Warwick), 25-31 May.

J. Weyers (Louvain-la-Neuve), 6-10 June.

A. Savini (Pavia), 7-12 June.

E. Müller (ETH, Zurich), 28-30 June.

A. Chodos (Yale), 28 June - 1 July.

D. J. E. Callaway (Univ. Calif. Santa Barbara), 30 June - 3 July.

A. van Enter (Heidelberg), 15-23 July.

J. Conlon (Missouri), 29-30 August.

M. Lindsay (Bedford Coll., London), 1-6 October.

E. B. Davies (KC London), 14 October.

E. Mognaschi (Pavia) 24-26 October.

M. Lunn (Oxford), 22-26 November

P. Martin (Lausanne), 22-27 November.

D. Williams (Swansea), 28-29 November.

Longer visits (up to one year) were made by

A. Nakazawa (Kyoto), 10 December 1982 - 27 January 1983.

D. Heffernan (DIT, Kevin St.), 1 January - 31 December.

P. Vanheuverzwijn (Leuven), 10 January - 5 February.

P. de Smedt (Leuven), 9 March - 6 April.

M. Yamada (Ibaraki Univ.), 9 March - 6 December.

K. C. Hannabuss (Oxford), 10 May -7 June.

R. F. O'Connell (Louisiana Univ., Baton Rouge), June.

G. W. Ford (Michigan) 20 June - 23 July.

J. McCabe (Ohio State Univ.), 3-26 July.

D. Pottinger (Glasgow), 4-30 July.

C. Bernard (UCLA) 23 July - 7 August.

J. Rayski (Krakow), 9 September - 17 October.

M. Vandyck (Louvain-la-Neuve), October

Visits in connection with the Schrodinger Symposium (see Section 7) were made by

S. W. Hawking (Cambridge), G. F. Imbusch (UCG), E. M. Lieb (Princeton), N. Symonds (Sussex), W. Thirring (Vienna), and H. Urbantke (Vienna).

10 ACTIVITIES ABROAD

Professor McConnell visited the University of Hull for a meeting of the Steering Committee of the EMLG on 28 March, and to attend the Joint Conference of the Royal Society of Chemistry and the EMLG on 'Liquids and Liquid Mixtures', 28-29 March. He visited the University of Pavia on 24 June, and attended the NATO Advanced Study Institute on Molecular Liquids in Florence, 26 June to 8 July. From 15-22 October he visited the Univ. Paris VI, for business meetings of the EMLG, and to give a seminar, and visited Univ. Paris XI (Orsay) for scientific discussions.

Professor Lewis visited University College, Swansea, for two weeks in January/February, for collaboration with Professor D. Williams

on the Ehrenfest model, and to give lectures, and again from 11-22 April for collaboration with Professor A. Truman on Stochastic Mechanics of Hydrogen Atom. He attended the IAMP Executive Meeting and the IAMP Conference in Boulder, Colorado, 1-10 August. From 5-15 December he visited the University of Warwick for collaboration with Dr. D. E. Evans, and to attend the Statistical Mechanics Conference at the Open University on 9 December.

Professors Lewis and van den Berg, and Drs. Pulè, Papiez, and Maassen attended the Fifteenth IUPAP Statphys Conference, Edinburgh 25-29 July. Professor van den Berg visited Groningen on 12 September and Delft on 14 September to give seminars; he visited Heidelberg from 10-17 December for collaborative work with Dr. R. Lang, and to give a seminar, and Eindhoven and Groningen from 18 to 21 December for research purposes.

Dr. Maassen attended the Workshop on Stochastic Differential Equations, held at Swansea 11-15 April, and the Seventh Statistical Mechanics Conference at the Open University, 9 December. He visited the Univ. Groningen 31 March - 10 April, the Universities of Nottingham and Warwick in May, and Bedford College, London, 26-29 November, for collaborations and to give seminars.

Professor O'Raifeartaigh visited Univ. Cath. Louvain in February for two weeks, and again in April for two weeks, to give courses; and he visited Univ. Milan in June for two weeks and again in October for two weeks to give courses. With Professor Yamada he attended the Int. Europhysics Conference on High Energy Physics, Brighton, 20-27 July. From 1 September he was on sabbatical leave of absence from the School, at IHES (Bures-sur-Yvette).

Dr. Murphy attended the UK Inst. for Theoretical High Energy Physics, Univ. Sussex, 1-8 August; with Dr. Garavaglia he attended the Conference on 'Quarks, Leptons and Beyond', in Munich 5-16 September, and the Rutherford Lab. Theoretical Physics Winter Meeting, 14-16 December.

Dr. Prince visited the Rijksuniv. Ghent from 8-22 April, the Open University 22 April - 1 May and 29-30 June, and Queen Mary Coll., London, 18 July - 28 August, for collaborations and to give seminars. He attended the GR10 (10th Internat. Conf. on General Relativity and Gravitation), Padova, 4-9 July.

Dr. Burzlaff visited Kaiserslautern Univ. from 16-18 May, Yale Univ. from 7-25 November, and Bonn Univ. 19-22 December to give seminars and for collaborative work.

Dr. Lenoach visited Leicester Univ. 10-12 April to give a seminar.

Dr. Marchesoni visited Univ. Madrid 14-18 December, and Univ. Barcelona 19-23 December for scientific collaborations and seminars.

Dr. Tchrakian visited Univ. Karlsruhe 13-27 July for collaborative work with Professor Wess; he visited Kaiserslautern Univ. 28-31 July, and Univ. Trento 1-4 August, to give seminars.

Seminars, Lectures, and Courses given Abroad:

Professor McCONNELL:

Lecture on The Stochastic Rotation Operator and Relaxation Processes, given at Pavia.

Seminar on Analytic Theory of Nuclear Magnetic Relaxation given at Paris.

Lecture on Analytical approach to molecular rotations in molecular liquids, given at Florence meeting.

Professor LEWIS:

Two Lectures on Boson Condensation, given at Swansea.

Talk on Boson Condensation, given at Boulder.

Professor O'RAIFEARTIAGH:

Course (6 lectures) on Unified Gauge Theories, Louvain-la-Neuve, February.

Course (6 lectures) on Topological Charges in UGT, Louvain-la-Neuve, April.

Course (6 lectures) on Path Integrals in Quantum Mechanics, Milan, June.

Course (6 lectures) on Path Integrals in Quantum Field Theory, Milan, October.

Seminar, Spontaneous Symmetry Breakdown and Renormalization Group, given at IHES (Bures-sur-Yvette).

Seminar, Effective Potential and Convexity, given at École Normale Superieure (Paris), November.

Professor van den BERG:

Lecture on Bounds on Trace $(e^{t\Delta})$ for Convex Regions with Smooth Boundaries, given at Groningen and at Delft.

Lecture on The Spectrum of the Dirichlet Laplacian for Horn-shaped Regions in R^N, given at Heidelberg.

Dr. PRINCE:

Contributed Paper: The Symmetry-conservation Law' Duality in GR via a New Approach to Projective Differential Geometry, Padua.

Lecture, New Results in the Class'n of Symmetries in Lagrangian Mechanics, given at Ghent.

Lecture, The Lagrangian Structure of Space-time, given at Ghent and at Open University.

Lecture, The New Geometry of the Geodesic Equation, given at Open University.

Dr. BURZLAFF:

Seminar on A Finite-Energy Solution in a Weinberg-Salam type model, given at Kaiserslautern.

Seminar on Radially Separated Classical Lumps in non-Abelian Gauge Models given at Yale.

Seminar on A Soliton-like Solution in a Model with a Higgs Doublet, given at Bonn.

Dr. MAASSEN:

Lecture on Fock Space Techniques for the Poisson Process, given at Groningen.

Lecture on Approach to Equilibrium for the Solution of a Quantum Langevin Equation, given at Nottingham, and at Warwick.

Lecture on Quantum Stochastic Differential Equations arising in the Weak and Singular Coupling Limit, given at Bedford Coll. London.

Dr. LENOACH:

Seminar on Surface Waves in a Random Elastic Layer, given at Leicester.

Dr. MARCHESONI:

Two lectures:

Non-linear and non-Markovian effects in relaxation processes: Application to molecular dynamics.

Limitations of the One-Body Approach to Dielectric Relaxation: Comparison with Rise Transients from Computer Simulation.

Both given at Madrid and at Barcelona.

Dr. TCHRAKIAN:

Seminar on Dimensional Reduction and Higher Order Topological Invariance, given at Kaiserslautern and at Trento.

Seminar on Vortex solutions in the Yang R-gauge, given at Trento.

