

51st Gregynog Statistical Conference 17th – 19th April 2015



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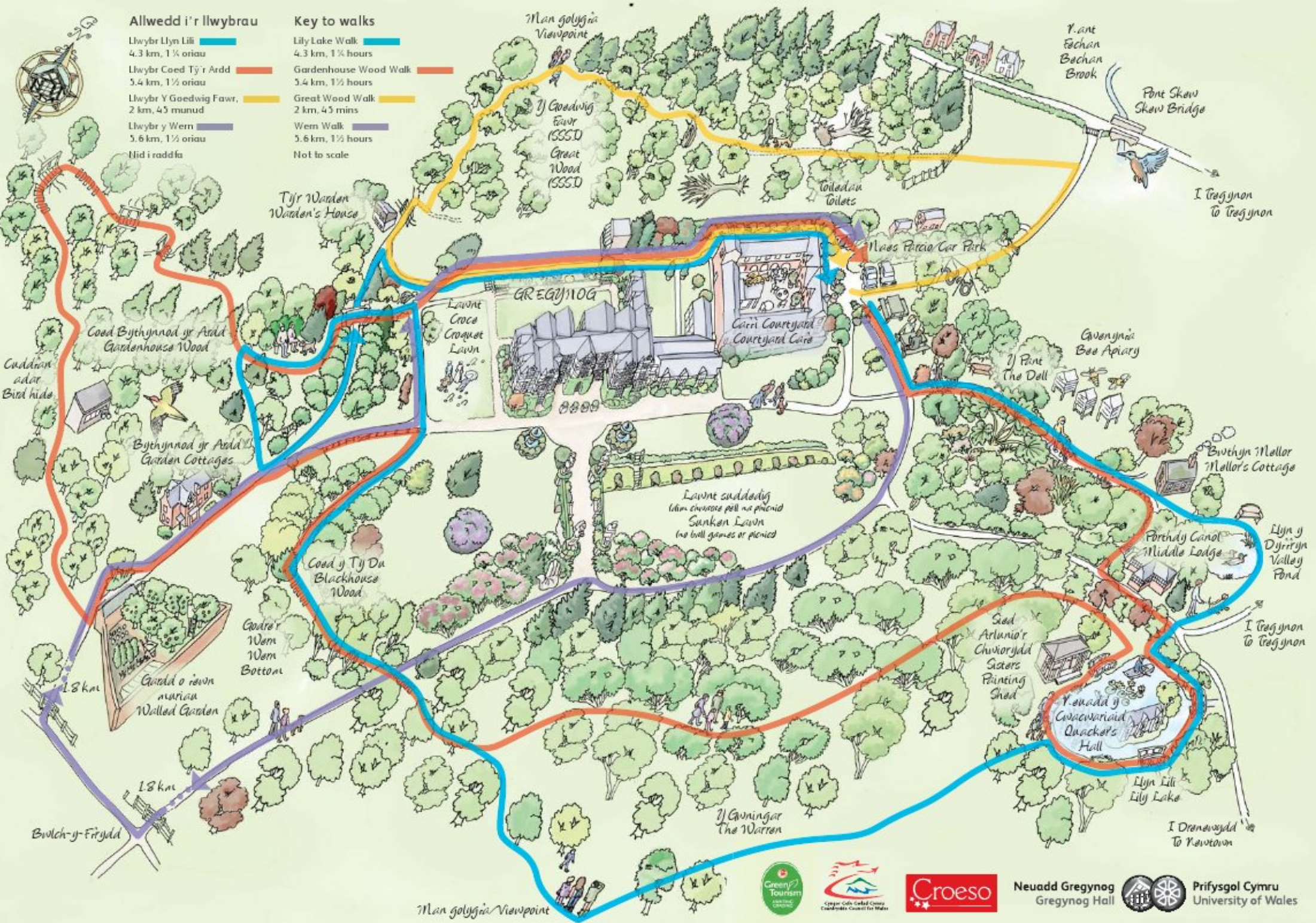
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Allwedd i'r llwybrau

- Llwybr Llyn Lili 4.3 km, 1 1/2 oriau
- Llwybr Coed Tŷ i'r Ardd 5.4 km, 1 1/2 oriau
- Llwybr Y Goedwig Fawr 2 km, 45 munud
- Llwybr y Wern 5.6 km, 1 1/2 oriau
- Nid i raddfa

