

# Institiúid Ard-Léinn Bhaile Átha Cliath

TUAIRISC BHLIANTÚIL 2013



Dublin Institute for  
Advanced Studies

ANNUAL REPORT 2013

$x+3=5$   
 $x^2-8=2 \cdot x$   
 $9-y=7$   
 $x(x-1)=x^2$   
 $y=4x^2$   
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 $-29^\circ$

$$\int B \cdot dA = 0$$





# Chairman's Statement

I am pleased to present the 2013 Annual Report of the Dublin Institute for Advanced Studies (DIAS).

The Dublin Institute for Advanced Studies is dedicated to the pursuit of advanced fundamental research in physics and celtic studies. The focus of its work is on the creation of new knowledge, advanced training and the dissemination of this knowledge for the benefit of the wider academic community. This summary report gives a general account of the main research developments that took place during 2013. More detailed information on the research activities of the individual Schools can be found in their respective annual Research Reports.

The report on the work of the constituent schools highlights the important contribution DIAS makes within the wider community. One of the main priorities for DIAS in 2013 was an increased focus on building collaboration and engagement with the wider academic community and the public. Significant progress was made by each of the Schools in this regard as is evidenced by the increased number of collaborative projects and initiatives, lectures and seminars being given by DIAS staff for university

students, academic staff delivering courses at local universities, as well as public outreach initiatives.

Each of the constituent Schools increased the number of seminars and lectures on specialist topics for university students. A new series of lectures hosted by the School of Celtic Studies during the year, in conjunction with the Royal Irish Academy, on Gaelic Literature through the ages, attracted a large number of university scholars. The School also held a two-day colloquium on Genre in Medieval Celtic Literature. The IGGP (Irish Geoscience Graduate Programme) co-ordinated by the Geophysics section, continues to grow with seven short courses on various geophysics topics taking place in DIAS during the year. The School of Theoretical Physics, in conjunction with NUIM, hosted a very successful Irish Quantum Field Theory meeting in May. The School also hosted a summer school in August, in collaboration with Chalmers University, Gothenburg (Sweden), on "Quantum Integrable Systems and Quantum Information Theory", which attracted postgraduate students and higher level undergraduate students.

DIAS research groups were again actively involved in national and international collaborative projects. A significant part of the research work of the School of Cosmic Physics is undertaken as part of major international research consortia. Participation in the HESS (The High Energy Stereoscopic System) consortium is a very exciting collaboration for the astrophysics group and has resulted in the publication of a significant number of scientific papers. The Geophysics section is involved in a number of major international projects and has been successful in getting new external funding in 2013 in an increasingly difficult funding environment. Following the success of its 2012 pilot project, the School of Celtic Studies continued with the scanning and digitisation of additional Ogham stones. The Ogham project, which is funded by the Department of Arts Culture and the Gaeltacht, aims to laser-scan as many as possible of surviving Ogham stones and make 3D models of them available online. The project is a collaborative initiative with the National Monuments Service. In May, a new Ogham in 3D website was launched by the Minister for Arts, Heritage and the Gaeltacht, Jimmy Deenihan, T.D. The level of media attention attracted by the event helped to promote the project within Ireland and abroad. The School also initiated new partnerships with the Marsh



*Prof Werner Nahm, Director School of Theoretical Physics, Prof Denjoe O'Connor, Sean Sherlock TD, Minister for Research and Innovation, Cecil Keaveney, Registrar and Prof Pádraig Breatnach, Director School of Celtic Studies during the visit of the Minister in March 2013.*

*An tOll. Werner Nahm, Stiúrthóir Scoil na Fisice Teoiriciúla, An tOll. Denjoe O'Connor, Sean Sherlock TD, Aire Taighde agus Nuálaíochta, Cecil Keaveney, Cláraitheoir agus An tOll. Pádraig Breatnach, Stiúrthóir Scoil an Leinn Cheiltigh le linn cuairt an Aire i mí Márta 2013.*

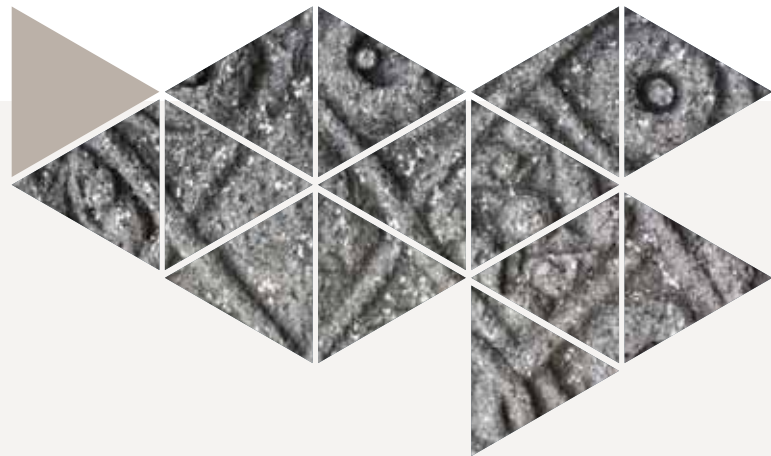
# Ráiteas an Chathaoirligh

Cúis áthais dom an Tuarascáil Bhliantúil d'Institiúid Ard-Léinn Bhaile Átha Cliath (DIAS) a chur i láthair.

Tá Institiúid Ard-Léinn Bhaile Átha Cliath tiomanta don ard-bhuntaighde sa Fisic agus sa Léann Ceilteach. Díríonn an obair seo ar eolas nua a chruthú, ardoiliúint agus scaipeadh an eolais seo chun tairbhe an phobail acadúil níos leithne. Tugann an tuarascáil achomair seo cuntas ginearálta ar na príomhfhorbairtí a tharla sa taighde le linn na bliana 2013. Is féidir eolas níos mionsonraithe ar ghníomhaíochtaí taighde na Scoileanna aonair a fháil ina dTuarascálacha Taighde bliantúla faoi seach.

Déanann an tuairisc ar obair na gcomhscoileanna suntas den chion tairbhe tábhachtach a dhéanann DIAS laistigh den phobal níos leithne. Ceann de na príomhthosaíochtaí a bhí ag DIAS sa bhliain 2013 ab ea fócas níos mó ar chomhoibriú agus rannpháirtíocht a thógáil leis an bpobal acadúil níos leithne agus leis an bpobal. Rinne gach ceann de na Scoileanna dul chun cinn suntasach ina leith seo mar is léir ón méadú ar líon na dtionscadal agus na dtionscnamh comhoibríoch, na léachtaí agus na seimineáir a thugann foireann DIAS do mhic léinn ollscoile, an fhoireann acadúil ag tabhairt cúrsaí ag ollscoileanna áitiúla, chomh maith le tionscnaimh for-rochtana poiblí.

Mhéadaigh gach ceann de na comhscoileanna líon na seimineáir agus na léachtaí ar thopaicí sainspéise do mhic léinn ollscoile. Mealladh líon mór de mhic léinn ollscoile ag sraith nua de léachtaí a d'eagraigh Scoil an Léinn Cheiltigh i rith na bliana, i gcomhar le hAcadamh Ríoga na hÉireann, ar Litríocht na Gaeilge in imeacht na mblianta. D'eagraigh an Scoil collóiciam dhá lá freisin ar Sheánra sa Litríocht Cheilteach Mheánaoiseach. Leanann Clár Iarchéime Geo-eolaíochta na hÉireann (IGGP), atá á chomhordú ag rannóg na Geoifisice, ag fás, agus bhí seacht ghearrchúrsa ar thopaicí éagsúla geoifisice ann i DIAS i rith na bliana. D'eagraigh Scoil na Fisice Teoiriciúla, i gcomhar le OÉ Má Nuad, cruinniú um Theoiric Réimse Chandamach Éireannach an-rathúil i mí Bealtaine. D'eagraigh an Scoil scoil samhraidh i mí Lúnasa freisin, i gcomhar le hOllscoil Chalmers, Gothenburg (An tSualainn), ar "Quantum Integrable Systems and Quantum Information Theory", a mheall mic léinn iarchéime agus mic léinn céime ardleibhéil.



Bhí grúpaí taighde DIAS gníomhach arís i dtionscadail chomhoibríocha náisiúnta agus idirnáisiúnta. Déantar cuid shuntasach d'obair thaighde Scoil na Fisice Cosmaí mar chuid de chuibhreannais taighde idirnáisiúnta. Comhoibriú an-spreagúil is ea an rannpháirtíocht sa chuibhreannas HESS (The High Energy Stereoscopic System) don ghrúpa réaltfhisice agus tá líon suntasach de pháipéir eolaíochta foilsithe dá bharr. Tá roinn na Geoifisice páirteach i roinnt mórtionscadal idirnáisiúnta agus d'éirigh leo maoiniú seachtrach nua a fháil sa bhliain 2013 d'ainneoin na deacrachtaí maoinithe atá ag méadú. Agus rath ar an tionscadal píolótach sa bhliain 2012, lean Scoil an Léinn Cheiltigh de scanadh agus digitiú ar bhreis clocha Ogham. Tá sé d'aidhm ag an tionscadal Ogham, atá maoinithe ag an Roinn Ealaíon, Oidhreacht agus Gaeltachta, léasarscanadh a dhéanamh ar an líon is mó agus is féidir de na clocha Ogham a mhaireann agus samhlacha 3-D díobh a chur ar fáil ar líne. Tionscnamh comhoibríoch is ea an tionscadal leis an tSeirbhís Séadchomharthaí Náisiúnta. I mí Bealtaine, sheol an tAire Ealaíon, Oidhreacht agus Gaeltachta, Jimmy Deenihan, T.D. suíomh gréasáin nua Ogham in 3D. Chuidigh méid na spéise sna meáin a mealladh ag an ócáid leis an tionscadal a chur chun cinn in Éirinn agus thar lear. Chuir an Scoil tús freisin le comhpháirtíochtaí nua le leabharlanna Marsh agus Óstaí an Rí faoina tionscadal Irish Script on Screen. Mar thoradh ar an gcomhoibriú seo, déanfar bailiúcháin iomlán de lámhscríbhinní Gaeilge an dá leabharlann sin a dhigitiú sa dá bhliain atá romhainn.



## Chairman's Statement (continued)

and Kings Inn libraries under its Irish Script on Screen project. This collaboration will result in the entire Gaelic manuscript collections of both libraries, being digitised over the next two years.

The School of Cosmic Physics' public outreach programme at Dunsink continues to grow in popularity. As well the usual programme of open nights and school tours, there were additional initiatives during the year including a training week for national school science teachers, a Science Week "Astronomy Watch" where secondary students could attend lectures and had an opportunity to look through the Grubb Telescope. In association with the French Embassy, Dunsink Observatory also hosted two lectures in July as part of the programme of fringe events to the Festival of Curiosity, Dublin's Annual Festival of Science & Culture. It also played host to a number of literary and artistic events during the year. The Seismology in Schools programme continues to attract interest from schools throughout the country but its development is restricted due to lack of funding and dedicated staff. Additional efforts were made to promote the work of DIAS throughout the year and the results of this are being realised with greater interest in public outreach events such as the statutory public lectures, Culture Night and the programme of events at Dunsink Observatory.

Budgetary and staffing restrictions continue to present ongoing challenges and have unavoidably impacted on research activity levels. Thanks to the high degree of dedication and commitment from the remaining staff we have been able to minimise the impact on the core research work. I would like to take this opportunity to thank all the staff for the flexibility and commitment they have shown during the year. I would also like to thank my fellow Council and Board members for giving so generously of their time and expertise.



## Ráiteas an Chathaoirligh (ar leanúint)

Leantar den fhás san éileamh ar chlár for-rochtana poiblí Scoil na Fisice Cosmaí ag Dún Sinche. Chomh maith leis an ngnáthchlár d'óicheanta oscailte agus turais scoile, bhí tionscnaimh bhreise i rith na bliana lena n-áirítear seachtain oiliúna do bhunmhúinteoirí eolaíochta, "Faire Réalteolaíochta" le linn Seachtain na hEolaíochta ina bhféadfadh scoláirí meánscoile freastal ar léachtaí agus deis a bheith acu amharc tríd an Teileascóp Grubb. I gcomhar le hAmbasáid na Fraince, d'eagraigh Réadlann Dhún Sinche dhá léacht i mí Iúil mar chuid de chlár d'ócáidí imeallacha leis an bhFéile Fiosracha, Féile Bhliantúil Eolaíochta agus Cultúir Bhaile Átha Cliath. D'eagraigh sé roinnt ócáidí liteartha agus ealaíne freisin i rith na bliana. Leanann an clár um Sheismeolaíocht i Scoileanna de spéis a mhealladh ó scoileanna ar fud na tíre agus tá an fhorbairt air teoranta mar thoradh ar easpa maoinithe agus easpa foirne ar leith. Rinneadh iarrachtaí breise le hobair DIAS a fhoilsiú i rith na bliana agus tá toradh le feiceáil air seo le suim níos mó sna hócáidí for-rochtana poiblí ar nós na léachtaí poiblí reachtúla, Oíche an Chultúir agus an clár imeachtaí i Réadlann Dhún Sinche.

Leantar den dúshlán mar thoradh ar shrianta buiséadta agus foirne agus dá bhrí sin, bhí leibhéal gníomhaíochta taighde thíos leis. A bhuíochas don leibhéal ard de dhíograis agus de thiomantas ón fhoireann atá fágtha, bhíomar in ann an tionchar ar an obair taighde a mhaolú. Ba mhaith liom an deis seo a thapú le buíochas a ghabháil leis an bhfoireann uile as an solúbthacht agus tiomantas atá léirithe acu le linn na bliana. Ba mhaith liom freisin buíochas a ghabháil le mo chomhaltaí ar an gComhairle agus ar an mBord as a bheith chomh fial flaithiúil lena gcuid ama agus saineolais.



# School of Celtic Studies

## RESEARCH

Liam Breatnach continued work on his edition of the Old Irish law tract *Córus Bésnái*, as well as on a Grammar of Middle Irish. Pádraig Breatnach continued work on *Chronicle poems of the Nine Years' War* (edition of poems for Aodh Ó Néill (1598) and Aodh Ruadh Ó Domhnaill (1600) by Dubhthach Óg Ó Duibhgeannáin), a *Catalogue of Irish manuscripts in Brussels*, and 'Togha na hÉigse 1700-1800' (*Ainnir mhiochair bhlasta mhilis* (Aogán Ó Raithile), *Créad ná canfainn cúpla véarsa ar aiste thúta* (Aindrias Mac Cruitín), *Tarla gné dhaoldatha d'fhoiligh gach rian* (Séamas Mac Coitir)). Fergus Kelly worked on revising his edition of an Old Irish text on legal disputes within marriage (D. A. Binchy, *Corpus Iuris Hibernici* i 144.5-150.16) in the light of the referees' comments, for publication in the Early Irish Law Series in 2014, and continued with an edition of an Early Modern Irish legal treatise attributed to the Connacht jurist Giolla na Naomh Mac Aodhagáin, who died in 1309 (D. A. Binchy, *Corpus Iuris Hibernici* ii 691.1-699.4). Aoibheann Nic Dhonnchadha continued research on the composition and contents of the collection of thirty Irish medical manuscripts, dating from the fifteenth and sixteenth centuries, that are housed in the Library of Trinity College, Dublin, and an early 15th-century medical manuscript in National University of Ireland, Maynooth (NUIM C 110) was examined in detail and Latin sources identified for some of its texts. Brian Ó Curnáin proofread a 29-page article, '153 Irish *Gaeilge*', to be published in *Word-*

*Formation; An International Handbook of the Languages of Europe*, De Gruyter Mouton, Berlin - New York, *Handbooks of Linguistics and Communication Sciences/Handbücher zur Sprach und Kommunikationswissenschaft (HSK)*, ed. Peter O. Müller et al., as well as continuing work on Modern Irish dialect studies, including the preparation of a monograph on East Galway Irish, and the transcription and editing of recorded materials for the GLÓR project. Gordon Ó Riain continued work on a new edition of Irish Grammatical Tracts V, including a draft study of the textual transmission and structure of the tract, as well as working on a short study of previously unnoticed terminology for the relative clause in the Early Modern Irish grammatical tracts, and an edition with translation, notes and study of a fragment of a tract on grammar and prosody inserted into UCD-OFM manuscript A 4. Deborah Hayden worked on an edition of and commentary on a short medieval Irish glossary, and carried out research for a presentation on a sixteenth-century Irish medical manuscript, which she gave at a Celtic Studies conference early in the New Year. She also worked with Dr Elizabeth Boyle of NUI Maynooth on the proofs for a volume of essays on medieval Irish literature, entitled *Authorities and Adaptations: The Reworking and Transmission of Textual Sources in Medieval Ireland*, which will be published by the Institute in 2014. It includes an introduction jointly written by the editors, as well as a chapter by Dr Hayden entitled 'Anatomical Metaphor in *Auraicept na nÉces*'. Mona Jakob completed her thesis and was awarded the degree of PhD at the end of February 2014. She began work on her project on rhyme in Old and Middle, including assembling a corpus of Old and Middle Irish poems and compiling a detailed profile for each of the poems or collection of poems. Síle Ní Mhurchú worked on an edition of *Agallamh Oisín agus Phádraig*, and researching the manuscript sources for Classical Irish love poetry (*dánta grádha*). Sorcha Nic Lochlainn continued work on a monograph entitled *Cross-Currents in Song: some relationships between songs in Irish, Scottish Gaelic, Manx and English*. It is intended that this work will be ready for publication by October 2014. A draft of an article entitled 'A pan-Gaelic perspective on the oral lament' is almost complete, and it is intended to present it at a conference as soon as is feasible, with a view to publishing it shortly thereafter. Nicole Volmering continued research towards finishing her PhD for submission in April 2014.



Minister Jimmy Deenihan T.D. at the launch of the Ogham in 3D project with Nora White, Cecil Keaveney and Professor Liam Breatnach.

An tAire Jimmy Deenihan T.D. ag lánseáil Ogham i 3D le Nora White, Cecil Keaveney agus an tOllamh Liam Breatnach.

## IRISH SCRIPT ON SCREEN (ISOS)

The Irish Script on Screen project continued work on digitisation of manuscripts and upgrading the huge database and archive of digitised material held by ISOS. New additions to the ISOS digital archive from the



# Scoil an Léinn Cheiltigh

## TAIGHDE

Lean Liam Breatnach lena chuid oibre ar a eagrán den téacs dlí Sean-Ghaeilge *Córus Bésnaí*, mar aon le Gramadach na Meán-Ghaeilge. Lean Pádraig Breatnach ag obair ar *Chronicle poems of the Nine Years' War* (eagrán de dhánta do Aodh Ó Néill (1598) agus Aodh Ruadh Ó Domhnaill (1600) ag Dubhthach Óg Ó Duibhgeannáin), *Catalogue of Irish manuscripts in Brussels*, agus 'Togha na hÉigse 1700-1800' (*Ainnir mhíochair bhlasta mhilis* (Aogán Ó Raithile), *Créad ná canfainn cúpla véarsa ar aiste thúta* (Aindrias Mac Cruitín), *Tarla gné dhaoldatha d'fhoiligh gach rian* (Séamas Mac Coitir)). D'oibrigh Fergus Kelly ar athcheartú ar a eagrán de théacs Sean-Ghaeilge ar dhíospóidí dlí laistigh de phósadh (D. A. Binchy, *Corpus Iuris Hibernici* i 144.5–150.16) i gcomhthéacs nótaí ó mholtóirí, le foilsiú san Early Irish Law Series in 2014, agus lean sé le heagrán de thráchtas dlí sa Nua-Ghaeilge Mhóch a bhaineann leis an dlí-eolaí Connachtach Giolla na Naomh Mac Aodhagáin, a bhásaigh i 1309 (D. A. Binchy, *Corpus Iuris Hibernici* ii 691.1–699.4). Lean Aoibheann Nic Dhonnchadha le taighde ar chomhdhéanamh agus ar ábhair an bhailiúcháin de thríocha lámhscríbhinn leighis Éireannacha, ón cúigiú agus an séú haois déag, atá i Leabharlann Choláiste na Tríonóide, Baile Átha Cliath, agus scrúdaíodh lámhscríbhinn ó thús an 15ú haois déag atá in Ollscoil na hÉireann, Maigh Nuad (NUIM C 110) go mion agus sainaitníodh foinsí Laidine do roinnt dá théacs. Phrofáil Brian Ó Curnáin alt 29 leathanach, '153 Irish Gaelge', le foilsiú in *Word-Formation; An International Handbook of the Languages of Europe*, De Gruyter Mouton, Beirlín - Nua Eabhrac Handbooks of Linguistics and Communication Sciences/Handbücher zur Sprach und Kommunikationswissenschaft (HSK), eag. Peter O. Müller et al., mar aon le leanúint ag obair ar staidéir ar chanúintí na Nua-Ghaeilge, lena n-áirítear monagraf ar Ghaeilge Oirthear na Gaillimhe, agus tras-scríobh agus eagarthóireacht ar ábhair thairfeada do thionscadal GLÓR. Lean Gordon Ó Riain le hobair ar eagrán nua de Irish Grammatical Tracts V, lena n-áirítear dréachtstaidéar ar an tarchur téacs agus struchtúr an tráchtas, mar aon le hoibriú ar staidéar gearr de théarmeolaíocht nár tugadh faoi deara cheana don chlásal coibhneasta i dtráchtas ghramadaí na Nua-Ghaeilge Moiche, agus leagan le haistriúchán, nótaí agus staidéar ar chuid den tráchtas ar ghramadach agus prosóid ionsáite i lámhscríbhinn A 4 UCD-OFM. D'oibrigh Deborah Hayden ar eagrán de ghluaisre Ghaeilge mheánaoiseach agus nótaí tráchtas leis, agus rinne sí taighde i gcomhair léacht ar lámhscríbhinn leighis ón séú haois déag, léacht a thug sí ag comhdháil Léinn Cheiltigh go luath san Aithbhliain. D'oibrigh sí

chomh maith leis an Dr Elizabeth Boyle as OÉ Maigh Nuad ar phrofaí d'imleabhar aistí a bhaineann le litríocht mheánaoiseach na hÉireann, dar teideal *Authorities and Adaptations: The Reworking and Transmission of Textual Sources in Medieval Ireland*, a fhoilseoidh an Institiúid in 2014. Áirítear ann réamhrá a scríobh na heagarthóirí le chéile, mar aon le caibidil ón Dr Hayden dar teideal 'Anatomical Metaphor in *Auraicept na nÉces*'. Chríochnaigh Mona Jakob a tráchtas agus bronnadh céim PhD uirthi ag deireadh mhí Feabhra 2014. Chuir sí tús le hobair ar a tionscadal ar rím sa tSean-Ghaeilge agus sa Mheán-Ghaeilge lena n-áirítear corpas a chur le chéile de dhánta Sean-Ghaeilge agus Meán-Ghaeilge agus próifíl mhionsonraithe a chur i dtoll a chéile ar gach dán nó bailiúchán dánta. D'oibrigh Síle Ní Mhurchú ar eagrán de *Agallamh Oisín agus Phádraig*, agus ar thaighde ar fhoinsí lámhscríbhinn do dhánta grá na Gaeilge Clasaicí (*dánta grádha*). Lean Sorcha Nic Lochlainn lena cuid oibre ar mhonagraf dar teideal *Cross-Currents in Song: some relationships between songs in Irish, Scottish Gaelic, Manx and English*. Táthar ag súil go mbeidh an saothar seo réidh le foilsiú faoi Dheireadh Fómhair 2014. Tá dréacht d'alt dar teideal 'A pan-Gaelic perspective on the oral lament' beagnach críochnaithe, agus tá sé i gceist é a chur i láthair ag comhdháil a luaithe agus is indéanta, agus chun é a fhoilsiú go gairid ina dhiaidh sin. Lean Nicole Volmering lena cuid taighde i dtreo a PhD a chríochnú agus a chur isteach in Aibreán 2014.

## MEAMRAM PÁIPÉAR RÍOMHAIRE (ISOS)

Lean tionscadal Mheamram Páipéar Ríomhaire le hobair ar dhigitiú lámhscríbhinní agus ar uasghrádú an bhunachair sonraí ollmhór agus cartlann an ábhair dhigitithe atá ag ISOS. Áirítear le míreanna nua le cartlann dhigiteach ISOS ó bhailiúcháin Acadamh Ríoga na hÉireann agus Leabharlann Náisiúnta na hÉireann roinnt lámhscríbhinní páir ón séú haois déag in RIA (uimh. 967, 1222, 1224), agus dhá LSS páir ón séú haois déag san NLI (G14, G 466), mar aon leis an dosaeen lámhscríbhinn pháipéir ón seachtú haois déag (NLI G 17, G 27, G 34, G 49, G 117, G 129, G 168, G 201, G 455, G 459). Atosaíodh clár digitithe ar lámhscríbhinní ó Choláiste na Tríonóide áit ar cuireadh LSS 1301 'Annála na gCeithre Máistrí', 1318 'Leabhar Buidhe Leacáin', 1319/2/7 (gramadach), agus 1340 'Duanair Thigh na Coille' leis.

Cuireadh tús le dhá chomhpháirtíocht nua i mbliana, le Leabharlann Marsh agus Óstaí an Rí, agus déanfar digitiú ar bhailiúcháin Ghaeilge an dá leabharlann, timpeall 40 lámhscríbhinn agus os cionn 11,500 íomhá, sa dá bhliain romhainn amach.

## School of Celtic Studies (continued)

collections of the Royal Irish Academy and the National Library of Ireland include several vellum manuscripts of the sixteenth century in the RIA (nos. 967, 1222, 1224), and two sixteenth-century vellums in the NLI (G14, G 466), in addition to approximately a dozen paper manuscripts of the seventeenth century (NLI G 17, G 27, G 34, G 49, G 117, G 129, G 168, G 201, G 455, G 459). A programme of digitisation was recommenced on manuscripts from Trinity College with the addition of MSS 1301 'The Annals of the Four Masters', 1318 'The Yellow Book of Lecan', 1319/2/7 Grammatical, and 1340 'The Tinnakill duanaire'.

Two new partnerships, with Marsh's Library and King's Inns, have begun this year, and will see the entire Gaelic collections of both libraries, some 40 manuscripts with over 11,500 images, being digitised over the next two years.

### OGHAM IN 3D:

In 2013, further financial support for the project was granted by the National Monuments Service (NMS), Department of Arts, Heritage and the Gaeltacht. Following the success of the 2012 pilot project, the proposal for 2013 was to continue the 3D laser scanning, research and digitisation of a number of additional ogham stones, focusing on those designated as National Monuments. A further 21 ogham stones were subsequently scanned and digitised, bringing the total available on the website to 70.

Also, in May 2013 the Ogham in 3D website was launched at the Dublin Institute for Advanced Studies by Jimmy Deenihan TD, Minister for Arts, Heritage and the Gaeltacht. In attendance were representatives of the National Monuments Service, the Discovery Programme and the National Museum of Ireland, as well as academics from many of Ireland's main Universities. The launch featured on RTÉ and TG4 news, which helped to promote the project here in Ireland and abroad.

Work also begun in late 2013 on an analysis of ogham carving techniques with sculptor Séighean Ó Draoi, with a view to determining the various tools and styles used by the ogham carvers. A report, including a video showing how different types of ogham inscriptions may have been carved, will be added to the website in due course.

A number of presentations were given by Nora White in connection with the project, namely, at the National Monuments Service annual conference at the National Gallery of Ireland, April 10, for Heritage Week at DIAS, August 21 and 22, for Culture Night at DIAS, September 20, and a paper on 'Progress to date on Ogham in 3D', at the Tionól, November 16.

### BIBLIOGRAPHY

Alexandre Guilarte continued to work on the compilation of the *Bibliography of Irish Linguistics and Literature (BILL)*, concentrating on the analysis and indexation of periodical titles while adding a large number of new entries for books and monographs on Irish philological studies. The focus of work on periodicals was *Scottish Gaelic Studies*, which at the end of 2013 had been described, indexed and analysed as far as volume 22 (2006). Many entries corresponding to various other periodical titles were also entered into the bibliography database, including the contents of the latest issues of the following, which appeared during 2013: *Ériu* (62 [2012]), *Éigse* (38 [2013]), *Celtica* (27 [2013]), *Zeitschrift für celtische Philologie* (60 [2012]). The work on books and monographs focused again this year on multi-authored works, as for instance, Dan Wiley ed. *Essays on the Early Irish King Tales*, Sharon Arbuthnot and Geraldine Parsons (eds) *The Gaelic Finn tradition*, Peter Hoare (ed.) *The Cambridge History of Libraries in Britain and Ireland*, and Eoin Mac Cárthaigh and Jürgen Ulich (eds) *Féilscríbhinn do Chathal Ó Háinle*.

### LEABHAR BREAC

Professor Liam Breatnach continued direction of a diplomatic edition of the early 15th-century manuscript *Leabhar Breac*.

### PUBLICATIONS

The year 2013 saw the publication of *The Four Masters and Their Manuscripts*, by Pádraig A. Breatnach, *Math Uab Mathonwy*, volume 13 in the Medieval and Modern Welsh Series, edited by Ian Hughes, and volume 27 of the School journal *Celtica*.

### LIBRARY

Current and retrospective cataloguing of the library continued and records were made available on the Online Public Access Catalogue. Acquisitions continued in subject areas relevant to the research needs of the School. Regular updates on recent accessions and current periodicals were issued and research and bibliographic queries from members of the School and from visitors were dealt with.

The library staff organised the School's participation in 'Culture Night' (September 2013). In order to demonstrate the work done by the Irish Script on Screen (ISOS) project, a slideshow of some ten manuscript images, dating from the 8th century to the 19th, was compiled for public display. A. Nic Dhonnchadha gave a talk on ISOS, its history and aims, and presented the images to visitors to the School on Culture Night.

# Scoil an Linn Cheiltigh (ar leanúint)

## OGHAM IN 3D

In 2013, bhronn an tSeirbhís Séadchomharthaí Náisiúnta (NMS), an Roinn Ealaíon, Oidhreachta agus Gaeltachta tuilleadh tacaíochta airgeadais don tionscadal. D'éirigh go maith leis an tionscadal píolótach in 2012, agus ba é an togra i gcomhair 2013 leanúint le scanadh léasair 3D, taighde agus digitíú a dhéanamh ar roinnt clocha ogham breise, ag díriú orthu siúd atá sainithe mar Séadchomharthaí Náisiúnta. Rinneadh scanadh agus digitíú ar 21 cloch ogham eile ina dhiaidh sin, a thug an t-iomlán atá ar fáil ar an suíomh chuig 70.

Chomh maith leis sin, i mí Bealtaine 2013, sheol an tAire Ealaíon, Oidhreachta agus Gaeltachta, Jimmy Deenihan TD suíomh gréasáin 'Ogham in 3D' ag Institiúid Ard-Léinn Bhaile Átha Cliath. Bhí ionadaithe ón tSeirbhís Séadchomharthaí Náisiúnta, ón gClár Fionnachtana agus ó Ard-Mhúsaem na hÉireann i láthair, mar aon le hacadóirí ó go leor de phríomh-Ollscoileanna na hÉireann. Bhí an seoladh ar nuacht RTÉ agus TG4, a chuidigh leis an tionscadal a chur chun cinn anseo in Éirinn agus thar lear.

Cuireadh tús ag deireadh 2013 chomh maith le hobair ar anailís ar theicnící greanta oghaim leis an dealbhóir Séighean Ó Draoi, lena fháil amach cé na huirlisí agus stíleanna éagsúla a d'úsáid na snoíodóirí oghaim. Cuirfear tuairisc, lena n-áireofar físeán a thaispeánann na bealagh ar greanadh na hinscríbhinní ogham éagsúla, leis an suíomh gréasáin in am trátha.

Thug Nora White roinnt cur i láthair maidir leis an tionscadal, eadhón, ag comhdháil bhliantúil na Seirbhíse Séadchomharthaí Náisiúnta ag an nGailearaí Náisiúnta, an 10 Aibreán, i gcomhair na Seachtaine Oidhreachta ag DIAS, an 21 agus 22 Lúnasa, i gcomhair na hOíche Cultúrtha ag DIAS, an 20 Meán Fómhair, agus páipéar maidir le 'Dul chun cinn go dtí seo ar Ogham in 3D', ag an Tionól, an 16 Samhain.

## LEABHARLIOSTA

Lean Alexandre Guilarte lena chuid oibre ar *Bibliography of Irish Linguistics and Literature (BILL)* a chur i dtoll a chéile, ag díriú ar anailís agus innéacsú ar theidil thréimhsiúla agus ag an am céanna ag cur líon mór iontrálacha nua isteach do leabhair agus monagraif ar staidéir theangeolaíoch na Gaeilge. Dhírigh an obair ar thréimhseacháin ar *Scottish Gaelic Studies*, a raibh cur síos, innéacsú agus anailís déanta air chomh fada le hImleabhar 22 (2006) ag deireadh 2013. Cuireadh go leor iontrálacha eile le teidil thréimhseachán eile isteach sa bhunachar sonraí leabharliosta chomh maith, lena

n-áirítear ábhar na n-eagrán is déanaí díobh seo a leanas, a foilsíodh i rith 2013: Ériu (62 [2012]), *Éigse* (38 [2013]), *Celtica* (27 [2013]), *Zeitschrift für celtische Philologie* (60 [2012]). Dhírigh obair na leabhar agus na monagraf arís i mbliana ar shaothair le roinnt údar, mar shampla, Dan Wiley (eag.) *Essays on the Early Irish King Tales*, Sharon Arbuthnot agus Geraldine Parsons (eag.) *The Gaelic Finn tradition*, Peter Hoare (eag.) *The Cambridge History of Libraries in Britain and Ireland*, and Eoin Mac Cárthaigh agus Jürgen Uhlich (eag.) *Féilscríbhinn do Chathal Ó Háinle*.

## LEABHAR BREAC

Lean an tOllamh Liam Breatnach ag stiúradh eagráin dioplómaitiúil den lámhscríbhinn ó thús na 15ú haoise déag, *An Leabhar Breac*.

## FOILSEACHÁIN

Foilsíodh *The Four Masters and Their Manuscripts*, le Pádraig A. Breatnach, *Math Uab Mathonwy*, imleabhar 13 sa Medieval and Modern Welsh Series, arna chur in eagar ag Ian Hughes, agus imleabhar 27 den iris Scoile *Celtica* in 2013.