Poster Sessions:

Professors LEWIS and van den BERG, and Dr. PULÈ: A general theory of Bose-Einstein condensation; at Edinburgh.

Professors LEWIS and van den BERG, and Dr. de SMEDT: Condensation in the imperfect Bose gas; at Edinburgh.

11 PUBLICATIONS

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

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

No. 27: Magnetic poles in gauge field theories.
By J. Burzlaff. Price £4.50. pp. v+58.
Published 30 August.

(2) Contributions to periodical and other publications:

J. L. Synge:

* A matter of chance. Old and new questions in physics, cosmology philosophy and theoretical biology (Yourgrau Memorial Volume), Ed. A. van der Merwe, Plenum 1983, pp. 789-803.

J. McConnell:

* Nuclear magnetic relaxation by quadrupole interactions in non-spherical molecules. Physica 117A (1983), 251-264.

G. W. Chantry, J. R. Birch, J. H. Calderwood, & J. McConnell:

A two-component interpretation of the far infrared dielectric loss in liquid methyl chloroform. Int. J. infrared and millimetre Waves 3 (1982), 897-907.

R. L. Fulton:

The theory of nonlinear dielectrics. Polar, polarizable molecules. J. Chem. Phys. 78 (1983), 6877-6884.

L. Accardi & A. Frigerio:

Markovian cocycles. Proc. Roy. Irish Acad. 83A (1983), 251-263.

M. van den Berg:

* On condensation in the free boson gas and the spectrum of the Laplacian. J. Statist. Phys. 31 (1983), 623-637.

On finite volume corrections to the equation of state of a free Bose gas. Helvetica Phys. 56 (1983), 1151-1157.

J. V. Pulè:

* The free boson gas in a weak potential field. J. Math. Phys. 24 (1983), 138-142.

E. Buffet & J. V. Pulè:

* Fluctuation properties of the imperfect gas. J. Math. Phys. 24 (1983), 1608-1616.

E. Buffet, P. de Smedt, & J. V. Pulè:

The condensate equation for some Bose systems. J. Phys. A Math. Gen. 16 (1983), 4307-4324.

M. Lunn:

Integral functions of the Bose gas. Lett. Math. Phys. 7 (1983), 51-53.

L. Papiez:

The limit diffusion mechanism of relaxation for spin systems. Physica 122A (1983), 413-430.

W. Sullivan & P. Vanheuverzwijn:

On the canonical Gibbs states associated with certain Markov chains. Z. Wahrscheinlichkeitstheorie Verw. Gebiete 62 (1983), 171-183.

B. Lenoach:

Comparison of averaging methods for scalar wave propagation in a random elastic layer. J. Phys. A Math. Gen. 16 (1983), 2979-2986.

L. O'Raifeartaigh & S. Rouhani:

* On the stability of the SU(2) separated monopole configuration. Phys. Lett. 121B (1983), 151-155.

On the symmetry properties of separated monopole configurations. Proc. Conf. on Differential Geometric Methods in Theor. Physics, Trieste 1981, Eds. G. Denardo & H. D. Doebner, World Sci. 1983, pp. 201-209.

T. Murphy and L. O'Raifeartaigh:

* A note on supersymmetry breaking in 1+1 dimensions. Nuclear Phys. 218B (1983), 484-492.

Effect of the renormalization group on the symmetry breaking patterns of the SU(n) Higgs potential. Nuclear Phys. 229B (1983), 509-527.

T. Murphy:

* Two-loop β functions for scalar fields. Nuclear Phys. 214B (1983), 357-368.

Y. Fujimoto, L. O'Raifeartaigh, & Parravicini:

* Effective potential for non-complex potentials. Nuclear Phys. 212B (1983), 268-300.

S. Aoyama, Y. Fujimoto, & Z. Zhao:

Unification incorporating observable fractional charge, magnetic monopole and maphon. Phys. Lett. 124B (1983), 185-191.

S. Aoyama & Y. Fujimoto:

Fermion couplied with vortex with dyon excitation. Phys. Lett. 124B (1983), 74-78.

S. Ciulli & T. D. Spearman:

* Search for physical structures on the boundary by optimal analytic continuation from a finite set of interior data points. Phys. Rev. 27B (1983), 1580-1596.

J. Burzlaff:

Uniqueness of the Boguta solution. Phys. Lett. 133B (1983), 95-98.

D. H. Tchrakian:

* Some geometrical models with torsion for monopole-like solutions. Acta Phys. Austriaca 55 (1983), 7-11.

On SU(3) monopoles in the Yang R-gauge. J. Phys. A Math. Gen. 16 (1983), 3639-3643.

J. Rayski & J. M. Rayski:

A supersymmetric (N=8) classification of elementary particles in eleven dimensions. Nuovo Cim. Lett. 37 (1983), 333-336.

P. Garbaczewski:

Chiral invariant Gross-Neveu model: classical versus quantum. Ann. Phys. 150 (1983), 22-47.

G. Prince:

* Reflections on the symmetry-conservation law duality and the Runge-Lenz vector. J. Phys. A Math. Gen. 16 (1983), L105-L108.

Homothethic Killing tensors. Phys. Lett. 97A (1983), 133-136.

P.S. Florides:

* The complete field of charged perfect fluid spheres and of other static spherically symmetric charged distributions. J. Phys. A Math. Gen. 16 (1983), 1419-1433.

* Generalized Robertson-Walker metrics and some of their properties. Phys. Lett. 96A (1983), 7-9.

J. D. McCrea:

* Static, vacuum, cylindrical and plane symmetric solutions of the quadratic Poincaré gauge field equations. J. Phys. A Math. Gen. 16 (1983), 997-1004.

P. A. Hogan:

* Some solutions of the Yang-Mills equations generalizing the Wu-Yang monopole. J. Math. Phys. 24 (1983), 674-676.

* Some Yang-Mills fields constructed from Maxwell fields. J. Math. Phys. 24 (1983), 1661-1664.

A. P. Fordy:

* Projective representations and deformations of integrable systems. Proc. RIA 83A (1983), 75-93.

A. P. Fordy & J. Gibbons:

* Nonlinear Klein-Gordon equations and simple Lie algebras. Proc. RIA 83A (1983), 33-44.

R. Dodd & A. Fordy:

* The prolongation structures of quasi-polynomial flows. Proc. Roy. Soc. 385A (1983), 389-429.

B. A. Kupershmidt:

Deformations of integrable systems. Proc. RIA 83A (1983), 45-74.

D. M. Heffernan:

* Single-parameter characterization of bistability in double contact injection lasers. Phys. Lett. 94A (1983), 106-108.

D. M. Heffernan & R. L. Liboff:

* Induced decay of positronium and grasers. Int. J. Theor. Phys. 22 (1983), 193-206.

K. McFarlane & K. -K. Wan:

* Quantization and meaning of observables linear in momentum. Int. J. Theor. Phys. 22 (1983), 55-66.

In the press:

J. McConnell:

Analytical approach to the study of molecular rotation in liquids. J. Molec. Liq.

Series expansion of the stochastic rotation operator. Proc. R.I.A.

J. T. Lewis & H. Maassen:

Hamiltonian models of quantum stochastic processes. Proc. Conf. on Quantum Probability and Applications to the Quantum Theory of Irreversible Processes, Rome, 1982. Springer.

J. T. Lewis & M. Schreiber:

On a theorem of Weyl. Integ. Eqns. Op. Th.

J. T. Lewis, J. V. Pulè, & P. de Smedt:

The super-stability of pair-potentials of positive-type. J. Statist. Phys.

M. van den Berg:

A uniform bound on trace ($e^{t\Delta}$) for convex regions in R^n with smooth boundaries. Commun. Math. Phys.

M. van den Berg & J. L. van Hemmen:

On a neutral plasma with quadratic interactions. J. Phys. A: Math. Gen.

H. Maassen:

Return to thermal equilibrium by the solution of a quantum Langevin equation. J. Statist. Phys.

J. Burzlaff:

A classical lump in SU(2) gauge theory with a Higgs doublet. Nuclear Phys. B.

J. Burzlaff & E. M. Hornos:

On the relation between complex manifolds and soliton theoretic constructions for self-dual fields. J. Math. Phys.

T. Garavaglia:

Dirac- and Majorana-neutrino-mass effects in neutrino-electron elastic scattering. Phys. Rev. D.

D. H. Tchrakian:

A formulation of massless fields with half-integer spin. Class. Q. Grav.