Key to walks

- Lily Lake Walk 4.3 km, 1 1/2 hours
- Gardenhouse Wood Walk 5.4 km, 1 1/2 hours
- Great Wood Walk 2 km, 45 mins
- Wern Walk 5.6 km, 1 1/2 hours
- Not to scale



Man golygfa Viewpoint

Yr Ant Fochan Bachan Brook

Pont Skew Skew Bridge

I Tregynon To Tregynon

Tŷr Warden Warden's House

GREGYNOG

Maes Ffawr Car Park

Gwynnfa's Bee Apiary

Coed Bythynnad yr Ardd Gardenhouse Wood

Cuddion adar Bird hide

Bythynnad yr Ardd Garden Cottages

Llawnt Croca Croquet Lawn

Cairi Courtyard Courtyard Cafe

Bwthyn Mollor Mollor's Cottage

Coed y Tŷ Du Blackhouse Wood

Llawnt suddedig lawn chwarae pell na phicied Sunken Lawn for ball games or picnics

Porchdy Canol Middle Lodge

Llyn y Dyffryn Valley Pond

Gardd o'r wain mariau Walled Garden

Gwre'r Wern Wern Bottom

Sed Arlunio's Chwilogyd Sisters Painting Shed

Yr eidd y Gwasanaid Quakers' Hall

Llyn Lili Lily Lake

I Tregynon To Tregynon

I Dronawydd To Newtown

Bwlch-y-Ffridd

Ŷ Gwningar The Warren

Man golygfa Viewpoint



Neuadd Gregynog Gregynog Hall



Prifysgol Cymru University of Wales



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1 Administrative Details

1.1 About

- The “51st Gregynog Statistical Conference” will take place from Friday, 17th – Sunday, 19th April 2015 at Gregynog Hall, in the fantastic Welsh countryside. The conference will comprise 2 short courses, 5 research talks and a poster session aimed at a general mathematical audience. There will be lots of opportunity (particularly for research students) to get to know one another, explore the numerous walks around the hall and even take an excursion to Powis Castle and Garden.
- Organising Committee: Jane Hutton (Warwick), John Lane (Aberystwyth), Murray Pollock (Warwick).

1.2 Webpages

- Conference: www.warwick.ac.uk/gregynog
- Past Conferences: www.warwick.ac.uk/gregynog/past

1.3 Key Dates & Times

- **Arrival & Check-In:** 2.30pm, Friday (Gregynog Hall Shop).
- **First Talk:** 2.55pm, Friday (Seminar Room, 2nd Floor)
- **Poster Session:** 6pm, Friday.
- **Breakfast:** 8am (Saturday / Sunday – Dining Room).
- **Coffee Breaks / Afternoon Tea:** 11am / 4pm (Blayney Room).
- **Lunch:** 12.30pm (Saturday / Sunday – Dining Room).
- **Dinner:** 7pm (Friday / Saturday – Dining Room).
- **Bar:** 9.15pm (Friday / Saturday – Basement).
- **Departure:** 1.30pm, Sunday.

1.4 Internet Access

- Wireless access is available in the lecture rooms and public areas.

1.5 Powis Castle Excursion

- An optional excursion to Powis Castle will take place on the Saturday after lunch. Please speak to Jane Hutton for further details and to register your interest.
- Powis Castle (Welsh: Castell Powis) is a medieval castle, fortress and grand country mansion located near the town of Welshpool, in Powys, Mid Wales. The residence of the Earl of Powis, the castle is known for its extensive, attractive formal gardens, terraces, parkland, deerpark and landscaped estate. The property is under the care of the National Trust, who operate it under the name “Powis Castle and Garden”. Princess Victoria (later Queen Victoria) visited the castle as a child when her mother took her to tour England and Wales in 1832.
- Webpage: www.nationaltrust.org.uk/powis-castle

2 Getting to Gregynog

2.1 Venue Details

- **Address:** Gregynog Hall, Tregynon, Nr. Newtown, Powys, SY16 3PW
- **Telephone:** 01686 650224
- **Webpage:** www.gregynog.org
- **Contact / Travel Information:** www.gregynog.org/contact/



2.2 Getting there by Minibus

- A minibus will leave from Warwick Statistics common room at 12.15pm *sharp* on the Friday going to Gregynog Hall, and leave from the Gregynog Hall dining room at 1.30pm *sharp* on the Sunday returning to Warwick. Individuals must request a place on the minibus. There will be limited space on the minibus, so please do not overpack.