## LEABHARLANN

Leanadh le catalógú reatha agus siarghabhálach ar an leabharlann agus cuireadh taifid ar fáil don Chatalóg ar líne don Phobal. Leanadh le sealbhú i gcomhair réimsí ábhair a bhí ábhartha do riachtanais thaighde na Scoile. Eisíodh nuashonruithe rialta ar shealbhú a rinneadh le déanaí agus ar thréimhseacháin reatha agus déileáladh le ceisteanna taighde agus leabharliosta ó bhail na Scoile agus ó chuariteoirí.

D'eagraigh foireann na leabharlainne rannpháirtíocht na Scoile san 'Oíche Chultúir' (Meán Fómhair 2013). D'fhonn an obair a rinne tionscadal Mheamram Páipéar Ríomhaire (ISOS) a léiriú, cuireadh taispeántas sleamhnán de dheich íomhá lámhscríbhinn, ón 8ú go dtí an 19ú haois, i dtoll a chéile le taispeáint go poiblí. Thug A. Nic Dhonnchadha caint ar ISOS, a stair agus a aidhmeanna, agus chuir sí íomhánna i láthair cuairteoirí chuig an Scoil ar an Oíche Chultúir.

## TIONÓL 2013

Mheall Tionól na bliana seo lucht éisteachta an-leathan arís i mbliana, le painéal idirnáisiúnta cainteoirí. Rinneadh freastal an-ard, suas le nócha duine sa lucht éisteachta. Tugadh na páipéir seo (san ord inar cuireadh i láthair iad) ar an Aoine an 15ú: Niamh Wycherley, 'Sacred remains: terms denoting corporeal relics in early Christian Ireland';

## School of Celtic Studies (continued)

### TIONÓL 2013

This year's Tionól again attracted a very wide audience, with an international panel of speakers. Attendance was high, with audiences reaching ninety people. The following papers were delivered (in order of presentation) on Friday the 15th: Niamh Wycherley, 'Sacred remains: terms denoting corporeal relics in early Christian Ireland'; Sarah Waidler, 'Warrior Saints? Contrasting Portrayals of Violence in Central Medieval Saints' Lives'; Patrick J. Zecher, 'The Medieval Irish Recensions of the Finding of the True Cross'; Elizabeth Boyle, 'Lay Morality, Clerical Immorality, and Pilgrimage in Tenth- and Eleventh-Century Ireland: *Cethrur macclérech and Epscop do Gaedelaib*'; Máire Ní Mhaonaigh, '*Intamlugud intliuchta*: Twelfth-century Learning, Heroism and the Six Ages of the World'; Marina Sneseva, 'Pausing and vowel lengthening as similar hesitation phenomena in Munster Irish'; Ruairí Ó hUiginn, 'The Irish interrogative relative clause'; Aaron Griffith, 'Too much or not enough: object marking in Old Irish'; Silva Nurmio, 'Plural adjectives in Middle Welsh: morphology and agreement'; Tino Oudesluijs, '*Wealth or Bryt?* Anglo-Saxon terminology for Britons in legal documentation'.

The following were delivered on Saturday the 16th: Nora White, 'Progress to date on Ogham in 3D'; Harald Flohr, 'Language policy revisited – 20 year strategy for the Irish language: an early assessment'; Pádraig Breatnach, 'Múnlaí seanamhrán i roinnt dánta ón 18ú haois'; Trevor Herbert, 'Demotion of a War-Goddess: The Móirríoghan in Bardic Poetry'; Caoimhín Breatnach, 'Manuscript references to the Book of Glendalough'; Johan Corthals, 'The *constitutiones* of ancient juridical rhetoric in early Irish jurisdiction'; Hanne-Mette Alsos Raae, 'The inheritance of property owned by women in early Irish law'; Christophe Archan, 'The Five Paths to a Judge: an Interpretation of *Cóic Conara Fugill* (Five Paths to Judgement)'; Immo Warntjes, 'Pseudo-Columbanus = Dicuil? Authorship and scientific importance of the tract *De saltu lunae* attributed to Columbanus of Bangor'; Grace Neville, 'Mission en Irlande: French Scholars in Early Twentieth Century Ireland'.

The Statutory Public Lecture held in conjunction with the Tionól, was delivered in Trinity College Dublin on Friday the 15th of November by Professor Fergus Kelly, under the title 'Early Irish Music: An Overview of the Linguistic and Documentary Evidence'. This was a particularly well-attended lecture, with an audience of well over 200 people. A recording of this lecture is now available on the School's website.

### GENRE IN MEDIEVAL CELTIC LITERATURE

This was the theme of a very successful two-day conference on 27–28 September, organised by O'Donovan Scholar Nicole Volmering, with the assistance of the School Secretary, Eibhlín Nic Dhonncha.

The following papers were delivered on Friday the 27th: Síle Ní Mhurchú, '*Atá sgéal agam ar Fhionn*: Cyclification in the Fenian Lays'; Geraldine Parsons, 'Form, Genre and Cyclic Identity: the Case of the *Acallam Bec*'; Hugh Fogarty, '*"Ferr a r Rath indás a r ríge... ferr a nguide oldás a n-éguidhí"*: the 'Embedded *Tecosc*' and the Ideology of Kingship'; Marjorie Housley, 'Transgression and Autonomy: Genre and Gender in the *Táin Bó Cuailnge* and the *Life of Brigit*'.

Papers delivered on Saturday the 28th were: David Callander, 'Narrative Verse as a Medieval Welsh Literary Genre'; Myriah Williams, 'Interpreting Dialogue: Form or Fragmentation in the Black Book of Carmarthen *Ymddiddanau?*'; Barry J. Lewis, 'Religious and Secular in the Analysis of Medieval Welsh Poetic Genres'; Michelle Doran, 'Editing Irish Lyrical Verse'; Kevin Murray, 'Genre Construction: the Creation of the *Dinnshenchas*'; Nicole Volmering, 'Genre Methodology and Early Irish Literature: Theory and Application'; Nike Stam and Ranke de Vries, 'Titles and Genre in Medieval Irish Literature'; Tatyana A. Mikhailova, 'The Middle Irish Compiler as an Intuitive Taxonomist or why *Togail Troí* but not *\*Imram Uilix?*'; Lisabeth C. Buchelt, 'Reading Readers Reading: the *Imrama* as Exemplars for Productive Monastic Reading Practices'; Patrizia de Bernardo Stempel, '*Fingal Rónáin* and its Theatrical Features'.

### LECTURE SERIES

In conjunction with the Royal Irish Academy the School hosted a series of lectures by Professor David Dumville, under the general title 'From Late Antiquity to Early Modernity: Towards a New History of Gaelic Literature, A.D. 250-1750', lasting from 18 February to 29 July, and open to the public. These amounted to forty lectures in all, the first two and final two being delivered in the Royal Irish Academy, and the remainder in the School of Celtic Studies.

### SEMINARS AND LECTURES

Liam Breatnach continued a seminar on the Early Middle Irish poem *A mmo Choimdiu nél*. Gordon Ó Riain conducted a seminar on a fifteenth-century poem by Maol Eachlainn na nUirsgeál Ó hUiginn.

## Scoil an Linn Cheiltigh (ar leanúint)

Sarah Waidler, 'Warrior Saints? Contrasting Portrayals of Violence in Central Medieval Saints' Lives'; Patrick J. Zecher, 'The Medieval Irish Recensions of the Finding of the True Cross'; Elizabeth Boyle, 'Lay Morality, Clerical Immorality, and Pilgrimage in Tenth- and Eleventh-Century Ireland: *Cethrur macclérech agus Epscop do Gaedelaib'*'; Máire Ní Mhaonaigh, '*Intamlugud intliuchta: Twelfth-century Learning, Heroism and the Six Ages of the World*'; Marina Snesareva, 'Pausing and vowel lengthening as similar hesitation phenomena in Munster Irish'; Ruairí Ó hUiginn, 'The Irish interrogative relative clause'; Aaron Griffith, 'Too much or not enough: object marking in Old Irish'; Silva Nurmio, 'Plural adjectives in Middle Welsh: morphology and agreement'; Tino Oudesluijs, '*Wealh or Bryt? Anglo-Saxon terminology for Britons in legal documentation*'.

Tugadh na cainteanna seo a leanas ar an Satharn an 16ú: Nora White, 'Progress to date on Ogham in 3D'; Harald Flohr, 'Language policy revisited – 20 year strategy for the Irish language: an early assessment'; Pádraig Breatnach, 'Múnlaí seanamhrán i roinnt dánta ón 18ú haois'; Trevor Herbert, 'Demotion of a War-Goddess: The Móirríoghan in Bardic Poetry'; Caoimhín Breatnach, 'Manuscript references to the Book of Glendalough'; Johan Corthals, 'The *constitutiones* of ancient juridical rhetoric in early Irish jurisdiction'; Hanne-Mette Alsos Raae, 'The inheritance of property owned by women in early Irish law'; Christophe Archan, 'The Five Paths to a Judge: an Interpretation of *Cóic Conara Fugill* (Five Paths to Judgement)'; Immo Warntjes, 'Pseudo-Columbanus = Dicuil? Authorship and scientific importance of the tract *De saltu lunae* attributed to Columbanus of Bangor'; Grace Neville, 'Mission en Irlande: French Scholars in Early Twentieth Century Ireland'.

Thug an tOllamh Fergus Kelly an Léacht Poiblí Reachtúil a reáchtáladh i gcomhar leis an Tionól i gColáiste na Tríonóide, Baile Átha Cliath ar a Aoine an 15 Samhain, faoin teideal 'Early Irish Music: An Overview of the Linguistic and Documentary Evidence'. Bhí freastal an-mhaith ar an léacht seo agus os cionn 200 duine sa lucht éisteachta. Tá taifead den léacht seo ar fáil anois ar shuíomh gréasáin na Scoile.

### SEÁNRA I LITRÍOCHT CHEILTEACH NA MEÁNAOISE

Ba é seo an téama a bhí le comhdháil dhá lá ar éirigh go hiontach leis ar an 27-28 Meán Fómhair, a rinne Scoláire Uí Dhonnabháin Nicole Volmering a reachtáil le cúnamh ó Rúnaí na Scoile, Eibhlín Nic Dhonncha.



Prof. Pádraig Breatnach and Michael D. Higgins, President of Ireland, at the Áras in November 2013.

An tOll. Pádraig Breatnach agus Michael D. Higgins, Uachtarán na hÉireann, ag an Áras Samhain 2013.

Tugadh na páipéir seo a leanas ar an Aoine an 27ú: Síle Ní Mhurchú, '*Atá sgéal agam ar Fhionn: Cyclification in the Fenian Lays*'; Geraldine Parsons, 'Form, Genre and Cyclic Identity: the Case of the *Acallam Bec*'; Hugh Fogarty, '*"Ferr a rath indás a ríghhe... ferr a nguide oldás a n-éguidhi"*: the 'Embedded *Tecosc*' and the Ideology of Kingship'; Marjorie Housley, 'Transgression and Autonomy: Genre and Gender in the *Táin Bó Cuailnge* and the *Life of Brigit*'.

Ba iad na páipéir a cuireadh i láthair ar an Satharn an 28ú: David Callander, 'Narrative Verse as a Medieval Welsh Literary Genre'; Myriah Williams, 'Interpreting Dialogue: Form or Fragmentation in the Black Book of Carmarthen *Ymddiddanau?*'; Barry J. Lewis, 'Religious and Secular in the Analysis of Medieval Welsh Poetic Genres'; Michelle Doran, 'Editing Irish Lyrical Verse'; Kevin Murray, 'Genre Construction: the Creation of the *Dinnshenchas*'; Nicole Volmering, 'Genre Methodology and Early Irish Literature: Theory and Application'; Nike Stam and Ranke de Vries, 'Titles and Genre in Medieval Irish Literature'; Tatyana A. Mikhailova, 'The Middle Irish Compiler as an Intuitive Taxonomist or why *Togail Troí* but not *\*Immram Uilix?*'; Lisabeth C. Buchelt, 'Reading Readers Reading: the *Immrama* as Exemplars for Productive Monastic Reading Practices'; Patrizia de Bernardo Stempel, '*Fingal Rónáin* and its Theatrical Features'.



## School of Celtic Studies (continued)

Papers and lectures were delivered by staff at national and international conferences and venues as follows: (Liam Breatnach) 'On the Glossing of the Early Irish Law Tracts', Oxford 12 April 2013; 'Fingen Mac Flainn's Poem to the Fir Arddae: an Early Medieval Irish Threat of Satire' in Department of Celtic Languages and Literatures, Harvard University, 3 October 2013; 'The Brehon Laws and Mediaeval Irish Society', Royal Irish Academy, Tuesday 5 November, 1.00 p.m.; 'LHEB: the Irish perspective', at the day workshop on Friday 6 December 2013 in Cambridge to celebrate 60 years of Kenneth Jackson's *Language and History in Early Britain* (Edinburgh 1953). (Pádraig Breatnach) 'Múnlaí seanamhrán i roinnt dánta ón 18ú haois I: athchuaire ar amhrán le hAogán Ó Raithile', Tionól, SCS, 2013. (Fergus Kelly) 'Early Irish Charms for Animals', Magic Moments in Maynooth: a Symposium on Charms and Magic in Medieval and Modern Ireland, Department of Early Irish, National University of Ireland, Maynooth (6 April); 'Procedure in Early Irish Law: the Role of Witnesses', Celtic Legal Procedure Conference, Jesus College, Oxford (9 May); 'Mills, Millers and Millwrights in Early Irish Law', Roscommon County Library, on the occasion of the launch of Neil Jackman, Cairtriona Moore and Colin Rynne (ed.), *The Mill at Kilbegly* (6 June); 'Neighbourhood in Ancient Ireland', Moyne Parish Church, Co. Wicklow 22 September; 'Early Irish Music: an Overview of the Linguistic and Documentary Evidence', School of Celtic Studies Statutory Public Lecture, Trinity College Dublin (15 November). (Brian Ó Curnáin) 'An Ghaeilge in Iorras Aithneach; inné, inniu, amárach', in Acadamh na hOllscolaíochta Gaeilge, An Cheathrú Rua, 31 January 2013; 'Gnéithe den Dátheangachas sa nGaeilge Neamhthraidisiúnta agus Laghdaithe', Teangeolaíocht na Gaeilge 15 in University College Dublin, 20 April 2013; 'Cumas dátheangach chainteoirí óga dúchais na Gaeltachta', with Conchúr Ó Giollagáin and Tamás Péterváry, at Riachtanais na Gaeilge san Oideachas organised by COGG, 23 May 2013; 'Anach Cuain, Sasanaí agus ar ais aríst', with Liam Ó Con Cheanainn, Comhdháil ar Litríocht agus Cultúr na Gaeilge, 2013 University College Galway, 11 October 2013. (Gordon Ó Riain) 'A fragmentary tract on grammar and prosody', 13th International Symposium of Societas Celtologica Nordica, Universitetet i Oslo, Norway, 30 November 2013; 'Aspects of the transmission and structure of IGT V', *Grammatica and the Celtic vernaculars in the medieval world*, University of Oxford, 13 April 2013. (Mona Jakob) 'Break 'em or make 'em - Rhyming Rules in *Saltair na Rann*', First European Symposium in Celtic Studies, Trier, August 2013. (Sorcha Nic Lochlainn) "'Bear my greetings across the sea": emigrant experiences and the Gaelic song tradition' presented to a folklore conference in Queen's University Belfast in September 2013; to be submitted to *Béaloideas* in

mid-May. (Nicole Volmering) 'Medieval Irish vision literature: a genre?', First European Symposium in Celtic Studies, Trier, 9 August 2013; 'Genre Methodology and Early Irish Literature: Theory and Application', Genre Conference at DIAS, 28 September.

### EDITING

Liam Breatnach was co-editor with D. Mc Manus of *Ériu* volume 63.

Pádraig Breatnach was co-editor with Fergus Kelly of *Celtica* 27.

Fergus Kelly was also internal editor of Ian Hughes (ed.), *Math uab Mathonwy* (Mediaeval and Modern Welsh Series 13), and of Elizabeth Boyle and Deborah Hayden (eds), *Authorities and Adaptations: The Reworking and Transmission of Sources in Medieval Ireland*. Aoibheann Nic Dhonnchadha continued editorship, in association with Prof. Pádraig Ó Macháin, of *An Linn Bhuí: Iris Ghaeltacht na nDéise*, volume 17 being published in 2013. Gordon Ó Riain was co-editor with Prof. Ailbhe Ó Corráin of *Celebrating Sixty Years of Celtic Studies at Uppsala University: Proceedings of the Eleventh Symposium of Societas Celtologica Nordica*. Acta Universitatis Upsaliensis: Studia Celtica Upsaliensia Vol. 9 (Uppsala 2013).

### EXTERNAL EXAMINING AND MEMBERSHIP OF COMMITTEES

Pádraig Breatnach was a member of Council of Royal Irish Academy (2012-13), and a member of Royal Irish Academy President's Advisory Committee on the Assessment of Candidates (2013-14).

Fergus Kelly was external examiner, Department of Early and Medieval Irish, University College, Cork, 2012-13, external examiner for an MA thesis in the Department of Early and Medieval Irish, University College, Cork, and for a PhD thesis in the Department of Old and Middle Irish and Celtic Philology, National University of Ireland, Galway. He acted as mentor for a PhD thesis and a Post-doctoral Fellowship at the School of Archaeology, University College, Dublin. He was a committee member of Irish Agricultural History Society. Aoibheann Nic Dhonnchadha was a member of Coiste Léann na Gaeilge, in the Royal Irish Academy, of An Fochoiste Leabharlainne, Coláiste na Rinne, and of the editorial board of CELT. Gordon Ó Riain was a member of the advisory board of the First Poznań conference of Celtic Studies, 18-19 October 2014. Deborah Hayden was Treasurer and Membership Secretary of the Henry Sweet Society for the History of Linguistic Ideas ([www.henrysweet.org](http://www.henrysweet.org)).

## Scoil an Lín Cheiltigh (ar leanúint)

### SRAITH LÉACHTAÍ

I gcomhar le hAcadamh Ríoga na hÉireann, d'óstáil an Scoil sraith léachtaí ón Ollamh David Dumville, faoin teideal ginearálta 'From Late Antiquity to Early Modernity: Towards a New History of Gaelic Literature, A.D. 250-1750', a mhair ón 18 Feabhra go dtí an 29 Iúil, agus a bhí oscailte don phobal. Ceathracha léacht ar fad a bhí i gceist, cuireadh an chéad phéire agus an péire deireanach i láthair in Acadamh Ríoga na hÉireann, agus cuireadh na cinn eile i láthair i Scoil an Léinn Cheiltigh.

### SEIMINEÁIR AGUS LÉACHTAÍ

Lean Liam Breatnach le seimineár maidir leis an dán Meán-Ghaeilge Mhoch *A mmo Choimdiu nél*. Réachtáil Gordon Ó Riain seimineár ar dhán ón gcúigiú haois déag de chuid Maol Eachlainn na nUirsgeál Ó hUiginn.

Chuir baill foirne páipéir agus léachtaí i láthair ag comhdhálacha agus ag ionaid náisiúnta agus idirnáisiúnta mar seo a leanas: Liam Breatnach, 'On the Glossing of the Early Irish Law Tracts', Oxford 12 Aibreán 2013; 'Fíngen Mac Flainn's Poem to the Fir Arddae: an Early Medieval Irish Threat of Satire' in Department of Celtic Languages and Literatures, Ollscoil Harvard, an 3 Deireadh Fómhair 2013; 'The Brehon Laws and Mediaeval Irish Society', Acadamh Ríoga na hÉireann, Dé Máirt, an 5 Samhain, 1.00 p.m.; 'LHEB: the Irish perspective', ag an gceardlann lae Dé hAoine an 6 Nollaig 2013 in Cambridge le ceiliúradh 60 bliain a dhéanamh ar *Language and History in Early Britain* de chuid Kenneth Jackson; Pádraig Breatnach 'Múnlaí seanamhrán i roinnt dánta ón 18ú haois (II): athchuir ar amhrán le hAogán Ó Raithile', Tionól, SCS, 2013; Fergus Kelly 'Early Irish Charms for Animals', Magic Moments in Maynooth: a Symposium on Charms and Magic in Medieval and Modern Ireland, Roinn na Sean-Ghaeilge, Ollscoil na hÉireann, Maigh Nuad, an 6 Aibreán; 'Procedure in Early Irish Law: the Role of Witnesses', Celtic Legal Procedure Conference, Jesus College, Oxford, an 9 Bealtaine; 'Mills, Millers and Millwrights in Early Irish Law', Leabharlann Contae Ros Comáin, ag seoladh Neil Jackman, Caitríona Moore agus Colin Rynne (eag.), *The Mill ag Kilbegly*, an 6 Meitheamh; 'Neighbourhood in Ancient Ireland', Moyne Parish Church, Co. Wicklow, an 22 Meán Fómhair; 'Early Irish Music: an Overview of the Linguistic and Documentary Evidence', Léacht Phoiblí Reachtuil i Scoil an Léinn Cheiltigh, Coláiste na Tríonóide, Baile Átha Cliath an 15 Samhain; Brian Ó Curnáin 'An Ghaeilge in Iorras Aithneach; inné, inniu, amárach', in Acadamh na hOllscolaíochta Gaeilge, An Cheathrú Rua, an 31 Eanáir 2013; 'Gnéithe den Dátheangachas sa nGaeilge Neamhthraidisiúnta agus Laghdaithe', Teangeolaíocht



na Gaeilge 15 sa Choláiste Ollscoile, Baile Átha Cliath, an 20 Aibreán 2013; 'Cumas dátheangach chainteoirí óga dúchais na Gaeltachta', le Conchúr Ó Giollagáin agus Tamás Pértarváry, ag Riachtanais na Gaeilge san Oideachas arna eagrú ag COGG, an 23 Bealtaine 2013; 'Anach Cuain, Sasanaí agus ar ais aríst', le Liam Ó Con Cheadainn, Comhdháil ar Litríocht agus Cultúr na Gaeilge, 2013 Ollscoile na hÉireann, Gaillimh, an 11 Deireadh Fómhair 2013; Gordon Ó Riain 'A fragmentary tract on grammar and prosody', 13th International Symposium of Societas Celtologica Nordica, Universitetet in Oslo, an Iorua, an 30 Samhain 2013; 'Aspects of the transmission and structure of IGT V', *Grammatica* and the Celtic vernaculars in the medieval world, Ollscoil Oxford, an 13 Aibreán 2013; Mona Jakob 'Break 'em or make 'em – Rhyming Rules in *Saltair na Rann*', First European Symposium in Celtic Studies, Trier, Lúnasa 2013; Sorcha Nic Lochlainn 'Bear my greetings across the sea': emigrant experiences and the Gaelic song tradition' arna chur i láthair ag comhdháil bhéaloidis in Ollscoil na Banríonn, Béal Feirste i Meán Fómhair 2013; le tairiscint don iris *Béaloides* i lár Bhealtaine; Nicole Volmering 'Medieval Irish vision literature: a genre?', First European Symposium in Celtic Studies, Trier, an 9 Lúnasa 2013; 'Genre Methodology and Early Irish Literature: Theory and Application', Comhdháil ar Sheánra ag an Institiúid Ard-Léinn, 28 Meán Fómhair.

### EAGARTHÓIREACHT

Bhí Liam Breatnach ina chomheagarthóir le D. Mc Manus ar *Ériu* imleabhar 63.

Bhí Pádraig Breatnach ina chomheagarthóir le Fergus Kelly ar *Celtica* 27.

Bhí Fergus Kelly ina eagarthóir inmheánach chomh maith ar Ian Hughes (eag.), *Math uab Mathonwy* (Mediaeval and Modern Welsh Series 13), agus ar Elizabeth Boyle agus Deborah Hayden (eag.), *Authorities and Adaptations: The Reworking and Transmission of Sources in Medieval Ireland*. Lean Aoibheann Nic Dhonnchadha mar eagarthóir, i gcomhar leis an Ollamh Pádraig Ó Macháin, ar *An Linn Bhuí: Iris Ghaeltacht na nDéise*, agus foilsíodh imleabhar 17 in 2013. Bhí Gordon Ó Riain ina chomheagarthóir leis

## School of Celtic Studies (continued)



Prof. Liam Breatnach, Ruairi Quinn TD, Minister for Education and Skills and Dr. Aoibheann Nic Dhonnchadha at a visit by the Minister to the DIAS in June 2013.

An tOll. Liam Breatnach, Ruairi Quinn TD, Aire Oideachais agus Scileanna agus an Dr. Aoibheann Nic Dhonnchadha ag cuairt an Aire chuig DIAS i mí an Mheithimh 2013.

### PUBLICATIONS

Liam Breatnach: 'The Lord's Share in the Profits of Justice and a Passage in *Cath Maige Tuired*', *Celtica* 27 (2013) 1–17.

A translation into Italian of his 'An Mheán-Ghaeilge' in Kim McCone et al. (eds) *Stair na Gaeilge in ómós do Phádraig Ó Fiannachta* (Maigh Nuad 1994) 221–333 appeared as: Elisa Roma, *Il Medioirlandese/Middle Irish. A translation into Italian of the Gaelic text An Mheán-Ghaeilge by Liam Breatnach*. Translated from the Gaelic with notes by Elisa Roma, with a foreword by Ruairí Ó hUiginn (Lewiston, NY 2013).

Pádraig Breatnach: *The Four Masters and their Manuscripts: Studies in Palaeography and Text*. (Dublin 2013).

'Poetics and the bardic imagination', *Celtica* 27 (2013) 95–113.

'Continuity and change in the script of some early modern Irish autograph manuscripts', in *Medieval Autograph Manuscripts. Proceedings of the XVIIIth Colloquium of the Comité International de Paléographie Latine held in Ljubljana, 7-10 September 2010*, ed. Nataša Golob Brepols, (Turnhout 2013) [= *Bibliologia* 36] 67–78.

Fergus Kelly: 'Myles Dillon: scholar, organiser, innovator', in *Lebor na Cert: Reassessments* (Irish Texts Society Subsidiary Series 25, ed. Kevin Murray) 1–12.

Obituary of Rolf Baumgarten (1936–2012), in *Celtica* 27, 174–5.

Review of Sara Elin Roberts (ed.), *The Legal Triads of Medieval Wales* (Cardiff 2007) in *Celtica* 27, 186–8.

Review of Neil Jackman, Cairtriona Moore and Colin Rynne (eds), *The Mill at Kilbegly. An Archaeological Investigation on the route of the M6 Ballinasloe to Athlone National Road Scheme* (Dublin 2013), in *Celtica* 27, 221–3.

Review of Mark Williams, *Fiery Shapes: Celestial Portents and Astrology in Ireland and Wales, 700–1700* (Oxford 2010), in *Celtica* 27, 223–5.

Accepted for publication: 'An Early Irish Swindler: the *mindach méith*' (for a *Festschrift*).

'Below Ground: a Study of Early Irish Pits and Souterrains' (for a *Festschrift*).

Aoibheann Nic Dhonnchadha: 'Ollscoil na hÉireann, Gaillimh, Ls Bhreise 175', *Celtica* 27 (2013) 148–53.

Gordon Ó Riain: 'Early modern technical verse from NLI G 3 (II)', *Celtica* 27 (2013) 55–78.

'Varia I: 1. Two quatrains in Cath Maighe Rath; 2. An unrecorded scribal note in RIA 23 Q 16; 3. IGT II 1258', *Ériu* 63 (2013) 145–53.

Forthcoming: 'Táinig an tráth nóna: old age in Classical Irish religious verse', in C. Breatnach & M. Ní Úrdail (eds), *Proceedings of Irish Studies Conference* 4.

Deborah Hayden: 'Two Fragments of *Auraicept na nÉces* in the Irish Franciscan Archive: Context and Content', in *Celts and their Cultures at Home and Abroad: A Festschrift for Malcolm Broun*, edited by Anders Ahlqvist and Pamela O'Neill, Sydney Series in Celtic Studies 15 (Sydney 2013) 91–124

'Some Notes on the Transmission of *Auraicept na nÉces*', *Proceedings of the Harvard Celtic Colloquium* 32 (2012) 134–79.

## Scoil an Linn Cheiltigh (ar leanúint)

an Ollamh Ailbhe Ó Corráin ar *Celebrating Sixty Years of Celtic Studies at Uppsala University: Proceedings of the Eleventh Symposium of Societas Celtologica Nordica*. Acta Universitatis Upsaliensis: Studia Celtica Upsaliensia Vol. 9 (Uppsala 2013).

### SCRÚDÚCHÁN SEACHTRACH AGUS BALLRAÍOCHT CHOISTÍ

Bhí Pádraig Breatnach mar bhall de Chomhairle Acadamh Ríoga na hÉireann (2012-13), agus mar bhall de Choiste Comhairleach Uachtarán Acadamh Ríoga na hÉireann maidir le Measúnú Iarrthóirí (2013-14).

Bhí Fergus Kelly ina scrúdaitheoir seachtrach, Roinn na Luath-Ghaeilge agus na Gaeilge Meánaoisí, Coláiste na hOllscoile, Corcaigh 2012-13, ina scrúdaitheoir seachtrach le haghaidh tráchtas MA i Roinn na Luath-Ghaeilge agus na Gaeilge Meánaoisí, Coláiste na hOllscoile, Corcaigh, agus le haghaidh tráchtas PhD i Roinn na Sean-Ghaeilge agus na Meán-Ghaeilge, Ollscoil na hÉireann, Gaillimh. Bhí sé ina mheántóir ar thráchtas PhD agus ar Chomhaltacht Iardhochtúireachta ag Scoil na Seandálaíochta, an Coláiste Ollscoile, Baile Átha Cliath. Bhí sé ina bhall de choiste Chumann Stair Thalmhaíocht na hÉireann. Bhí Aoibheann Nic Dhonnchadha ina comhalta de Choiste Léann na Gaeilge, in Acadamh Ríoga na hÉireann, d'Fhochoiste Leabharlaine, Coláiste na Rinne, agus de bhord eagarthóireachta CELT. Bhí Gordon Ó Riain ina chomhalta de bhord comhairleach an Chéad Chomhdháil um Léann Ceilteach in Poznań, 18-19 Deireadh Fómhair 2014. Bhí Deborah Hayden ina Cisteoir agus ina Rúnaí Ballraíochta den Henry Sweet Society for the History of Linguistic Ideas ([www.henrysweet.org](http://www.henrysweet.org)).

### FOILSEACHÁIN

Liam Breatnach: 'The Lord's Share in the Profits of Justice and a Passage in *Cath Maige Tuired*', *Celtica* 27 (2013) 1-17.

Foilsíodh aistriúchán Iodáilise ar a chaibidil 'An Mheán-Ghaeilge' in Kim McCone et al. (eag.) *Stair na Gaeilge in ómós do Phádraig Ó Fiannachta* (Maigh Nuad 1994) 221-333 mar: Elisa Roma, *Il Medioirlandese/Middle Irish. Aistriúchán chuig Iodáil ar théacs Gaeilge An Mheán-Ghaeilge le Liam Breatnach*. Aistrithe ó Ghaeilge le nótaí ag Elisa Roma, le réamhrá ó Ruairí Ó hUiginn (Lewiston, NY 2013).

Pádraig Breatnach: *The Four Masters and their Manuscripts: Studies in Palaeography and Text*. Baile Átha Cliath 2013.

'Poetics and the bardic imagination', *Celtica* 27 (2013) 95-113.

'Continuity and change in the script of some early modern Irish autograph manuscripts', in *Medieval Autograph Manuscripts. Proceedings of the XVIIth Colloquium of the Comité International de Paléographie Latine held in Ljubljana, 7-10 September 2010*, ed. Nataša Golob (Brepols, Turnhout 2013) [= *Bibliologia* 36] 67-78.

Fergus Kelly: 'Myles Dillon: scholar, organiser, innovator', in *Lebor na Cert: Reassessments* (Irish Texts Society Subsidiary Series 25, eag. Kevin Murray) 1-12.

'Rolf Baumgarten (1936-2012)', in *Celtica* 27, 174-5.

Léirmheas ar Sara Elin Roberts (eag.), *The Legal Triads of Medieval Wales* (Cardiff 2007) in *Celtica* 27, 186-8.

Léirmheas ar Neil Jackman, Cairtriona Moore agus Colin Rynne (eag.), *The Mill at Kilbegly. An Archaeological Investigation on the route of the M6 Ballinasloe to Athlone National Road Scheme* (Baile Átha Cliath 2013), in *Celtica* 27, 221-3.

Léirmheas ar Mark Williams, *Fiery Shapes: Celestial Portents and Astrology in Ireland and Wales, 700-1700* (Oxford 2010), in *Celtica* 27, 223-5.

Glactha lena bhfoilsíú: 'An Early Irish Swindler: the *mindach méith*' (le haghaidh Festschrift).

'Below Ground: a Study of Early Irish Pits and Souterrains' (le haghaidh Festschrift).

Aoibheann Nic Dhonnchadha: 'Ollscoil na hÉireann, Gaillimh, Ls Bhreise 175', *Celtica* 27 (2013) 148-53.

Gordon Ó Riain: 'Early Modern Technical Verse from NLI G 3 (II)', *Celtica* 27 (2013) 55-78.

'Varia I: 1. Two Quatrains in Cath Maighe Rath; 2. An Unrecorded Scribal Note in RIA 23 Q 16; 3. IGT II 1258', *Ériu* 63 (2013) 145-53.

Le foilsíú: 'Táinig an tráth nóna: Old Age in Classical Irish Religious Verse', in C. Breatnach & M. Ní Úrdail (eag.), *Proceedings of Irish Studies Conference* 4.

Deborah Hayden: 'Two Fragments of *Auraicept na nÉces* in the Irish Franciscan Archive: Context and Content', in *Celts and their Cultures at Home and Abroad: A Festschrift for Malcolm Broun*, arna chur in eagar ag Anders Ahlqvist agus Pamela O'Neill, Sydney Series in Celtic Studies 15 (Sydney 2013) 91-124

'Some Notes on the Transmission of *Auraicept na nÉces*', *Proceedings of the Harvard Celtic Colloquium* 32 (2012) 134-79.