M. Crampin & G. E. Prince:

The geodesic spray, the vertical projection, and Raychaudhuri's equation. Gen. Rel. Grav.

P. A. Hogan:

Kaluza-Klein theory derived from a Riemannian submersion. J. Math. Phys.

J. D. McCrea:

A NUT-like solution of the quadratic Poincaré gauge field equations. Phys. Lett. A.

F. Marchesoni:

Use and misuse of adiabatic elimination procedures for stochastic processes. Phys. Lett. A.

E. Guardia, F. Marchesoni, & San Miguel:

Escape times in systems with memory effects. Phys. Lett. A.

C. Festa, L. Fronzoni, P. Grigolini, & F. Marchesoni:

The range of validity of the current procedures of adiabatic elimination: Experimental and theoretical evidence. Phys. Lett. A.

M. Dugas, R. Godel, & B. Goldsmith:

Representation of algebras over a complete valuation ring. Q. Jl. Math. (Oxford).

12 LIBRARY

Approximately 290 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 RIA 'permanent loan' scheme was continued, as were other forms of cooperation with research libraries at home and abroad.

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

Other gifts of books and journals - in addition to material

received under exchange arrangements - were received from: Professor McConnell, Dr. Lenoach, Dr. McCrea, Dr. Yamada, Mr. R. Anderson (Dublin), Professor B. Bertotti (Pavia), Dr. V. G. Hart (Queensland Univ.), Mr. P. Larkin (Dublin), Math. Centrum (Amsterdam), EEC, ICTP (Trieste), Karl Marx University (Leipzig), Univ. Korlova (Prague), NORDITA (Copenhagen), Inst. Theor. Phys. (Warsaw), Polish Academy of Sciences (Warsaw), USSR Government Publications (Moscow), Nauka (Alma-Ata, USSR), Kerman University (Iran), and Fermilab (Batavia, USA).

A copy of a cartoon was presented by Imperial College London, and a copy of a photograph of G. J. Stoney was presented by Dr. Yamada.

A small exhibition was mounted in the Lecture Theatre during the Schrödinger Symposium; it consisted mainly of photographs, a collection of books by (or about) Schrödinger, and notebooks, etc.

IV - Annual Report of the Governing Board of the School of Cosmic Physics adopted at its meeting on 17th May, 1984.

A ASTRONOMY SECTION

1 STAFF AND SCHOLARS

Senior Professor:

P. A. Wayman

Professor:

T. Kiang

Research Assistant:

I. Elliott

Experimental Officer:

B. D. Jordan

Research Associates appointed during the year:

P. B. Byrne (Armagh), B. McBreen (UCD), T. P. Ray (UCD), R. M. Redfern (UCG).

Technical and Clerical Staff:

A. M. Callanan, W. M. Dumpleton, P. Duane (to 4 November), W. Fenton (from 1 January to 19 October).

Scholars:

H. Deasy, P. Callanan (from 17 October).

P. A. Wayman served as Adviser to the Executive Committee of the International Astronomical Union throughout the year. He also served on the HIPPARCOS Program Selection Committee of the European Space Agency, on the Irish National Committee for Astronomy, on the Board of Governors of Armagh Observatory, and on the La Palma Working Group of the UK Science and Engineering Research Council. I. Elliott became Secretary/Treasurer of the Irish Astronomical Science Group in May and continued through the year as Secretary of the Irish National Committee for Astronomy and as Observer for Ireland in the Joint Organisation for the Solar Observations.

Jun-han You, from the University of Science and Technology, Hefei, China, was appointed as a Visiting Professor for the period 18 November to 31 December.

J. A. Graham (Cerro Tololo) visited the Astronomy Section from 14 to 29 September.

2 RESEARCH WORK

Cepheid Variable Stars: P. A. Wayman, H. Deasy, with M. J. Stift (Vienna) and C. J. Butler (Armagh).

Dunsink data on the period-luminosity relationships were presented by M. J. Stift and, separately, by M. W. Feast (Cape Town) at the IAU Symposium on the Structure and Evolution of the Magellanic Clouds in Tubingen in September. The paper by Wayman, Stift and Butler, referred to in the 1982 report, was accepted for publication with minor changes.

H. Deasy completed his thesis "Period Changes in Cepheid Variables in the Magellanic Clouds" in May. The analysis showed that from 30 to 40 per cent of the cepheids displayed significant period changes; in about half of the cases the two successive estimates of period change indicated a non-constant rate of change of period. There was general agreement with the estimates based on stellar evolutionary mechanisms as the underlying cause but the significant erratic changes, which were found to be more prevalent for the Small Magellanic Cloud, require another explanation. Some possible mechanisms, including convection changes, were investigated. It was shown that binary orbits would not explain large changes of period.

Photometry of Ap Stars: I. Elliott

An investigation was begun to search for examples of cool Ap stars (Spectrum type: A 'peculiar') which show brightness variations on the time scale of minutes. A proposal for observation with the La Palma 1-m telescope was prepared.

Asteroid Dynamics: T. Kiang

The differing behaviour of asteroids at the 2:1 and 3:2 commensurabilities with Jupiter, resonances to be regarded respectively unstable and stable, were found to correspond to two types of solution of a Hill's equation for departure from a model periodic solution. For a rigorous treatment, displacements in three orbital quantities other than the semi-major axis had to be considered but the procedure led to a logical inconsistency. A new possibility, by using the relations in the approximate, purely-gravitational, "average model"

has been actively considered during the year.

Cosmological Deceleration Parameter: T. Kiang.

In respect of the determination q_o from the Hubble Diagram of quasars, it has been found that the assumption of normal distribution of quasar luminosities gave a less accurate determination than the mere assumption that luminosity is uncorrelated with distance. The combination of likelihood function with other concepts of testing hypotheses has been investigated in order to elucidate this problem.

Cerenkov Line Radiation: T. Kiang, J. H. You.

The theory of Cerenkov line emission, originated by J. H. You, was investigated. The theory attributes broad emission lines in quasars to relativistic electrons emitting radiation in restricted spectral regions near to the wavelengths of strong atomic lines. It was investigated how some features of quasars, especially the anomalously low Lynam/Balmer ratio, the steep decrement along the Balmer series, and other properties might be accounted for. It was found that the theory predicts certain relations among Balmer line intensities, with no free parameter, and that these predictions are satisfied by available observations.

X-ray Sources: P. Callanan, R. M. Redfern (UCG).

A review of x-ray and optical properties of x-ray binaries has been begun, with a view to making simultaneous optical/x-ray observations, using Exosat and the La Palma telescopes. Observations are planned for Her X-1, LMC X-4 and the globular cluster NGC 6624.

3 ELECTRONICS LABORATORY AND WORKSHOP: B. D. Jordan, B. McBreen (UCD).

Development of a Charge-coupled device (CCD) camera jointly with the Physics Department, UCD, continued during the year. The design of a mechanism to display the image on a monitor was considered and the commercially-available MATROX board was adopted, this being an addition to the LSI 11 computer used for camera control, permitting the display of a 256 x 256 pixel image. A special-purpose very-large scale-integration silicon chip has been designed by B. D. Jordan and L. Metcalfe (UCD) and made by the Microelectronics Department at Queen's University, Belfast, using an "uncommitted logic" device, so as to replace the existing clock circuitry of the CCD. In the Astronomy Section improved level-shifting and clock drive boards have been built.

At UCD the LSI 11 computer was interfaced to the CCD and macro programs were developed to handle the data and write to a floppy disk unit. A larger disk system is under consideration to improve

flexibility and speed.

Jointly with the UCD Physics Department and the UCD Computer Centre, the Astronomy Section has installed a Sigma T5607 graphics terminal and an Anadex 9620 printer capable of providing a terminal to the VAX 11/780 computer so as to utilize 'Starlink' software and data files.

A 1200-baud modem has been leased from Telecom Eireann and installed at Dunsink Observatory to provide a high speed link with the UCD computers and thence to the Starlink network.

The Shortt Free Pendulum Clock was cleaned, overhauled and remounted as a display item near the Meridian Room; a new power supply was provided replacing the battery unit formerly in use.

The documentation of the Acquisition & Guidance box control computer completed on behalf of the Royal Greenwich Observatory in 1981 was written up in the form of a maintenance file. The workshop lathe and milling machine were renovated during the year.

4 COMPUTER INSTALLATION: I. Elliott, B. D. Jordan

A spooling device was added to the Apple II word processing system, increasing its effective speed. It has been in constant use for producing typed documents. A similar device (SPRINTER) was added to increase the power of the Nova System matrix printer and to make it suitable for receiving data at 1200 baud.