2.3 Getting there by Car

- Gregynog's location near the quiet village of Tregynon, 6 miles north of Newtown in Powys, makes it reachable within 3 hours from all parts of Wales, within 2 hours from Birmingham, Manchester, Chester and Liverpool and just 50 minutes from Shrewsbury.
- **From Newtown**

- Entering Newtown from the South, keep on the A489 until you reach the traffic lights at McDonalds. Turn left at the traffic lights (keeping McDonalds on your left).

Go over the river bridge following signs for the hospital. Take the fifth turning on the right (opposite the Bell Hotel). Carry on up the hill out of Newtown for approx. 6 miles.

The entrance to Gregynog is sign-posted on the left just before the village of Tregynon.

- **From Welshpool**

- Head towards Newtown on the A483 for approx. 4 miles. Turn right towards Berriew (B4390).

In Berriew village take the second turning on the left, sign posted Bettws Cedewain 5 miles.

In Bettws follow the road round to the right (keeping the New Inn pub on your right) sign-posted Tregynon 2.5 miles.

At the next T junction the entrance to Gregynog is sign posted straight opposite.

- **For satellite navigation**

- Use the postcode SY16 3PL, which will bring you into the Hall grounds via the main Estate entrance. From the Berriew direction, it may also direct you to turn right towards Brooks, which is a steep single track road. Please ignore this and continue onto Bettws Cedewain.

2.4 Getting there by Train

- Rail links are via the Birmingham Aberystwyth line. The local train station is Newtown (Powys), approximately a 12 taxi journey from Gregynog Hall. There are direct trains to Newtown (Powys) from Birmingham Int'l and Birmingham New Street.

2.5 Local Taxi Companies

- **Station Taxis:** 01686 621818
- **Pauls Taxis:** 01686 624314
- **Ross Taxis:** 01686 627600

3 About Gregynog

3.1 History

Gregynog has existed for 800 years. By the 16th century it was the home of the Blayney family, local gentry who claimed descent from the early Welsh princes and whose courage and benevolence were praised by the court poets. Their coat of arms is the centrepiece of the fine oak carvings in what we now call the Blayney Room.

For hundreds of years Gregynog was one of Montgomeryshires leading landed estates, at the heart of the community and the local economy. The Blayney squires gave way to the Lords Sudeley, then Lord Joicey.

After several hundred years of private ownership, in 1913 a huge estate sale saw Gregynogs farms, cottages and woodlands sold off, many to their tenants. Gregynog Hall might have been demolished had not the wealthy Davies sisters acquired it in 1920 to become the headquarters of their enterprise to bring art, music and creative skills to the people of Wales in the aftermath of the First World War.

For twenty years the house was full of music, fine furniture and ceramics, hand-printed books from the Gregynog Press and, most extraordinary of all, the sisters collection of paintings by artists such as Monet, Cezanne and Van Gogh. Leading lights, such as George Bernard Shaw and Gustav Holst visited during these years for musical concerts or simply to enjoy the beautiful gardens and woodland walks.

At the end of the 1950s, after wartime use as a Red Cross convalescent home, Gregynog was bequeathed to the University of Wales as a conference centre. It welcomed its first students in 1963 and theyve been coming ever since! But the old Gregynog lives on the music, the art, the printing press and the gardens. It is still a magical, timeless place where you can walk in the grounds on a quiet evening and listen to the birdsong just as the Davies sisters did many decades ago.

3.2 Walks

The gardens at Gregynog are unrivaled, offering a mixture of formal and woodland walks.

To assist our visitors in fully appreciating the beauty and diversity of the estate, we have created a variety of colour-coded woodland walks. The walks are of varying length and difficulty, weaving their way through the estate to offer tantalising views of both the Hall and the stunning Montgomeryshire countryside.

The new Lily Lake Walk, Warren Walk, Great Wood Walk and Valley Walk have been created to offer something of interest to everyone.