# School of Cosmic Physics

## Research: Astronomy and Astrophysics

In the broad area of high-energy astrophysics fundamental work was done by Felix Aharonian and co-workers on the physical processes whereby electrons and other charged particles moving in highly tangled magnetic fields produce X-rays and gamma-rays. In such extreme systems the conventional treatment (the so-called synchrotron radiation theory) is inappropriate and we enter the regime of jitter and curvature radiation. A further complication is that in many cases the radiation is produced in regions that are moving at close to the speed of light so that relativistic corrections are also important. It is important to have simple approximate formulae for such cases to allow the correct modelling and interpretation of the observations being made by among other instruments NASA's Fermi gamma-ray observatory and the HESS system of ground-based imaging atmospheric Cherenkov telescopes in which DIAS is a partner.

The HESS telescope system remains highly productive and is expected to become even more so in the near future with the addition of the very large central telescope. During the year the central telescope was commissioned and tested and is expected to start taking scientific data in 2014. Over 30 scientific papers are currently in preparation on Galactic sources alone in a working group that is coordinated by Felix Aharonian.

In addition to HESS and Fermi data, Andrew Taylor worked on the interpretation of data on the very highest energy cosmic rays published by the Pierre Auger Observatory and its implications for source models. He also worked on the discovery potential of future neutrino telescopes such as the proposed KM3NeT. Other areas of research included work by Maria Chernyakova (DCU/DIAS) on gamma-ray emission from binary systems.

Luke Drury proposed a model to explain the small angular scale structure seen in the cosmic ray arrival direction distribution in terms of electric fields in the outer heliosphere. He also worked with Turlough Downes (DCU/DIAS) on the amplification of magnetic fields in shock precursors as a result of cosmic ray pressure driven instabilities. This offers a robust and interesting alternative to the conventional current-driven plasma instability model.

In the area of star formation work focused mainly on low-mass star formation and brown dwarf studies. The relation between accretion (mainly through disc-like structures)

and outflow (often in the form of tightly collimated jets) has been an active area of research, both theoretically and observationally, for many years. It has become clear that broadly similar physical processes occur across the whole mass range from normal stars to sub-stellar objects such as brown dwarfs. The processes are however still not well understood part of the problem being that the systems seem to be episodic with a lot of inherent time variability. Large surveys are thus important to get comprehensive data sets. This is now possible with the advent of improved instrumentation and large synoptic digital sky surveys as well as the increased availability of robotic telescopes. Tom Ray has, for example, been exploring the use of the Liverpool robotic telescope for long-term monitoring of young stellar objects; Alex Scholz (DIAS/St Andrew's) and Paul Dawson have been using the UK Infrared digital sky survey to perform a census of brown dwarf candidates in the upper Scorpius region; and Antonella Natta (DIAS/Arcetri Observatory, Florence) and co-workers have used the new X-Shooter spectroscope on the European Southern Observatory's Very Large Telescope to observe a sample of forming proto-stars.

In addition to these optical and near infra-red studies, significant observational work is also done at sub-millimetre and radio wavelengths. Rachael Ainsworth has used the Indian Giant Metre-wave Radio Telescope to study non-thermal radio emission from young stellar object outflows; Tom Ray and co-workers have used the American Very Large Array and the English e-MERLIN system to study the jet from the young proto-star DG Tau; Vincent Geers was part of a team that used the new Atacama Large Millimetre Array (ALMA) to study the distribution of dust in the discs around young stars with implications for planet formation; and Malcolm Walmsley (DIAS/Arcetri Observatory, Florence) used the Australia Telescope Compact Array to study molecular line emission from proto-stellar cores. Satellite data, from the Hubble Space telescope as well as the Herschel infrared space mission, were also extensively used.

## Research: Geophysics

The Geophysics Section continued in its three main areas of research from global imaging to regional studies to local studies of direct Irish societal benefit, plus studies of the physical properties of rocks.



# Scoil na Fisice Cosmaí

## Taighde: Réalteolaíocht agus Réaltfhisic

I réimse leathan na réaltfhisice ardfhuinnimh rinne Felix Aharonian agus comhghleacaithe obair bhunúsach ar na próisis fhisiciúla ina dtáirgeann leictreoin agus cáithníní luchtaithe eile atá ag gluaiseacht i réimsí maighnéadacha in ard-aimhréidhe X-ghathanna agus gáma-ghathanna. I gcorais fhoircneacha mar sin tá an ghnáthchóiríocht (teoiric na radaíochta sioncraatóin, mar a thugtar air) míchuí agus téim isteach i réimeas an ghiodaim agus na radaíochta cuaire. Castacht eile ná go dtáirgtear, i neart cásanna, an radaíocht i réigiúin atá ag gluaiseacht i ngaireacht do luas an tsolais agus, mar sin, tá tábhacht le ceartúcháin choibhneasaíocha freisin. Tá sé tábhachtach neas-fhoirmli simplí a bheith ann do chásanna dá leithéid sa chaoi is go gceadófar an múnú agus an léirmhíniú ceart ar na nithe a bhreathnaítear ag uirlisí eile ar nós réadlann gáma-gha Fermi de chuid NASA agus an córas HESS teileascóip Cherenkov atmaisféireach íomháithe ina bhfuil DIAS ina chomhpháirtí.

Leanann an córas teileascóp HESS de bheith an-táirgiúil agus meastar go mbeidh sé níos táirgiúla fós amach anseo nuair a chuirtear teileascóp lárnach an-mhór leis. I rith na bliana tinneadh an teileascóp lárnach a ordú agus a thástáil agus meastar go dtosóidh sé ag glacadh sonraí eolaíochta i 2014. Tá breis agus 30 páipéar eolaíochta á n-ullmhú faoi láthair ar fhoinsí Réaltracha amháin i ngrúpa oibre atá á chomhordú ag Felix Aharonian.

Chomh maith le sonraí HESS agus Fermi, d'oibrigh Andrew Taylor ar léirmhíniú sonraí ar na gathanna cosmacha is airde fuinnimh ar fad a d'fhoilsigh Réadlann Pierre Auger agus na himpleachtaí atá aige do mhúnlaí foinse. D'oibrigh sé freisin ar an gcumas fionnachtana ag teileascóip neoidrionó sa todhchaí ar nós an KM3NeT atá molta. I measc na réimse eile taighde bhí obair a rinne Maria Chernyakova (DCU/DIAS) ar astú gáma-gha ó chórais dénártha.

Mhol Luke Drury múnla chun míniú a thabhairt ar an struchtúr scála ulleach beag a fheictear sa dáileadh treo sroichte gathanna cosmacha i dtéarmaí réimsí leictreacha sa héilísféar amuigh. D'oibrigh sé freisin le Turlough Downes (DCU/DIAS) ar aimplí na réimsí maighnéadacha i réamhtheachtaithe turrainge mar thoradh ar neamshocrachtaí tiomáinte ag brú gathanna cosmacha. Soláthraíonn sé seo rogha láidir agus suimiúil ar an múnla gnásúil neamshocrachta plasma tiomáinte ag sruth.



Lars Bergstrom from Stockholm University presenting the 2013 Statutory Public Lecture, DIAS School of Cosmic Physics.

*"Solving the Puzzle of Dark Matter?"*

Lars Bergstrom ó Ollscoil Stockholm ag cur Leacht Reachtúil Phoiblí 2013 i Láthair, Scoil na Fisice Cosmaí DIAS.

I réimse na réaltfhoirmíochta bhí an obair dírithe don chuid is mó ar low-mass réaltfhoirmíocht ísealmhaise agus ar staidéir ar abhaic dhonna. Le neart blianta anuas, réimse gníomhach taighde, ó thaobh na teoirice agus na breathnadóireachta araon, is ea an gaol idir fhuilleamh (trí structhúir ar chuma diosca, den chuid is mó) agus eisreabhadh (go minic i bhfoirm scairdeanna dlúth-chomhlínithe). Is léir go dtarlaíonn próisis fhisiciúla atá cosúil lena chéile, a bheag nó a mhór, thar an réimse maise iomlán ó ghnáth-réalta go nithe fo-réaltaacha ar nós abhaic dhonna. Ní thuigtear na próisis go maith fós, áfach - cuid den fhadhb is ea gur cosúil go mbíonn na córais eipeasóideach, agus an-chuid éagsúlachta ama iontu ó bhunús. Mar sin, tá tábhacht le suirbhéanna móra chun tacair chuimsitheacha sonraí a fháil. Tá sé seo indéanta anois le huirlisí feabhsaithe agus le mórshuirbhéanna spéire digiteacha sionoptacha, chomh maith leis an infhaighteacht níos mó ar theileascóip róbatacha. Tá fiosrú déanta ag Tom Ray, mar shampla, ar úsáid theileascóp róbatach Learphoill do mhonatóireacht fhadtéarmach ar nithe réaltacha óga; bhain Alex Scholz (DIAS/St Andrew's) agus Paul Dawson úsáid as suirbhé spéire digiteach Infridhearg na Ríochta Aontaithe chun áireamh a dhéanamh ar abhaic dhonna ionchasacha i limistéar uachtarach Scorpius; agus bhain Antonella Natta (DIAS/Arcetri Observatory, Florence) agus comhghleacaithe úsáid as an Speictreascóp nua X-Shooter

## School of Cosmic Physics (continued)



*Prof Luke Drury, Director School of Cosmic Physics, Sean Sherlock TD, Minister for Research and Innovation and Prof Jean-Christophe Desplat (ICHEC) at the hosting of the new Irish supercomputer "Fionn" in Dunsink Observatory as part of Science Week 2013.*

*Photos by Chris Bellew/Copyright Fennell Photography 2013.*

*An tOll. Luke Dury, Stiúrthóir Scoil na Fisice Cosmaí, Sean Sherlock TD, Aire Stáit agus An tOll. Jean-Christophe Desplat (ICHEC) ag óstáil an sár-ríomhaire nua "Fionn" i Readlann Dhúnsínche mar chuid de Sheachtain na hEolaíochte 2013.*

### Global studies

PhD student Andrew Schaeffer and Professor Sergei Lebedev released their global tomographic model of the upper mantle down to depths of some 400 km in their paper "Global shear-speed structure of the upper mantle and transition zone", published in *Geophysical Journal International*. Schaeffer won one of the two 2013 Student Author Awards of the journal for this contribution. The new model, constrained by an unprecedentedly large new dataset of multimode waveform fits, demonstrates increased resolution compared to other existing models for a variety of features; it captures regional scale heterogeneity globally, within both the upper mantle and the crust.

Professor Zdenec Martinec continued his theoretical studies of the modelling and interpretation of magnetic data from the German GeoForschungsZentrum's (GFZ) CHAMP (CHALLENGING Minisatellite Payload) satellite and the European Space Agency's (ESA) SWARM constellation of three satellites, and also considered the gravity field observed by ESA's GOCE (Gravity field and steady-state

Ocean Circulation Explorer) data. Martinec showed that very careful filtering of the GOCE data using closed and spherical-harmonic forms of the Green's functions is required in order to utilize the data to its fullest extent.

### Regional Studies

Regional studies of the physical parameters of the upper mantle were undertaken in many parts of the globe, including Europe, South Africa, China, West Africa, North America, the Arctic, and the Antarctic.

A new project was initiated by Senior Professor Alan G. Jones in West Africa as part of the West African Exploration Initiative (WAXI: [www.waxi2.org](http://www.waxi2.org)), which is funded by industry contributions through AMIRA International. Deep-probing electromagnetic measurements were made on a 600-km-long profile across southern Burkina Faso and northern Ghana. Fieldwork by Dr. Florian Le Pape and Technician Colin Hogg, with a huge amount of assistance from Burkinian and Ghanaian people, was challenging, but the data acquired yield insight into the geometries of large structures, down to depths in excess of 200 km, that are mapped on the surface.

Martinec and his group present regional-scale mass balances for 25 drainage basins of the Antarctic Ice Sheet (AIS) from satellite observations of the Gravity and Climate Experiment (GRACE) for time period January 2003 to September 2012. They developed an improved glacial-isostatic adjustment (GIA) estimate for Antarctica using newly available GPS uplift rates, allowing more accurate separation of GIA-induced trends in the GRACE gravity fields from those caused by current imbalances of the AIS. The revised GIA estimate is considerably lower than previous predictions, yielding an estimate of apparent mass change of  $53 \pm 18 \text{ Gt yr}^{-1}$ .

Lebedev and Schaeffer derived a new model of the upper mantle beneath the entire North America by means of inversion of multimode waveform fits of 3/4 of a million vertical-component, broadband seismograms. Of these, almost 230 thousand are from the Transportable Array component of USArray, several tens of thousands from other USArray-affiliated stations, and the rest from global networks and other arrays. The unprecedentedly large waveform dataset, with highly complementary USArray and global-network sub-sets within it, produces improved resolution for a variety of features in North American upper mantle, compared to other available models.

## Scoil na Fisice Cosmaí (ar leanúint)

ar Theileascóp An-Mhór Réadlann Dheisceart na hEorpa chun breathnú ar shampla de phróta-réalta ag foirmiú.

Chomh maith leis na staidéir optúla agus gar-infridhearga seo, déantar obair shuntasach breathnúcháin ag tonnfhaid fo-mhíliméadair agus raidió. Bhain Rachael Ainsworth úsáid as an Indian Giant Metre-wave Radio Telescope chun staidéar a dhéanamh ar astú raisió neamh-theirmach ó eis-sreafaí nithe óga réaltacha; bhain Tom Ray agus comhghleacaithe úsáid as American Very Large Array agus córas e-MERLIN Shasana chun staidéar a dhéanamh ar an scaird ón bpróta-réalt óg DG Tau; bhí Vincent Geers ina bhall den fhoireann a d'úsáid an Atacama Large Millimetre Array (ALMA) chun staidéar a dhéanamh ar dháileadh an deannaigh sna díoscaí mórthimpeall ar réalta óga le himpleachtaí d'foirmiú plainéid; agus bhain Malcolm Walmsley (DIAS/Arcetri Observatory, Florence) úsáid as an Australia Telescope Compact Array chun staidéar ar astú líne móilíneach ó chroíthe próta-réaltacha. Baineadh úsáid go forleathan freisin as sonraí sailtíle Hubble agus misean spáis infridhearg Herschel.

### Taighde: Geoifisic

Lean Rannóg na Geoifisice de na trí phríomhréimse taighde ó íomháu domhanda go staidéir réigiúnda go staidéir áitiúla atá chun leasa shochoaí na hÉireann go díreach, móide staidéir ar airíonna fisiciúla atá ag carraigeacha.

### Staidéir dhomhanda

D'fhoilsigh mac léinn PhD Andrew Schaeffer agus an tOllamh Sergei Lebedev a múnla tómagrafach domhanda den mhaintlín síos chuig doimhne 400 km ina bpáipéar "Global shear-speed structure of the upper mantle and transition zone", a foilsíodh i Geophysical Journal International. Bhuaigh Schaeffer ceann amháin de dhá Ghradam Údair Mac Léinn 2013 de chuid na hirise as an alt seo. Taispeánann an múnla nua, srianta ag tacar mór sonraí, nach raibh a leithéid ann roimhe, faoi shocruithe tonnchruthanna ilmhódacha, gléine níos mó i gcomparáid le múnlaí eile atá ann do réimse de thréithe; gabhann sé ilghnéitheacht ar scála réigiúnda go domhanda, laistigh den mhaitlín uachtarach agus den screamh.

Lean an tOllamh Zdenec Martinec dá staidéar teoiriciúil ar mhúnlú agus léirmhíniú ar shonraí maighnéadacha shaitilít GeoForschungsZentrum's na Gearmáine (GFZ) CHAMP (CHALLENGING Minisatellite Payload) agus ó chnuasach trí shaitilít SWARM Ghníomhaireacht Spáis na hEorpa (ESA), agus rinne sé staidéar freisin ar an réimse domhantarraingthe a bhreathnaigh sonraí GOCE ESA

(Gravity field and steady-state Ocean Circulation Explorer). Léirigh Martinec go bhfuil gá le scagadh an-chúramach ar shonraí GOCE ag baint úsáid as foirmeacha iata agus sféarúla-armónacha d'fheidhmeanna Green chun na sonraí a úsáid sa mhéid agus is féidir.

### Staidéir réigiúnda

Rinneadh staidéir réigiúnda ar pharaméadair fhisiciúla an mhiatlín uachtair i neart áiteanna sa chruinne, lena n-áirítear an Eoraip, an Afraic Theas, an tSín, Iarthar na hAfraice, Meiriceá Thuaidh, an tArtach agus an tAntartach.

Chuir an tOllamh Sinsearach Alan G. Jones tionscadal nua ar bun in Iarthar na hAfraice mar chuid den West African Exploration Initiative (WAXI: [www.waxi2.org](http://www.waxi2.org)), atá maoinithe ag ranníocaíochtaí an tionscail trí AMIRA International. Rinneadh tomhais dhomhain ar phróifíl 600 km ar fhad thar dheisceart Bhuircíne Fasó agus tuaisceart Ghána. Bhí dúshlán san obair allamuigh a rinne an Dr. Florian Le Pape agus an teicneoir Colin Hogg dúshlánach, le cúnamh mór ó mhuintir Bhuircíne agus Ghána, ach tugann na sonraí léargas ar na geoiméadrachtaí atá ag struchtúir mhóra, síos chomh domhain le breis agus 200 km, atá mapáilte ar an dromchla.

Cuireann Martinec agus a ghrúpa maischothromaíochtaí ar scála réigiúnda i láthair do 25 abhantrach draenála san Oighearchlúid Antartach (AIS) ó bhreathnuithe sailtíle sa turgnamh Gravity and Climate Experiment (GRACE) don tréimhse ama ó Eanáir 2003 go Meán Fómhair 2012. D'fhorbraigh siad meastachán feabhsaithe um cheartú oighear-iseastatach (GIA) don Antartach ag baint úsáide as rátaí ardaithe GPS atá ar fáil as an nua, a cheadaíonn deighilt níos cruinne idir threonna spreagtha ag GIA sna réimsí domhantarraingthe agus iad siúd atá ann mar thoradh ar neamhchothromaíochtaí reatha an AIS. Tá an meastachán GIA leasaithe níos ísle go mór ná na meastacháin a rinneadh roimhe, le meastachán d'athrú maise follasach de  $53 \pm 18 \text{ Gt yr}^{-1}$ .

Bhain Lebedev agus Schaeffer múnla nua amach den mhaintlín uachtair faoi Mheiriceá Thuaidh ina iomláine trí inbhéartú ar shocruithe tonnchrutha ilmhód de 3/4 de mhíliúin seismegram leathanbhanda le comhpháirt cheartingear. Díobh seo, tá beagnach 230 míle ó chomhpháirt Transportable Array den USArray, tá deiceanna de mhílte ó stáisiúin eile atá nasctha le USArray, agus tagann an fuilleach ó líonraí domhanda agus eagair eile. Mar thoradh ar an tacar sonraí tonnchrutha chom mór sin, le fothacair chomhlántacha laistigh de ó USArray agus líontaí domhanda, táirtgear

## School of Cosmic Physics (continued)

Both Jones and Lebedev contributed chapters to a special issue of the journal *Tectonophysics* in celebration of 100 years since the discovery by Andrija Mohorovičić of a seismological boundary at the base of the crust that is now ubiquitously called the “Moho” in his honour. Lebedev discussed the seismological signals from the Moho whereas Jones considered resolution in the modelled responses for a step-like change in electrical conductivity at the Moho (an “eMoho”).

Jones, together with Dr. Jan Vozar (DIAS), Dr. Juan Carlos Afonso (Macquarie), and Dr. Javier Fulla (CSIC, Madrid), employed the LitMod petrological-geophysical modelling framework in a number of localities. LitMod ensures that all physical observables, including topography, heat flow, geoid, the gravity field, and seismological and electromagnetic data, are modelled within a self-consistent manner that respects permissible variations of the oxide chemistry in the lithospheric mantle. For Tibet it is possible to demonstrate that the upper mantle beneath the area in the central Tibetan Plateau must be dry, but the upper mantle further south, presumably from the Indian craton, must contain tiny amounts of water (some 100 parts-per-million). For the Kaapvaal Craton in South Africa a seismic boundary at some 160 km, previously interpreted as the base of the rigid lithosphere, was proven to be a mid-lithospheric discontinuity (MLD), with the real thickness of the plate being some 240 km.

### Local studies

In terms of local studies, the role that the Geophysics Section has played since the mid-1980s in proving that continental crust extends well into the Atlantic is crucial to Ireland’s arguments for territorial claims to an area that is some ten times the exposed landmass of Ireland under the Law of the Sea. Offshore studies continue today, and Professor Brian O’Reilly secured significant funding in late-2013 from the Irish Petroleum Infrastructure Programme as part of the government and industry-initiated North Atlantic Petroleum Systems Assessment (NAPSA) program. This funding will bring more staff into DIAS and is designed to investigate the entire structure of the Porcupine Basin using an integrated scientific approach. The group will investigate and re-evaluate the crustal structure of the basin using a multitude of geological and geophysical tools and a very diverse range of academic and industry expertise. The aim of this project is a) to quantify variations in crustal geometry and seismic properties along the basin axis and towards mainland

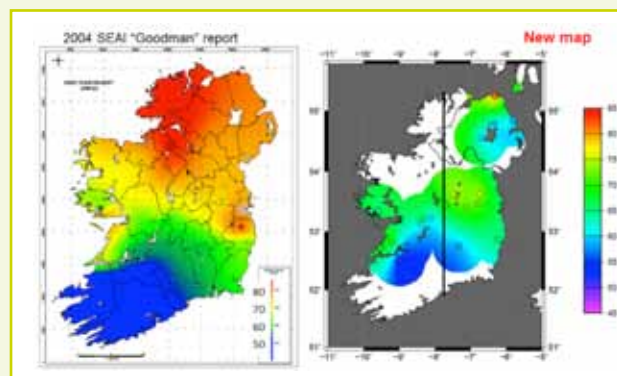
Ireland and b) to investigate the stratigraphic response to tectonic hyperextension and its potential impact on petroleum systems.

The geothermal assessment project entitled IRETherm ([www.iretherm.ie](http://www.iretherm.ie)) completed its geophysical data acquisition during 2013 and continued on its quest until mid-2015 to develop a strategic and holistic understanding of Ireland’s deep geothermal energy potential. Due to a lot of cultural interference during the Summer of 2012, a third unplanned field campaign took place in the Spring of 2013 when the cow fences were mostly turned off. The Summer campaign was in part in the difficult terrain of NW Donegal, and equipment had to be manually hauled up and down the hills. IRETherm activities have four main threads, namely

- (1) Geophysical assessment of the potential for Hot Dry Rock (HDR) geothermal energy provision in Ireland,
- (2) Geophysical assessment of the potential for Hot Sedimentary Aquifer (HSA) geothermal energy provision in Ireland,
- (3) Warm springs in Ireland, and,
- (4) Heat production and heat distribution in Ireland’s crust.

Activities (1)-(3) are being undertaken primary in DIAS, and activity (4) primary by UCD collaborators.

One major contribution was a re-assessment of the surface heat flow (SHF) map of Ireland. A prior map published in 2004 (left map, below figure) inferred far higher thermal environment in the northern half of Ireland compared to the southern half. Careful examination of the data and rejection of suspect data yields a very different map with generally moderate SHF across Ireland, with some possible minor enhancement in the middle.



## Scoil na Fisice Cosmaí (ar leanúint)

gléine níos fearr do thréithe éagsúlaí maintlín uachtar Mheiriceá Thuaidh, i gcomparáid le múnlaí eile atá ar fáil.

Scríobh Jones agus Lebedev araon caibidlí d'eagrán speisialta den iris *Tectonophysics* mar cheiliúradh ar 100 bliain ó tháinig Andrija Mohorovičić ar theorainn seismeoilíoch ag bun na screimhe ar a dtugtar "Moho" anois in onór dó. Phléigh Lebedev na comharthaí seismeoilíochacha ón Moho agus rinne Jones plé faoi ghléine sna freagraí múnlaíthe d'athrú céime i seoltacht leictreach ag an Moho ("eMoho").

Bhain Jones, in éineacht leis an Dr. Jan Vozar (DIAS), an Dr. Juan Carlos Afonso (Macquarie), agus an Dr. Javier Fulla (CSIC, Madrid), úsáid as an gceat múnla peitreoilíoch-geoifisicúil LitMod i roinnt áiteanna. Cinntíonn LitMod go ndéantar na nithe fisiciúla inbhreathnaithe uile, lena n-áirítear topagrafaíocht, sreabhadh teasa, geoid, an réimse domhantarraingthe, agus sonraí seismeoilíochacha agus leictreamaighnéadacha, a mhúnlú laistigh de mhodh féinchoimhsheasmhach a thugann aird ar athruithe ceadaithe den cheimic ocsaíde sa mhaintlín litisféarach. Don Tibéid is féidir a thaispeáint nach mór don mhaintlín uachtair faoi bhun an limistéir san Ardchlár Tibéideach lárnach a bheith tirim, ach nach mór don mhaintlín uachtair níos faide ó dheas, ó chratón na hInde is dócha, méideanna bídeacha uisce a bheith ann (thart ar 100 cuid in aghaidh an mhilliúin). Do Chratón Kaapvaal san Afraic Theas cruthaíodh go raibh teorainn seismeach ag thart ar 160 km, a measadh roimhe sin a bheith ina bhonn leis an righin, ina neamhleanúnachas lár-litisféarach (MLD), agus go raibh fíorthiús de thart ar 240 km ag an bpláta.

### Staidéir áitiúla

I dtéarmaí staidéir áitiúla, tá an ról atá ag Rannóg na Geoifisice ó lár na 1980í i gcruthú go síneann an screamh ilchríochach i bhfad amach sa Atlantách ríthábhachtach d'argóintí na hÉireann maidir le héilimh críche ar limistéar atá deich n-oiread níos mó ná mórchríoch nochtaithe na hÉireann faoi Dhlí na Mara. Leantar de staidéir easchósta inniú, agus bhain an tOllamh Brian O'Reilly maoiniú suntasach amach ag druidim le deireadh 2013 ón Clár Infreastruchtúir Peitiriliam na hÉireann mar chuid den chlár atá curtha ag bun ag an rialtas agus an tionscal North Atlantic Petroleum Systems Assessment (NAPSA). Tabharfaidh an maoiniú seo níos mó foirne isteach in DIAS agus tá sé ceaptha le fiosrú a dhéanamh ar struchtúr iomlán Imchuach Porcupine ag baint úsáid as cur chuig eolaíoch comhtháite. Déanfaidh an grúpa imscrúdú agus athbhreithniú ar struchtúr screamhach na himchuaiche



*Prof. Gerry Wrixon, Chairman of School of Cosmic Physics Governing Board, Ruairi Quinn TD, Minister for Education and Skills and Prof. Alan Jones at a visit by the Minister to the DIAS in June 2013.*

*An tOll. Gerry Wrixon, Cathaoirleach an Bhoird, Scoil na Fisice Cosmaí, Ruairi Quinn TD, Aire Oideachais agus Scileanna agus An tOll. Alan Jones ag cuairt an Aire chuig DIAS i mí an Mheithimh 2013.*

ag baint úsáide as an iliomad uirlisí geolaíochacha agus geoifisice agus as réimse an-leathan de shaineolas acadúil agus tionscail. Tá sé d'aidhm ag an tionscadal seo a) athruithe sa éagsúlachtaí sa gheoiméadracht scribebh agus in airíonna seismeacha a chainníochtú thar ais na himchuaiche agus i dtreo mhórchríoch na hÉireann agus b) inscrúdú a dhéanamh ar an bhfreagairt stratagrafach ar hipirshíneadh teicteonach agus an tionchar a d'fhéadfadh a bheith aige ar chórais peitiriliam.

Chuir an tionscadal measúnaithe geoitéarmach ar a dtugtar IRETherm ([www.iretherm.ie](http://www.iretherm.ie)) críoch le bailiú sonraí geoifisice le linn 2013 agus leanadh dá lorg go dtí lár 2015 le tuiscint straitéiseach agus iomlánaíoch a fhorbairt ar phoitéinseal fuinnimh geoitéarmach domhain na hÉireann.

Mar thoradh ar neart trasnaíochta cultúrtha i rith an tSamhraidh 2012, bhí tríú feachtas allamuigh neamhbheartaithe ann in Earrach na bliana 2013 nuair a bhí na cláíochá bó múchta, cuid mhór. Bhí cuid d'fheachtas an tSamhraidh i dtír-raon deacair in Iarthuaisceart Dhún na nGall, agus ba ghá trealamh a tharraingt suas agus síos cnoca de láimh. Tá ceithre phríomh-shnáithe ag gníomhaíochtaí IRETherm, is iad sin



## School of Cosmic Physics (continued)

Two papers were published in 2013 that utilize the LitMod approach to demonstrate that the cold rigid uppermost mantle plate must be some 100 km in thickness beneath Ireland, contrary to previously-published very shallow estimates of 55-85 km. A new partner joined the IRETherm consortium in 2013, namely Providence Resources, which facilitated making additional measurements on Rathlin Island off the north coast of Ireland. Studies in the Dublin Basin, in collaboration with industry partner GT Energy, are showing the geometries of major structures and faults at depth. This knowledge aids definition of any future commercial exploration programme of the area. Dr. Mark Muller, the Schrödinger Fellow and one of the driving forces behind the initiation of IRETherm, decided to take his career in a different direction. In his place, we successfully recruited Dr. Volker Rath from Madrid, who has considerable experience in geothermal energy exploration.

The seismic structure of Ireland's crust and upper mantle is now receiving considerable attention through the Science Foundation Ireland (SFI) Starting Investigatory Research Grant (SIRG) to awardee Dr. Nicola Piana Agostinetti. Dr. Piana Agostinetti's work meshed perfectly with that of his mentor, Lebedev, and is using the Ireland Array stations together with focussed dedicated arrays on two areas of interest, namely the Dublin Basin and NW Donegal (most seismically active area of Ireland).

### Rock properties studies

Jones continued his collaboration with specialists in the University of Montpellier II comparing and contrasting the electrical properties of rocks with seismic ones and their petrological nature. Jones employed an approach that is becoming more-and-more commonplace in Solid State Physics, namely the Meyer-Neldel Rule (MNR) by which the logarithm of the pre-exponent term and the activation energy of any process that can be described in an Arrhenian manner are linearly related. Jones demonstrated that diffusion of hydrogen in minerals is MNR consistent, with different MNR slopes and intercepts for each mineral. Jones also showed that the formulae used by laboratories for fitting their proton conduction data are inconsistent with the MNR and need to be revised.

### Contributions to Third Level Education

Tom Ray gave two courses of lectures to TCD Physics students as well as a seminar on the James Webb Space Telescope to the UCD taught MSc programme in Space

Science and Technology. Four final year student projects in TCD were supervised by Tom Ray and Luke Drury. A research student position was jointly funded with DCU to support the work of Dr Maria Chernyakova. The Lindsay scholar (jointly funded with Armagh Observatory) completed her PhD in QUB. The research collaboration involving the secondment on a part-time basis of Dr Turlough Downes to DIAS by DCU was continued. Senior Technical Officer Mike Smyth was seconded to UCD to assist with the development of their taught MSc in Space Science and Technology.

### Research Infrastructure and Public Service

Tom Ray is a co-PI on the Mid Infra-red Instrument (MIRI) for the James Webb Space Telescope (the successor to the Hubble space telescope). The hardware has now been delivered to NASA for integration and the emphasis in Dublin has moved to the software development phase. As a consequence of his role in MIRI Tom Ray was also asked to join the Exoplanet Characterisation Observatory proposal (EChO) for the European Space Agency's next medium scale mission (M3). A proposal has been made together with Jodrell Bank and TCD to carry out an absolutely calibrated radio sky survey in the L-band using the radio-quiet location of Birr.

The high-energy astrophysics group continues to play an active role in the HESS collaboration as well as contributing to the scientific case studies for the European Strategic Forum for Research Infrastructure projects CTA and KM3NeT.

DIAS is gradually moving out of the area of HPC infrastructure having helped to establish the Irish Centre for High-End Computing (ICHEC). However DIAS retains very strong links with ICHEC and was instrumental in obtaining funding for their latest supercomputer, Fionn. It was thus fitting that the name of the new machine was announced at a ceremony in Dunsink Observatory and that DELL corporation decided to hold their second HPC day there.

In partnership with the Department of Education and Skills a training week for national school science teachers was held in Dunsink for the second year.

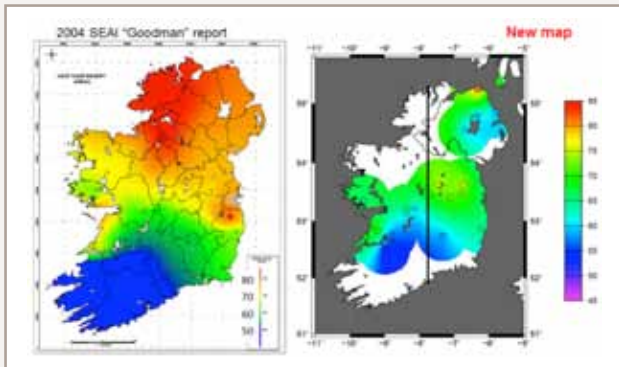
Luke Drury served as President of the Royal Irish Academy. Felix Aharonian served as vice-president of the "High-Energy Phenomena and Fundamental Physics" division of the International Astronomical Union, as ESA

# Scoil na Fisice Cosmaí (ar leanúint)

- (1) Measúnú geofisice ar an bpoitéinseal do sholáthar fuinnimh geoitéirmeach Charraig The Thirim (HDR) in Éirinn,
- (2) Measúnú geofisice ar an bpoitéinseal do sholáthar fuinnimh geoitéirmeach Uiscíoch Dríodrach Te (HSA) in Éirinn,
- (3) Foinsí Bhogthe in Éirinn, agus,
- (4) Táirgeadh teasa agus dáileadh teasa i screamh na hÉireann.

Tá gníomhaíochtaí (1)-(3) á ndéanamh don chuid is mó ag DIAS, agus gníomhaíocht (4) don chuid is mó ag comhoibrithe UCD.

Cion tairbhe mó ab ea athbhreithniú ar mhapa shreabhadh teasa dromhchla (SHF) na hÉireann. Thug mapa a foilsíodh roimhe seo i 2004 (fíor thíos, mapa ar chlé) le tuiscint go raibh timpeallacht theirmeach i bhfad níos airde sa leath thuaidh d'Éirinn i gcomparáid leis an leath ó dheas. Nuair a déantar scrúdú cúramach ar na sonraí agus nuair a dhiúltaítear do shonraí amhrasacha faightear mapa an-éagsúil ar fad le SHF measartha i gcoitinne ar fud ke hÉireann, le breisiú beag, b'fhéidir, sa lár.



