Further Information for Candidates

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UCD Meteorology & Climate Centre

The UCD Meteorology & Climate Centre (MCC) was established in September, 2004. The current Director of the Centre is Prof Peter Lynch. The Director is appointed by the President of the University.

The M.Sc. programme in meteorology has been in place since 2004. It is a one year taught programme. An average of nine students annually have taken the course over the past eight years. The M.Sc. programme is currently arranged in six taught modules: Physical Meteorology, Dynamic Meteorology, Climate Dynamics, Numerical Weather Prediction and Synoptic Meteorology I and II. All students undertake a research project over the Summer period.

As part of the M.Sc. programme, a field-trip to Valentia Observatory takes place in October each year. This includes a tour of the observatory and a series of short lectures on the observing programme there. We propose to develop and expand this component of the programme.

In addition to the MSc students, several PhD students have been studying meteorology and climate science as part of their structured doctoral programmes.

Prof Peter Clark, University of Surrey, is External Examiner for the period 2010-2013.

Restructuring of the MSc Programme

We keep the MSc programme under constant review. Modifications were introduced in 2009 to enhance the synoptic meteorology content of the programme, following discussions with Met Eireann and feedback from employers in the private meteorology sector.

However, we now planning to change the focus of the programme to climate science and modelling climate change. This will involve a complete overhaul of the programme. The person appointed will play a major role in developing the new programme structure. The success of the programme will also depend on effective marketing and promotion.

Doctoral Programme in Meteorology

Three PhD students supervised by Prof Lynch completed their doctoral studies during the past four years. Michael Clark undertook an analysis of the energy spectrum of the atmosphere. Paul Nolan studied the influence of climate change on Ireland's climate. Colm Clancy implemented a filtering time integration scheme based on the Laplace transform. Currently, Jennifer Courtney is investigating the application of Bayesian Model Averaging to wind forecasting.

Research

In parallel with our teaching programme, we are very active in research in meteorology and climate science. A list of publications that have appeared during the past year may be found at the end of this document.

Earth Institute

UCD has recently acquired substantial funding to support the establishment of the UCD Earth Institute. The Director of the institute is Prof. Chris Bean. The Meteorology and Climate Centre is a critical partner in the Earth Institute. Plans are currently being developed for our activities in connection with this. The mission of the institute is: "To find solutions to key challenges in sustainable energy, climate change, natural hazards and nature conservation that are relevant for Ireland and contribute to global understanding". For further information, see (www.ucd.ie/earth).

External Funding

Several successful applications for external funding have been made. The greatest effort was exerted in connection with PRTLI 5, the fifth round of the Programme for Research in Third Level Institutes. A successful bid by UCD includes funding for a new building, in which the Earth Institute will be housed. The value of the bid is of the order of 120M euro.

In 2009 Prof Lynch was awarded 204,320 Euro as Principal Investigator of a project to develop an advanced forecasting system for efficient use of wind energy, and a further grant to simulate future climate change in Ireland.

There is a national computing centre, the Irish Centre for High-End Computing (ICHEC; see website www.ichec.ie) that provides advanced computing facilities to researchers in Ireland.

We currently have an ICHEC Class A licence for our Climate modelling research project. This award has a substantial value in equivalent financial terms, and provides us with access to very powerful computational facilities.

Collaboration with Met Eireann

The collaboration between UCD and Met Eireann continues on a number of fronts. The M.Sc. Programme forms an integral part of the training of meteorologists in Met Eireann. Real-time meteorological data continue to be provided by Met Eireann for educational purposes.

Automatic Weather Station

The Automatic Weather Station (AWS) equipment acquired in 2009 has been installed at Rosemount, on the Belfield campus. A 10 metre mast has been erected and the data logger and sensors have been mounded on it. Observations are now automatically archived in our data base.

MetVue: The Meteorological Visualization System

The MetVue system is used to display meteorological imagery on large-format screens in the Schools of Mathematical Sciences and School of Physics. It uses data provided by Met Eireann and data from our own forecast model system.

The WRF Model

The numerical prediction model WRF (Weather Research and Forecasting) is run in the MCC on an operational basis. Forecasts to 48 hours are made every six hours, and are available on our website and on the MetVue system.

The MCC website: http://maths.ucd.ie/met

We have continued the active development of the website for the Centre. The site is very valuable as a means of publicising the Centre. It is also very beneficial as an educational aid. It is under ongoing development.

Seminar Programme

We have a series of invited seminars on meteorology and climate. There is a modest budget to support visiting speakers. A list of all past seminars is available on the MCC website.

About the UCD School of Mathematical Sciences

The UCD School of Mathematical Sciences is the largest of its kind in Ireland. The School is a dynamic, multi-disciplinary department which engages in research and teaching in three disciplines:

- Mathematics
- Applied and Computational Mathematics
- Statistics and Actuarial Science

The following undergraduate degrees are available through the BSc Programme at UCD (CAO Code DN200MPS):

- BSc Mathematics,
- BSc Statistics,
- BSc Applied and Computational Mathematics,
- BSc Mathematical Science,
- BSc Theoretical Physics.