Attractions on the walks include the secluded Mellors cottage, the Davies sisters painting shed and Quackers Hall, perched in the middle of the lily lake, and a birdwatching hide located deep in the Garden House Wood. Simultaneously striking and amusing is the stone statue of a giant hand protruding from the earth, a particular favourite of passers-by taking a woodland stroll. Against this backdrop, the meandering Bechan Brook flows through the estate attracting birds, including kingfishers.



The Bee Apiary, acknowledged to be the prettiest in Wales, is located in the Dell. Visitors can see the bees flying from their hives and coming back again after collecting pollen from the gardens. The attractive viewing shelter has been designed to allow close but safe access to the bees: there are over one million of them, and contains interpretation boards describing the importance of bees, their life cycle and the various types of hives within the apiary. Find out about when the beekeepers will be in the apiary, as they will bring frames of bees close enough for you to see and smell, by visiting the Monty Bees website.

With support from Natural Resources Wales, a number of wildlife interpretation boards are installed throughout the estate, enabling visitors to understand the importance of the natural environment within Gregynog, recently designated a National Nature Reserve.

Our walks are naturally maintained, mainly by people's feet and dogs' paws with minimal interference in this unspoilt environment. You may find yourself bashing through bracken and wading through muddy patches at times .. just a perfect escape in the wilds of Wales, but bring your boots!

3.3 Library

A unique collection of books

The fine arts, Gregynog Press books, Welsh history, literature, culture and language

The books on open access in the west corridor and in the Thomas Jones Library and Dora Herbert Jones Library are the most visible part of a substantial collection of books and



archive material held at Gregynog. Many of the books once belonged to the Davies sisters, although most of the general non-fiction collection has been acquired since the 1960s when the University of Wales took over the hall. The policy behind the development of the library over the years has been firstly, to complement the activities which take place at Gregynog; secondly, to offer insights into its history and its special significance to music, art and fine printing; and thirdly, to reflect its nature as an institution at the heart of Welsh cultural life.

In addition, a considerable number of documents and other items relating to the history of the house have been collected over the years and these are now listed and stored securely. This includes a full set of Gregynog Press and Gwasg Gregynog publications which can be consulted on application.

However it should be noted that most surviving archive material relating to Gregynog, including items such as the Visitors Book kept here in the 1920s and 1930s, is now in the National Library of Wales in Aberystwyth.

Gregynog Library books are not available for external loan, but we welcome Visiting Readers. By becoming a Gregynog Member you can apply for a Visiting Readers ticket which will entitle you to visit Gregynog on most occasions when the house is open, to research, study or just browse in the library.

Books on open access for browsing and private reading are arranged as follows:

1 The Library Corridor

The books on open access in the library corridor are general non-fiction books and literature. Subjects include philosophy, religion, history and literature. There is a large collection of books on the fine arts, including Impressionist and Post-Impressionist painters, also printing, binding and the book arts. Journals include *The Studio* magazine dating back to the early 20th century, also *The Burlington Magazine* and other art related journals.

Gregynogs collection of material relating to Irish language and literature is shelved here, and at the far end of the corridor is a separate collection of material relating to Arthurian myth and legend as it spread from its Celtic roots to German, France and beyond.