Foilsíodh dhá pháipéar i 2013 a bhaineann úsáid as an gcur chuige LitMod chun a thaispeáint nach mór don phláta maintlín righin is airde a bheith thart ar 100 km i dtiús faoi bhun na hÉireann, i gcodarsnacht leis na meastacháin an-éadomhain de 55-85 km a foilsíodh roimhe sin. Tháinig comhpháirtí nua isteach i gcuibhreas IRETherm i 2013, is é sin Providence Resources, a d'éascaigh tomhais bhreise a dhéanamh ar Oileán Reachlainn amuigh ó chósta thiar na hÉireann. Léiríonn staidéir in Imchuach Átha Cliath, i gcomhar le comhpháirtí tionscail GT Energy, geoméadrachtaí mhórstruchtúr agus lochtanna i ndoimhne. Cuidíonn an t-eolas seo le sainmhíniú ar aon chlár fionnachtá trachtála sa limistéar amach anseo.

Chinn an Dr. Mark Muller, an Comhalta Schrödinger agus duine díobh siúd ba chúis le bunú IRETherm, ar a ghairm a dhéanamh i dtreo eile. Ina áit, rinneamar an Dr. Volker Rath ó Madrid a earcú, a bhfuil taithí suntasach aige i bhfionnachtain fuinnimh geoitéirmeach.

Tá aird shuntasach anois á fháil ag struchtúr seismeach screabh agus mhaintlín uachtair na hÉireann tríd an deontas taighde a bhronn Fondúireacht Eolaíochta Éireann (SFI) ar an Dr. Nicola Piana Agostinetti. Comhghreamaíonn obair an Dr. Piana Agostinetti go foirfe le hobair a mheantóra, Lebedev, agus tá sé ag baint úsáide as stáisiúin Eagar na hÉireann chomh maith le heagair dhírthe thiomanta ar dhá réimse spéise, is iad sin Imchuach Átha Cliath agus Iarthuaisceart Dhún na nGall (an limistéar is gníomhaí in Éirinn ó thaobh na seismeoilíochta de).

## Staidéir airíonna carraige

Lean Jones dá chomhoibriú le speisialtóirí in Ollscoil Montpellier II agus déanamh comparáid agus codarsnacha idir airíonna leictreacha ag carraigeacha agus cinn siesmeacha agus a nádúr peitreoilíoch. D'úsáid Jones cur chuige atá ag éirí níos coitianta i bhFisic Sholadstaide, is é sin Rial Meyer-Neldel (MNR) trína bhfuil gaol líneac idir logartam an téarma réamh-easpónaint agus fuinneamh gníomhachtaí aon phróis ar féidir cur síos a dhéanamh air ar bhealach Arrhenian. Léirigh Jones go bhfuil idirleathadh ar hidrigin i mianraí comsheasmhach ó thaobh MNR, le fánaí agus idircheapa MNR éagsúla le haghaidh gach mianra. Léirigh Jones freisin nach bhfuil na foirmle a úsáideanna saotharlanna chun a sonraí seolta prótóin a shocrú comhsheasmhach leis an MNR agus nach mór iad a leasú.

## Cion Tairbhe don Oideachas

Thug Tom Ray dhá chúrsa léachtaí chuig mic léinn Fisice TCD chomh maith le seimineár ar Theileascóp Spáis James Webb chuig an gclár múinte UCD MSc san Eolaíocht agus Teicneolaíocht Spáis. Bhí ceithre thionscadal mic léinn blian deiridh i TCD á maoiniú ag Tom Ray agus Luke Drury. Rinneadh post taighde mic léinn a chomh-mhaoiniú le DCU chun tacú le hobair an Dr. Maria Chernyakova. Chríochnaigh an scoláire Lindsay (comh-mhaoinithe le Réadlann Ard Mhacha) a PhD i QUB. Leanadh den chomhoibriú taighde ina raibh iasacht ar bhonn páirtaimseartha den Dr. Turlough Downes chuig DIAS ó DCU. Chuaigh an tOifigeach Sinsearach Teicniúil Mike Smyth ar iasacht chuig UCD chun cuidiú le forbairt a gcéime múinte MSc san Eolaíocht agus Teicneolaíocht Spáis.

## School of Cosmic Physics (continued)

representative to the Japanese Astro-H mission, as an editor of the International Journal of Modern Physics, and on many panels and committees. Tom Ray served as chair of the European Southern Observatory's Observing Programme Committee for studies of the ISM, Star Formation and the Solar System; on the EU's Marie Curie Fellowship panel for Physics; on the Council of the RIA; on the British Science and Technology Facilities Council e-MERLIN steering committee; on ESA's MIRI steering committee; on the Joint Management Board of the Armagh Observatory and Planetarium; and on other committees and panels.

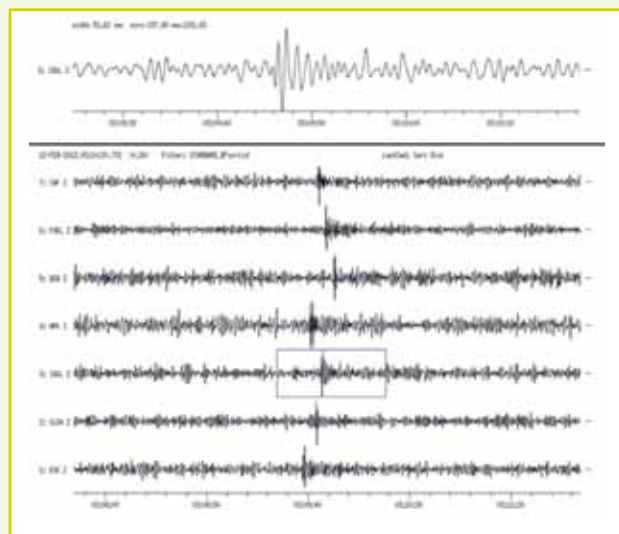
The Geophysics Section runs the Irish Geoscience Graduate Programme (IGGP, [www.igpp.ie](http://www.igpp.ie)), an All-Ireland virtual graduate training school in the geosciences providing tuition on Short Courses located at the Institution where the expertise is. Irish (North and South) students travel for the 3-5 day courses, with reimbursement of some costs. The IGGP continues to grow year-on-year offering higher quality courses to Post Graduates. For 2013-14 DIAS is contributing 13 courses of the 27 currently on the IGGP website. The total enrollment for the academic year is over 180.

### Third Pillar – Research Infrastructure and Public Service

The Geophysics Section runs the Irish National Seismic Network (INSN), an array of five very broadband seismometers located around Ireland sending information in real-time to Dublin, from which the data are made available internationally. The INSN records both local seismicity (down to magnitude 1.0) as well as large teleseismic events, and seismic information is made available to the State. The INSN seismic station network continued to function without any major problems in recording seismic data and its near real-time transmission to the server in DIAS. The development of the station ILTH in Louth is currently under-way. In 2013 the strongest teleseismic event recorded by the network was a Mag 7.8 in Awaran, Pakistan and the nuclear test in North Korea. (See table below).

DIAS/SCP/Geo hosts the Irish National Data Centre (NDC) for the Preparatory Commission for the Comprehensive nuclear-Test-Ban Treaty Organization (CTBTO, [www.ctbto.org/](http://www.ctbto.org/)). The NDC was officially opened in June, 2012 by Mr. Eamon Gilmore, Tanaiste, Minister for Foreign Affairs and Trade and Dr. Lassina Zerbo, Director of International

Monitoring Division, now the Executive Secretary, CTBTO, Vienna. The NDC continued to raise its profile and that of the CTBTO throughout the year. One event in particular brought the NDC to the attention of the public and in particular the media. On Feb 12, 2013, the Irish National Seismic Network (INSN) recorded an unusual seismic event in the Democratic People's Republic of Korea (DPRK). The DPRK claimed that it had conducted yet another nuclear test, the third within the last seven years. Initial estimates showed that this event measured Mag 4.9, and occurred at 02.58 GMT approx. It was located in the region of the previous North Korean nuclear tests of 2006 and 2009. The South Korean defence ministry has provided preliminary yield estimates for the test of between 6 - 7 kilotons. The picture shows the energy generated by the nuclear test arriving at our stations in DSB Dublin and IDGL Donegal, approx 11 minutes after the time of detonation.



### Public Outreach

The premier outreach event of the School is of course the Statutory Public Lecture which was given in 2013 by Professor Lars Bergström from the Oscar Klein Centre for Cosmoparticle Physics in Stockholm. His title was "Solving the Puzzle of Dark Matter?" and the talk was given in the Moore auditorium of the new O'Brien centre for science in UCD. A recording of the talk is available on YouTube.

# Scoil na Fisice Cosmaí (ar leanúint)

## Infreastruchtúr Taighde agus an tSeirbhís Phoiblí

Is comh-Phríomhthaighdeoir é Tom Ray ar an Uirlis Infridhearg Láir (MIRI) don Teileascóp Spáis James Webb (a tháinig i gcomharbacht ar theileascóp spáis Hubble). Tá na crua-earraí anois tugtha do NASA le comhtháthú agus tá an bhéim anois i mBaile Átha Cliath ar chéim forbartha na mbogearraí. Mar thoradh ar a ról in MIRI iarradh ar Tom Ray páirt a ghlacadh san iarratas Exoplanet Characterisation Observatory (EChO) don chéad mhísean ar scála láir de chuid Ghníomhaireacht Spáis na hEorpa (M3). Tá moladh déanta in éineacht le Jodrell Bank agus TCD le suirbhé spéire raidió calabraithe go hiomlán san L-bhanda ag baint úsáide as suíomh raidió-chiúin Bhiorra.

Leanann an grúpa réaltfhisice ard-fhuinnimh de ról gníomhach a imirt sa chuibhreas HESS chomh maith le cur le cás-staidéir eolaíochta don bhFóram Straitéiseach Eorpach do thionscadail um Infreastruchtúr Taighde CTA agus KM3NeT.

Tá DIAS ag bigadh amach as réimse an infreastruchtúir HPC de réir a chéile i ndiaidh dó Ionad na hÉireann um Ríomhaireacht Ardleibhéil (ICHEC) a bhunú. Mar sin féin, coinníonn DIAS naisc an-láidir le ICHEC agus chuidigh DIAS le maoiniú a bhaint amach dá sár-ríomhaire, Fionn. Dá bhrí sin, bhí sé cuí go bhfógrófaí ainm an innill nua ag ócáid i Réadlann Dhún Sinche agus gur chinn comhlacht DELL ar an dara lá HPC a thionól ansin.

I gcomhpháirt leis an Roinn Oideachais agus Scileanna eagraíodh seachtain oiliúna do bhunmhúinteoirí eolaíochta i nDún Sinche don dara bliain.

D'fhreastal Luke Drury mar Uachtarán ar Acadamh Ríoga na hÉireann. D'fhreastal Felix Aharonian mar leas-uachtarán ar an roinn 'Fisic Ardhuinnimh agus Bhunúsach' den Aontas Réalteolaíochta Idirnáisiúnta, mar ionadaí ESA ar mhísean Seapánach Astro-H, mar eagarthóir ar International Journal of Modern Physics, agus ar neart painéal agus coistí. D'fhreastal Tom Ray mar chathaoirleach ar Choiste Cláir Breathnaithe de chuid Réadlann Theas na hEorpa don staidéar ar ISM, Réaltfhoirmíocht agus an Grianchóras; ar phainéal Marie Curie an AE don Fhisic; ar Chomhairle Acadamh Ríoga na hÉireann; ar choiste stiúrtha e-MERLIN de chuid British Science and Technology Facilities Council; ar choiste stiúrtha MIRI de chuid ESA; ar Bhord Comhbhainistíochta de chuid Réadlann agus Pláinéadlann Ard Mhacha; agus ar choistí agus painéil eile.

Eagraíonn Rannóg na Geoifisice Clár Iarchéime Geo-eolaíochta na hÉireann (IGGP, [www.igpp.ie](http://www.igpp.ie)), scoil oiliúna fhíorúil iarchéime uile-Éireann sna geo-eolaíochtaí a chuireann teagasc ar fáil ar Ghearrchúrsaí lonnaithe san Institiúid ina bhfuil an saineolas. Taistealaíonn mic léinn Éireannacha (Thuaidh agus Theas) do na cúrsaí 3-5 lá, le haisiúc ar roinnt de na costais. Leanann IGGP ag fás bliain i ndiaidh bliana ag tairiscint cúrsaí ard-cáilíochta d'iar-chéimithe. Do 2013-14 tá DIAS ag soláthar 13 cúrsa de na 27 atá ar shuíomh gréasáin IGGP faoi láthair. Tá breis agus 180 san iomlán cláraithe don bhliain acadúil.

## An Tríú Colún – Infreastruchtúr Taighde agus an tSeirbhís Phoiblí

Ritheann Rannóg na Geoifisice Líonra Seismeach Náisiúnta na hÉireann (INSN), eagar de chúig sheismiméadar le banda an-leathan lonnaithe timpeall na hÉireann a chuireann eolas réad-ama go Baile Átha Cliath, óna gcuirtear na sonraí ar fáil go hidirnáisiúnta. Déanann an INSN taifeadh ar sheismeacht áitiúil (síos go méid 1.0) chomh maith le heachtraí móra teiliseismeacha, agus cuirtear eolas seismeach ar fáil don Stát. Leanann an stáisiún seismeach INSN ag feidhmiú gan aon mhór-fhadhbanna ag taifeadh sonraí seismeacha agus ag seoladh beagnach san fhíor-am chuig an bhfreastalaí i DIAS. Tá forbairt an stáisiúin ILTH i gContae Lú ar siúl faoi láthair. Sa bhliain 2013 ba í an eachtra theiliseismeach ba mhó a chláraigh an líonra ná Mag 7.8 in Awaran na Pacastáine agus an triail núicléach sa Chóiré Theas. (Féach an tábla thíos).

Déanann DIAS/SCP/Geo óstáil ar Lárionad Sonraí Náisiúnta (NDC) na hÉireann d'Eagraíocht an Chonartha um Chosc Cuimsitheach ar Thrialacha (CTBTO, [www.ctbto.org/](http://www.ctbto.org/)). Osclaíodh an NDC go hoifigiúil i Meitheamh na bliana 2012 ag an Uas.Eamon Gilmore, Tánaiste, Aire Gnóthaí Eachtracha agus Trádála agus an Dr Lassina Zerbo, Stiúrthóir an Rannáin Monatóireachta Idirnáisiúnta, anois an Rúnaí Feidhmiúcháin CTBTO, An Vín. Lean an NDC dá phróifíl agus de phróifíl CTBTO a ardú i rith na bliana. Bhí ócáid amháin ach go háirithe a tharraing aird an phobal agus na meán ach go háirithe ar an NDC. Ar 12 Feabhra, 2013, chláraigh Líonra Seismeach Náisiúnta na hÉireann (INSN) eachtra seismeach neamhghnách i nDaon-Phoblacht Dhaonlathach na Cóiré (DPRK). Mhaigh DPRK go raibh triail núicléach eile déanta aige, an tríú ceann le seacht mbliain anuas. Léirigh na meastacháin tosaigh go raibh tomhas Mag 4.9 ar an eachtra seo, agus tharla sé thart ar 02.58 GMT. Bhí sé lonnaithe sa réigiún céanna inar rinneadh trialacha núicléacha na Cóiré Thuaidh roimhe seo i 2006 agus 2009. Thug aireacht cosanta na Cóiré

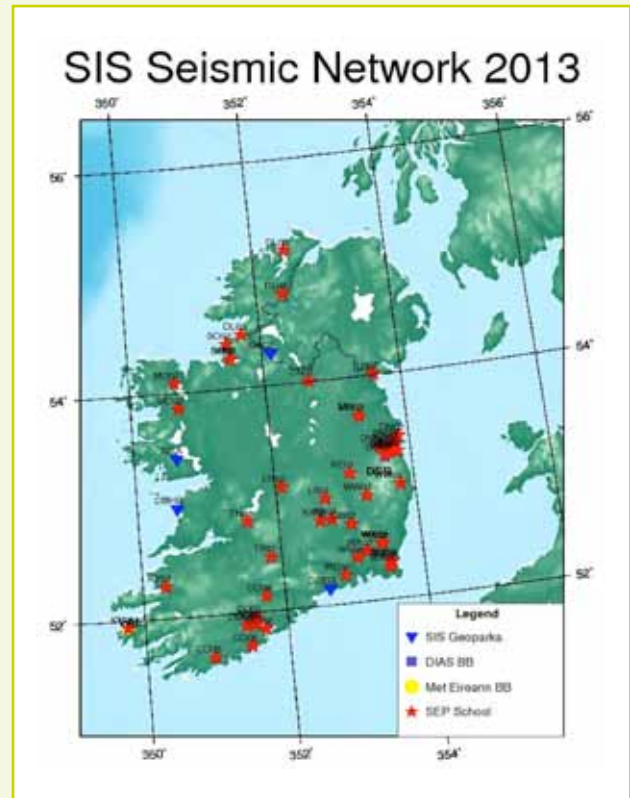
## School of Cosmic Physics (continued)

A meeting was held in the Crawford Observatory Cork with the support of the French Embassy to discuss using the Irish Astronomy Trail, launched in 2012 by DIAS, as a model for a similar French Route of Astronomical Observatories which could then form the basis for a European funding proposal.

The usual busy programme of open nights and related events was held in Dunsink Observatory with the assistance of volunteers from the Irish Astronomical Society. In addition to these strictly astronomical events, a number of more literary and artistic events were also held in Dunsink. These included, at the initiative of Tom Ray, a very successful production of Brecht's "The Life of Galileo" by the Greenwood Theatre Company which was held in the run-up to science week. Poet Iggy McGovern launched his latest book, "A Mystic Dream of 4", a sequence of sonnets based on the life of Sir William Rowan Hamilton on the eve of the Hamilton walk and artist Bernadette Dignam exhibited a series of textile works called "Light Echo" and inspired by images from the Hubble Space Telescope in the observatory.

The Geophysics Section runs the highly successful Seismology In Schools/Seismolaíocht sa Scoil programme (<http://www.dias.ie/sis/>). The programme continues to attract potential schools throughout the country. Current membership stands at 60 schools, 2 IT colleges in Dublin and Sligo, and 3 Geoparks. The Copper Coast Geopark, Bunmahon, Waterford is playing a very important role in the raising levels of awareness of the SIS and regularly have information meetings about the seismometer in their centre. The most recent secondary school to join the programme is Good Counsel College, New Ross Co Wexford.

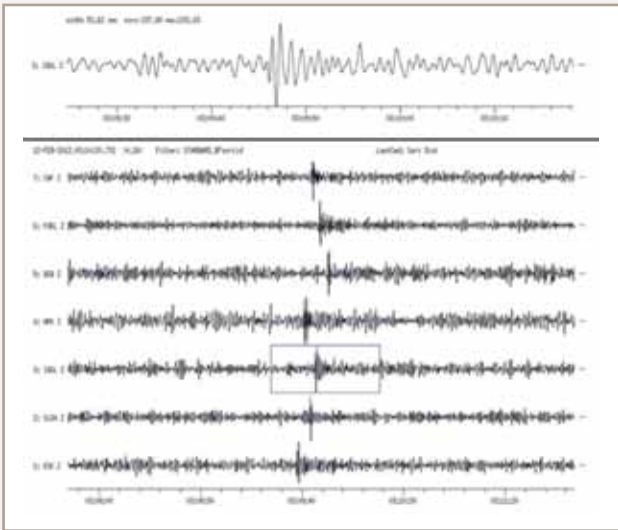
The SIS programme featured again when DIAS/SCP/Geo teamed up with the Geological Survey Ireland (GSI) to participate in the 50th BT Young Scientist Exhibition that took place in the Royal Dublin Society (RDS) Ballsbridge in January 2014





## Scoil na Fisice Cosmaí (ar leanúint)

Theas meastacháin tosaigh ar thoradh don triail, idir 6 - 7 cileaton. Taispeánann an pictúr an fuinneamh a ghin an triail núicléach ag sroicheadh ár stáisiún i DSB Baile Átha Cliath agus IDGL Dún an nGall, thart ar 11 nóiméad i ndiaidh am an mhadhmtha.



### For-rochtain Phoiblí

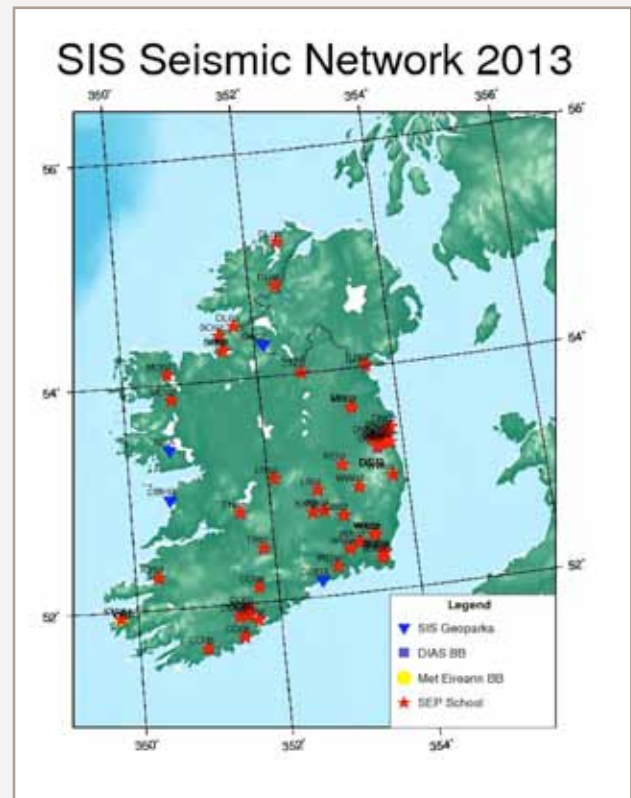
Is í príomhócáid for-rochtana na Scoile, ár ndóigh, ná an Léacht Phoiblí Reachtúil a tugadh sa bhliain 2013 ag an Ollamh Lars Bergström ó Lárionad Oscar Klein don Fhísic Chosmacháithní i Stockholm. Ba é teideal a léachta ná "Solving the Puzzle of Dark Matter?" agus tugadh an chaint in amharclann Moore in ionad nua O'Brien don Eolaíocht i UCD. Tá taifeadadh ar an gcaint ar fáil ar YouTube.

Tionóladh cruinníú i Réadlann Crawford i gCorcaigh le tacaíocht ó Ambasáid na Fraince chun plé a dhéanamh ar úsáid Rian Réalteolaíochta na hÉireann, a sheol DIAS i 2012, mar mhúnla do Rian Francach de Réadlanna Réalteolaíochta cosúil leis, a d'fhéadfadh a bheith mar bhunús ansin d'iaratas ar mhaoiníú Eorpach.

Tionóladh an gnáthchlár gnóthach d'óicheanta oscailte agus d'ócáidí gaolmhara i Réadlann Dhún Sinche le cabhair ó oibrithe deonacha ó Chumann Réalteolaíochta na hÉireann. Chomh maith leis na heachtraí seo a bhaineann leis an réalteolaíocht amháin, eagraíodh roinnt ócáidí níos liteartha agus níos ealaíonta i nDún Sinche freisin. Ina measc siúd bhí, ar thionscnamh Tom Ray, léiriú an-rathúil ar "The Life of Galileo" le Breacht ag Compántas Drámaíochta Greenwood a eagraíodh roimh sheachtain na heolaíochta. Sheol an file Iggy McGovern a leabhair is déanaí, "A Mystic Dream of 4", sraith de shoinéid bunaithe ar shaol Sir William Rowan Hamilton

an oíche roimh an tsiúlóid Hamilton agus thaispeáin an t-ealaíontóir Bernadette Dignam sraith de shaothair teicstíle ar a tugadh "Light Echo" a fauir ionsparáid ó íomhánna ó Theileascóp Spáis Hubble sa réadlann.

Eagraíonn an Rannóg Geoifisice an clár an-rathúil Seismeolaíocht sa Scoil (SIS) (<http://www.dias.ie/sis/>). Leanann an clár de scoileanna ionchasacha a mhealladh ar fud na tíre. Faoi láthair tá 60 scoil ina mbaill, 2 Institiúid Teicneolaíochta i mBaile Átha Cliath agus i Sligeach, agus trí Gheo-Pháirc. Tá ról an-tábhachtach ag Geo-Pháirc an Chósta Copair, Buna Machan, Co. Phort Láirge, san ardú ar leibhéal na feasachta faoi SIS agus bíonn cruinnithe rialta acu faoin seismiméadar ina n-ionad. Is é Coláiste na Dea-Chomhairle, Ros Mhic Thriúin, Co. Loch Garman, an mheánscoil is déanaí a chuaigh isteach sa chlár.



Bhí an clár SIS chun tosaigh arís nuair a chuaigh DIAS/SCP/Geo i gcomhar le Suirbhéireacht Gheolaíochta na hÉireann (GSI) le páirt a ghlacadh sa 50ú Taispeántas na nEolaithe Óga BT a bhí ar siúl i gCumann Ríoga Bhaile Átha Cliath (RDS) Droichead na Dothra in Eanáir na bliana 2014.

### Publications

#### Astronomy and Astrophysics

#### Peer-reviewed Publications in 2013

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- 2 A. Abramowski et al. "Search for Photon-Linelike Signatures from Dark Matter Annihilations with H.E.S.S.". In: *Physical Review Letters* 110.4, 041301 (Jan. 2013), p. 041301. DOI: 10.1103/PhysRevLett.110.041301. arXiv: 1301.1173 [astro-ph.HE].
- 3 B. S. Acharya et al. "Introducing the CTA concept". In: *Astroparticle Physics* 43 (Mar. 2013), pp. 3–18. DOI: 10.1016/j.astropartphys.2013.01.007.
- 4 F. A. Aharonian. "Gamma rays from supernova remnants". In: *Astroparticle Physics* 43 (Mar.2013), pp. 71–80. DOI: 10.1016/j.astropartphys.2012.08.007.
- 5 F. Aharonian et al. "TeV gamma rays from blazars beyond  $z=1$ ?" In: *Phys. Rev. D* 87.6, 063002 (Mar. 2013), p. 063002. DOI: 10.1103/PhysRevD.87.063002. arXiv: 1206.6715 [astro-ph.HE] [cit. on p. 3].
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- 9 P. Dawson et al. "New brown dwarf discs in Upper Scorpius observed with WISE". In: *MNRAS* 429 (Feb. 2013), pp. 903–914. DOI: 10.1093/mnras/sts386.
- 10 D. Froebrich and A. Scholz. "The main sequence of three red supergiant clusters". In: *MNRAS* 436 (Dec. 2013), pp. 1116–1122. DOI: 10.1093/mnras/stt1633. arXiv: 1308.6436 [astro-ph.GA] [cit. on p. 19].
- 11 H. F. Henrichs et al. "Discovery of the magnetic field in the pulsating B star  $\gamma$  Cephei". In: *A&A* 555, A46 (July 2013), A46. DOI: 10.1051/0004-6361/201321584. arXiv: 1305.2601 [astro-ph.SR] [cit. on p. 21].
- 12 H.E.S.S. Collaboration et al. "Discovery of high and very high-energy emission from the BL Lacertae object SHBL J001355.9-185406". In: *A&A* 554, A72 (June 2013), A72. DOI: 10.1051/0004-6361/201220996. arXiv: 1304.4023 [astro-ph.HE].
- 13 H.E.S.S. Collaboration et al. "Discovery of TeV  $\gamma$ -ray emission from PKS 0447-439 and derivation of an upper limit on its redshift". In: *A&A* 552, A118 (Apr. 2013), A118. DOI: 10.1051/0004-6361/201321108. arXiv: 1303.1628 [astro-ph.HE].
- 14 H.E.S.S. Collaboration et al. "Discovery of very high energy  $\gamma$ -ray emission from the BL Lacertae object PKS 0301-243 with H.E.S.S.". In: *A&A* 559, A136 (Nov. 2013), A136. DOI: 10.1051/0004-6361/201321639. arXiv: 1309.6174 [astro-ph.HE].30
- 15 HESS Collaboration et al. "HESS and Fermi-LAT discovery of  $\gamma$ -rays from the blazar 1ES 1312- 423". In: *MNRAS* 434 (Sept. 2013), pp. 1889–1901. DOI: 10.1093/mnras/stt1081. arXiv: 1306.3186 [astro-ph.HE].
- 16 H.E.S.S. Collaboration et al. "H.E.S.S. discovery of VHE  $\gamma$ -rays from the quasar PKS 1510-089". In: *A&A* 554, A107 (June 2013), A107. DOI: 10.1051/0004-6361/201321135. arXiv: 1304.8071 [astro-ph.HE].
- 17 H.E.S.S. Collaboration et al. "H.E.S.S. observations of the binary system PSR B1259-63/LS 2883 around the 2010/2011 periastron passage". In: *A&A* 551, A94 (Mar. 2013), A94. DOI: 10.1051/0004-6361/201220612. arXiv: 1301.3930 [astro-ph.HE].
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- 23 D. V. Khangulyan et al. "Star-Jet Interactions and Gamma-Ray Outbursts from 3C454.3". In: *ApJ* 774, 113 (Sept. 2013), p. 113. DOI: 10.1088/0004-637X/774/2/113. arXiv: 1305.5117 [astro-ph.HE] [cit. on p. 4].

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- 34 N. Nooraee. "Light curves of six bright soft X-ray transients in M31". In: *MNRAS* 428 (Jan. 2013), pp. 205–211. DOI: 10.1093/mnras/sts024.
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### Geophysics

#### Publications in International Literature

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- 6 **Fullea, J.**, **M.R. Muller**, **A.G. Jones**, and J.C. Afonso (2013), The lithosphere-asthenosphere system beneath Ireland from integrated geophysical-petrological modeling - II: 3D thermal and compositional structure. *Lithos*, **189**, 49-64, doi:10.1016/j.lithos.2013.09.014.
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- 25 **Schaeffer, A.J.**, and **S. Lebedev** (2013), Global shear-speed structure of the upper mantle and transition zone. *Geophys. J. Int.*, **194**, 417–449. [Winner, GJI Student Author Award for best paper, 2013 (A.J. Schaeffer).]
- 26 **Schaeffer, A.J.**, and **S. Lebedev** (2013), Global heterogeneity of the lithosphere and underlying mantle. A seismological appraisal based on multimode surface-wave dispersion analysis, shear-velocity tomography, and tectonic regionalization. *Invited Review* in: "The Earth's Heterogeneous Mantle," Springer, accepted September 9, 2013.
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- 28 Sodoudi, F., X. Yuan, R. Kind, **S. Lebedev**, **J. Adam**, E. Kästle, F. Tilmann (2013), Seismic evidence for stratification in composition and anisotropic fabric within the thick lithosphere of Kalahari Craton. *Geochemistry, Geophysics, Geosystems*, **14**, 5393–5412, DOI: 10.1002/2013GC004955, 2013.
- 29 Spada, M., I. Bianchi, E. Kissling, **N. Piana Agostinetti**, and S. Wiemer (2013), Combining controlled-source seismology and receiver function information to derive 3-D Moho topography for Italy. *Geophys. J. Int.*, **194**, 2, 1050–1068.

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- 30 Spratt, J., T. Skulski, J.A. Craven, **A.G. Jones**, D. Snyder, and **D. Kiyani**, (2014), Magnetotelluric investigations of the lithosphere beneath the central Rae Craton, mainland Nunavut, Canada. *Journal of Geophysical Research*, accepted 20 January 2014.
- 31 Sun, D., M.S. Miller, **N. Piana Agostinetti**, P.D. Asimow, and D. Li (2013), Modelling high frequency waves in the slab beneath Italy, *Earth Pla. Sci. Lett.*, in press.
- 32 **Tirel, C.**, J.-P. Brun, E. Burov, M.J.R. Wortel, and **S. Lebedev** (2013), A plate tectonics oddity: Caterpillar-walk exhumation of subducted continental crust. *Geology*, **41**, 555-558.
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### Theses

**Agius, M.R.**, "The structure and dynamics of the lithosphere beneath Tibet from seismic surface-wave analysis" (supervisor: S. Lebedev). Trinity College Dublin, degree awarded April, 2013.

**Adam, J. M.-C.**, "Seismic structure and anisotropy in southern Africa's lithosphere: Constraints from broad-band surface-wave dispersion" (supervisor: S. Lebedev). Trinity College Dublin, degree awarded April, 2013.

**Dostal, J.**, Modelling of the Magnetic Field Induced by Ocean Circulation. Ph.D. thesis, Institute for Meteorology, Free University in Berlin, submitted for the defence in January 30, 2014 (supervisors Z. Martinec and M. Thoma).