The Starlink Software Collection was installed on the VAX 11/780 computer at UCD. Arrangements were made for gaining direct access to the Starlink packet-switching network from Dunsink and from UCD. The network permits access to the data bases for the International Ultraviolet Explorer, the UK Schmidt Telescope, and the Anglo-Australian Telescope, and to over 500 Starlink users in the UK for exchange of data and information in astronomy and related sciences. The Numerical Algorithms Group Library was incorporated on a joint DIAS-UCD subscription.

5 OBSERVATORY DEL ROQUE DE LOS MUCHACHOS

The 1-m telescope was delivered to the observatory site on the Spanish island of La Palma and the building, erected on the mountain at an altitude of 2369m above sea level, was substantially completed during the year. The Observers Guide for UK Optical Telescopes on La Palma was distributed to nine locations in Ireland by the Royal Greenwich Observatory (RGO). Guidelines for application for telescope time through the UK Panel for Allocation of Telescope Time

(PATT) were distributed to interested scientists in Ireland and applications for 'Semester F' (ending 31 August 1984) were received by the Advisory Committee for the La Palma Project prior to their being sent to PATT. This was in accord with an informal but specific agreement made with the Chairman of PATT and the RGO director that the 27 nights' entitlement with the 1-m telescope be commuted, for an initial (unspecified) period, for the right of Irish observers to compete with UK and Dutch observers on PATT applications of all kinds; this was judged to be in the best interests of Irish astronomers with varied requirements and to be such as to encourage interchange of material with astronomers elsewhere.

The Advisory Committee produced Information Sheet Nos 6 & 7 in May and October respectively.

6 1983 SUMMER SCHOOL IN PHYSICS

The topic of Astrophysics was chosen for a Summer School held in the DIAS Lecture Room, 10 Burlington Road, from 26 June to 8 July 1983. Principal lecturers were:

Professor L. Mestel (Sussex)
Professor J. L. Culhane (Mullard Space Science Laboratory, London)
Professor R. D. Davies, (Jodrell Bank)
Dr. N. O'Murchada (UCC)
Professor L. O'Raifeartaigh (DIAS)
Professor P. A. Wayman (DIAS)
Dr. M. de Groot (Armagh)
Dr. B. McBreen (UCD)
Professor P. K. Carroll (UCD)
Professor D. O'Sullivan (DIAS)
Dr. S. M. P. McKenna-Lawlor (Maynooth)
Professor N. A. Porter (UCD)
Dr. P. B. Byrne (Armagh)

There were other contributions for seminars and single-lecture sessions; the course attracted 34 registered participants.

7 CONFERENCES, LECTURES, ETC.

The Statutory Public Lecture for the School was given by Professor A. Blaauw (University of Groningen, Netherlands), formerly President of the International Astronomical Union, who spoke on "Star-Formation and Interstellar Clouds" at University College, Dublin, at Belfield, on Wednesday, 4th May.

The following astronomy colloquia were arranged:

19 April	P. B. Byrne (Armagh): "Flare Star Statistics"
3 May	T. Kiang: "Stability of Asteroids in near resonance with Jupiter".
17 May	H. Deasy: "Instabilities in Upper Main Sequence Stars".
28 Sept	J. A. Graham and P. A. Wayman: "Summary of IAU Symposium on the Magellanic Clouds".

University lecture courses were given by P. A. Wayman in Trinity College, Dublin (Hilary Term) "Introduction to Nuclear Astrophysics" and in University College, Dublin, (Michaelmas Term), "Physical Properties of Stars".

The following Scientific Meetings were attended:

P. A. Wayman:	Royal Astronomical Society Spring Meeting, Keele, 7-8 April. Symposium on Stellar Classification, Toronto, 8-9 June. IAU Colloquium on Nearby Stars, Middletown, Connecticut, 13-15 June. IAU Symposium No. 108 on the Structure and Evolution of the Magellanic Clouds, Tubingen, FRG, 5-8 September.
T. Kiang:	Conference on Asteroids, Comets and Meteors, Uppsala, 20-22 June. IAU Symposium on "Statistical Methods in Astronomy, Strasbourg, 12-16 September.
I. Elliott:	EPS Study Conference: Oscillations as a Probe of the Sun's Interior, Catania, Italy, 20-24 June.
B. D. Jordan:	Instrumentation in Astronomy, V., Imperial Coll., London, 5-9 September.
H. Deasy:	Study Course on Instabilities in Upper Main Sequence Stars, Saas-Fee, Switzerland, 20-26 March.

P. A. Wayman attended the IAU Executive Committee Meeting No. 51, Munich, FRG, 12-16 September.

T. Kiang visited the Jet Propulsion Laboratory, Pasadena, the Lowell Observatory, Arizona, and the U.S. Naval Observatory, Washington during April by invitation, lecturing on Chinese Traditional Astronomy.

P. A. Wayman lectured to the Irish Astronomical Association, Belfast, on the La Palma Observatory (9 Nov) and to the Dublin Centre, Irish Astronomical Society on the Magellanic Cloud Cepheids (5 Dec).

Public Open Nights were held on 15 occasions during the year, and visiting groups from Colaiste Eoin (23 March), Royal Dublin Society Youth Week (6 July), The 1983 Dublin Summer School in Physics (7 July), The Irish Horological Society (29 October) and UCD Extra-Mural Group (7 Dec) were received. Other visitors included J. Allen (NASA), H. Albers (Vassar), A. Blaauw, J. Graham, Lord Rosse and Patrick Moore.

A Special Exhibition - *Scientific Instruments of Birr Castle* - was mounted 28 December 1983-17 January 1984 and was opened by Professor W. A. Watts, Provost of Trinity College, on 28 December.

8 PUBLICATIONS

The publication arrangements for the Irish Astronomical Journal and the Chinese Journal of Astronomy and Astrophysics continued as in previous years.

Published 1983:

Irish Astronomical Journal Vol. 15, No. 3 (March 1982)
Vol. 15, No. 4 (September 1982)

Chinese Astronomy & Astrophysics Vol. 7.

P. A. Wayman joined the Editorial Board of Vistas in Astronomy.

Journals, etc.:

T. Kiang:
"Stability of Asteroids in near-resonance with Jupiter: a new approach", in Asteroids, Comets and Meteors (ed. Lagerkvist and Rickman), Uppsala, 1983, pp. 145-148.

T. Kiang:
"Statistical Problems in the Determination of the Cosmological Parameter q_o", Proceedings of the Symposium on Statistical Methods in Astronomy, Strasbourg, 1983, pp. 209-213.

P. A. Wayman, M. J. Stift, and C. J. Butler:
"Photometry of Cepheid Variables in the Large Magellanic Cloud", Astronomy & Astrophysics Suppl. 56: 169-220, 1984.

H. P. Deasy and P. A. Wayman:
"Period-Change in Magellanic Cloud Cepheids", IAU Symposium No. 108 (ed. S. van den Bergh, K. S. de Boer), Reidel 1984, p. 227.

H. P. Murphy:
"CCD Camera Observations of Nearby Rich Clusters, II. Techniques and Results for A85", Mon. Not. R. Astron. Soc. (in press).

T. Kiang:
"Notes on Traditional Chinese Astronomy", The Observatory, 104: 19, 1984.

I. Elliott:
"Time, Eternity and James Joyce", Irish History Workshop Journal (in press).

Notes, Abstracts, etc. in the Irish Astronomical Journal:

P. A. Wayman:
"Dunsink Observatory in 1982", 16: 1983.
"A Lunar Crown", 16: 77, 1983.
"Astronomy as a Leisure Activity of the Future", 16: 1983.

I. Elliott:
"The Large European Solar Telescope", 16: 23, 1983.
"Remote Observing", 16: 78, 1983.
"Nobel Prize for Astrophysicists, 16: 1983.
"The Irish Meteorological Society, 16: 1983.

Reviews, etc. and Theses

T. Kiang:
The Shorter Science and Civilisation in China: Z - An Abridgement by C. A. Ronan of Joseph Needham's original text. The Observatory, 104: 42, 1984.

I. Elliott:
Disturbing the Universe, by F. Dyson, I.A.J. 16: 88, 1983.
Newgrange, by M. J. O'Kelly, I.A.J. 16: 1983.

P. A. Wayman:
The Cosmic Serpent, by V. Clube and W. Napier, I.A.J. 16: 1983.
R. S. Ball, biographical notice
J. Brinkley, biographical notice
Dictionnaire des Philosophes, Presses Universitaires de France, 1984.