The School runs the BAFS degree (CAO Code DN230). This degree is fully accredited by the Institute and Faculty of Actuaries, with students having the potential to gain nine exemptions from the professional actuarial examinations.

Students can also study for a BA degree (CAO Code DN500) in Mathematics and Statistics.

Masters Degrees available in the School include:

- MSc Statistics,
- MSc Mathematics,
- MSc Simulation Science,
- MSc Meteorology,
- MSc Mathematical Science.

We also provide PhD degrees in Mathematics, Statistics and Applied and Computational Mathematics.

In addition we offer the following Higher Diplomas which allow students with Bachelors degrees in cognate disciplines the opportunity to achieve a recognised qualification in the mathematical sciences: HDip Mathematical Science, HDip Statistics, HDip Actuarial Science, HDip Mathematical Studies.

All of our academic staff are engaged in active research with a strong record of publications in international journals. Our staff have been very successful in obtaining funding from national and international agencies and from industry.

Graduates from our degree programmes have skills that are rare and in high demand. Even in the current economic climate all of our recent graduates are either in employment or further study. Our graduates do not necessarily all continue to become mathematicians or statisticians; instead they have a wide variety of career opportunities.

A Selection of Recent Publications

Bates, J.R., 2010: Climate Stability and Sensitivity in Some Simple Conceptual Models. Clim.Dynam. http://www.springerlink.com /content/v381411603787223/

Caballero, Rodrigo and Peter Lynch, 2011: Climate modeling and deep-time climate change. Pp. 44-61 in Climate Change, Ecology and Systematics, Trevor Hodkinson, Mike Jones, John Parnell and Steve Waldren (Eds.), Cambridge University Press (ISBN-13: 9780521766098).

Caballero, R. and M. Huber (2010): Spontaneous transition to superrotation in warm climates simulated by CAM3. Geophys.Res.Lett., 37, L11701, doi:10.1029\-/2010GL043468.

Goldner, A., M. Huber, N. Diffenbaugh and R. Caballero (2011): Implications of the permanent El Nino teleconnection ``blueprint" for past global and North American hydroclimatology. Clim. Past, 7, 723--743, doi:10.5194/cp-7-723-2011.

Hanafin, J., McGrath, R., Semmler, T., Wang, S., Lynch, P., Steele-Dunne, S. and Nolan, P, 2010: Air flow and stability indices in GCM future and control runs. Int. J. Climatol., 31 (8), 1240-1247. DOI: 10.1002/joc.2125

Hanley, J. and R. Caballero (2011): Objective identification and tracking of multi-centre cyclones in the ERA-Interim reanalysis dataset. Quart.J.Roy.Meteorol.Soc., doi:10.1002/qj.948.

Hazeleger, W. and 30 others including R. Caballero (2010): EC-Earth: A seamless Earth system prediction approach in action. Bull.Amer.Meteor.Soc., 91, 1357--1363, doi: 10.1175/ 2010BAMS2877.

Huber, M. and R. Caballero (2011): The early Eocene equable climate problem revisited. Clim. Past, 7, 603--633, doi:10.5194/cp-7-603-2011.

Clancy, Colm and Peter Lynch, 2011a: Laplace transform integration of the shallow water equations. Part 1: Eulerian formulation and Kelvin waves. Q. J. Roy. Met. Soc., 137, 792--799.

Clancy, Colm and Peter Lynch, 2011b: Laplace transform integration of the shallow water equations. Part 2: Lagrangian formulation and orographic resonance. Q. J. Roy. Met. Soc., 137, 800--809.

Lynch, Peter 2011: The Two-Child Paradox: Dichotomy and Ambiguity. Bull. Irish Math. Soc., 67, 67--73.

Lynch, Peter 2011: From Richardson to Early Numerical Weather Prediction. Pp. 3--17 in The Development of Atmospheric General Circulation Models: Complexity, Synthesis and Computation. Leo Donner, Wayne Schubert, Richard Somerville (Eds). Cambridge University
Press, 255+xvi pp. (ISBN-13: 9780521\-190060).

Lynch, Peter 2010: Weather and Climate Forecasting: Chronicle of a Revolution. WMO Bulletin. 59, 75--78.

Nolan, Paul, Peter Lynch Ray McGrath, Tido Semmler and Shiyu Wang, 2011: Simulating Climate Change and its Effects on the Wind Energy Resource of Ireland. Wind Energy. DOI: 10.1002/we.489.

Sweeney, Conor and Peter Lynch, 2011: Adaptive post processing of short-term wind forecasts for energy applications. Wind Energy, 14, 317-–325. DOI: 10.1002/we.420.

Sweeney, Conor, Peter Lynch and Paul Nolan, 2011: Reducing errors of wind speed forecasts by an optimal combination of post-processing methods. Met. Applications. DOI: 10.1002/met.294.