### Invited presentations

- 1 **Lebedev, S.** and **A.J. Schaeffer**. Seismic tomography with millions of waveforms and global upper-mantle heterogeneity, with a zoom-in on the Arctic. Invited seminar, Univ. Oslo, 24 October 2013.
- 2 **Jones, A.G.**, 2013. Calibrating laboratory observations using field data. Invited paper at: EGU, Vienna, Austria, 8-12 April.
- 3 **Jones, A.G.**, J. Ledo, I.J. Ferguson, J.A. Craven, M.J. Unsworth, M. Chouteau and J.E. Spratt, 2013. The electrical resistivity of Canada's Lithosphere: Ian Gough's lasting legacy to Canadian Geoscience. Invited paper at: IAGA, Merida, Mexico, 26-31 August.
- 4 **Jones, A.G.**, 2013. Geophysical petrological modelling of the thermal and compositional structure of the lithosphere – integrating elevation, potential fields, seismology magnetotelluric and surface heat flow data. Invited keynote paper at: SAGA, Kruger Park, South Africa, 6-9 October.
- 5 **Jones, A.G.**, J.S. Daly, A. Allen, R. Goodman, N.H. Hunter Williams, M. Lee, D. Reay, M. Feely, P. Hanly, R. Pasquali, N. Piana Agostinetti, **S. Lebedev**, M. Long, **J. Fulla, J. Vozar, J. Campanya, S. Blake, M. de Block, R. Delhaye, T. Farrell**, T. Fritschle, N. Willmont Noller, **T. Waters, (Muller, M., Yeomans C.)** (2013), IRETherm: Research and Exploration Challenges in Assessing Ireland's Deep Low-Enthalpy Geothermal Energy Potential: Overview, Status Quo and Quo Vadimus. GAI Conference, Kilkenny, 13 November, invited oral presentation.
- 6 **Jones, A.G.**, 2013. Insights into the Continental Lithosphere from Electromagnetic Studies combined with other geoscientific data: a Plea for embracing holistic modelling that satisfies all available Data. Invited keynote paper at: Workshop on "Structure and Dynamics of the Lithosphere/Asthenosphere System", College de France, Paris, 19-20 November.
- 7 **Jones, A.G.**, 2013. Cratonic lithosphere: an electrifying view. Invited keynote paper at: AGU, San Francisco, USA, 9-13 December.
- 8 **Jones, A.G.**, 2013. Modeling the physical properties and composition of the mantle lithosphere using magnetotellurics combined with other information. Invited keynote paper at: AGU, San Francisco, USA, 9-13 December.
- 9 **Lebedev, S.**, Global tomography and mantle dynamics, Invited seminar, University of Southern California, Los Angeles, 6 December 2013.
- 10 **Lebedev, S.** and **A.J. Schaeffer**. Seismic Tomography of the Arctic: Continental Cratons, Ancient Orogens, Oceanic Lithosphere and Convecting Mantle Beneath. [Invited paper talk, 9 December], AGU Fall Meet., San Francisco, 9-13 December 2013.
- 11 Sachl, L., and D. Einspigel. Simple benchmarks for ocean models, a comparison study. Presentation at: Seminar on Geodynamics, Charles University in Prague, 20 November 2013.
- 12 Sachl, L. LSG Ocean Model - Introduction and Preliminary Results. Presentation at: Week of Doctoral Students 2013, Charles University in Prague, 6 June 2013.
- 13 **Schaeffer, A.J.**, Heterogeneity and anisotropy of the Earth's upper mantle: from global to regional scales. Invited Seminar. School of Geological Sciences, University College Dublin, January 2013.
- 14 **Schaeffer, A.J.**, and **S. Lebedev**. Heterogeneity and anisotropy of the North American upper mantle, imaged using multimode waveform tomography. Invited talk. GSC GEM Diamonds Project, University of British Columbia, Robson Square, Canada, February 2013.

# School of Theoretical Physics



*Prof. Jaffe, Chairman of School of Theoretical Physics Governing Board, Prof. Jean-Christophe Desplat (ICHEC), Dr. Vincent Cunnane, Chairman of Council, Prof Luke Drury, Director School of Cosmic Physics, Cecil Keaveney, Registrar and Prof Werner Nahm, Director School of Theoretical Physics attending the 2013 Statutory Public Lecture, DIAS School of Theoretical Physics in TCD.*

*An tOll. Jaffe, Cathaoirleach an Bhoird, Scoil na Fisice Teoiriciúla, An tOll. Jean-Christophe Desplat (ICHEC), An Dr. Vincent Cunnane, Cathaoirleach na Comhairle, An tOll. Luke Dury, Stiúrthóir Scoil na Fisice Cosmaí, Cecil Keaveney, Cláraitheoir agus An tOll. Werner Nahm, Stiúrthóir Scoil na Fisice Teoiriciúla ag freastal ar an Leacht Reachtúil Phoiblí 2013, Scoil na Fisice Teoiriciúla DIAS i TCD.*

In 2013 we still had a full number of Schrödinger Fellows and Scholars. The work discussed below concerns quantum mechanics, quantum information, quantum field theory and string theory. In addition it should be mentioned how Brian Dolan's interesting paper on 'The compressibility of rotating black holes in D-dimensions' (arXiv: 1308.5403 [gr-qc]) defines a thermodynamic volume as conjugate variable to the cosmological constant (interpreted as pressure) while obtaining an elegant expression for the speed of sound. Brian spent the appropriate time with his teaching duties at DIAS before moving on to Heriot-Watt.

After his retirement from NUI Maynooth, STP became the regular place of work for our associate Tigran Tchraikian. In the paper 'Dyon of a non-Abelian Chern-Simons-Yang-Mills-Higgs system in 3+1 dimensions' (with F. Navarro-Lerida, arXiv: 1311:3950 [hep-th]) he constructed a new type of dyons, characterized by their Chern-Simons densities introduced in a previous paper. An intriguing possibility is the existence of solutions with vanishing electric charge yet non-vanishing electrostatic potential.

Under Denjoe O'Connor's supervision, two pre-doctoral scholars (T. Kaltenbrunner and M. Vachovski) were finishing their PhDs. In 2013, there were two IRCSET Fellows, one of whom, V. Filev, remains with the school, whereas M. Ihl left at the end of September. Denjoe, B. Dolan and M. Vachovski continued their work on (fuzzy) geometry emerging as a low temperature phase in matrix models. The paper 'Critical Behaviour of the Fuzzy Sphere' (arXiv: 1308.6512 [hep-th], JHEP 1312 (2013) 085) was published on the subject. In the model under consideration they derived critical exponents from theoretical arguments and confirmed the result by Monte Carlo simulations. Denjoe and V. Filev had previously written a paper on nearly commuting matrix models in 2012 (published in JHEP 1304 (2013) 144). In that line of research they studied Hoppe's two matrix model which is approximately commuting at large coupling, where they found the joint eigenvalue distribution of the two matrices. At small coupling they found a cross-over to a Wigner semicircle eigenvalue distribution. The methods are more widely applicable, as was shown explicitly for a three matrix model ('Multi-matrix models at general coupling', arXiv: 1304.7723 [hep-th], J.Phys.A46 (2013) 475403).

In the line of previous work on the catalysis of chiral symmetry breaking by magnetic fields, V. Filev and M. Ihl considered a new model in 2+1 dimensions, realized by a defect in a 3+1 dimensional gauge theory embedded in a higher dimensional AdS/CFT setting. The model has strongly coupled fermions, yet the meson spectrum is calculable. Calculation of the relevant thermodynamic quantities showed that the system yielded a consistent quantum field theory with a meson-melting phase transition that coincided with chiral symmetry breaking ('A novel [2+1]-dimensional model of chiral symmetry breaking', arXiv: 1310.1222 [hep-th], JHEP12 (2013) 072).

V. Filev also worked on non-commutative super Yang-Mills theories (with G. Itsios and D. Zoakos) in the context of the AdS/CFT duality. They considered a theory with massless fermions in the fundamental representation. They constructed the gravity dual of the Yang-Mills theory by a non-perturbative method. The effective Yang-Mills coupling turned out to be independent of the non-commutativity, but the theory remained strongly coupled at high energies and appeared to have a Landau pole ('Backreacted flavor in non-commutative gauge theories', arXiv: 1304.5211 [hep-th], JHEP06 (2013) 092). In a similar context M. Ihl and co-workers investigated the thermodynamic consequences of the presence of a Landau pole and concluded that the model had a rich phase

# Scoil na Fisice Teoiriciúla

Sa bhliain 2013 bhí ár líon iomlán de Chomhaltaí agus Scoláirí Schrödinger againn. Baineann an obair a luaitear thíos le meicnic chandamach, faisnéis chandamach, teoiric réimse chandamach agus teoiric na dteagrán. Ina theannta sin ba chóir tagairt a dhéanamh don pháipéar suimiúil a scríobh Brian Dolan ar 'The compressibility of rotating black holes in D-dimensions' [arXiv: 1308.5403 [gr-qc]]. Sainmhíniú sé toirt theirmidinimiciúil mar athróg chomhchuingeach leis an tairiseach cosmeolaíoch (léirmhíniú mar bhrú) agus aimsíonn sé slann snasta do luas na fuaime. Chaith Brian an méid ama agus a cheadaigh a dhualgais teagaisc sular bhog sé go Heriot-Watt.

I ndiaidh dó scor ó OÉ Má Nuad, is í Scoil na Fisice Teoiriciúla an gnáth-ionad oibre d'ár gcomhghleacaí Tigran Tchrakian. Sa pháipéar 'Dyon of a non-Abelian Chern-Simons-Yang-Mills-Higgs system in 3+1 dimensions' (le F. Navarro-Lerida, arXiv: 1311.3950 [hep-th]) chruthaigh sé cineál nua de dhíoin, le dlúsanna Chern-Simons, a luadh i bpáipéar roimhe seo, mar shaintréith acu. Féidearthacht shuimiúil is ea go mbeadh réitigh ann le lucht leictreach ag téaltú ach le poitéinseal leictreastatach nach bhfuil ag téaltú.

I ngrúpa Denjoe O'Connor bhí beirt scoláirí réamh-dhochtúirachta (T. Kaltenbrunner agus M. Vachovski) ag cur críoch lena gcéimeanna PhD. Bhí beirt chomhaltaí IRCSET, a bhfuil duine díobh, V. Filev, fós anseo, ach d'fhág M. Ihl ag deireadh Mheán Fómhair. Lean Denjoe, B. Dolan agus M. Vachovski ag obair le chéile ar gheiméadracht (dhoiléir) ag eascairt mar phas teochta ísle i múnlaí mairíse agus d'fhoilsigh an páipéar 'Critical Behaviour of the Fuzzy Sphere' [arXiv: 1308.6512 [hep-th], JHEP 1312 (2013) 085]. Sa mhúnla a bhí idir lámha acu dhíorthaigh siad easpónaint chriticiúla ó argóintí teoiriciúla agus dhearbhaigh siad an toradh le hionsamhluithe Monte Carlo. Bhí páipéar scríofa ag Denjoe agus V. Filev ar mhúnlaí mairíse beagnach comhalartaithe sa bhliain 2012 (foilsithe i JHEP 1304 (2013) 144). Sa réimse taighde rinne siad staidéar ar mhúnla dhá mhaitrís Hoppe atá beagnach comharlataithe ag cúpláil mhór, áit a d'aimsigh siad comhdháileadh luach eigen an dá mhaitrís. Ag cúpláil bheag d'aimsigh siad trasnaíl chuig dáileadh luach eigen leathchiorcail Wigner. Is féidir na modhanna a chur i bhfeidhm níos leithne, mar a léiríodh go follasach do mhúnla trí mhaitrís ('Multi-matrix models at general coupling', arXiv: 1304.7723 [hep-th], J.Phys.A46 (2013) 475403).

Ag teacht leis an obair roimhe sin ar chatalú bhriseadh na siméadrachta ciriúile ag réimsí maighnéadacha,

scrúdaíonn V. Filev agus M. Ihl múnla nua i dtoisí 2+1, a tharlaíonn mar thoradh ar locht i dteoiric tomhais toise 3+1 neadaithe i suíomh toise níos airde AdS/CFT. Tá fearmóin cúplaithe go láidir ag an múnla, ach tá an speictream méasóin inríofa. Léiríonn ríomh na gcainníochtaí teirmidinimiciúla cuí go dtugann an córas teoiric réimse chandamach sheasta le trasdul pas méasóin-leá a chomhtharlaíonn le briseadh na siméadrachta ciriúile ('A novel (2+1)-dimensional model of chiral symmetry breaking', arXiv: 1310.1222 [hep-th], JHEP12 (2013) 072).

D'oibrigh V. Filev freisin ar shárteoiricí Yang-Mills neamh-chomhalartacha (le G. Itsios agus D. Zoakos) i gcomhthéacs na déachta AdS/CFT. Rinne siad machnamh ar teoiric le fearmóin gan mais sa léiriú bunúsach. Chruthaigh siad déacht domhantarraingthe na teoirice Yang-Mills trí mhodh neamh-chorraíola. Tharla sé go raibh an chúpláil Yang-Mills fheidhmiúil neamhspleách ar an neamh-chomhalartacht, ach fanann an teoiric le cúpláil láidir ag fuinnimh arda agus is cosúil go bhfuil pol Landau aici ('Backreacted flavor in non-commutative gauge theories', arXiv: 1304.5211 [hep-th], JHEP06 (2013) 092). I gcomhthéacs cosúil leis sin, rinne M. Ihl agus comhghleacaithe imscrúdú ar na hiarmhairtí teirmidinimiciúla ag pol Landau agus bhain siad de thátal as go bhfuil struchtúr pas saibhir ag an múnla ('Dynamics of Non-supersymmetric Flavours', M.S. Alam, M. Ihl, A. Kundu, S. Kundu, arXiv: 1306.2178 [hep-th], JHEP09 (2013) 130).

Rinne V. Filev machnamh freisin ar an gcúlra Klebanov-Witten (le D. Arnaudov agus R. Rashkov). Anseo is cosúil go bhfuil na measóin dícheangailte ag an bhfuinneamh Casimir ('Flavours in global Klebanov-Witten background' arXiv: 1312.7224 [hep-th], glactha ag JHEP).

I ngrúpa Tony Dorlas tá an Comhalta Schrödinger I. Lyberg agus na scoláirí iardhochtúireachta M. Beau agus B. Savoie. Lean Tony dá chuid oibre ar fhaisnéis chandamach trí staidéar ar an bhfo-eantrópacht (Wootters 1994). Tá bealaí éagsúla le hinneachar faisnéise na staideanna candamacha a shainiú, leis an bhfo-eantrópacht mar íoschuimse agus an eantrópacht von Neumann mar uaschuimse. Ina staidéar shainmhíniú Tony agus a chomhghleacaithe freisin tuairim na fo-eantrópachta coinníollaí agus rinne siad gaol idir í agus an dóchúlacht tomhais i staideanna dhá ghotán candamach. Tá sé fós le taispeáint go bhfuil an chuimse i bhfeidhm ar chórais níos mó freisin ('Properties of subentropy, N. Datta, T. Dorlas, R. Josza, F. Benatti, arXiv: 1310.1312 [quant-ph]).

## School of Theoretical Physics (continued)

structure ('Dynamics of Non-supersymmetric Flavours', M.S. Alam, M. Ihl, A. Kundu, S. Kundu, arXiv: 1306.2178 [hep-th], JHEP09 [2013] 130).

V. Filev also considered the Klebanov-Witten background (with D. Arnaudov and R. Rashkov). Here it seemed that the mesons had disassociated by the Casimir energy ('Flavours in global Klebanov-Witten background' arXiv: 1312.7224 [hep-th], accepted by JHEP).

Under Tony Dorlas' supervision were Schrödinger Fellow I. Lyberg and postdoc scholars M. Beau and B. Savoie. Tony continued his work on quantum information by a study of subentropy (Wootters 1994). There are various ways to define the information content of quantum states, with the subentropy as a lower and the von Neumann entropy as an upper bound. In their study Tony and co-workers also defined the notion of conditional subentropy and related it to the guessing probability in states of two qubits. It remains to show that the bound also applies to larger systems ('Properties of subentropy', N. Datta, T. Dorlas, R. Josza, F. Benatti, arXiv: 1310.1312 [quant-ph]).

With M. Beau, T. Dorlas revisited the slit diffraction in quantum mechanics. This classical thought experiment has become reality for various systems like cold atoms, but its theoretical treatment has always used truncations. The authors calculated the expected corrections and concluded that they would be measurable for mesoscopic systems with good statistics ('Quantum slit diffraction in space and in time of a Gaussian wave packet and semi-classical approximation', arXiv: 1310.5614 [quant-ph]).

In the paper 'Comment on higher derivative Lagrangians in relativistic theory' (arXiv: 1305.5759 [gr-qc]) M. Beau discussed the generalization of the concept of inertia in the presence of higher derivative Lagrangians in the setting of relativistic quantum mechanics.

M. Beau and B. Savoie investigated the Bose gas in highly anisotropic traps using the reduced density matrix. This involves additional mesoscopic contributions in addition to the isotropic situation. The results should guide numerical investigations on highly anisotropic systems based on the Path Integral Monte Carlo method ('Rigorous investigation of the reduced density matrix for the ideal Bose gas in harmonic traps by a loop-gas-like approach', arXiv:1306.3639 [math-ph]).

V. Braun remained under Werner Nahm's supervision until the end of May when his time with the school concluded.

Schrödinger Fellow V. Braun left at the end of May. During his time here he continued his work on string theory, both in the heterotic and the F-theory version. String theoretic versions of the standard model have a hidden sector which is responsible for the breaking of supersymmetry; about which very little is otherwise known. Two explicit hidden sectors were constructed, one with the gauge group  $E7 \times U(1)$  and a second with an  $SO(12) \times U(1) \times U(1)$  gauge group. Both render the heterotic standard model entirely supersymmetric and satisfy the physical constraints within some region of the parameter space (V. Braun, Y.H. He, B. Ovrut, arXiv: 1301.6767 [hep-th], JHEP09 [2013] 008). In the context of grand unified theory the non-observation of proton decay posed strong constraints on the allowed models. As a consequence F-theoretical models with grand unified symmetry are hard to construct and even no-go theorems were formulated. In the paper 'New Global F-theory GUTs with  $U(1)$  symmetries' (V. Braun, T. Grimm, J. Kettel, arXiv: 1302.1854 [hep-th], JHEP09 [2013] 154) it was revealed how to avoid these constraints.

Schrödinger Fellow S. Kovacs published the result of an ambitious test of the AdS/CFT duality in an M-theoretic regime ('Membranes from monopole operators in ABJM theory: large angular momentum and M-theoretic AdS<sub>4</sub>/CFT<sub>3</sub>', S. Kovacs, Y. Sato, H. Shimada, arXiv: 1310.0016 [hep-th]). Membrane states of large angular momentum  $J$  were used and treated by an expansion in terms of  $1/J$ . On the AdS side this could be done by a perturbative matrix model calculation, on the CFT side a Born-Oppenheimer type expansion arises in spite of the theory being strongly coupled. The energy spectra on the two sides agree at leading order. The work simultaneously tested AdS/CFT duality and the description of supersymmetric membranes by a matrix model and opened the way for the study of membrane interactions, once calculations beyond leading order have been performed.

M. Leitner published part of the results of her mathematic PhD work, which was informally supervised by W. Nahm ('Virasoro correlation functions on hyperelliptic Riemann surfaces', Lett. Math. Phys. 103.7 [2013], 701-728). The paper 'CFTs on Riemann Surfaces of genus  $g \geq 1$ : Dependence on moduli' (arXiv: 1305.0469 [math-ph]) contains further results and will be published in more complete form with W. Nahm. The aim is the use of rational conformal field theory as a rich source of automorphic forms for the mapping class groups of Riemann surfaces of genus greater than 1. They should extend the corresponding modular forms for genus 1.



## Scoil na Fisice Teoiriciúla (ar leanúint)

In éineacht le M. Beau, rinne T. Dorlas athscrúdú ar an díraonadh scoiltíneach sa mheicnic chandamach. Rinneadh rud réadúil den turgnamh claisiceach smaointe seo do chórais éagsúla amhail adaimh fhuara, ach sa chóiríocht teoiriciúil baineadh úsáid as teascaí i gcónaí. Ríomh na húdair na ceartúcháin a rabhthas ag súil leo agus bhain siad de thátal as go mbeidís intomhaiste do chórais mhéiseascópacha le staitisticí maithe ('Quantum slit diffraction in space and in time of a Gaussian wave packet agus semi-classical approximation', arXiv: 1310.5614 [quant-ph]).

Sa pháipéar 'Comment on higher derivative Lagrangians in relativistic theory' (arXiv: 1305.5759 [gr-qc]) rinne M. Beau plé ar ghinearálú choincheap na táimhe i láthair na Lagrangaigh ard-díorthacha i suíomh na meicnice candamaí coibhneasai.

Rinne M. Beau agus B. Savoie imscrúdú ar an ngás Bose i ngaistí ard-ainiseatrópacha ag baint úsáide as an mairíris dlúis laghdaithe. Bíonn cionta méiseascópacha breise i gceist anseo in éineacht leis an staid iseatrópach. Ba chóir go dtabharfadh na torthaí treoir d'inscrúduithe uimhriúla ar chórais ard-ainiseatrópacha bunaithe ar an modh Monte Carlo ('Rigorous investigation of the reduced density matrix for the ideal Bose gas in harmonic traps by a loop-gas-like approach', arXiv:1306.3639 [math-ph]).

I ngrúpa Werner Nahm d'fhág an Comhalta Schrödinger V. Braun ag deireadh mhí Bealtaine. Bhí sé tar éis leanúint dá chuid oibre ar theoiric na dteaghrán, sa leagan heatrach agus as leagan F-teoirice araon. I leaganacha theoiric na dteaghrán den mhúnla caighdeánach tá teascóg fholaithe atá freagrach as briseadh na sárshiméadrachta, ach is beag atá ar eolas faoi seachas

sin. Cruthaíodh dhá theascóg fholaithe fhollasach, ceann amháin leis an ngrúpa tomhais  $E7 \times U(1)$  agus ceann eile le grúpa tomhais  $SO(12) \times U(1) \times U(1)$ . Cuireann an dá ceanna sárshiméadracht iomlán ar an múnla caighdeánach heatrach agus sásaíonn siad na srianta fisiciúla laistigh de réigiúin éigin den spás paraiméadair (V. Braun, Y.H. He, B. Ovrut, arXiv: 1301.6767 [hep-th], JHEP09 (2013) 008).

I gcomhthéacs na mórtheoirice aontaithe leagtar srianta láidre ar na múnlaí ceadaithe mar thoradh ar neamhbhreathnú an mheatha prótóin. Dá bhrí sin, is deacair múnlaí F-teoirice le mórshiméadracht aontaithe a chruthú agus, fiú, ceapadh teorimí neamhfhéidearthachta. Sa pháipéar 'New Global F-theory GUTs with  $U(1)$  symmetries' (V. Braun, T. Grimm, J. Kettel, arXiv: 1302.1854 [hep-th], JHEP09 (2013) 154) taispeánadh conas na srianta seo a sheachaint.

D'fhoilsigh an Comhalta Schrödinger an toradh ar thriail uailmhianach ar an déacht AdS/CFT i réim M-teoirice ('Membranes from monopole operators in ABJM theory: large angular momentum and M-theoretic AdS4/CFT3', S. Kovacs, Y. Sato, H. Shimada, arXiv: 1310.0016 [hep-th]). Úsáideadh staideanna scannáin le móiminteam uilleach ard J agus cóiríodh iad le leathnú i dtéarmaí  $1/J$ . Ar an taobh AdS d'fhéadfaí é seo a dhéanamh le ríomh mhúnla mairírise corraíola, ar an taobh CFT tarlaíonn leathnú de chineál Born-Oppenheimer d'ainneoin na teoirice a bheith cúpláilte go láidir. Aontaíonn na speictrim fuinnimh ar an dá thaobh lena chéile ag an bpríomhord. Déanann an obair tástáil go comhuaineach ar dhéacht AdS/CFT agus ar an gcur síos as scannáin shárshiméadracha trí mhúnla mairírise agus mar thoradh air seo is féidir staidéar a dhéanamh ar idirghníomhaíochtaí scannáin, a luaithe agus a bhíonn ríomh níos faide anonn ná an príomhord déanta.



*Students and Researchers at the DIAS Theoretical Physics Summer School August 2013.*

*"Quantum Integrable systems and Quantum Information"*

*Mic Leinn agus Taighdeoirí ag Scoil Samhraidh na Fisice Teoiriciúla DIAS Lúnasa 2013.*

## School of Theoretical Physics (continued)

Mathematicians have found very few examples so far. The procedure has been tested for the special case of the (2,5) minimal model. For genus 1 there are no problems, but for genus 2 the degree of the differential equation is 5 instead of the expected 4. Thus there must be a spurious, non-algebraic solution. We must understand this issue before we can make further progress.

W. Nahm continued the study of vanishing theorems ('A general vanishing theorem', F. Laytimi and W. Nahm, Proceedings – Mathematical Sciences 123, Nov. 2013, 479-490). Moreover, a previous proof that the tensor product of two semiample vector bundles is semiample was extended to tensor products of semiample and k-ample vector bundles. It was shown that the result is k-ample, modulo an issue of commutative algebra that should create no problems according to the experts, but is unfortunately beyond our current understanding.

W. Nahm also did some interdisciplinary work on Mesopotamian chronology. Mesopotamia provides important instances for the effect of climate change on society, in particular the collapse of urban civilisation in the South in the middle of the 2nd millennium that was followed by a century-long dark age. The importance of climate in these events can only be evaluated when scientific measurements can be synchronized with historical documents. This has been impossible due to disagreements about the chronology which amount to more than 150 years and have lasted for over 100 years. Nahm's work should resolve the debate ('The Case for the Lower Middle Chronology', *Altorientalische Forschungen* 40, 2013, 350-372). It was favorably discussed at the 59th international Assyriological meeting in Ghent and has been accepted by some of the experts, but acceptance by the

major group which published a different solution depends on a detailed study of a cuneiform document from 1700 BC housed in Ankara. A 3D recording was prepared which should take place in 2014. If Nahm's reading is verified this will resolve the issue. The reading of the eroded text was based on the processing of successively better photographs, the first instalment of which was made possible by help from the School of Cosmic Physics.



*Prof. Werner awarded the Max Planck Medal. Professor Werner Nahm pictured with Professor Johanna Stachel, the President of the Deutsche Physikalische Gesellschaft.*

*"Photo: DPG/photographer: Socher"*

*Bronnadh an Bonn Max Planck ar an Oll. Werner Nahm. An tOll. Werner Nahm i dteannta leis an Oll. Johanna Stachel, Uachtarán an Deutsche Physikalische Gesellschaft.*

## Scoil na Fisice Teoiriciúla (ar leanúint)

D'fhoilsigh M. Leitner cuid de na torthaí ar a saothar matmaitice PhD, a bhí faoi stiúr neamhfhoirmiúil ag W. Nahm ('Virasoro correlation functions on hyperelliptic Riemann surfaces', Lett. Math. Phys. 103.7 [2013], 701-728). Tá tuilleadh torthaí sa pháipéar 'CFTs on Riemann Surfaces of genus  $g \geq 1$ : Dependence on moduli' (arXiv: 1305.0469 [math-ph]) agus foilseofar i bhfoirm níos iomláine é le W. Nahm. Is í an aidhm ná teoiric réimse cóimheasta chomhfhoirmiúil a úsáid mar fhoinse shaibhir d'fhoirmeacha uathmhorfach do rang-ghrúpaí mapála de dhromchlaí Riemann de ghéineas níos mó ná 1. Ba chóir go leathnóidís na foirmeacha modhúlacha gaolta do ghéineas 1. Is fíor-bheagán samplaí atá aimsithe ag matamaiticeoirí go dtí seo. Tá tástáil déanta ar an modh do chás speisialta an mhúnla íosta [2,5]. Níl fadhb ar bith ann do ghéineas 1, ach do ghéineas 2 is é 5 méid na cothromóide difreálaí, seachas 4 a bhfuiltear ag súil leis. Mar sin, ní móide go bhfuil réiteach bréagach neamh-ailgéabrach ann. Ní mór dúinn an cheist seo a thuiscint sular féidir linn tuilleadh dul chun cinn a dhéanamh.

Lean W. Nahm den staidéar ar theoirimí téaltaithe ('A general vanishing theorem', F. Laytimi agus W. Nahm, Proceedings – Mathematical Sciences 123, Nov. 2013, 479-490). Ina theannta sin, leathnaíodh cruthúnas a rinneadh roimhe sin, go bhfuil toradh teinseoirí ar dhá chual veicteoirí leath-imleor leath-imleor, go dtí torthaí teinseoirí ar chuail veicteoirí leath-imleor agus k-imleor. Tá sé léirithe againn go bhfuil an toradh k-imleor, modulo saincheist san ailgéabar cómhálartach nár chóir fadhb ar bith a chruthú, de réir na saineolaithe, ach faoi láthair ní féidir linn é a thuiscint, ar an drochuair.

Rinne W. Nahm obair idirdhisciplíneach freisin ar croineolaíocht na Measpatáime. Soláthraíonn an Mheaspatáim samplaí tábhachtacha don tionchar a bhíonn ag an athrú aeráide ar an sochaí, ach go háirithe loiceadh na sibhialtacht a uirbí sa Deisceart i lár na 2ú mílaoise agus a leanadh ag ré dhorcha a mhair céad bliain. Ní féidir an tábhacht atá leis an aeráid sna heachtraí seo a mheas ach amháin nuair is féidir tomhais eolaíochta a shioncronú le cáipéisí stairiúla. Bhí sé seo dodhéanta de bharr easaontais faoin gcroineolaíocht a bhfuil breis agus 150 bliain i gceist, agus a mhair le breis agus 100 bliain.

Ba chóir go réiteodh obair Nahm an díospóireacht ('The Case for the Lower Middle Chronology', Altorientalische Forschungen 40, 2013, 350-372). Pléadh go dearfach é ag an 59ú cruinniú idirnáisiúnta um Aisiria i Ghent agus tá glactha leis ag cuid de na saineolaithe, tá an glacadh ag an mórghrúpa a d'fhoilsigh réiteach eile ag brath ar ghrinnstaidéar ar cháipéis dhingchruthach ó 1700 BC atá coinnithe in Ankara. Ullmhíodh taifeadadh 3D agus ba chóir go ndéanfaí an staidéar i 2014. Má dhearbhaítear léamh Nahm, réiteoidh sé seo an scéal. Bhí léamh an téacs creimthe bunaithe ar ghrianghrafa a bhí níos fearr de réir a chéile a phróiseáil, agus chuidigh Scoil na Fisice Cosmaí leis an gcéad iarracht.



## School of Theoretical Physics (continued)

### PUBLICATIONS 2013

#### Papers published in refereed journals

- 1 Bayona, C. A. B., Boschi-Filho, H., Braga, N. R. F., **Ihl, M.** and Torres, M. A. C. (2013) "Generalized baryon form factors and proton structure functions in the Sakai-Sugimoto model", *Nuclear Physics B*, 866, 124.
- 2 **Filev, V. G.** and **Ihl, M.** (2013) "Flavoured large N gauge theory on a compact space with an external magnetic field", *JHEP*, 1301, 130.
- 3 **Beau, M.** and **Dorlas, T. C.** (2013) "Discrete-time path distributions on Hilbert space", *Indagationes Mathematicae*, 24, 212-228.
- 4 **O'Connor, D.** and **Filev, V.** (2013) "Near commuting multi-matrix models", *JHEP*, 04, 144.
- 5 Ghesquiere, A. and **Dorlas, T. C.** (2013) "Entanglement of a two-particle Gaussian state interacting with a heat bath", *Physics Letters A*, 377, 40, 2831-2839.
- 6 **Dolan, B. P.**, Kastor, D., Kubizňák, D., Mann, R. B., and Traschen, J. (2013) "Thermodynamic volumes and isoperimetric inequalities for de Sitter black holes", *Physics Review D*, 87, 104017.
- 7 **Dolan, B. P.** and Szabo, R. (2013) "Solitons and Yukawa couplings in nearly Kähler flux compactifications", *Physics Review D*, 88, 066002.
- 8 **Dolan, B. P.**, **O'Connor, D.** and Vachovski, M. (2013) "Critical behaviour of the fuzzy sphere", *JHEP*, 12, 085.
- 9 Brihaye, Y., Manvelyan, R., Radu, E. and **Tchrakian, D. H.** (2013) "Electrically charged black branes in N=4+, D=5 gauged super-gravity", *Physics Letters B*, 720, 224-231.
- 10 Radu, E., **Tchrakian, D. H.** and Yang, Y. (2013) "Abelian hopfions of the CPn model on R2n+1 and a fractionally powered topological lower bound", *Nuclear Physics B*, 875, 388-407.
- 11 Blázquez-Salcedo, J. L., González-Romero, L. M., Navarro-Lérida, F. and **Tchrakian, D. H.** (2013) "Non-abelian Chern-Simons-Higgs vortices with a quartic potential", *Physics Review D*, 88, 025026.
- 12 **Leitner, M.** (2013) "Virasoro correlation functions on hyperelliptic Riemann surfaces", *Letters in Mathematical Physics*, 103, 7.
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- 14 Sohaib Alam, M., **Ihl, M.**, Kundu A. and Kundu, S. (2013) "Dynamics of non-supersymmetric flavours", *JHEP*, 1309, 130.
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- 17 **Braun, V.**, Grimm, T. W. and Keitel, J. (2013) "New global F-theory GUTs with U(1) symmetries", *JHEP*, 09, 154.
- 18 **Braun, V.**, He, Y.-H. and Ovrut, B. A. (2013) "Supersymmetric hidden sectors for heterotic standard models", *JHEP*, 09, 008.
- 19 **Lyberg, I.** (2013) "Free energy of the Ising lattice with Brascamp-Kunz boundary conditions", *Physical Review E*, 87, 062141.
- 20 **Nahm, W.** (2013) "A general vanishing theorem", *Proceedings: Mathematical Sciences*, 123, 4, 479-490.
- 21 **Nahm, W.** (2013) "The case for the Lower Middle Chronology", *Altorientalische Forschungen*, 40, 2, 350-372.
- 22 **Filev, V. G.** and **O'Connor, D.** (2013) "Multi-matrix models at general coupling", *Journal of Physics A*, 46, 475403.
- 23 Itsios, G., **Filev, V. G.** and Zoakos, D. (2013) "Backreacted flavor in non-commutative gauge theories", *JHEP*, 1306, 092.

## School of Theoretical Physics (continued)

### Papers published in conference proceedings and edited works

- 1 Radu, E. and **Tchrakian, D. H.** (2013) "New Chern-Simons densities in both odd and even dimensions" in Gurzadyan, V.G., Klümper A. and Sedrakyan, A.G. (eds). Low Dimensional Physics and Gauge Principle, Singapore: World Scientific Press.

### Preprints (unpublished articles)

- 1 **Dolan, B. P.**, Kastor, D., Kubizňák, D., Mann, R. B. and Traschen, J. (2013) "Thermodynamic volumes and isoperimetric inequalities for de Sitter Black Holes".
- 2 **Braun, V.**, Grimm, T. W. and Keitel, J. (2013) "New global F-theory GUTs with U(1) symmetries".
- 3 **Braun, V.**, He, Y.-H. and Ovrut, B.A. (2013) "Supersymmetric hidden sectors for heterotic standard models".
- 4 Sohaib Alam, M., **Ihl, M.**, Kundu, A. and Kundu, S. (2013) "Dynamics of non-supersymmetric flavours".
- 5 **Filev, V.**, Itsios, G. and Zoakos, D. (2013) "Backreacted flavor in non-commutative gauge theories".
- 6 **Filev, V.** and **O'Connor, D.** (2013) "Multi-matrix models at general coupling".
- 7 **Beau, M.** and **Savoie, B.** (2013) "The ideal Bose gas in open harmonic trap systems and its condensation revisited".
- 8 **Dolan, B. P.** (2013) "The compressibility of rotating black holes in D-dimensions".
- 9 **Kovacs, S.**, Sato, Y. and Shimada, H. (2013) "Membranes from monopole operators in ABJM theory: large angular momentum and M-theoretic AdS<sub>4</sub>/CFT<sub>3</sub>".
- 10 **O'Connor, D.**, **Dolan, B. P.** and Vachovski, M. (2013) "Critical behaviour of the fuzzy sphere".
- 11 **Filev, V.**, **Ihl, M.** and Zoakos, D. (2013) "A novel (2+1)-dimensional model of chiral symmetry breaking".
- 12 Datta, N., **Dorlas, T. C.**, Jozsa, R. and Benatti, F. (2013) "Properties of subentropy".