H. P. Deasy:
Period-Changes in Magellanic Cloud Cepheids, M.Sc. Thesis, University of Dublin, 1983.

9 MISCELLANEOUS

Buildings and Grounds, Dunsink Observatory

A small dwelling, "The Grove", was completed during the year and occupied by J. McFeeley, groundsman.

The Joyce Monument at Sandymount Park

The design of the Joyce Sundial was completed in consultation with Cliodna Cussen, sculptress, and the erection of the sundial was supervised by I. Elliott, being oriented by observations of Polaris. The momument was inaugurated by the Lord Mayor of Dublin, Mr. Michael Keating, T.D., on 16th December.

B COSMIC RAY SECTION

1 STAFF AND SCHOLARS

Senior Professor:

C. O. Ceallaigh

Professor:

Vacant

Assistant Professors:

D. O'Sullivan and A. Thompson

Research Assistant:

Vacant

Experimental Officer:

J. Daly

Technical and Clerical Staff:

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

2 RESEARCH WORK

(a) Space Shuttle Related Projects

(i) The Long Duration Exposure Facility (LDEF) Mission

The final stages of preparation for the Cosmic Ray Section's extensive study of ultra heavy cosmic ray nuclei in collaboration with the European Space Research and Technology Centre (ESTEC) were completed successfully. Vibration tests of the experiment hardware to the new levels stipulated by NASA in 1982, were continued at ESTEC and were finalised in March 1983. The vibrated pressure vessels were then leak tested and all were found to conform to NASA flight acceptance criteria.

The assembly and integration of the thermal control covers with the experiment trays were carried out between March and May. Estimates of temperature extremes expected during the LDEF mission, derived from the final overall NASA thermal analysis, were communicated to experimenters by the Langley Research Center.

In 1982, the world's first high energy ultra-heavy ion beams were successfully accelerated at the Berkeley Bevalac and a proposal by A. Thompson and D. O'Sullivan to calibrate the LDEF solid state nuclear track detector hardware with ultra-heavy ions was accepted by the Bevalac Nuclear Science Programme Advisory Committee. In May 1983, A. Thompson and J. Daly carried out a series of calibration irradiations using 960 MeV/N uranium (U^{238}) ions and 300 MeV/N iron (Fe^{56}) ions at the Bevalac. Twelve flight stacks and one control stack were exposed to both beams within their respective sealed pressure vessels. The exposures to ultra heavy ions will greatly enhance the scientific value of the experiment and further (post-flight) calibration is planned after the retrieval of the LDEF in 1985.

During November and December, the sixteen flight trays which were completely assembled, tested and inspected were shipped to Kennedy Space Center in Florida to await integration with the LDEF, prior to launch into earth orbit using the Space Shuttle Challenger, during flight 41-C scheduled for April 1984.

(ii) The Second LDEF Mission

In July 1983, D. O'Sullivan and A. Thompson were invited to the Goddard Space Flight Center together with scientists from four of the leading U.S. groups in the field of cosmic rays to present new results which were relevant to a proposed LDEF-2 mission and to discuss a management plan and the general experimental approach for such a mission. At this meeting it emerged that the recent discoveries at the DIAS Cosmic Ray Section of the Registration Temperature Effect and of a new polycarbonate solid state nuclear track detector, were regarded as being a major contribution to the planning of the second LDEF mission. In fact, these DIAS discoveries have become central experiment design drivers for the mission.

The U.S. Academy of Sciences voted to approve the LDEF-2 programme in October 1983. NASA will cover the cost of all hardware, experiment development and flight operations. Because of the magnitude of the programme, the experiment hardware will be built by commercial contract, at a centre with facilities for the construction of space qualified equipment. The launch date is scheduled for 1987 with recovery two years later. Members of a small Science Steering Committee will be selected for the mission on a competitive basis, via proposals, during the first half of 1984 and later an Announcement of Opportunity will be distributed to the scientific community inviting proposals for analysing the stored data after recovery.

(b) Giotto Mission

The Energetic Particle Experiment (EPONA) which involves a collaboration between the Cosmic Ray Section, St. Patrick's College Maynooth, The Max Planck Institut für Aeronomie (MPAe), Germany,

ESTEC and the University of Sydney continued to an advanced stage of development during 1983. The experiment was one of ten chosen for the European Space Agency's Giotto Mission to Halley's Comet in 1985-86. An important milestone in the development of the experiment was the Intermediate Design Review held at Maynooth in May and attended by the Giotto Project Scientist R. Reinhardt, the Project Manager D. Dale, the Project Engineers J. Credland and J. Beale, as well as the European members of the EPONA team (E. Kirsch, S. McKenna-Lawlor, D. O'Sullivan, A. Thompson and K.-P. Wenzel).

Construction of the engineering model (EM) was completed during 1983. Environmental tests of the EM took place at Braunschweig, Germany (magnetic cleanliness), at MPAe (thermal vacuum tests) and at ESTEC (vibration acoustic and mechanical tests). The Institut für Datenverarbeitungsanlagen (IDA) at Braunschweig developed the software required for the automatic testing of the experiment.

The EPONA EM was successfully integrated with the spacecraft EM at British Aerospace, Bristol in September 1983 and work is now proceeding on two flight models.

A. Thompson and D. O'Sullivan spent two working periods at MPAe and ESTEC in furtherance of the EPONA experiment and collaborated with personnel from the IDA, Braunschweig in the development of experiment ground support systems for use during the mission. Of particular importance, with regard to the latter, is the provision of "Quick-look" facilities for all of the nine operating modes of the EPONA instrument to monitor data recorded and telemetered during the mission.

(c) Track Response Studies and Detector Development

Studies of the track response of dielectric materials to heavy ions continued and were considerably augmented by exposures to the newly available ultra heavy beams at the Lawrence Berkeley Laboratory Bevalac. Most of the effort during the year was dedicated to the investigation of various aspects of the Registration Temperature Effect. Preliminary data analysis has now been completed for an experiment designed to investigate the Registration Temperature Effect in the temperature interval below - 100°C but above the anomalous liquid nitrogen region using a number of different solid state nuclear track detector stacks sealed in a temperature controlled pressure vessel and irradiated with 245 MeV/N Fe^{56} ions (see Annual Report 1982). It has now been established that the relative signal strength continues to increase with decrease in registration temperature in this low temperature domain above the anomalous nitrogen region. Furthermore, within the limits of experimental error and temperature cycle time no evidence of hysteresis in the registration temperature effect was observed for any of the detector polymers under study. This is an extremely important result for the design of "event temperature" monitoring equipment for the LDEF-2 mission.

During May an extension of the DIAS programme to investigate the Registration Temperature Effect for ultra heavy ions was initiated by exposing a number of track detector stacks, incorporating two types of polycarbonate polymer and three types of allyl diglycol carbonate polymer (CR-39), to high energy Uranium (U^{238}) and Iron (Fe^{56}) beams at different registration temperatures. The irradiations were carried out at the Bevalac by A. Thompson and J. Daly. Information in this area is urgently required for the LDEF-2 experiment hardware design and, indeed, for the overall thermal design of the LDEF-2 spacecraft, in order to optimise the charge and energy resolution of the data to be collected during the mission. The Cosmic Ray Section is, at present, the only group in the world in a position to provide the relevant experimental data.

Scanning, track measurement and data analysis are now in progress and preliminary results indicate that the Registration Temperature Effect for Uranium nuclei is greater than expected, for all five types of solid state nuclear track detector polymer under study. A major new result is the discovery that the rate of increase of relative signal strength (with decrease in registration temperature) is itself a strongly increasing function of ionisation.

4 EXTERNAL ACTIVITIES

Working visits were made to the following centres by staff members, in furtherance of the LDEF-1, LDEF-2 and Giotto space missions

MPAe, Germany and ESTEC, Holland (8-12 March)	A. Thompson,	D. O'Sullivan
Maynooth (2-4 May)	"	"
Berkeley and NRL Washington (19 May - 2 June)	"	J. Daly
Goddard Space Center, USA (23-29 July)	"	D. O'Sullivan
MPAe and ESTEC (12-17 December)	"	"

D. O'Sullivan attended the 12th International Conference on Solid State Nuclear Track Detectors in Mexico in September. He delivered an invited talk and presented a number of papers on recent results obtained by the Cosmic Ray Section.

A. Thompson and D. O'Sullivan attended the Irish Astronomical Science Group meeting in Armagh on May 5th.

D. O'Sullivan contributed two lectures at the Dublin Summer School in Astrophysics in July, addressed the Dublin University Physical Society (April) and delivered a talk during the RDS Astronomy week (July).