- 13 **Beau, M.** and **Dorlas, T. C.** (2013) "Quantum slit diffraction in space and in time of a Gaussian wave packet and semi-classical approximation".
- 14 Arnaudov, D., **Filev, V.** and Rashkov, R. (2013) "Flavours in global Klebanov-Witten background".
- 15 **Dolan, B. P.** (2013) "On the thermodynamic stability of rotating black holes in higher dimensions: a comparison of thermodynamic ensembles".
- 16 Navarro-Lérida, F. and **Tchrakian, D. H.** (2013) "Dyon of a non-Abelian Chern-Simons-Yang-Mills-Higgs system in 3+1 dimensions".
- 17 **Leitner, M.** (2013) "CFTs on Riemann surfaces of genus  $g \geq 1$ : dependence on moduli".
- 18 **Beau, M.** (2013) "Comment on the higher derivative Lagrangians in relativistic theory".



# Administration and Finance

The terms of the Haddington Road Agreement were implemented for all staff. The increase in working hours is being implemented on a phased basis. Recruitment restrictions coupled with further cuts in the Pay Grant continue to present difficulties in filling key posts. There is also growing pressure on administrative and technical support services. Staff co-operated fully with the introduction of new standardised leave arrangements and other measures aimed at minimising the impact of staffing reductions.

With the help of an external PR adviser, steps were taken during the year to better promote the work of DIAS and to enhance public engagement. This resulted in better publicity with coverage of a number of events during the year in the national media.

A review of fire safety systems commenced at the end of the year which has identified urgent measures required to upgrade the fire safety system at the Burlington Road site. A plan is currently being developed to address this.

## Finance

The attached financial statements report a loss of €19,058 for the year. This compares with a loss of €147,246 in the year to 31st December 2012. The reason for the large overspend in 2012 is due to the payment of pension gratuities to staff members who opted for early retirement in February 2012. There was only one retirement in 2013.

Total income for the Institute decreased from €10,839,464 in 2012 after adjusting for pensions to €9,049,979 in 2013.

This represents a decrease of €1,789,485 or 16.51% and the main decreases occurred in projects and pay grant income.

In 2013 the level of activity on the e-Inis project decreased significantly as the project came to a close.

Also in 2013, the adoption of the Haddington Road Agreement resulted in further cuts in the DIAS pay grant.

# Riarachán agus Airgeadas

Cuireadh téarmaí Chomhaontú Bhóthar Haddington i bhfeidhm don fhoireann uile. Tá an méadú in uaireanta oibre á chur i bhfeidhm ar bhonn céimnithe. Mar thoradh ar shrianta earcaíochta in éineacht le tuilleadh ciorraithe sa Deontas Pá bíonn deacrachtaí ann le post thábhachtacha a líonadh. Tá brú freisin, atá ag dul i méid, ar sheirbhísí tacaíochta riaracháin agus teicniúla. Rinne an fhoireann comhoibriú iomlán le tabhairt isteach na socruithe nua saoire caighdeánaithe agus le bearta eile a fhéachann leis an tionchar a bhíonn an lagduithe foirne a mhaolú.

Le cabhair ó chomhairleoir seachtrach sa Chaidreamh Poiblí, glacadh céimeanna i rith na bliana chun obair DIAS a fhoilsiú agus chun cur le rannpháirtíocht an phobail. Mar thoradh air seo, bhí poiblíocht níos fearr ann agus rinneadh roinnt ócáidí a chlúdach sna meáin náisiúnta i rith na bliana.

Cuireadh tús le hathbheithniú ar chórais sábháilteachta dóiteáin ag deireadh na bliana a d'aithin bearta práinneacha atá de dhíth chun an córas sábháilteachta dóiteáin i mBóthar Burlington a uasghrádú. Tá plan á fhorbairt faoi láthair chun aghaidh a thabhairt air seo.

## Airgeadas

Tuairiscíonn na ráitis airgeadais, atá ag gabháil leis seo, cailteanas €19,058 don bhliain. Is féidir seo a chur i gcomparáid le cailteanas €147,246 sa bhliain go dtí 31 Nollaig 2012. Is í an chúis leis an ró-chaiteachas seo i 2012 ná an íocaíocht aiscí pinsin do bhaill foirne a roghnaigh scor luath i mí Feabhra 2012.

Tar éis coigeartú do phinsin i 2013, laghdaigh ioncam iomlán na hInstitiúide ó €10,839,464 i 2012 go €9,049,979 i 2013.

Léiríonn sé seo laghdú €1,789,485 nó 16.51% agus tharla na laghdaithe is mó i dtionscadail agus in ioncam deontais.



# Institute Staff

## Council of the Institute

### Chairman

V. Cunnane

### Ex-Officio Members

H. Brady, President, UCD

L. Drury, President, RIA

P. Prendergast, Provost, TCD

### Members Appointed by the Governing Boards of Constituent Schools

G. Wrixon

A. Jaffe

A. Ahlqvist

W. Nahm

L. Breatnach

## Governing Board of the School of Celtic Studies

### Chairman

A. Ahlqvist

### Senior Professors

L. Breatnach

F. Kelly

P. Breatnach

### Appointed Members

D. Ó Baoill

M. Herbert

R. Ó hUigínn

E. Ní Dhea

K. Simms

N. Ó Muraíle

A. Ó Corráin

M. Ní Mhaonaigh

J. McCloskey

U. Mac Gearailt

## Governing Board of the School of Theoretical Physics

### Chairman

A. Jaffe

### Senior Professors

T. Dorlas

D. O'Connor

W. Nahm

### Appointed Members

A. Breslin

H. Nicolai

M. Grünewald

M. Tuite

P. Knight

L. Hau

R. Dijkgraaf

S. Shatashvili

D. Gilbert

D. Zagier

J. Frohlich

## Governing Board of the School of Cosmic Physics

### Chairman

G. Wrixon

### Senior Professors

L. Drury

A. Jones

### Appointed Members

A. Khan

O. Glaser

L. Enright

R. Perrott

M. Fowler

S. Cloetingh

L. Pedersen

C. Ceccarelli

E. Meehan

A. Watson

## Administrative Staff of the Institute 2013

### Registrar

C. Keaveney

### Finance Officer

G. Forkin

### Senior Administrative Officer

M. Burke

### Assistant Finance Officer

R. Byrne

### Clerks

M. Loughman

H. Moynihan

E. Barrett

M. Brennan

### Head of IT

D. Grigoriev

### Senior Systems Administrator

J. Bucas

### Systems Administrator

P. Grange

### Support Staff

G. Casey (to 30 April)

R. Jones

B. Judge

P. McDonald

C. Doyle

T. Ó Gríofa

K. Earley

P. Wynne

## Staff and Scholars of the School of Celtic Studies 2013

### Senior Professors

L. Breatnach (Director)

P. Breatnach

F. Kelly

### Assistant Professors

A. Nic Dhonnchadha

M. O Riordan (Publications Officer)

### Dialectologist

B. Ó Curnáin

### Assistant Librarian

M. Irons

### Library Assistant

Ó. Ní Chanainn

### School Administrator

E. Nic Dhonncha

### Technical Staff

#### ISOS

A. O'Brien

### IT Support

A. McCarthy (part-time)

S. McCullagh (part-time)

### Bibliographer

A. Guilarte

### Bergin Fellows

G. O Riain (Ireland)

### Scholars

E. Lash (U.S.A.)

S. Nic Lochlainn (Ireland)

N. Volmering (Netherlands)

M. Jakob (Germany) (from 1 January)

S. Ní Mhurchú (Ireland) (from 1 October)

D. Hayden (U.S.A) (from 1 November)

### Project Staff

#### Ogham in 3D Principal Investigator

N. White (to 25 September)

### Professor Emeritus

M. Ó Murchú

## Institute Staff (continued)

### Staff and Scholars of the School of Theoretical Physics 2013

#### Senior Professors

W. Nahm (Director)  
T. Dorlas  
D. O'Connor

#### Librarian

M. Williams

#### Post-Doctoral Scholars

M. Beau (France)  
B. Savoie (France) (from 1 October)  
M. Leitner (Germany) (from 1 September)  
I. Lyberg (Sweden) (from 1 June to 31 October)  
V. Filev (Bulgaria) (from 1 August)

#### Pre-Doctoral Scholars

O. Smits (Netherlands) (to 1 March)  
M. Vachovski (Bulgaria) (to 31 December)  
T. Kaltenbrunner (Austria) (to 31 December)

#### Schrodinger Fellows

V. Braun (Germany) (to 30 April)  
S. Kovacs (Italy)  
I. Lyberg (Sweden) (to 4 May)

#### Project Staff

#### Irish Research Council for Science, Engineering & Technology (IRCSET) Government of Ireland Postdoctoral Research Fellows

V. Filev (Bulgaria) (to 31 July). *"Phase structure of flavored holographic gauge theories in external magnetic field"*  
M. Ihl (Germany) (to 28 September). *"Application of gauge/gravity correspondences to strongly coupled physical systems, with an emphasis on phenomenology of pions, mesons and baryons in holographic realizations of QCD-like flavour physics at zero and finite temperature"*

### Staff and Scholars of the School of Cosmic Physics 2013

#### Senior Professors

L. Drury (Director)  
A. Jones

#### Professors

T. Ray  
F. Aharonian  
Z. Martinec

#### Assistant Professors

S. Lebedev  
B. O'Reilly

#### Schrodinger Fellows

M. Muller (South Africa) (to 31 March)  
A. Scholz (Germany) (to 15 June)  
A. Taylor-Castillo (U.K.)

#### Experimental Officer

T. Blake

#### Senior Technical Assistants

C. Horan  
M. Smyth

#### Technical Assistants

E. Flood  
A. Grace  
H. O'Donnell  
L. Collins  
C. Hogg

#### Clerical Staff

P. Daly  
A. Sewielska



### **Scholars**

J. Buckenmeyer (France) (to 31 January)  
E. Mandolesi (Italy) SFI Project  
F. Le Pape (France) Geo External (to 31 January)  
D. Kiyan (Turkey) IRCSET  
G. Costigan (Ireland) Lindsay Scholar  
A. Schaeffer (Canada) SFI Project  
R. Ainsworth (USA) SFI Project  
P. Dawson (Ireland) Brown Dwarfs  
T. Farrell (Ireland) Iretherm  
S. Blake (Ireland) Iretherm  
T. Fritschle (Germany) Iretherm  
J. Hagedoorn (Germany) (to 31 December)  
C. Romoli (Italy)  
D. Rodgers-Lee (Ireland)  
R. Delhaye (France/New Zealand) Iretherm  
D. Bolte (Germany) SFI Project (to 30 June)  
A. Licciardi (Italy) SFI Project  
T. Waters (Ireland) Iretherm  
J. Campaña (Spain) IRCSEM (from 8 March)  
L. Sachl (Czech Republic) SFI Project (from 15 October)  
M. Ravenna (Italy) SFI Project (from 1 November)  
E. Neenan (Ireland) (from 1 March)

### **Project Staff**

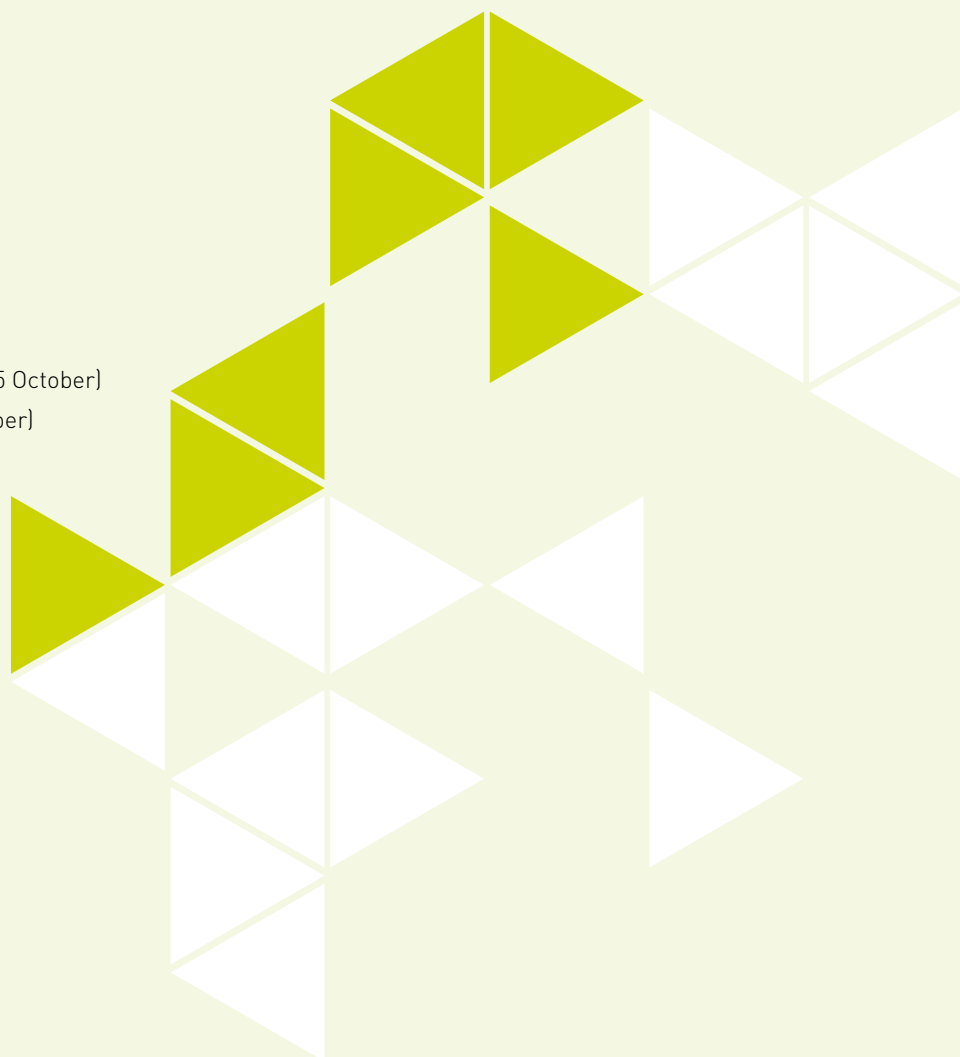
E. Whelan (Ireland) IRCSET  
K. Rochford (Ireland) e-INIS (to 10 May)  
C. Moloney (Ireland) IGGP  
R. Azzollini (Spain) MIRI  
V. Geers (Holland) MIRI  
J. Vozar (Slovakia) SFI Project  
N. Piana Agostinetti (Italy) SFI Project  
F. Le Pape (France) WAXI (from 1 February)

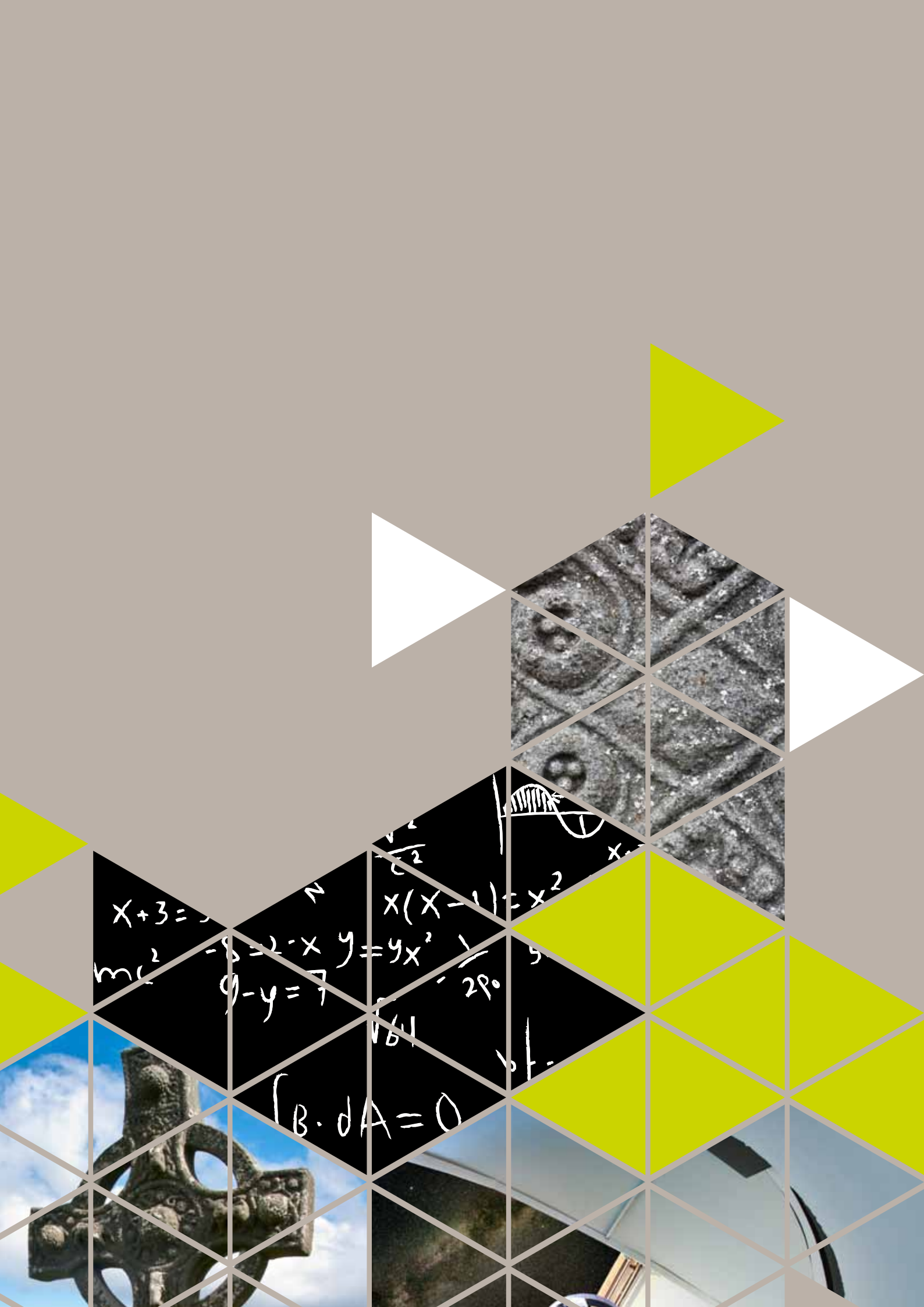
### **Professor Emeritus**

P. Readman  
D. O'Sullivan  
A. Thompson

### **Vacation Students**

E. Neenan (to 28 February)  
J. Rose (from 14 March to 14 April)  
S. Blake (from 1 July to 30 September)





$x+3=5$   
 $m^2 - 8 = 2 \cdot x$   
 $9 - y = 7$   
 $x(x-1) = x^2$   
 $y = 4x^2$   
 $\frac{1}{2\pi}$   
 $\sqrt{b^2}$   
 $\sqrt{b^2}$

$$\int B \cdot dA = 0$$





# Statement of Responsibilities of the Council

The Council of the Dublin Institute for Advanced Studies is required under section 28(2) of the Institute for Advanced Studies Act 1940 to prepare financial statements in such form as shall be approved by the Minister for Education & Skills with the concurrence of the Minister for Finance.

In preparing those financial statements the Council is required to:

- select suitable accounting policies and apply them consistently;
- make judgements and estimates that are reasonable and prudent;
- prepare the financial statements on the going concern basis unless it is inappropriate to presume that the Institute will continue in operation; and
- disclose and explain any material departures from applicable accounting standards.

The Council is responsible for keeping proper books of account which disclose with reasonable accuracy at any time the financial position of the Institute and which enable it to ensure that the financial statements comply with Section 28(2) of the Act. The Council is responsible for safeguarding the assets of the Institute and for taking reasonable steps for the prevention and detection of fraud and other irregularities.



**Anders Ahlqvist**  
Council Member



**Liam Breatnach**  
Council Member

# Statement on Internal Financial Control

## Responsibility for Internal Financial Control

On behalf of the Council of the Institute I acknowledge our responsibility for ensuring that an effective system of internal financial control is maintained and operated.

The system can only provide reasonable and not absolute assurance that assets are safeguarded, transactions authorised and properly recorded, and that material errors or irregularities are either prevented or would be detected in a timely period.

## Key Control Procedures

The Council has taken steps to ensure an appropriate control environment by

- clearly defining management responsibilities;
- establishing formal procedures for reporting significant control failures and ensuring appropriate corrective action.

The Council has established processes to identify and evaluate business risks by

- identifying the nature, extent and financial implication of risks facing the Institute including the extent and categories which it regards as acceptable;
- assessing the likelihood of identified risks occurring;
- assessing the Institute's ability to manage and mitigate the risks that do occur;
- assessing the costs of operating particular controls relative to the benefit obtained.

The system of internal financial control is based on a framework of regular management information, administrative procedures including segregation of duties, and a system of delegation and accountability.

In particular it includes:

- comprehensive budgeting system with an annual budget which is reviewed and agreed by the Council of the Institute;
- regular reviews by the Council of periodic and annual financial reports which indicate financial performance against forecasts;

- setting targets to measure financial and other performance;
- adherence to public procurement guidelines;
- regular reviews by the Council of external research projects.

The Audit Committee continues to review internal control matters and issues raised by the Comptroller and Auditor General. In 2013, the Audit Committee met on three occasions.

In addition, the 2013 report on internal control systems as provided by the Internal Auditor has been made available to Members of Council.

The Council's monitoring and review of the effectiveness of the system of internal financial control is informed by the work of the internal auditor, the Registrar and other officers within the Institute who have responsibility for the development and maintenance of an appropriate financial control framework and comments made by the Audit Committee and the Comptroller and Auditor General in his management letter or other reports.

## Annual Review of Controls

I confirm that in the year ended 31st December 2013 Council conducted a review of the effectiveness of the internal financial controls of the Institute.

Signed on behalf of the Council of the Institute



**Vincent Cunnane**

*Chairman - Council of the Institute*

27th June 2014



# Comptroller and Auditor General

## Report for presentation to the Houses of the Oireachtas

I have audited the financial statements of the Dublin Institute for Advanced Studies for the year ended 31 December 2013 under the Institute for Advanced Studies Act 1940. The financial statements, which have been prepared under the accounting policies set out therein, comprise the Accounting Policies, the Income and Expenditure Account, the Statement of Total Recognised Gains and Losses, the Balance Sheet, the Cash Flow Statement and the related notes. The financial statements have been prepared in the form prescribed under Section 28 of the Act and in accordance with Generally Accepted Accounting Practice in Ireland.

### Responsibilities of the Council

The Council is responsible for the preparation of the financial statements, for ensuring that they give a true and fair view of the state of the Institute's affairs and of its income and expenditure, and for ensuring the regularity of transactions.

### Responsibilities of the Comptroller and Auditor General

My responsibility is to audit the financial statements and report on them in accordance with applicable law.

My audit is conducted by reference to the special considerations which attach to State Bodies in relation to their management and operation.

My audit is carried out in accordance with the International Standards on Auditing (UK and Ireland) and in compliance with the Auditing Practices Board's Ethical Standards for Auditors.

### Scope of Audit of the Financial Statements

An audit involves obtaining evidence about the amounts and disclosures in the financial statements, sufficient to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or error. This includes an assessment of

- whether the accounting policies are appropriate to the Institute's circumstances, and have been consistently applied and adequately disclosed
- the reasonableness of significant accounting estimates made in the preparation of the financial statements, and
- the overall presentation of the financial statements.

I also seek to obtain evidence about the regularity of financial transactions in the course of audit.

In addition, I read the Institute's Annual Report to identify material inconsistencies with the audited financial statements. If I become aware of any apparent material misstatements or inconsistencies I consider the implications for my report.

### Opinion on the Financial Statements

In my opinion, the financial statements, which have been properly prepared in accordance with Generally Accepted Accounting Practice in Ireland, give a true and fair view of the state of the Institute's affairs at 31 December 2013 and of its income and expenditure for 2013.


In my opinion, proper books of account have been kept by the Institute. The financial statements are in agreement with the books of account.

### Matters on which I Report by Exception

I report by exception if

- I have not received all the information and explanations I required for my audit, or
- my audit noted any material instance where money has not been applied for the purposes intended or where the transactions did not conform to the authorities governing them, or
- the information given in the Institute's Annual Report is not consistent with the related financial statements, or
- the Statement on Internal Financial Control does not reflect the Institute's compliance with the Code of Practice for the Governance of State Bodies, or
- I find there are other material matters relating to the manner in which public business has been conducted.

I have nothing to report in regard to those matters upon which reporting is by exception.



**Patricia Sheehan**

For and on behalf of the Comptroller and Auditor General  
30 June 2014

# Accounting Policies

## GENERAL

The Institute was established under the Institute for Advanced Studies Act, 1940.

Its functions include the provision of facilities for the furtherance of advanced studies and the conduct of research in specialised branches of knowledge.

It comprises three Schools - Celtic Studies, Theoretical Physics and Cosmic Physics.

## ACCOUNTING POLICIES

### 1. Basis of Accounting

The financial statements have been prepared on an accruals basis under the historical cost convention and in accordance with generally accepted accounting practice. Financial Reporting Standards recommended by the recognised accounting bodies are adopted as they become applicable.

### 2. Oireachtas Grants

Income is shown on a cash received basis.

### 3. Fixed Assets

Fixed Assets comprise the furniture, equipment, computers and motor vehicles of the Institute and are shown at cost less accumulated depreciation. The rates of depreciation, calculated on a straight line basis, are as follows:

Furniture and Equipment	10%
Computers	25%
Motor Vehicles	25%

Premises occupied by the Institute are leased from the Office of Public Works.

### 4. Capital Reserve

The capital reserve represents the unamortised value of income used for the purchase of Fixed Assets.

### 5. Library

Expenditure on library books and materials is written off in the year in which it is incurred.

### 6. Publications

Expenditure on publications is written off in the year in which it is incurred.

### 7. Superannuation

The Dublin Institute for Advanced Studies operates a defined benefit pension scheme which is funded annually on a pay as you go basis from monies available to it, including monies provided by the Department of Education and Skills and from contributions deducted from staff salaries.

Pension costs reflect pension benefits earned by employees in the period and are shown net of staff pension contributions which are retained by the Dublin Institute for Advanced Studies. An amount corresponding to the pension charge is recognised as income to the extent that it is recoverable, and offset by grants received in the year to discharge pension payments.

Actuarial gains or losses arising on scheme liabilities are reflected in the Statement of Recognised Gains and Losses and a corresponding adjustment is recognised in the amount recoverable from the Department of Education and Skills.

Pension liabilities represent the present value of future pension payments earned by staff to date. Deferred pension funding represents the corresponding asset to be recovered in future periods from the Department of Education and Skills.

### 8. Projects

The Dublin Institute for Advanced Studies receives external funding from industry, government bodies and the European Commission. A chart of accounts is maintained for each project.

Income and expenditure on projects is reflected in the financial statements in the year to which they relate. A surplus or deficit on a project is reflected in the financial statements when realised.

# Income and Expenditure Account

	Notes	2013 €	2012 €
<b>Income</b>			
Oireachtas Grant		6,442,000	6,856,000
Net deferred funding for pensions	11.c	1,372,232	1,719,800
Sales of Publications		37,030	41,487
Projects	2	1,143,236	2,157,337
Other	3	55,481	64,840
		9,049,979	10,839,464
Transfer (to)/from Capital Reserve	5	388,087	4,287
		9,438,066	10,843,751
<b>Expenditure</b>			
	1		
School of Celtic Studies		1,285,545	1,316,886
School of Theoretical Physics		931,123	1,068,519
School of Cosmic Physics		2,684,752	3,285,046
Administration		4,555,704	5,320,546
		9,457,124	10,990,997
<b>Deficit for the year</b>		<b>(19,058)</b>	<b>(147,246)</b>
Balance at 1 January		680,105	827,351
<b>Balance at 31 December</b>		<b>661,047</b>	<b>680,105</b>
<b>Statement of Total Recognised Gains and Losses</b>			
		<b>2013</b>	<b>2012</b>
Deficit for the year		(19,058)	(147,246)
Experience gains/(losses) on pension scheme liabilities		(487,000)	2,499,000
Changes in assumptions underlying the present value of pension scheme liabilities		2,794,000	(5,398,000)
<b>Actuarial Gain/(Loss) on Pension Liabilities</b>	11.b	<b>2,307,000</b>	<b>(2,899,000)</b>
<b>Adjustment to Deferred Pension Funding</b>		<b>(2,307,000)</b>	<b>2,899,000</b>
<b>Total Recognised (Loss) for the Year</b>		<b>(19,058)</b>	<b>(147,246)</b>

The Statement of Accounting Policies and notes 1 to 14 form part of these financial statements.



**Anders Ahlqvist**  
Council Member



**Liam Breatnach**  
Council Member

# Balance Sheet

	Notes	2013 €	2012 €
<b>Assets</b>			
Fixed Assets	4	1,732,348	2,120,435
Current Assets:			
Cash on Hand and at Bank		3,420,292	3,490,596
Debtors and Prepayments	7	178,282	213,197
Project Debtors	2	44,306	19,092
<b>Total Assets</b>		<b>5,375,228</b>	<b>5,843,320</b>
<b>Less Liabilities</b>			
Creditors - Amounts falling due within one year			
Creditors and Accruals	6	1,376,531	1,550,260
Project Creditors	2	1,577,653	1,448,834
Creditors - Amounts falling due after one year			
	6	27,649	43,686
<b>Total Liabilities Before Pensions</b>		<b>2,981,833</b>	<b>3,042,780</b>
<b>Assets Less Liabilities Before Pensions</b>		<b>2,393,395</b>	<b>2,800,540</b>
Deferred Pension funding	11.c	44,190,000	45,125,000
Pension Liabilities	11.b	(44,190,000)	(45,125,000)
		0	0
<b>Net Assets</b>		<b>2,393,395</b>	<b>2,800,540</b>
<b>Financed by:</b>			
Income and Expenditure Account		661,047	680,105
Capital Reserve	5	1,732,348	2,120,435
		<b>2,393,395</b>	<b>2,800,540</b>

The Statement of Accounting Policies and notes 1 to 14 form part of these financial statements.



**Anders Ahlqvist**  
Council Member



**Liam Breatnach**  
Council Member

# Cash Flow Statement

	Notes	2013 €	2012 €
<b>Reconciliation of Operating (Deficit)/Surplus to Net Cash Inflow from Operating Activities</b>			
Deficit for the Year		(19,058)	(147,246)
Interest Received	3	(36,229)	(51,045)
(Decrease)/Increase in Creditors		(189,766)	266,062
Decrease/(Increase) in Debtors		34,915	(11,753)
Net Increase/(Decrease) in Research Programmes and Fees		103,605	(606,023)
Depreciation	4	515,330	472,486
Capital Reserve Transfer	5	(388,087)	(4,287)
Loss on Disposal		-	1,746
<b>Net Cash Inflow/(Outflow) from Operating Activities</b>		<b>20,710</b>	<b>(80,060)</b>
<b>Cash Flow Statement</b>			
Net Cash Inflow/(Outflow) from Operating Activities		20,710	(80,060)
<b>Returns on Investments and Servicing of Finance</b>			
Bank Interest Received	3	36,229	51,045
<b>Capital Expenditure</b>			
Purchase of Tangible Assets	4	(127,243)	(469,945)
<b>Decrease in Cash</b>		<b>(70,304)</b>	<b>(498,960)</b>
<b>Reconciliation of Net Cash Flow to Movement in Net Funds</b>			
Decrease in Cash		(70,304)	(498,960)
Net Funds at 1 January		3,490,596	3,989,556
<b>Net Funds at 31 December</b>		<b>3,420,292</b>	<b>3,490,596</b>

	Cash at bank and in hand €	Bank Overdraft €	Total €
Analysis of Change in Net Funds			
At Beginning of Year 2013	3,490,596	-	3,490,596
Cash Flows	(70,304)	-	(70,304)
<b>At End of Year 2013</b>	<b>3,420,292</b>	<b>-</b>	<b>3,420,292</b>

The Statement of Accounting Policies and Notes 1 to 14 form part of these financial statements.



**Anders Ahlqvist**  
Council Member



**Liam Breatnach**  
Council Member



# Notes to the Financial Statements

## 1. Detailed Analysis of Income & Expenditure for the year ended 31/12/2013

	Notes	School of Celtic Studies	School of Theoretical Physics	School of Cosmic Physics	Administration	2013 Total	2012 Total
		€	€	€	€	€	€
<b>INCOME</b>							
Dept.of Education and Skills							
Grant-In-Aid (Annual)		1,491,285	937,763	2,374,581	1,638,371	6,442,000	6,856,000
*Net Deferred Funding for Pensions	11.c	(306,430)	(105,924)	(650,697)	2,435,283	1,372,232	1,719,800
Sales of Publications		37,030	-	-	-	37,030	41,487
Project Income	2.a	70,282	101,694	971,260	-	1,143,236	2,157,337
Other	3	918	2,007	-	52,556	55,481	64,840
		1,293,085	935,540	2,695,144	4,126,210	9,049,979	10,839,464
<b>Transfer (to)/from Capital Reserve</b>					388,087	388,087	4,287
		1,293,085	935,540	2,695,144	4,514,297	9,438,066	10,843,751
<b>EXPENDITURE</b>							
Payroll Costs	8	1,135,910	785,180	1,592,970	725,113	4,239,173	4,370,794
*Pension Costs	11.a	(27,304)	(34,875)	(53,546)	2,586,545	2,470,820	3,237,027
Project Costs	2.a	70,282	99,306	965,709	-	1,135,297	1,753,113
Library and Book Storage		46,211	66,571	49,574	861	163,217	174,089
Depreciation	4	-	-	-	515,330	515,330	472,486
Rent, Rates and Insurance		-	-	-	192,305	192,305	187,716
General Expenses	9	16,623	1,174	21,365	113,224	152,386	201,741
Travel and Seminar Expenses		13,434	7,737	54,771	7,124	83,066	92,842
Premises Maintenance and Security		-	-	-	163,408	163,408	157,158
Computer and Internet Expenses		1,866	2,280	45,512	62,280	111,938	107,809
Fuel Light and Power		-	-	-	147,793	147,793	151,650
Postage and Telephone		-	-	-	27,067	27,067	27,114
Stationery		14,270	541	1,602	4,150	20,563	25,388
Publications		12,364	-	3,598	-	15,962	19,010
Advertising		50	345	676	1,674	2,745	7,687
Minor Office Equipment		1,839	2,864	2,521	8,830	16,054	3,627
Disposal	5	-	-	-	-	-	1,746
		1,285,545	931,123	2,684,752	4,555,704	9,457,124	10,990,997
<b>SURPLUS/(DEFICIT) FOR YEAR</b>		<b>7,540</b>	<b>4,417</b>	<b>10,392</b>	<b>(41,407)</b>	<b>(19,058)</b>	<b>(147,246)</b>
Balance at 1 January		264,767	93,371	1,099,405	(777,439)	680,105	827,351
<b>Balance at 31 December</b>		<b>272,307</b>	<b>97,788</b>	<b>1,109,797</b>	<b>(818,846)</b>	<b>661,047</b>	<b>680,105</b>

**Note (a):** \*The net of 11c and 11a represents the superannuation paid less contributions deducted within each of the schools and section.

**Note (b):** Costs directly related to research (e.g., pay, library, computer expenses, travel) have been apportioned to the schools.

Overhead costs such as rent, insurance, utilities and property maintenance have been charged to Administration.

## Notes to the Financial Statements (continued)

### 2.(a) Projects

	<b>2013</b>	<b>2012</b>			
	<b>€</b>	<b>€</b>			
Opening Balances	1,429,742	2,035,765			
Receipts	1,246,841	1,551,314			
	<b>2,676,583</b>	<b>3,587,079</b>			
Closing Balances (Project Debtors €44,306, Project Creditors €1,577,653)	(1,533,347)	(1,429,742)			
Applied as Income	1,143,236	2,157,337			
<b>Income Allocation</b>					
School of Celtic Studies	70,282	25,436			
School of Theoretical Physics	101,694	130,886			
School of Cosmic Physics	971,260	1,596,184			
	<b>1,143,236</b>	<b>1,752,506</b>			
Administration Capital		404,831			
Total Project Income	1,143,236	2,157,337			
<b>Project Costs</b>					
	<b>Celtic Studies</b>	<b>Theoretical Physics</b>	<b>Cosmic Physics</b>	<b>2013 Total</b>	<b>2012 Total</b>
	<b>€</b>	<b>€</b>	<b>€</b>	<b>€</b>	<b>€</b>
Payments to Partners/Associates	39,724	-	35,311	75,035	794,359
Salaries/Scholarships	28,654	62,157	540,684	631,495	663,572
Travel	510	36,280	253,431	290,221	182,852
Other	1,394	869	136,283	138,546	112,330
Total Project Cost	70,282	99,306	965,709	1,135,297	1,753,113

### 2.(b) Project Detail

	<b>Funding Authority</b>	<b>Opening Balance</b>	<b>Receipts</b>	<b>Recurrent Expenditure</b>	<b>Applied as Income (including Capital)</b>	<b>Closing Balance</b>	<b>Capital</b>
		<b>€</b>	<b>€</b>	<b>€</b>	<b>€</b>	<b>€</b>	<b>€</b>
<b>School of Celtic Studies</b>							
Irish Script on Screen		17,372	-	514	514	16,858	-
Celtic Summer School		12,350	610	-	-	12,960	-
Ogham	Dept. Arts	43,691	55,000	69,768	69,768	28,923	-
<b>Total Celtic Studies</b>		<b>73,413</b>	<b>55,610</b>	<b>70,282</b>	<b>70,282</b>	<b>58,741</b>	<b>-</b>

## Notes to the Financial Statements (continued)

### 2.(b) Project Detail

	Funding Authority	Opening Balance €	Receipts €	Recurrent Expenditure €	Applied as Income (including Capital) €	Closing Balance €	Capital €
<b>School of Theoretical Physics</b>							
Bethe Ansatz	SFI	18,351	5,900	13,018	13,018	11,233	-
Non-Commutative Geometry	EC	1	-	-	1	-	-
T.Tchrakian	SFI	17,776	-	5,105	5,105	12,671	-
Veselin Filev Inspire Award	IRCSET	58,846	-	50,601	52,988	5,858	(2,387)
M.Ihl Fellow	IRCSET	20,886	19,820	30,582	30,582	10,124	-
<b>Total Theoretical Physics</b>		<b>115,860</b>	<b>25,720</b>	<b>99,306</b>	<b>101,694</b>	<b>39,886</b>	<b>(2,387)</b>
<b>School of Cosmic Physics</b>							
Gamma Ray Bursts	SFI	16,043	-	2,500	2,500	13,543	-
<b>Total Astronomy</b>		<b>16,043</b>	<b>-</b>	<b>2,500</b>	<b>2,500</b>	<b>13,543</b>	<b>-</b>
Dos Max	EC	1,502	-	-	-	1,502	-
*CosmoGrid	PRTL I	509,056	-	-	-	509,056	-
Nam Conference	A. Observ' tory	29,769	-	-	-	29,769	-
Jetset	EC	9,227	385	2,975	2,975	6,637	-
GNM	SFI	15,159	-	1,419	1,419	13,740	-
E-Inis -Cycle 4	PRTL I	(19,203)	341,841	59,889	58,747	263,891	-
Pic Simulations	SFI	60,789	-	-	-	60,789	-
D.Coffey Fellow	IRCSET	6,350	-	-	-	6,350	-
KM3Net -PP	EC	13,553	-	2,740	2,740	10,813	-
E.Whelan Inspire	IRCSET	8,452	-	-	-	8,452	-
NGST Project	ESA	17,931	90,594	140,849	143,598	(35,073)	(2,749)
Dobies	ESA	3,315	-	403	403	2,912	-
KVM3Net	EC	(845)	7,981	-	-	7,136	-
Valenti EC Reintegration	EC	12,486	-	-	-	12,486	-
Aleks Scholz-Brown Dwarfs	SFI	44,156	16,990	33,945	33,945	27,201	-
Origin of Jets	SFI	30,772	36,228	44,829	44,829	22,171	-
<b>Total Astrophysics</b>		<b>742,469</b>	<b>494,019</b>	<b>287,049</b>	<b>288,656</b>	<b>947,832</b>	<b>(2,749)</b>

## Notes to the Financial Statements (continued)

### 2.(b) Project Detail

	Funding Authority	Opening Balance	Receipts	Recurrent Expenditure	Applied as Income (including Capital)	Closing Balance	Capital
		€	€	€	€	€	€
Samtex	Industry	40,938	-	24,392	24,392	16,546	-
Geo External Funds	Industry	5,477	22,494	22,427	22,427	5,544	-
Joint RFP	SFI	5,213	-	-	-	5,213	-
Isle 2	SFI	7,733	-	1,815	1,815	5,918	-
Geophysics Schools Seismology	Various	8,467	244	1,806	1,806	6,905	-
Dynamics of Continuity	SFI	8,233	-	886	886	7,347	-
TopoMed	IRCSET	41,630	-	19,135	19,135	22,495	-
Regional Seismic	SFI	19,155	-	28,388	28,388	(9,233)	-
Irish Geoscience Graduate Prog.	D. Comm.	70,567	2,775	36,109	36,109	37,233	-
IRETHERM	SFI	200,004	225,636	226,673	228,365	197,275	(3,870)
GIANICE 11	SFI	43,202	32,500	14,172	14,172	61,530	-
SIRG E2174	SFI	18,132	138,395	110,081	112,333	44,194	(2,252)
ESA UWB Grant	ESA	13,206	25,326	3,697	3,697	34,835	-
WAXI	Industry	-	193,422	181,113	181,113	12,309	-
IRECCSEM	SFI	-	30,700	5,466	5,466	25,234	-
<b>Total Geophysics</b>		<b>481,957</b>	<b>671,492</b>	<b>676,160</b>	<b>680,104</b>	<b>473,345</b>	<b>(6,122)</b>
<b>Total Cosmic Physics</b>		<b>1,240,469</b>	<b>1,165,511</b>	<b>965,709</b>	<b>971,260</b>	<b>1,434,720</b>	<b>(8,871)</b>
<b>Total Net Balances - DIAS</b>		<b>1,429,742</b>	<b>1,246,841</b>	<b>1,135,297</b>	<b>1,143,236</b>	<b>1,533,347</b>	<b>(11,258)</b>

#### Note

Project receipts are applied as project income, at a level that equals the annual expenditure incurred by the associated project. The closing balances above represent overhead earned to date and advance funding to meet financial commitments in 2014. The capital column outlines the expenditure on fixed assets during 2013.

\*The CosmoGrid project is now complete and the balance of (€509,056) has been included in the project creditors at the year end. Once the final report from the EU Commission has been issued, the funds will be available for investment in new projects.

### 3. Other Income

	2013	2012
	€	€
Bank Interest	36,229	51,045
Fees and Grants	1,597	4,692
Other	17,655	9,103
<b>Total</b>	<b>55,481</b>	<b>64,840</b>

## Notes to the Financial Statements (continued)

### 4. Fixed Assets

	<b>Furniture &amp; Equipment</b>	<b>Motor Vehicles</b>	<b>Computers</b>	<b>Total</b>
<b>Cost</b>	<b>€</b>	<b>€</b>	<b>€</b>	<b>€</b>
Opening Balance 1/1/2013	3,862,634	53,200	2,419,967	6,335,801
Additions*	32,920	1,750	92,573	127,243
Disposals**	-	(9,250)	(279,096)	(288,346)
	<b>3,895,554</b>	<b>45,700</b>	<b>2,233,444</b>	<b>6,174,698</b>
<b>Depreciation</b>				
Opening Balance 1/1/2013	2,397,465	53,200	1,764,701	4,215,366
Charge	246,215	295	268,820	515,330
Disposals	-	(9,250)	(279,096)	(288,346)
	<b>2,643,680</b>	<b>44,245</b>	<b>1,754,425</b>	<b>4,442,350</b>
Net book value 31/12/2013	1,251,874	1,455	479,019	1,732,348
Net book value 31/12/2012	1,465,169	-	655,266	2,120,435

#### Note

\*All fixed assets in excess of €1,000 are capitalised in the books of DIAS.

\*\*Following a detailed computer asset verification exercise, the register was updated to reflect a large number of disposals that had occurred in previous years.

### 5. Capital Reserve

	<b>2013</b>	<b>2012</b>
	<b>€</b>	<b>€</b>
Balance at 1 January	2,120,435	2,124,722
<b>Transfer from/(to) Income and Expenditure Account</b>		
Income allocated to acquire fixed assets (Project Funded)	11,258	404,831
Income allocated to acquire fixed assets (Exchequer Funded)	115,985	65,114
Amortisation in line with asset depreciation	(515,330)	(472,486)
Amount released on disposals	-	(1,746)
	<b>(388,087)</b>	<b>(4,287)</b>
<b>Balance at 31 December</b>	<b>1,732,348</b>	<b>2,120,435</b>



## Notes to the Financial Statements (continued)

### 6. Creditors due within twelve months

	<b>2013</b>	<b>2012</b>
	<b>€</b>	<b>€</b>
Trade Creditors	82,872	176,838
Accruals	973,237	947,887
Sundry	12,004	12,011
VAT	17,955	11,145
Revenue Creditors	129,534	288,507
Pension Control Account	160,929	113,872
	<b>1,376,531</b>	<b>1,550,260</b>

### 6. Creditors due after twelve months

	<b>2013</b>	<b>2012</b>
	<b>€</b>	<b>€</b>
These comprise:		
Vernam Hull Bequest	25,189	41,226
Carmody Fund	2,460	2,460
	<b>27,649</b>	<b>43,686</b>

The funds relating to the above are held on deposit. Funds were utilised during the year.

### 7. Debtors

	<b>2013</b>	<b>2012</b>
	<b>€</b>	<b>€</b>
Prepayments	159,970	192,924
Book Sales Debtors	2,777	2,618
Sundry	15,535	-
Accrued Income	-	17,655
	<b>178,282</b>	<b>213,197</b>

### 8. Payroll Costs

	<b>Celtic Studies</b>	<b>Theoretical Physics</b>	<b>Cosmic Physics</b>	<b>Admin.</b>	<b>2013 Total</b>	<b>2012 Total</b>
	<b>€</b>	<b>€</b>	<b>€</b>	<b>€</b>	<b>€</b>	<b>€</b>
Salaries/Wages	1,031,554	680,920	1,456,275	725,113	3,893,862	4,114,740
Scholarships	99,166	97,339	131,164	-	327,669	240,131
Visitors	3,318	6,921	5,531	-	15,770	14,323
Honoraria	1,872	-	-	-	1,872	1,600
	<b>1,135,910</b>	<b>785,180</b>	<b>1,592,970</b>	<b>725,113</b>	<b>4,239,173</b>	<b>4,370,794</b>

#### Note

Pension levy deductions of €278,267 (2012: €293,028) were paid to the Department of Education and Skills during 2013. Staff Numbers 55.5 (2012: 56.5), ECF Numbers 56 (2012: 57).

## Notes to the Financial Statements (continued)

### 9. General Expenses

	<b>Celtic Studies</b>	<b>Theoretical Physics</b>	<b>Cosmic Physics</b>	<b>Admin.</b>	<b>2013 Total</b>	<b>2012 Total</b>
	€	€	€	€	€	€
Miscellaneous	10,529	806	15,302	18,827	45,464	71,821
Promotions/Lunches	6,044	368	4,990	3,822	15,224	15,738
Professional Fees	-	-	-	36,099	36,099	51,092
Training	50	-	1,073	4,561	5,684	7,714
Audit Fee	-	-	-	18,800	18,800	18,189
Bank Charges	-	-	-	2,568	2,568	2,855
Board Meeting Expenses	-	-	-	22,170	22,170	31,487
Health & Safety	-	-	-	6,377	6,377	2,845
	<b>16,623</b>	<b>1,174</b>	<b>21,365</b>	<b>113,224</b>	<b>152,386</b>	<b>201,741</b>

### 10. Leasing

#### Operating Leases

The premises occupied by the Institute are leased from the Office of Public Works.

The premises include Observatory House Dunsink, 5 Merrion Square, 9-10 Burlington Road and 31 Fitzwilliam Place.

There is a term of 84 years left on the lease for Observatory House and the other leases are renewed on an annual basis.

The commitment on foot of such leases in respect of 2014 is €113,609.

<b>Office of Public Works Leases</b>	<b>Annual Rent</b>
	€
Observatory House Dunsink	330
5 Merrion Square	5,022
9-10 Burlington Road	50,167
31 Fitzwilliam Place	58,090
	<b>113,609</b>

## Notes to the Financial Statements (continued)

### 11. Pension Costs

<b>a) Analysis of total pension costs charged to Expenditure</b>	<b>2013</b>	<b>2012</b>
	<b>(€'000)</b>	<b>(€'000)</b>
Current Service Cost	1,019	1,339
Interest on Pension Scheme Liabilities	1,593	2,051
Employee Contributions	(141)	(153)
	<b>2,471</b>	<b>3,237</b>

<b>b) Movement in Net Pension Liability during the financial year</b>	<b>2013</b>	<b>2012</b>
	<b>(€'000)</b>	<b>(€'000)</b>
Net Pension Liability at 1 January	(45,125)	(40,506)
Current Service Cost	(1,019)	(1,339)
Interest Costs	(1,593)	(2,051)
Actuarial (Loss)/Gain	2,307	(2,899)
Pensions Paid in the Year	1,240	1,670
<b>Net Pension Liability at 31 December</b>	<b>(44,190)</b>	<b>(45,125)</b>

#### c) Deferred Funding for Pensions

DIAS recognises these amounts as an asset corresponding to the unfunded deferred liability for pensions on the basis of the set of assumptions described above and a number of past events. These events include the statutory basis for the establishment of the pension scheme, and the policy and practice in relation to funding public service pensions including contributions by employees and the annual estimates process. While there is no formal agreement regarding these specific amounts with the Department of Education and Skills, the DIAS has no evidence that this funding policy will not continue to meet such sums amount in accordance with current practice.

The Net Deferred Funding for Pensions recognised in Income and Expenditure Account was as follows:

	<b>2013</b>	<b>2012</b>
	<b>(€'000)</b>	<b>(€'000)</b>
Funding Recoverable in Respect of Current Year Pension Costs	2,612	3,390
State Grant Applied to Pay Pensioners	(1,240)	(1,670)
	<b>1,372</b>	<b>1,720</b>

The deferred funding asset for pensions as at 31 December 2013 amounted to €44,190 million (2012: €45.125 million).

<b>d) History of defined benefit obligations</b>	<b>2013</b>	<b>2012</b>	<b>2011</b>	<b>2010</b>
	<b>(€'000)</b>	<b>(€'000)</b>	<b>(€'000)</b>	<b>(€'000)</b>
Defined Benefit Obligations	44,190	45,125	40,506	36,736
Experience (Gains)/Losses on Scheme Liabilities Amount	(487)	2,499	(188)	(1,998)
Percentage of Scheme Liabilities	(1.10%)	5.50%	(0.50%)	(5.40%)

The cumulative actuarial (gain)/loss recognised in the Statement of Total Recognised Gains and Losses amounts to (€3,401,000).

## Notes to the Financial Statements (continued)

### 11. Pension Costs (continued)

#### e) General Description of the Scheme

The pension scheme is a defined benefit final salary pension arrangement with benefits and contributions defined by reference to current "model" public sector scheme regulations.

The scheme provides a pension (eightieths per year of service), a gratuity or lump sum (three eightieths per year of service) and spouse's and children's pensions. Normal Retirement Age is a member's 65th birthday, and pre 2004 members have an entitlement to retire without actuarial reduction from age 60. Pensions in payment (and deferment) normally increase in line with general public sector salary inflation.

The valuation used for FRS17 disclosures has been based on a full actuarial valuation by a qualified independent actuary taking account of the requirements of the FRS in order to assess the scheme liabilities at 31 December 2013.

The principal actuarial assumptions were as follows:

	At 31/12/13	At 31/12/12	At 31/12/11
Rate of Increase in Salaries	3.00%	3.00%	3.50%
Rate of Increase in Pensions in Payment	2.50%	2.50%	3.25%
Discount Rate	3.75%	3.50%	5.00%
Inflation Rate	2.00%	2.00%	2.00%

The mortality basis adopted allows for improvements in life expectancy over time, so that the life expectancy at retirement will depend on the year in which a member attains retirement age (age 65). The table below shows the life expectancy for members attaining age 65 in 2013 and 2033.

Year of Attaining Age 65	2013	2033
Life Expectancy - Male	87.3	89.9
Life Expectancy - Female	88.7	90.9

### 12. Disclosure of Transactions

The Council of the Institute adopts procedures in accordance with guidelines issued by the Department of Finance in relation to the disclosure of interests by Council Members and these procedures have been adhered to by the Council Members during the year. No Council Member has declared an interest.

## Notes to the Financial Statements (continued)

### 13. Disclosure of Council Members/Registrar Salary, Fees and Expenses

	<b>Total Remuneration 2013 €</b>	<b>Total Expenses 2013 €</b>	<b>Total Remuneration 2012 €</b>	<b>Total Expenses 2012 €</b>
<b>Council Member</b>				
Dr Vincent Cunnane		261		None
<b>Members Appointed by the Governing Boards of Constituent Schools</b>				
Professor Gerry Wrixon		126		621
Professor Arthur Jaffe		1,325		1,935
Professor Anders Ahlqvist		7,262		9,195
Professor Werner Nahm				
Professor Luke Drury				
Professor Pdraig Breatnach				
<b>Registrar</b>				
Mr. Cecil Keaveney*	100,756		101,021	
	<b>100,756</b>	<b>8,974</b>	<b>101,021</b>	<b>11,751</b>

#### \*Note

The Registrar is in receipt of a salary only. He is not paid any bonus. The Registrar's pension entitlements does not exceed the standard entitlements in the model public sector defined benefit superannuation scheme.

### 14. Approval of Accounts

The Financial Statements were approved by Council on the 20th June 2014.





# Ráiteas Freagrachtaí na Comhairle

Éilítear ar Chomhairle Institiúid Ard-Léinn Bhaile Átha Cliath faoi alt 28(2) den Acht um Institiúid Ard-Leighinn, 1940 ráitis airgeadais a ullmhú ar shlí a cheadóidh an tAire Oideachais & Eolaíochta le comhthoilíú an Aire Airgeadais.

Agus an Chomhairle ag ullmhú na ráitis airgeadais sin éilítear uirthi:

- polasaithe chuntasaíochta oiriúnacha a roghnú agus iad a chur i bhfeidhm go comhleanúnach;
- breithiúnais agus meastacháin a dhéanamh atá réasúnach agus stuama;
- na ráitis airgeadais a ullmhú ar bhonn gnóthais leantach mura bhfuil sé míchuí glacadh leis go leanfaidh an Institiúid ag oibriú; agus
- aon imeacht ábhartha ó chaighdeáin chuntasaíochta infheidhme a nochtadh agus a mhíniú

Tá freagracht ar an gComhairle leabhair chuntais chearta a choinneáil a nochtáíonn ag aon am le cruinneas réasúnach staid airgeadais na hInstitiúide agus a chuireann ar a cumas a chinntiú go gcloíonn na ráitis airgeadais le hAlt 28(2) den Acht. Tá freagracht ar an gComhairle sócmhainní na hInstitiúide a shlánú agus as céimeanna réasúnacha a ghlacadh le cosc a chur ar chalaíoch agus ar neamhrialtachtaí eile agus iad a aimsiú.



**Anders Ahlqvist**  
*Comhalta Den Chomhairle*



**Liam Breatnach**  
*Comhalta Den Chomhairle*

# Ráiteas faoin gCóras Rialaithe Airgeadais Inmheánaigh

## Freagracht as an gCóras Rialaithe Airgeadais Inmheánaigh

Thar ceann Chomhairle na hInstitiúide is mian liom ár bhfreagracht a chur in iúl lena chinntiú go ndéantar cothabháil agus go n-oibrítear córas rialaithe airgeadais inmheánaigh.

Ní féidir leis an gcóras ach dearbhú réasúnach agus ní dearbhú críochnaitheach a chur ar fáil go ndéantar slánú ar shócmhainní, go mbíonn idirbheartaíochtaí údaraithe agus taifeadta i gceart, agus go gcuirtear cosc ar earráidí ábhartha nó ar neamhrialtachtaí nó go n-aimseofaí iad i dtréimhse chaoithiúil.

## Nósanna Imeachta Rialaithe Lárnacha

Tá céimeanna glactha ag an gComhairle lena chinntiú go mbeidh timpeallacht rialaithe chuí i bhfeidhm trí

- sainmhíniú soiléir a thabhairt maidir le freagrachtaí bainistíochta;
- nósanna imeachta foirmiúla a bhunú le teipeanna rialaithe suntasacha a thuairisciú agus lena chinntiú go dtógtar gníomh cuí leis an gceist a cheartú.

Tá próisis bunaithe ag an gComhairle le rioscaí gnó a aithint agus iad a luacháil trí

- nádúr, méid agus tionchar airgeadais na rioscaí a bhíonn os comhair na hInstitiúide a aithint lena n-áirítear méid agus catagóir a mheasann an Institiúid a bheith inghlactha;
- measúnú a dhéanamh ar an dóchúlacht atá ann go dtarlóidh na rioscaí aitheanta;
- measúnú a dhéanamh ar chumas na hInstitiúide na rioscaí a tharlaíonn a bhainistiú agus a mhaolú;
- measúnú a dhéanamh ar na costais a bhaineann le rialacháin áirithe a oibriú a bhaineann leis an sochar a bhaintear amach.

Tá an córas rialaithe airgeadais inmheánaigh bunaithe ar chreat oibre eolais bainistíochta rialta, nósanna imeachta riaracháin lena n-áirítear dualgais a roinnt, agus córas toiscaireachta agus cuntasachta.

Áirítear leis go háirithe:

- córas buiséid cuimsitheach le buiséad bliantúil a ndéanann Comhairle na hInstitiúide athbhreithniú air agus a bhíonn comhaontaithe aici;
- athbhreithnithe rialta ag an gComhairle ar thuairiscí airgeadais tréimhseacha agus bliantúla a léiríonn feidhmíocht airgeadais in aghaidh réamhaisnéisí;
- spriocanna a leagan síos le feidhmíocht airgeadais agus feidhmíocht eile a thomhas;
- cloí le treoirlínte chun soláthar don earnáil phoiblí.
- athbhreithnithe rialta ag an gComhairle ar thionscadail taighde seachtaracha.

Leanann an Coiste Iniúcháireachta ag déanamh athbhreithniú ar chúrsaí rialaithe inmheánacha agus ar shaincheisteanna a d'ardaigh an tArd-Reachtaire Cuntas agus Ciste. I 2013, bhuaill an Coiste Iniúchoireachta le cheile trí huair. Ina theannta sin, an tuarascáil ar chórais rialaithe inmheánacha don bhliain 2013 a chuir an tIniúcháir Inmheánach ar fáil tugadh do bhaill na Comhairle í.

Tá monatóireacht agus athbhreithniú na Comhairle ar éifeachtúlacht an chórais rialaithe airgeadais inmheánaigh coinnithe ar an eolas trí obair an iniúcháora inmheánaigh, trí obair an Chláraitheora agus oifigigh eile laistigh den Institiúid atá freagrach as creat oibre rialaithe airgeadais cuí a fhorbairt agus a chothabháil, agus trí thuairimí a dhéanann an Coiste Iniúchta agus an tArd-Reachtaire Cuntas agus Ciste ina litir bhainistíochta no i dtuairiscí eile.

## Athbhreithniú Bliantúil ar Rialacháin

Dearbhaím go ndearna an Bord athbhreithniú ar éifeachtachas chórais rialaithe airgeadais inmheánaigh na hInstitiúide sa bhliain dár críoch 31ú Nollaig 2013.

Sínithe thar ceann Chomhairle na hInstitiúide



**Vincent Cunnane**

*Cathaoirleach-Comhairle Na hInstitiúide*

27 Meitheamh 2014

# Tuarascáil an Ard-Reachtair Cuntas agus Ciste

le cur i láthair Thithe an Oireachtais

## Institiúid Ard-Léinn Bhaile Átha Cliath

Tá ráitis airgeadais Institiúid Ard-Léinn Bhaile Átha Cliath don bhliain dar críoch 31 Nollaig 2013 iniúchta agam faoin Acht Um Institiúid Ard-Léinn, 1940.

Tá na ráitis airgeadais, a ullmhaíodh faoi na beartais chuntasaíochta arna leagan amach sna ráitis, comhdhéanta de na Beartais Chuntasaíochta, an Cuntas Ioncaim agus Caiteachais, an Ráiteas Gnóthachan agus Caillteanas Aitheanta lomlán, an Clár Comhardaithe, an Ráiteas ar Shreabhadh Airgid, agus na nótaí gaolmhara. Ullmhaíodh na ráitis airgeadais san fhoirm a leagtar amach faoi Alt 28 den Acht agus de réir Cleachtas Chuntasaíochta a nGlactar Leis go Coitianta in Éirinn.

## Freagrachtaí na Comhairle

Tá an Chomhairle freagrach as na ráitis airgeadais a ullmhú, as léargas fóircheart ar riocht ghnóthaí na hInstitiúide a chinntiú, as a hioncam agus a caiteachas a chinntiú, agus as rialtacht na n-idirbheart a chinntiú.

## Freagrachtaí an Ard-Reachtair Cuntas agus Ciste

Is é m'fhreagrachta ná na ráitis airgeadais a iniúchadh agus tuairisc a thabhairt orthu de réir dlí is infheidhme.

Riar mé m'iniúchadh trí thagairt a dhéanamh to na nithe ar leith is gá a chur san áireamh i ndáil le cúrsaí bainisteoireachta agus oibriúcháin a ghabhann le Comhlachtaí Stáit.

Rinne mé m'iniúchadh de réir Caighdeán Idirnáisiúnta maidir le hIniúcháireacht (Ríocht Aontaithe agus Éire) agus de réir Caighdeán Eiticíúil an Bhoird um Chleachtas Iniúcháireachta d'Iniúcháirí.

## Réimse Iniúchta na Ráiteas Airgeadais

Cuimsíonn iniúchadh fianaise a fháil faoi na suimeanna agus na nochtuithe sna ráitis airgeadais, ionas go mbeadh leordhóthain fianaise agam a d'fhágfadh cinnteacht réasúnach ann go bhfuil na ráitis airgeadais saor ó mhíríteas ábhartha, cibé acu calaois nó neamhrialtacht is cúis leis sin. Cuimsíonn sé seo measúnú

- an n-oireann na beartais chuntasaíochta don bhail atá ar chúrsaí na hInstitiúide, ar feidhmíodh na beartais sin ar bhealach leanúnach agus ar foilsíodh iad ar bhealach sásúil
- réasúntacht meastacháin suntasacha chuntasaíochta a rinneadh in ullmhúchán na ráiteas airgeadais, agus
- leagan amach foriomlán na ráiteas airgeadais.

ina theannta sin, léigh mé Tuarascáil Bhliantúil na hInstitiúide le haghaidh neamhréireachtaí ábhartha leis na ráitis airgeadais iniúchta. Mar aon leis sin, léim an fhaisnéis airgeadais agus neamhairgeadais sa Tuarascáil Bhliantúil chun neamhréireachtaí ábhartha a aithint leis na ráitis airgeadais iniúchta. Má thagaim ar an eolas faoi mhíríteas ábhartha dealraitheacha nó neamhréireachtaí cuirim na himpleachtaí san áireamh i mo thuarascáil.

## Tuairim ar na Ráitis Airgeadais

Is é mo thuairim go dtugann na ráitis airgeadais, a ullmhaíodh i gceart de réir Cleachtas Chuntasaíochta a nGlactar Leis go Coitianta in Éirinn, léargas fóircheart ar riocht ghnóthaí na hInstitiúide ag 3 Nollaig 2013 agus ar a hioncam agus ar a caiteachas don bhliain 2013.

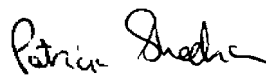
Is é mo thuairim go raibh leabhair chuntais chúil coinnithe ag an Institiúid. Tá na ráitis airgeadais ag teacht leis na leabhair chuntais.

## Nithe ar a dTuairiscím Eisceachtaí

Tuairiscím eisceachtaí

- mura bhfuair mé an fhaisnéis agus na mínithe ar fad a theastaigh uaim do m'iniúchadh, nó
- má d'aimsigh m'iniúchadh aon chás ábhartha nár feidhmíodh suimeanna airgid chun na gcríoch a bhí beartaithe nó sa chás nár lean na hidirbhearta do na húdaráis a rialaíonn iad, nó
- mura bhfuil an fhaisnéis a tugadh i dTuarascáil Bhliantúil na hInstitiúide ag teacht leis na ráitis airgeadais gaolmhara,
- mura gcomhlíonann Ráiteas na hInstitiúide maidir le Rialú Inmheánach Airgeadais Cód Cleachtas maidir le Rialachas Comhlachtaí Stáit, nó
- má fhaighim amach go bhfuil nithe ábhartha eile maidir leis an modh a riaradh gnó poiblí.

Níl a thuilleadh le tuairiscíú agam maidir leis na nithe seo lena mbaineann tuairisceoireacht eisceachtaí.



**Patricia Sheehan**

Le haghaidh agus thar ceann an Ard-Reachtair Cuntas agus Ciste

30 Meitheamh 2014

# Polasaithe Chuntasaíochta

## GINEARÁLTA

Bunaíodh an Institiúid faoin Acht um Institiúid Ard-Leighinn, 1940.

Áirítear ar a cuid feidhmeanna saoráidí a sholáthar le hard-léinn a chur chun cinn tuilleadh agus le taighde a dhéanamh i mbrainsí speisialtacha eolais.

Tá trí Scoil inti - Scoil an Léinn Cheiltigh, Scoil na Fisice Teoiriciúla agus Scoil na Fisice Cosmaí.

## POLASAITHE CHUNTASAÍOCHTA

### 1. Bunús Cuntasaíochta

Tá na ráitis airgeadais ullmhaithe ar bhonn fabhráithe faoin gcoinbhinsiún costais stairiúil agus de réir chleachtas cuntasaíochta a nglactar leo tríd is tríd. Glactar le Caighdeáin Thuairiscithe Airgeadais a bhí molta ag na comhlachtaí cuntasaíochta aitheanta mar is infheidhme iad.

### 2. Deontais Oireachtais

Taispeántar ioncam ar bhunús airgid isteach.

### 3. Sócmhainní Seasta

Is éard is Sócmhainní Seasta ann ná troscán, trealamh, ríomhairí agus mótarfeithiclí na hInstitiúide agus taispeántar iad ag costas lúide dímheas carntha. Is mar seo a leanas atá na rátaí dímheasa, ríofa ar bhunús dronlíneach:

Troscán agus Trealamh	10%
Ríomhairí	25%
Mótarfeithiclí	25%

Faightear áitribh atá i seilbh na hInstitiúide ar léas ó Oifig na nOibreacha Poiblí.

### 4. Cúlchiste Caipitil

Léiríonn cúlchiste caipitil luach neamh-amúchta ioncain a úsáidtear le Sócmhainní Seasta a cheannach.

### 5. Leabharlann

Díscríobhtar caiteachas ar leabhair leabharlainne agus ábhair sa bhliain a dtabhaítear é.

### 6. Foilseacháin

Díscríobhtar caiteachas ar fhoilseacháin sa bhliain a dtabhaítear é.

## 7. Aoisliúntas Pinsin

Feidhmíonn Institiúid Ard-Léinn Bhaile Átha Cliath scéim phinsin shochair shonraithe a mhaoinítear go bliantúil ar bhonn íoc mar a imíonn tú ó chistí atá ar fáil dó, lena n-áirítear cistí a chuireann an Roinn Oideachais agus Scileanna ar fáil agus ó ranníocaíochtaí a asbhaintear ó thuarastail foirne.