Professor O Ceallaigh as a member of the Space Science Standing Committee of the European Science Foundation, attended a meeting in Munich (11,12 January).

5 GENERAL

A. Thompson continued as secretary of the National Committee for Physics and as a member of the Royal Irish Academy Committee for Space Research. D. O'Sullivan continued as a member of the Editorial Board of the journal Nuclear Tracks and Radiation Measurements.

Working visits to the Cosmic Ray Section were made during the year by Dr. A. Vidal-Quadras, University of Barcelona (January and July).

6 PUBLICATIONS

D. O'Sullivan, A. Thompson, J. Daly, C. O'Ceallaigh, K.-P. Wenzel, V. Domingo and A. Smit:

The Ultra Heavy Cosmic Ray Experiment on the NASA Long Duration Exposure Facility (LDEF). Proceedings of the 18th International Cosmic Ray Conference, Bangalore, India, 22 August - 3 September, 1983.

A. Thompson and D. O'Sullivan:

Preliminary Results on the Registration Temperature Effect for Uranium Ions in Various Solid State Nuclear Track Detectors. Proceedings of the 12th International Conference on Solid State Nuclear Track Detectors, Acapulco, Mexico, 4-10 September, 1983.

D. O'Sullivan, A. Thompson, J. H. Adams and L. P. Beahm:

New Results on the Investigation of the Variation of Nuclear Track Detector Response with Temperature. Proceedings of the 12th International Conference on Solid State Nuclear Track Detectors, Acapulco, Mexico, 4-10 September, 1983.

D. O'Sullivan:

Some Recent Developments in the Study of the Elements and Isotopes of the Cosmic Radiation. Vistas in Astronomy, Vol. 26, pp. 87-105, 1982.

A. Thompson, D. O'Sullivan, J. H. Adams and L. P. Beahm:

The Variation of Track Response with Registration Temperature in Solid State Nuclear Track Detectors and its Implications for Cosmic Ray Composition Studies. Proceedings of the 18th International Cosmic Ray Conference, Bangalore, India, 22 August - 3 September, 1983.

S. McKenna-Lawlor, A. Thompson, D. O'Sullivan, E. Kirsch, K.-P. Wenzel and D. Melrose:

EPONA, An Energetic Particle Detector System for the Giotto Mission to Halley's Comet. Proceedings of the 18th International Cosmic Ray Conference, Bangalore, India, 22 August - 3 September, 1983.

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

Research Associate:

N. P. Murphy (from October 1)

Scholar:

C. P. Lowe (from November 1)

Technical and Clerical Staff:

K. Bolster, Miss A. Byrne, Mrs. D. Young née E. Ryan, Miss V. Ward, G. Wallace.

Vacation Students:

Miss A. Doyle, Miss G. McDonald.

2 RESEARCH WORK

(a) Gravity

Following the study of the Irish maps as reported last year the positions of the gravity stations can now be given to an accuracy of ten metres: the method will be published later. This enables the results of the survey to be published in the form of an overlay for superposition on the Ordance Survey half an inch to one mile sheets. The drafting of the results to the current international specifications was started.

Additional readings were taken in Co. Clare covering in greater detail than formerly the area traversed by the cross country deep seismic line.

Analysis of certain areas from Mullingar to Gort, where the gravity field is low indicates that the cause is most likely a granitic body and not a thick sedimentary formation. This study was extended to other parts and there is a distinct correlation between the postulated granites and base metal deposits.

During a "site investigation" in the Boyne valley at Drogheda, just east of the railway viaduct, the contractors encounted dioritic granite where the underlying rock was considered as Carboniferous limestone and mapped as such. This unusual occurrence confirmed a postulation made in our Memoir No. 2 published in 1952.

Further gravity readings were taken in the west Kildare-Wicklow district to bring the density up to the required value.

(b) Magnetics

A survey of the western part of Galway Bay was undertaken in collaboration with the Applied Geophysics Department of University College Galway using the R.V. Lough Beltra. The results were used in a thesis by Miss Carmel Lowe, a graduate student at the above Department, who later joined the Section as a Scholar. Preliminary analysis shows the sharp change in magnetic character along a north-west-southeast line which extends a similar marked feature in Co. Clare that cuts across the seismic line already referred to. It seems to mark a major boundary.

(c) Rock Magnetism

Palaeomagnetic measurements were continued on Lough Doo (Co. Mayo) and Danish lake sediment cores. Since D.I.A.S. does not have facilities for demagnetization of palaeomagnetic samples and also since many of the samples are so weakly magnetised (intensity of natural remanence J_N < 100 pT that a SQUID magnetometer is necessary for their accurate measurement, most of the measurements were performed at the Department of Geophysics, University of Edinburgh, to whom we are most grateful (facilities are made available without charge). (a) Lough Doo: Alternating field demagnetization studies show the magnetization direction is quite stable up to peak fields of at least 20 - 30 mT, the limit being controlled mainly by the intensity of magnetization which becomes too weak to determine accurately. The variations of declination and inclination with depth in the cores show certain similarities with records from the U.K., but it is not possible to completely correlate both the inclination and declination using the preliminary dating constraints suggested by pollen analysis (performed at the Department of Botany,

U.C.G.). At this stage we suspect physical disturbances of the cores may be the cause, rather than a major difference in the geomagnetic field behaviour between Ireland and the U.K. Radiocarbon dating which is presently in progress should give better dating control with depth and allow a more definite interpretation of the geomagnetic record.

Rock magnetic measurements e.g. acquisition and demagnetization of anhysteretic and isothermal remanences suggest that the main magnetic mineral is fine grained magnetite. An interesting result is the unusally high J_N/low field susceptibility ratio compared to other lake sediments. Although this may arise from the overall low values of both quantities so that the diamagnetic contribution to the susceptibility becomes significant, or from the occurrence of a particular grain size distribution, it most probably indicates a higher than usual alignment efficiency of the magnetic particles in the sediment. The Zoology Department at U.C.D. is performing detailed mineral analysis on one of the cores from Lough Doo and it is hoped that comparison with the magnetic properties will yield further insight into the magnetic mineralogy and also into the soil development history around the lake. (b) Danish Lakes: Samples have now been removed and measured from a total of eight cores from four different lakes. The most weakly magnetized material (< 10 pT) from Lake Grane Langso shows scattered directions of magnetization yielding very little information about geomagnetic field variations, but the cores from Lakes Sorroso, Skanderberg and Stubbso give high quality palaeomagnetic records with good intra-lake correlation. Six radiocarbon dates on a core from Sorroso have been authorized, and it is hoped to get more from Lake Skanderborg which will allow more definite inter-lake correlation. Preliminary correlations suggest there are some differences between the Danish and U.K. records suggesting that short period secular variations are geographically more variable than is generally supposed.