Léiríonn costais phinsin na sochair phinsin a thuilleann fostaithe sa tréimhse agus léirítear iad glan ar ranníocaíochtaí pinsin foirne a bhíonn coinnte ag Institiúid Ard-Léinn Bhaile Átha Cliath. Aithnítear suim a chomhfhreagraíonn don mhúirear pinsin mar ioncam sa mhéid go bhfuil sé inaisghabhála, go ndéantar é a fhritháireamh in aghaidh deontais a bhíonn faighte sa bhliain chun íocaíochtaí pinsin a ghlanadh.

Tá gnóthachain nó cailteanais achtúireacha ar dhliteanais na scéime léirithe sa Ráiteas ar Ghnóthachain agus Cailteanais Aitheanta agus aithnítear coigeartú comhfhreagrach sa mhéid is féidir a aisghabháil ón Roinn Oideachais agus Scileanna.

Léiríonn na dliteanais phinsin luach reatha na n-íocaíochtaí pinsin don todhchaí atá tuillte ag an bhfoireann go dtí seo. Léiríonn maoiniú pinsin iarchurtha an tsócmhainn chomhfhreagrach a bheidh aisghafa i dtréimhsí amach anseo ón Roinn Oideachais agus Scileanna.

## 8. Tionscadail

Faigheann Institiúid Ard-Léinn Bhaile Átha Cliath maoiniú seachtarach ó thionscal, ó chomhlachtaí rialtais, agus ó Choimisiún na hEorpa. Coinnítear cairt chuntais i gcás gach tionscadail.

Léirítear ioncam agus caiteachas ar thionscadail sna ráitis airgeadais sa bhliain lena mbaineann siad. Taispeántar barrachas nó easnamh tionscadail sna ráitis airgeadais nuair a léirítear sin.

# Cuntas Ioncaim agus Caiteachais

	Notes	2013 €	2012 €
<b>Ioncam</b>			
Deontas Oireachtais		6,442,000	6,856,000
Glan-mhaoiniú iarchurtha do phinsin	11.c	1,372,232	1,719,800
Díolacháin Foilseachán		37,030	41,487
Tionscadail	2	1,143,236	2,157,337
Eile	3	55,481	64,840
		9,049,979	10,839,464
Aistriú (chuig)/ó Cúlchiste Caipitil	5	388,087	4,287
		9,438,066	10,843,751
<b>Caiteachas</b>			
	1		
Scoil an Léinn Cheiltigh		1,285,545	1,316,886
Scoil na Fisice Teoiriciúla		931,123	1,068,519
Scoil na Fisice Cosmaí		2,684,752	3,285,046
Riarachán		4,555,704	5,320,546
		9,457,124	10,990,997
<b>Easnamh don bhliain</b>		<b>(19,058)</b>	<b>(147,246)</b>
Iarmhéid amhail an 1 Eanáir		680,105	827,351
<b>Iarmhéid amhail an 31 Nollaig</b>		<b>661,047</b>	<b>680,105</b>
<b>Ráiteas ar Ghnóthachain agus Caillteanais Aitheanta</b>			
		<b>2013</b>	<b>2012</b>
Easnamh don bhliain		(19,058)	(147,246)
(Gnóthachain) iarbhíre ar dhlíteanais na scéime pinsin		(487,000)	2,499,000
Athruithe i dtoimhdí is bonn do luach reatha dhlíteanais na scéime pinsin		2,794,000	(5,398,000)
<b>(Gnóthachan) achtúireach ar Dhlíteanais Phinsin</b>	<b>11.b</b>	<b>2,307,000</b>	<b>(2,899,000)</b>
<b>Coigeartú ar Mhaoiniú an Phinsin Iarchurtha</b>		<b>(2,307,000)</b>	<b>2,899,000</b>
<b>(Gnóthachan) iomlán aitheanta don bhliain</b>		<b>(19,058)</b>	<b>(147,246)</b>

Is cuid de na ráitis airgeadais sin é an Ráiteas Beartais Cuntasaíochta agus nótaí 1 go dtí 14.



**Anders Ahlqvist**  
Comhalta Den Chomhairle



**Liam Breatnach**  
Comhalta Den Chomhairle



# Clár Comhardaithe

	Notáí	2013 €	2012 €
<b>Sócmhainní</b>			
Sócmhainní Seasta	4	1,732,348	2,120,435
Sócmhainní Reatha:			
Airgead sa Lámh agus ag an mBanc		3,420,292	3,490,596
Féichiúnaithe agus Réamhíocaíochtaí	7	178,282	213,197
Féichiúnaithe Tionscadal	2	44,306	19,092
<b>Sócmhainní Iomlána</b>		<b>5,375,228</b>	<b>5,843,320</b>
<b>Lúide Dliteanais</b>			
Creidiúnaithe - Méideanna atá dlite laistigh de bhliain amháin			
Creidiúnaithe agus Fabhruithe	6	1,376,531	1,550,260
Creidiúnaithe Tionsadail	2	1,577,653	1,448,834
Creidiúnaithe - méideanna atá dlite tar éis bliana amháin	6	27,649	43,686
<b>Dliteanais Iomlána Roimh Phinsin</b>		<b>2,981,833</b>	<b>3,042,780</b>
<b>Sócmhainní lúide dliteanais Roimh Phinsin</b>			
		<b>2,393,395</b>	<b>2,800,540</b>
Maoiniú an Phinsin Iarchurtha	11.c	44,190,000	45,125,000
Dliteanais Phinsin	11.b	(44,190,000)	(45,125,000)
		0	0
<b>Sócmhainní Glana</b>		<b>2,393,395</b>	<b>2,800,540</b>
<b>Maoinithe ag:</b>			
Cuntas Ioncaim agus Caiteachais		661,047	680,105
Cúlchiste Caipitil	5	1,732,348	2,120,435
		<b>2,393,395</b>	<b>2,800,540</b>

Is cuid de na ráitis airgeadais seo é an Ráiteas Beartais Cuntasaíochta agus na nótaí ó 1 go dtí 14.



**Anders Ahlqvist**  
Comhalta Den Chomhairle



**Liam Breatnach**  
Comhalta Den Chomhairle

# Ráiteas Sreabhadh Airgid

	Nótaí	2013 €	2012 €
<b>Réiteach (easnamh)/barrachais oibríochta chuig glan-insreabhadh airgid ó ghníomhaíochtaí oibríochta</b>			
Easnamh don bhliain		(19,058)	(147,246)
Ús infhaighte	3	(36,229)	(51,045)
(Laghdú)/Ardú i gCreidiúnaithe		(189,766)	266,062
Ardú/(Laghdú) i bhFéichiúnaithe		34,915	(11,753)
Glan-ardú/(laghdú) i gCláir Thaighde agus Táillí		103,605	(606,023)
Dímheas	4	515,330	472,486
Aistriú Cúlchiste Caipitil	5	(388,087)	(4,287)
Caillteanas ar dhiúscairt		-	1,746
<b>Glan(eis-sreabhadh)/insreabhadh Airgid tirim ó ghníomhaíochtaí oibríochta</b>		<b>20,710</b>	<b>(80,060)</b>
<b>Ráiteas Sreabhadh Airgid</b>			
Glan(eis-sreabhadh)/insreabhadh airgid tirim ó ghníomhaíochtaí oibríochta		20,710	(80,060)
<b>Aischiú ar infheistíochtaí agus seirbhísí airgeadais</b>			
Ús Bainc Infhaighte	3	36,229	51,045
<b>Caiteachas Caipitiúil</b>			
Ceannach Sócmhainní Inláimhsithe	4	(127,243)	(469,945)
<b>Laghdú ar Airgead</b>		<b>(70,304)</b>	<b>(498,960)</b>
<b>Réiteach glaninsreabhadh airgead tirim chuig gluaiseacht i nglanchistí</b>			
Laghdú ar Airgead Tirim		(70,304)	(498,960)
Iarmhéid faoin 1 Eanáir		3,490,596	3,989,556
<b>Iarmhéid faoin 31 Nollaig</b>		<b>3,420,292</b>	<b>3,490,596</b>

Anailís ar athrú i nglanchistí	Airgead infhaighte sa Bhanc €	Ró tharraingt €	Iomlán €
I dtús na bliana 2013	3,490,596		3,490,596
Sreabhadh Airgid	(70,304)		(70,304)
<b>Ag deireadh na bliana 2013</b>	<b>3,420,292</b>		<b>3,420,292</b>

Is cuid de na ráitis airgeadais seo é an Ráiteas Beartais Cuntasaíochta agus na nótaí ó 1 go dtí 14.



**Anders Ahlqvist**  
Comhalta Den Chomhairle



**Liam Breatnach**  
Comhalta Den Chomhairle

# Nótaí do na Ráitis Airgeadais

## 1 Anailís Shonraithe d'Ioncam & Caiteachas don bhliain dár críoch 31/12/2013

IONCAM	Nótaí	Léann	Fisic	Fisic	Riarachán	2013	2012
		Cheilteach	Theoiriciúil	Chosmach		Iomlán	Iomlán
		€	€	€	€	€	€
Deontais Oireachtais		1,491,285	937,763	2,374,581	1,638,371	6,442,000	6,856,000
*Glan-mhaoiniú iarchurtha do phinsin	11.c	(306,430)	(105,924)	(650,697)	2,435,283	1,372,232	1,719,800
Díolacháin Foilseachán		37,030	-	-	-	37,030	41,487
Ioncam Tionscadail	2.a	70,282	101,694	971,260	-	1,143,236	2,157,337
Ioncam Eile	3	918	2,007	-	52,556	55,481	64,840
		1,293,085	935,540	2,695,144	4,126,210	9,049,979	10,839,464
<b>Aistriú ó Chúlchiste Caipitil</b>		-	-	-	388,087	388,087	4,287
		1,293,085	935,540	2,695,144	4,514,297	9,438,066	10,843,751
<b>CAITEACHAS</b>							
Costais Phárolla	8	1,135,910	785,180	1,592,970	725,113	4,239,173	4,370,794
*Costais Phinsin	11.a	(27,304)	(34,875)	(53,546)	2,586,545	2,470,820	3,237,027
Costais Tionscnamh	2.a	70,282	99,306	965,709	-	1,135,297	1,753,113
Stóráil Leabharlaine agus Leabhar		46,211	66,571	49,574	861	163,217	174,089
Dímheas	4	-	-	-	515,330	515,330	472,486
Cíos, Rátaí agus Árachas		-	-	-	192,305	192,305	187,716
Costais Ghinearálta	9	16,623	1,174	21,365	113,224	152,386	201,741
Costais Taistil agus Seimineáir		13,434	7,737	54,771	7,124	83,066	92,842
Cothabháil Áitribh agus Slándáil		-	-	-	163,408	163,408	157,158
Costais ríomhairí agus Idirlín		1,866	2,280	45,512	62,280	111,938	107,809
Breosta Solas agus Cumhacht		-	-	-	147,793	147,793	151,650
Post agus Teileafón		-	-	-	27,067	27,067	27,114
Páipéarachas		14,270	541	1,602	4,150	20,563	25,388
Foilseacháin		12,364	-	3,598	-	15,962	19,010
Fógraíocht		50	345	676	1,674	2,745	7,687
Mion Trealamh Oifige		1,839	2,864	2,521	8,830	16,054	3,627
Caillteanas ar dhiúscairt	5	-	-	-	-	-	1,746
		1,285,545	931,123	2,684,752	4,555,704	9,457,124	10,990,997
<b>BARRACHAS/(EASNAMH) DON BHLIAIN</b>		<b>7,540</b>	<b>4,417</b>	<b>10,392</b>	<b>(41,407)</b>	<b>(19,058)</b>	<b>(147,246)</b>
Iarmhéid amhail an 1 Eanáir		264,767	93,371	1,099,405	(777,439)	680,105	827,351
<b>Iarmhéid amhail an 31 Nollaig</b>		<b>272,307</b>	<b>97,788</b>	<b>1,109,797</b>	<b>(818,846)</b>	<b>661,047</b>	<b>680,105</b>

**Nóta (a):** \*Léiriú is ea glanshuim 11c agus 11a ar an aoisliúntas a íocadh lúide ranníocaíochtaí a asbhaineadh laistigh gach ceann de na scoileanna agus rannóga.

**Nóta (b):** Cionroinneadh costais a bhaineann go díreach le taighde (m.sh. pá, leabharlann, costais ríomhaire, taisteal) ar an scoileanna. Gearradh forchostais ar nós cíós, árachas, fónais agus cothabháil maoinne ar Riarachán.

## Nótaí do na Ráitis Airgeadais (ar leanúint)

### 2.(a) Tionscadail

	2013 €	2012 €
Iarmhéideanna Tosaigh	1,429,742	2,035,765
Admhálacha	1,246,841	1,551,314
	2,676,583	3,587,079
Iarmhéideanna Deiridh (Féichiúnaithe €44,306 Creidiúnaithe €1,577,653)	(1,533,347)	(1,429,742)
Curtha i bhfeidhm mar ioncam	1,143,236	2,157,337
<b>Leithroinnt Ioncain</b>		
Scoil an Léinn Cheiltigh	70,282	25,436
Scoil na Fisice Teoiriciúla	101,694	130,886
Scoil na Fisice Cosmaí	971,260	1,596,184
	1,143,236	1,752,506
Riarachán	-	404,831
Ioncam Iomlán Thionscadal	1,143,236	2,157,337

### Costais Tionscadal

	Léann Cheilteach €	Fisic Theoiriciúil €	Fisic Chosmach €	2013 Iomlán €	2012 Iomlán €
Íocaíochtaí chuig Páirtithe/ Comhlachais	39,724	-	35,311	75,035	794,359
Tuarastail/Scoláireachtaí	28,654	62,157	540,684	631,495	663,572
Taisteal	510	36,280	253,431	290,221	182,852
Eile	1,394	869	136,283	138,546	112,330
Costas Iomlán Tionscadal	70,282	99,306	965,709	1,135,297	1,753,113

### 2.(b) Sonraí Tionscadail

Udarás Cistiúcháin	Iarmhéid Tosaigh €	Admhálacha €	Caiteachas Aisfhillteach €	Curtha i bhfeidhm mar Iomlán (Caipiteal san áireamh) €	Iarmhéid Deiridh €	Caipiteal €
<b>Scoil an Leinn Cheiltigh</b>						
Meamram Páipéar Ríomhaire	17,372	-	514	514	16,858	-
Scoil Samhraidh Ceilteach	12,350	610	-	-	12,960	-
Ogham	An Roinn Ealaíon	43,691	55,000	69,768	69,768	28,923
<b>Iomlán-Leánn Ceilteach</b>	<b>73,413</b>	<b>55,610</b>	<b>70,282</b>	<b>70,282</b>	<b>58,741</b>	<b>-</b>

## Nótaí do na Ráitis Airgeadais (ar leanúint)

### 2.(b) Sonraí Tionscadail (ar lean)

	Udarás Cistiúcháin	Iarmhéid Tosaigh €	Admhálacha €	Caiteachas Aisfhillteach €	Curtha I bhfeidhm mar Ioncam (Caipéal san áireamh) €	Iarmhéid Deiridh €	Caipiteal €
<b>Scoil na Fisice Teoiriciúla</b>							
Bethe Ansatz	SFI	18,351	5,900	13,018	13,018	11,233	-
Non-Commutative Geometry	EC	1	-	-	1	-	-
T.Tchrakian	SFI	17,776	-	5,105	5,105	12,671	-
Veselin Filev Inspire Award	IRCSET	58,846	-	50,601	52,988	5,858	(2,387)
M.Ihl Fellow	IRCSET	20,886	19,820	30,582	30,582	10,124	-
<b>Iomlán-FisicTeoiriciúil</b>		<b>115,860</b>	<b>25,720</b>	<b>99,306</b>	<b>101,694</b>	<b>39,886</b>	<b>(2,387)</b>
<b>Scoil na Fisice Cosmaí</b>							
Gamma Ray Bursts	SFI	16,043	-	2,500	2,500	13,543	-
<b>Iomlán-Réalteolaíocht</b>		<b>16,043</b>	<b>-</b>	<b>2,500</b>	<b>2,500</b>	<b>13,543</b>	<b>-</b>
Dos Max	EC	1,502	-	-	-	1,502	-
*CosmoGrid	PRTL	509,056	-	-	-	509,056	-
Nam Conference	A. Observ'tory	29,769	-	-	-	29,769	-
Jetset	EC	9,227	385	2,975	2,975	6,637	-
GNM	SFI	15,159	-	1,419	1,419	13,740	-
E-Inis -Cycle 4	PRTL	(19,203)	341,841	59,889	58,747	263,891	-
Pic Simulations	SFI	60,789	-	-	-	60,789	-
D.Coffey Fellow	IRCSET	6,350	-	-	-	6,350	-
KM3Net -PP	EC	13,553	-	2,740	2,740	10,813	-
E.Whelan Inspire	IRCSET	8,452	-	-	-	8,452	-
NGST Project	ESA	17,931	90,594	140,849	143,598	(35,073)	(2,749)
Dobies	ESA	3,315	-	403	403	2,912	-
KVM3Net	EC	(845)	7,981	-	-	7,136	-
Valenti EC Reintegration	EC	12,486	-	-	-	12,486	-
Aleks Scholz-Brown Dwarfs	SFI	44,156	16,990	33,945	33,945	27,201	-
Origin of Jets	SFI	30,772	36,228	44,829	44,829	22,171	-
<b>Iomlán-Réaltfhisic</b>		<b>742,469</b>	<b>494,019</b>	<b>287,049</b>	<b>288,656</b>	<b>947,832</b>	<b>(2,749)</b>

## Nótaí do na Ráitis Airgeadais (ar leanúint)

### 2.(b) Sonraí Tionscadail (ar lean)

	Udarás Cistiúcháin	Iarmhéid Tosaigh €	Admhálacha €	Caiteachas Aisfhillteach €	Curtha I bhfeidhm mar Ioncam (Caipiteal san áireamh) €	Iarmhéid Deiridh €	Caipiteal €
Samtex	Industry	40,938	-	24,392	24,392	16,546	-
Geo External Funds	Industry	5,477	22,494	22,427	22,427	5,544	-
Joint RFP	SFI	5,213	-	-	-	5,213	-
Isle 2	SFI	7,733	-	1,815	1,815	5,918	-
Schools Seismology	Various	8,467	244	1,806	1,806	6,905	-
Dynamics of Continuity	SFI	8,233	-	886	886	7,347	-
TopoMed	IRCSET	41,630	-	19,135	19,135	22,495	-
Regional Seismic	SFI	19,155	-	28,388	28,388	(9,233)	-
Irish Geoscience Graduate Prog.	Dept. Commun.	70,567	2,775	36,109	36,109	37,233	-
IRETHERM	SFI	200,004	225,636	226,673	228,365	197,275	(3,870)
GIANICE 11	SFI	43,202	32,500	14,172	14,172	61,530	-
SIRG E2174	SFI	18,132	138,395	110,081	112,333	44,194	(2,252)
ESA UWB Grant	ESA	13,206	25,326	3,697	3,697	34,835	-
WAXI	Industry	-	193,422	181,113	181,113	12,309	-
IRECCSEM	SFI	-	30,700	5,466	5,466	25,234	-
<b>Iomlán-Geoifisic</b>		<b>481,957</b>	<b>671,492</b>	<b>676,160</b>	<b>680,104</b>	<b>473,345</b>	<b>(6,122)</b>
<b>Iomlán Físic Chosmach</b>		<b>1,240,469</b>	<b>1,165,511</b>	<b>965,709</b>	<b>971,260</b>	<b>1,434,720</b>	<b>(8,871)</b>
<b>Iomlán DIAS</b>		<b>1,429,742</b>	<b>1,246,841</b>	<b>1,135,297</b>	<b>1,143,236</b>	<b>1,533,347</b>	<b>(11,258)</b>

#### Nótaí

Cuirtear fáiltais tionscadail i bhfeidhm mar ioncam tionscadail, ag leibhéal arb ionann an caiteachas bliantúil ag an tionscadal lena mbaineann siad.

Léiriú is ea na comhorduithe dúnta thuas ar forchostas a tuilleadh go dáta agus maoiniú roimh ré chun freastal ar thiomantais airgeadais i 2014.

Léiríonn an colún caipitil an caiteachas ar shócmhainní seasta i rith 2013 - ba é treallamh stórála sonraí faoi thionscadal e-INIS an ceann ba mhó acu.



## Nótaí do na Ráitis Airgeadais (ar leanúint)

### 3. Ioncam Eile

	2013	2012
	€	€
Ús bainc	36,229	51,045
Táillí & Deontais	1,597	4,692
Eile	17,655	9,103
<b>Iomlán</b>	<b>55,481</b>	<b>64,840</b>

### 4. Sócmhainní Seasta

	Troscán & Trealamh	Mótarfheithicilí	Ríomhairí	Iomlán
Costais	€	€	€	€
Iarmhéid Tosaigh 1/1/2013	3,862,634	53,200	2,419,967	6,335,801
Breiseanna*	32,920	1,750	92,573	127,243
Riарtha**	-	(9,250)	(279,096)	(288,346)
	3,895,554	45,700	2,233,444	6,174,698

#### Dímheas

Iarmhéid Tosaigh 1/1/2013	2,397,465	53,200	1,764,701	4,215,366
Muirear	246,215	295	268,820	515,330
Riарtha	-	(9,250)	(279,096)	(288,346)
	2,643,680	44,245	1,754,425	4,442,350

Luach glan de réir na leabhar 31/12/2013	1,251,874	1,455	479,019	1,732,348
Luach glan de réir na leabhar 31/12/2012	1,465,169	-	655,266	2,120,435

#### Notáí

\*Caipitlítear na sócmhainní seasta de bhreis ar €1,000 i leabhair DIAS.

\*\*Mar thoradh ar chleacht deimhnithe um shócmhainn ríomhaireachta, nuashonraíodh an clár chun an líon mór diúscairtí a rinneadh i mblianta roimhe sin a léiriú.

### 5. Cúlchiste Caipitil

	2013	2012
	€	€
Iarmhéid amhail an 1 Eanáir	2,120,435	2,124,722
<b>Aistriú ó/(chuig) Cuntas Ioncaim agus Caiteachais</b>		
Ioncam leithroinnte le sócmhainní seasta a fháil (Maoinithe ag Tionascadal)	11,258	404,831
Ioncam leithroinnte le sócmhainní seasta a fháil (Maoinithe ag an Stáitchiste)	115,985	65,114
Amúchadh ag teacht le dímheas sócmhainní	(515,330)	(472,486)
Méid scaoilte ar dhiúscairtí	-	(1,746)
	(388,087)	(4,287)
<b>Iarmhéid amhail an 31 Nollaig</b>	<b>1,732,348</b>	<b>2,120,435</b>

## Nótaí do na Ráitis Airgeadais (ar leanúint)

### 6. Creidiúnaithe - Méideanna atá dlite laistigh de bhliain amháin

	2013	2012
	€	€
Creidiúnaithe Trádála	82,872	176,838
Fabhruithe	973,237	947,887
Ilnithe	12,004	12,011
CBL	17,955	11,145
Creidiúnaithe Ioncaim	129,534	288,507
Cuntas Rialúcháin Pinsean	160,929	113,872
	<b>1,376,531</b>	<b>1,550,260</b>

### 6. Creidiúnaithe dlite tar éis dhá mhí dhéag

	2013	2012
	€	€
Comhdhéanta as:		
Vernam Hull Bequest	25,189	41,226
Carmody Fund	2,460	2,460
	<b>27,649</b>	<b>43,686</b>

Tá an t-airgead a bhaineann leo seo sealbhaithe mar éarlais. Baineadh úsáid as aon mhéideanna le linn na bliana.

### 7. Féichiúnaithe

	2013	2012
	€	€
Réamhíocaíochtaí	159,970	192,924
Féichiúnaithe-Díolacháin Leabhar	2,777	2,618
Ilnithe	15,535	-
Ioncam Fabhráithe	-	17,655
	<b>178,282</b>	<b>213,197</b>

### 8. Costais Phárolla

	Léann Cheilteach	Fisic Theoiriciúil	Fisic Chosmach	Riar.	2013 Iomlán	2012 Iomlán
	€	€	€	€	€	€
Tuarastal/Pá	1,031,554	680,920	1,456,275	725,113	3,893,862	4,114,740
Scoláireachtaí	99,166	97,339	131,164	-	327,669	240,131
Cuairteoirí	3,318	6,921	5,531	-	15,770	14,323
Airgead Oinigh	1,872	-	-	-	1,872	1,600
	<b>1,135,910</b>	<b>785,180</b>	<b>1,592,970</b>	<b>725,113</b>	<b>4,239,173</b>	<b>4,370,794</b>

#### Nota

Tocadh luach €278,267 (2012: €293,028) laghdaithe tabhaidh pinsin leis on Roinn Oideachais agus Scileanna I rith 2013. Uimhir foirne 55.5 (2012: 56.5), Uimhir ECF 56 (2012: 57).

## Nótaí do na Ráitis Airgeadais (ar leanúint)

### 9. Costais Ghinearálta

	<b>Léann Cheilteach</b>	<b>Fisic Theoiriciúil</b>	<b>Fisic Chosmach</b>	<b>Riar.</b>	<b>2013 Iomlán</b>	<b>2012 Iomlán</b>
	€	€	€	€	€	€
Ilghnéitheach	10,529	806	15,302	18,827	45,464	71,821
Tionscnaimh cur chun cinn/Lóin	6,044	368	4,990	3,822	15,224	15,738
Táillí Gairmiúla	-	-	-	36,099	36,099	51,092
Oiliúint	50	-	1,073	4,561	5,684	7,714
Táille Iniúchta	-	-	-	18,800	18,800	18,189
Muirir Bhainc	-	-	-	2,568	2,568	2,855
Costais Cruinnithe Boird	-	-	-	22,170	22,170	31,487
Sláinte agus Sábháilteacht	-	-	-	6,377	6,377	2,845
	<b>16,623</b>	<b>1,174</b>	<b>21,365</b>	<b>113,224</b>	<b>152,386</b>	<b>201,741</b>

### 10. Léasáil

#### Léasanna Oibríochta

Tá na háitribh atá i seilbh na hInstitiúide ar léas ó Oifig na nOibreacha Poiblí. Is iad na háitribh a n-airítear ná Réadlann Dhún Since, 5 Cearnóg Mhuirfean, 9-10 Bóthar Burlington agus 31 Plás Mhic Liam. Tá téarma 87 bliana fágtha ar an léas do Réadlann Dhún Since agus athnuaitear na léasanna eile ar bhonn bliantúil. Is é tiomantas ar bhonn léasanna den sórt sin maidir le 2014 na €113,609.

<b>Léasanna Oifig na nOibreacha Poiblí</b>	<b>Cíos Bliantúil</b>
	€
Réadlann Dhún Since	330
5, Cearnóg Mhuirfean	5,022
9-10 Bóthar Burlington	50,167
31, Plás Mhic Liam	58,090
	<b>113,609</b>

## Nótaí do na Ráitis Airgeadais (ar leanúint)

### 11. Costais Pinsean

<b>a) Anailís ar na costais iomlána pinsin curtha chun dochair do Chaiteachas</b>	<b>2013</b>	<b>2012</b>
	<b>(€'000)</b>	<b>(€'000)</b>
Costas seirbhíse reatha	1,019	1,339
Ús ar Dhilteanas na Scéime Pinsin	1,593	2,051
Ranníocaíochtaí Fostaí	(141)	(153)
	<b>2,471</b>	<b>3,237</b>

<b>b) Gluaiseacht i nGlan-Dilteanas Pinsin i rith na bliana airgeadais</b>	<b>2013</b>	<b>2012</b>
	<b>(€'000)</b>	<b>(€'000)</b>
Glan-Dilteanas Pinsin amhail an 1 Eanáir	(45,125)	(40,506)
An Costas Seirbhíse Reatha	(1,019)	(1,339)
Costais Úis	(1,593)	(2,051)
(Gnóthachan)/caillteanas achtúireach	2,307	(2,899)
Pinsin íoctha sa bhliain	1,240	1,670
<b>Glan-Dilteanas Pinsin amhail an 31 Nollaig</b>	<b>(44,190)</b>	<b>(45,125)</b>

### c) Cistiú larchurtha do Phinsin

Aithníonn DIAS na méideanna seo mar shócmhainn a chomhfhreagraíonn don dliteanas iarchurtha neamh-mhaoinithe do phinsin bunaithe ar na toimhdí thuaslaithe agus ar roinnt imeachtaí a tharla cheana. Áirítear ar na himeachtaí seo an bonn reachtúil chun sceim aoisliúntais a bhunú, agus an polasaí agus an cleachtas i ndáil le pinsin seirbhíse poiblí a mhaoiniú, lena n-áirítear ranníocaíochtaí ag fostóirí agus próiseas na meastachán bliantúil. Cé nach bhfuil aon socrú foirmiúil maidir leis na méideanna sonracha seo déanta leis an Roinn Oideachais agus Scileanna, níl aon fhianaise ag DIAS nach leanfaidh an polasaí maoinithe seo de bheith ag freastal ar a leithéid de shuimeanna de réir an chleachtais reatha.

Sa Chuntas Ioncam agus Caitheachais, aithníodh an Glan-Mhaoiniú larchurtha do Phinsin sa bhliain mar seo leanas:

	<b>2013</b>	<b>2012</b>
	<b>(€'000)</b>	<b>(€'000)</b>
Maoiniú inaisghabhála i ndáil le costais pinsin na bliana reatha	2,612	3,390
Deontas Stáit feidhmithe chun pinsinéirí a íoc	(1,240)	(1,670)
	<b>1,372</b>	<b>1,720</b>

Ba í €44.190 milliún (2012: €45.125 milliún) an tsócmhainn mhaoinithe iarchurtha do phinsin amhail an 31 Nollaig 2013.

# Nótaí do na Ráitis Airgeadais (ar leanúint)

## 11. Costais Pinsean (ar leanúint)

### d) Stair na nOibleagáidí faoin scéim shochair shainithe.

	2013 (€'000)	2012 (€'000)	2011 (€'000)	2010 (€'000)	2009 (€'000)
Oibleagáidí shochair shainithe (Gnóthachain)/caillteanais iarbhíre ar dhliteanais na scéime	44,190	45,125	40,506	36,736	32,556
Céatadán de luach dhliteanais na scéime	(487)	2,499	(188)	(1,998)	(328)
	(1.10%)	5.50%	(0.50%)	(5.40%)	(1.01%)

Tá (gnóthachan)/caillteanas achtúireach carnach (€3,401,000) aitheanta sa Ráiteas d'Iomlán na nGnóthachan agus na gCaillteanas Aitheanta.

### e) Cur síos ginearálta ar an Scéim

Is é atá sa scéim pinsean ná socrú aoisliúntais shochair shonraithe chríoch-thuarastail le sochair agus ranníocaíochtaí faoi threoir rialachán reatha scéime 'eiseamláire' na hearnála poiblí.

Soláthraíonn an scéim pinsean (ochtóidí in aghaidh na bliana seirbhíse), aisce nó cnapshuim (trí hochtóidí in aghaidh na bliana seirbhíse) agus pinsin do chéilí agus leanaí. De ghnáth, is é an 65ú breithlá an aois scoir agus tá bail a thosaigh roimh 2004 i dteideal éirí as ag aois 60 gan aon laghdú achtúireach. De ghnáth, méadaíonn na pinsin atá á n-íoc (agus pinsin iarchurtha) de réir bhoilsciú ginearálta na hearnála poiblí.

Bunaíodh an luacháil a úsáideadh i gcás nochtadh faisnéise faoi FRS17 ar luacháil iomlán achtúireach a rinne achtúire neamhspleách cáilithe a chuir ceanglais FRS san áireamh chun dliteanais na scéime amhail an 31 Nollaig 2013 a mheasúnú.

Is mar a leanas a bhí na príomh-thoimhdí achtúireacha a úsáideadh:

	At 31/12/13	At 31/12/12	At 31/12/11
Ráta na nArduithe Tuarastail	3.00%	3.00%	3.50%
Ráta na nArduithe Pinsin atá á n-íoc	2.50%	2.50%	3.25%
Ráta Lascaine	3.75%	3.50%	5.00%
Ráta Boilscithe	2.00%	2.00%	2.00%

Leis an mbonn mortlaíochta atá á leanadh, is féidir dul chun cinn in ionchas saoil le himeacht ama a chur san áireamh; mar sin, braithfidh ionchas saoil ag dul ar scor ar an mbliain a shroichfidh ball aois scoir (65 bliana). Léiríonn an tábla thíos ionchas saoil na mball a shroichfidh aois 65 in 2013 agus in 2033.

	2013	2033
Aois 65 sa bhliain		
Ionchas saoil – fir	87.3	89.9
Ionchas saoil – mná	88.7	90.9

## 12. Nochtadh Idirbheartaíochtaí

Glacann Comhairle na hInstitiúide le nósanna imeachta de réir threoirlínte atá eisithe ag an Roinn Airgeadais maidir le leasanna a nochtáíonn Comhaltaí na Comhairle agus chloígh Comhaltaí na Comhairle leis na nósanna imeachta sin le linn na bliana. Níor léirigh aon Chomhalta de chuid na Comhairle leas.

## Nótaí do na Ráitis Airgeadais (ar leanúint)

### 13. Nochtadh Comhaltaí na Comhairle/Tuarastal an Chláraitheora, Táillí agus Costais

	<b>Luach Saothair Iomláin 2013 €</b>	<b>Speansais Iomlána 2013 €</b>	<b>Luach Saothair Iomláin 2012 €</b>	<b>Speansais Iomlána 2012 €</b>
<b>Comhalta den Chomhairle</b>				
Dr Vincent Cunnane		261		Nada
<b>Baill ceaptha ag Boird Rialaithe na gComhScoileanna</b>				
An tOllamh Gerry Wrixon		126		621
An tOllamh Arthur Jaffe		1,325		1,935
An tOllamh Anders Ahlqvist		7,262		9,195
An tOllamh Werner Nahm				
An tOllamh Luke Drury				
An tOllamh Padraig Breatnach				
<b>Cláraitheoir</b>				
Cecil Uasal Keaveney*	100,756		101,021	
	100,756	8,974	101,021	11,751

#### \*Nóta

Faigheann an Cláraitheoir turastail anháin. Ní íochtar aon bhónas leis. Ní sháraíonn teidlíochtaí pinsin an Chláraitheora gnáththeidlíochtaí scéim aoisliúntais le sochar sainithe na hearnála poiblí.

### 14 Ceadú Cuntais

Cheadaigh an Chomhairle na Ráitis Airgeadais ar an 20 Meitheamh 2014.