(d) Meteorology

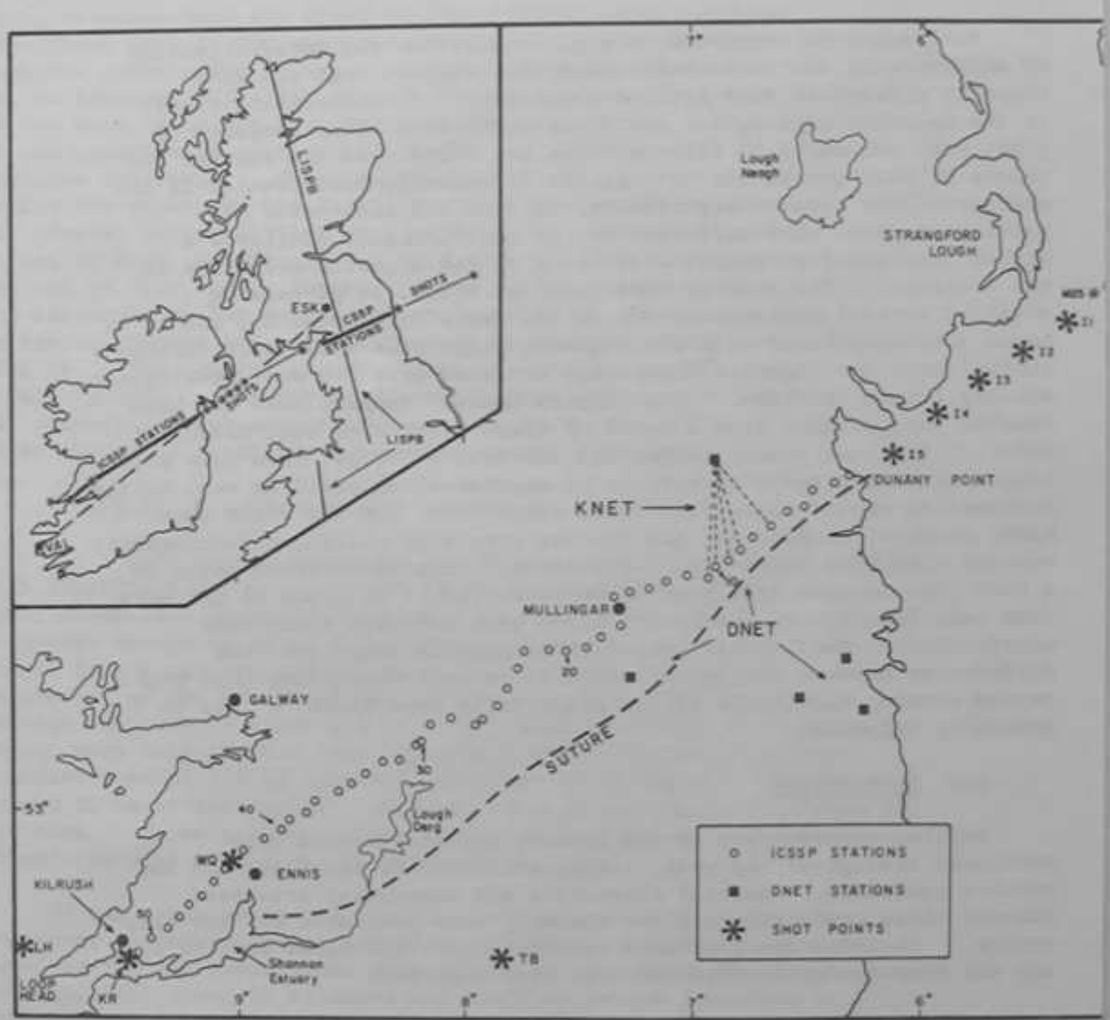
Routine observations of the meteorological elements were continued throughout the year, autographic records tabulated and the results published. Several scientific and commercial interests request these since they are now the only ones available for the city centre. Included are Ice Cream manufacturers, for sales forecasts, and Gas Company for correlation with past supplies.

(e) Seismology

Seismic structure of Ireland.

The Irish Caledonian Suture Seismic project (ICSSP), which took place in the summer of 1982 (see Map), again dominated activities under this heading in 1983. Some additional data gathering was carried out in January and February in Co. Clare. In early March

all the ICSSP data recorded on our own recorders was transcribed onto Geostore library tapes. These tapes were taken to Edinburgh and digitized there on the PDP 11/50 computer belonging to the Global Seismological Unit of IGS.



Location map of shots and stations in the Irish Caledonian Suture Experiment, Inset ICSSP in relation to other experiments.

In April this digital data was taken to Karlsruhe by Professor Jacob (BJ). The digitizing of the data recorded by the German stations in 1982 (see last year's report) was then begun. This stage, together with the checking, "despiking" of the digital data, merging of the DIAS and Karlsruhe data sets, etc., took until the end of June. During this period BJ was helped for three two-week periods by Eilish Ryan, Vivienne Ward and Kevin Bolster (chronological order). Throughout this period the processing occupied the Raytheon 500 computer almost 100% of the time, 24 hours a day, 7 days a week. Dr. W. Kaminski did a lot of work too in the second stage processing of the data which ran parallel with the digitizing. By early July it was possible to start plotting the very large number of seismic stations available. This process took about two more months but within two weeks, by mid-July, the preliminary sections necessary for the crustal interpretation were ready. Dr. C. Prodehl and BJ were joined by Prof. Murphy (TM) in this work. TM returned to Dublin at the end of July, BJ in August. Some further work was done in Dublin and Karlsruhe in the autumn and in December BJ spent a few days in Karlsruhe (before and after a Council of Europe Meeting in Strasbourgh) with CP. The crustal structure for the seismic profile was finalized then. Reports have already been written for the mining and oil companies which gave financial support to the project. The first paper should be ready for submission in the spring of 1984.

A very brief summary of the results is as follows:

The P_g velocities recorded in eastern Ireland rise quite rapidly with depth to 6.3 - 6.5 km/s but in the western part of the profile lower velocities between 6.0 and 6.3 km/s were recorded. Prominent energy in later arrivals can be correlated by two reflected phases from a mid-crustal boundary and the Moho. A low-velocity zone is present at the NE end of the line and a mid-crustal layer with an average velocity of about 6.4 km/s is separated from the lower crust, mean velocity 6.8 km/s, by a well established mid-crustal boundary zone of 1-2 km thickness at about 20 km depth. The Moho, around 32 km at its deepest, shallows towards the sea at both ends of the line. It is a sharp discontinuity under western Ireland but a transition zone of 3-4 km thickness in the east.

BJ was assisted in his stay in Karlsruhe by a grant from the Deutscher Akademischer Austauchdienst (DAAD). During his stay he also visited the geophysical observatory at Schiltach, the German Seismological Array in Erlangen and the Geophysical Institute in Munich. He obtained computer programs from Erlangen and Munich.

The Erlangen program was a new synthetic seismogram program written by Dr. R. Kind. Dr. Kind subsequently visited Dublin in October. He and BJ got this very large program going on the DIAS Eclipse S130.

Seismic Networks

The seismic networks (DNET and ENET) continued to operate during 1983. No additions were made to the existing eight stations. The summer and autumn were notable for a series of severe thunderstorms. This caused an unusually large amount of "down-time" on the network. DNET was knocked out in July and, though it was subsequently repaired, there was quite a long sequence of trouble with it. This was probably caused by electronic components which suffered damage which only emerged after some further use. The final stroke, literally, occurred just before Christmas when a strike at Carnsore Point knocked out ENET. The restoration of this network will be discussed with the ESB.

The most interesting local seismic event happened near Enfield, Co. Meath on Sunday 11 September. It was a very small event (M_L = 0.8) but it was very shallow and reached unusually high intensity over a small area.

Enquiries

A variety of enquiries have been dealt with. The largest one concerned vibrations in a water intake tower at the Turlough Hill pump storage site. The frequencies were so low that the ESB test equipment could not handle the measurements. Because the amplitudes were so large the DIAS Geostore equipment had to be "de-tuned". Recordings were made for two weeks and the time-of-occurrence, amplitudes, and frequencies of the vibrations were successfully measured.

3 EXTERNAL ACTIVITIES

A geophysics course, comprising eleven lectures and one field demonstration, was given by A. W. B. Jacob, T. Murphy and P. W. Readman in the Physics Department of University College Dublin as part of their curriculum for third and fourth year students: February 1 - March 11.

A. W. B. Jacob gave a seminar "Seismic studies of the Crust in Ireland", at U.C. Galway, February 11.

A. W. B. Jacob, T. Murphy and P. W. Readman attended the 7th United Kingdom Geophysical Assembly held in Leicester April 11-13.

A. W. B. Jacob attended the Royal Society Working Group on Explosion Seismology at Leicester April 14 and the Council of Europe Meeting of the Ad. Hoc. Committee of Experts on Earthquake Research at Strasbourgh, December 19-20.

4 PUBLICATIONS

A. W. B. Jacob, G. Neilson and V. Ward:

"A seismic event near the Hebrides Terrace Seamount", Scott. J. Geol., 19, 287-296, 1983.

A. P. Beese, P. M. Brück, J. Feehan and T. Murphy:

"A silica deposit of possible Tertiary age in the Carboniferous Limestone near Birr, County Offaly, Ireland". Geol. Mag. 120, 331-340, 1983.

Abstracts:

A. W. B. Jacob, T. Murphy, W. E. A. Phillips and C. Prodehl:

"The Irish Caledonian Suture seismic programme 1982". Geophys. J.R. astr. Soc. 73, 285.

P. W. Readman (with S. Papamarinopoulos, Y. Maniatis and A. Simopoulos):

"Petromagnetic and Palaeomagnetic Studies at Petralona Cave, Greece". International Symposium for Archaeometry, Naples.

5 SEMINARS

October 20 Dr. R. Kind of Central Seismic Observatory, Germany: "Synthetic Seismograms".

6 MISCELLANEOUS

N. P. Murphy, ex scholar, took up position of Lecturer in Physics in the Regional Technical College Waterford in October and became a Research Associate in November.

Vacation students, Misses A. Doyle and G. McDonald of the Regional Technical College, Athlone, spent six weeks each in the School being instructed in reading seismic records and processing.

COMPUTER INSTALLATIONS

Data General Eclipse System:

During the year a new operating system was put into action. This was necessary to handle some hardware additions and changes. The

Dasher LP2 Printer now has its own controller. This has removed one source of delays encountered by users as it has become a spoolable device. A Westward 1015 Graphics Terminal was also added to the system and this operates in a similar way to the CalComp Plotter. The terminal enables plots to be rapidly displayed before plotting. This saves time (and paper) in program development and it also speeds up computer modelling processes - where the user is seeking theoretical models to match experimental data.

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

Income and Expenditure Account
for the year ended 31 December 1983

982			1983
£	INCOME	NOTES	£
'4,000	Oireachtas Grants	1(a), 2	1,435,800
8,944	Sales of Publications	3	43,225
5,920	N.B.S.T. Project		4,749
0,165	Miscellaneous	4	43,732
9,029			1,527,506
	EXPENDITURE	5	
1,921	Administration		393,121
'5,476	School of Celtic Studies		327,925
9,623	School of Theoretical Physics		232,786
6,018	School of Cosmic Physics		538,537
6,140	Adaptation of Premises		34,933
9,178			1,527,302
9,851	SURPLUS (DEFICIT) for year	6	204

Notes 1 to 11 form part of these accounts.

T. K. WHITAKER
CHAIRMAN - COUNCIL OF THE INSTITUTE

25th July, 1984.

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

Balance Sheet at 31 December 1983

1982				1983
£	CURRENT ASSETS	NOTES		£
246,723	Cash on hands and at Bank			188,100
56,684	Debtors and Prepayments			102,135
303,407				290,235
	Less			
	CURRENT LIABILITIES			
47,657	Creditors and accruals		32,590	
11,691	Vernam Hull Bequest	7	13,382	45,972
59,348				
244,059	NET CURRENT ASSETS			244,263
	Represented by	6		
244,059	INCOME and EXPENDITURE - Accumulated Surplus			244,263

Notes 1 to 11 form part of these accounts.

T. K. WHITAKER
CHAIRMAN - COUNCIL OF THE INST

25th July, 1984.

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

NOTES TO THE ACCOUNTS

1. Accounting policies

(a) Oireachtas Grants:- Income shown in the Accounts as Oireachtas Grants is the actual cash received in the period of the Account and includes £49,800 for increases in remuneration.

(b) Premises:- The premises occupied by the Institute are leased from the Office of Public Works.

Expenditure on additions to such premises is written off in the Income and Expenditure Account.

(c) Furniture and Equipment:- Expenditure on furniture and equipment is written off in the year in which it is incurred.

(d) Library:- Expenditure on library books and materials is charged to the Income and Expenditure Account. The current value of such books and materials is estimated at £368,000.

(e) Publications:- Expenditure on publications is written off in the year it is incurred. The estimated value of such publications on hand at 31 December 1983 was £445,000.

2. Oireachtas Grants

Grants voted to the Institute have been allocated under the following headings:

1982		£	£
372,290	Administration	331,708	
257,800	School of Celtic Studies	298,000	
206,000	School of Theoretical Physics	223,592	
537,900	School of Cosmic Physics	552,500	
10	Adaptation of Premises	30,000	1,435,800
1,374,000			

3. Sales of Publications

26,743	School of Celtic Studies	42,943	
55	School of Theoretical Physics	43	
2,146	School of Cosmic Physics	239	43,225
28,944			

4. Miscellaneous Income

47,215	Administration	41,266	
1,800	School of Celtic Studies	711	
---	School of Theoretical Physics	470	
1,150	School of Cosmic Physics	1,285	43,732
50,165			

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

NOTES TO THE ACCOUNTS

5. Analysis of Expenditure

1982		Total	Administration	School of Celtic Studies	School of Theoretical Physics	Scho Cosmic
£		£	£	£	£	
862,710	Salaries, Wages & Superannuation	940,505	188,482	222,428	140,366	369
57,946	Scholarships	51,640	-	18,678	29,089	5
100	Honoraria	283	-	200	63	
45,336	Library	56,482	-	6,156	29,428	20
47,356	Publications	71,665	663	68,583	1,748	
47,380	Furniture & Equipment	59,065	4,214	3,479	8,773	41
152,412	General Administration	190,420	190,420	-	-	
45,017	Travel, Survey & Seismic Research	46,784	802	4,064	7,339	34
1,361	Symposium, Summer School & Seminar Expenses	3,071	-	535	935	1
20,578	Consumable Equipment	28,847	-	-	-	28
39,683	General Expenses	35,755	8,560	5,802	7,351	14
-	Schroedinger Commemoration	2,812	-	-	2,812	
5,788	NDST Project	5,060	-	-	5,060	
22,706	Special Commitments	-	-	-	-	
2,942	Fire Replacement Expenses	-	-	-	-	
1,353,038		1,492,369	393,121	327,925	232,766	32
6,140	Adaptation of Premises	34,933				
1,359,178		1,527,302				

6. Surplus/Deficit Position

	Balance 1/1/83	Year to 31/12/83	Balance 31/12/83
Administration	95,749	(20,147)	75,602
School of Celtic Studies	72,599	13,729	86,328
School of Theoretical Physics	3,658	(3,932)	(274)
School of Cosmic Physics	49,643	15,487	65,130
Adaptation of Premises	22,410	(4,933)	17,477
	244,059	204	244,263

This surplus is available towards meeting the Institute's expenditure commitments outstanding at 31 December 1983 (see Note 11).

7. Vernam Hull Bequest

The project to be financed by this bequest to the School of Celtic Studies has not yet been decided on.

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

NOTES TO THE ACCOUNTS

8. General Administration Expenses

	£	£
Rent, Rates & Insurance	65,216	
Premises Maintenance	62,626	
Postage & Telephones	28,413	
Fuel, Light & Power	30,228	
Sundry Supplies	3,937	190,420

9. Superannuation

Salaries are charged net of pension contributions. Expenditure arising under the Institute's superannuation schemes is met out of Oireachtas Grants in the year of payment. No provision has been made in these accounts for future superannuation commitments.

10. Seismic Research

Contributions received from external sponsors and agencies have been set off against the expenditure of the Institute. These contributions were as follows:-

Contributor	Research Project	Amount
		£
T.C.D.	Irish Caledonian Suture Seismic Project	5,742
E.S.B.	Seismic Survey at Carnsore	300
		6,042

11. Outstanding Commitments

The estimated cost of commitments outstanding at 31 December 1983 exclusive of Current Liabilities shown on the Balance Sheet, is as follows:-

	£
Administration	76,500
School of Celtic Studies	86,700
School of Theoretical Physics	500
School of Cosmic Physics	65,000
Adaptation of Premises	17,000
	245,700

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

Report of the Comptroller and Auditor General

I have examined in accordance with approved auditing standards the Accounts set out on Pages 1 to 5 which are in the form approved under the provisions of Acht um Institiúid Ard-Léinn, 1940. I have obtained all the information and explanations which I considered necessary for the purpose of my audit.

In my opinion proper books of account have been kept by An Institiúid and the Accounts, which are in agreement with them, give a true and fair view of the state of its affairs at 31 December 1983 and of its transactions for the year then ended.

P. L. McDONNELL
Comptroller and Auditor General

12 September, 1984.

				Celtic Studies	Theoretical Physics	Cosmic Physics
£		£	£	£	£	£
862,710	Salaries, Wages & Superannuation	940,505	188,462	222,428	140,388	389,227
57,946	Scholarships	51,640	-	16,676	29,089	5,875
100	Honoraria	263	-	200	63	-
45,336	Library	56,482	-	6,158	29,428	20,896
47,358	Publications	71,665	663	68,583	1,748	671
47,380	Furniture & Equipment	59,065	4,214	3,479	8,773	42,599
152,412	General Administration	190,420	190,420	-	-	-
45,517	Travel, Survey & Seismic Research	46,784	802	4,064	7,239	34,679
1,581	Symposium, Summer School & Seminar Expenses	3,071	-	535	935	1,601
20,578	Consumable Equipment	28,847	-	-	-	28,847
39,683	General Expenses	35,755	8,560	5,802	7,251	14,142
-	Schroedinger Commemoration	2,812	-	-	2,812	-
5,789	NBST Project	5,060	-	-	5,060	-
22,706	Special Commitments	-	-	-	-	-
3,942	Fire Replacement Expenses	-	-	-	-	-
1,353,038		1,492,369	393,121	327,925	232,786	538,537
6,140	Adaptation of Premises	34,933				
1,359,178		1,527,302				