2 The Thomas Jones Library

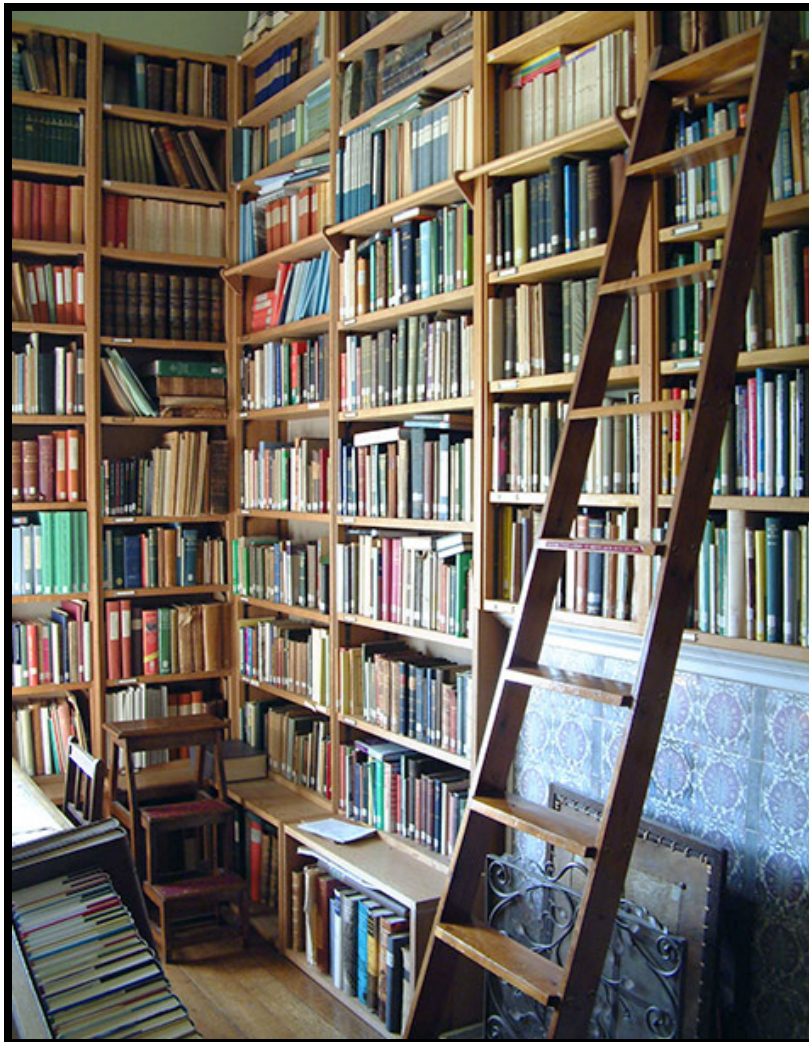
The Thomas Jones library houses a collection of reference books, encyclopaedias, dictionaries, atlases etc., including some useful horticultural reference books. A section of the Fine Art Collection is also housed in this room, which is in regular use for meetings and seminars.

3 **The Music Library**

This is a collection of books shelved in the corridor next to the Music Room. It includes an early edition of Groves Dictionary of Music, and a large collection of biographies of musicians and composers.

4 **The Dora Herbert-Jones Library**

This is what is known as the small library at the far end of the library corridor, where the Librarians desk and computer are also located. All the books and journals in this library relate to Wales and the Celtic countries, either in Welsh or other Celtic languages, or about Wales and the Celtic countries, their history, literature and culture.



4 Timetable

4.1 Friday 17th April

All talks will take place in the Seminar Room, 2nd Floor.

Time	Presenter	Title	Pg
12:15	Warwick Minibus	Departure from Statistics Common Room 12:15 sharp	-
14:30	Arrival & Check-In	Gregynog Hall Shop	-
14:55	Welcome	-	-
15:00	Idris Eckley	Locally stationary time series methods: making sense of sensor data	14
16:00	Afternoon Tea	Blayney Room	-
17:00	Philip Protter	Liquidity theory and high frequency trading	14
18:00	Poster Session	-	-
	Francois-Xavier Briol	Hawkes Processes to predict the success of movies	17
	Patrick Conrad	Probability Measures on Numerical Solutions of ODEs and PDEs for Uncertainty Quantification and Inference	17
	Mathias Cronjager	Determining the expected site frequency spectrum associated with Xi-coalescents	17
	Christiane G3rger	Interpolating Polynomials for Staged Trees and Chain Event Graph	18
	Felipe Medina Aguayo	Is Pseudo-Marginal Always the Best?	18
	Helen Ogden	Approximating the normalizing constant in sparse graphical models	18
	Murray Pollock	Algorithmic Design for Big Data: The ScaLE Algorithm	19
	Nick Tawn	Improving the Efficiency of the Parallel Tempering Algorithm	19
19:00	Dinner	Dining Room	-
20:15	Ioannis Kosmidis	Bias in parametric estimation: reduction and useful side-effects	16
21:15	Bar	Basement	-

4.2 Saturday 18th April

All talks will take place in the Seminar Room, 2nd Floor.

Time	Speaker	Title	Pg
08:00	Breakfast	Dining Room	-
09:00	Idris Eckley	Locally stationary time series methods: making sense of sensor data	14
10:00	Philip Protter	Liquidity theory and high frequency trading	14
11:00	Coffee Break	Blayney Room	-
11:15	<i>Tutorial</i>	<i>Either {Idris Eckley & Tim Park} or Philip Protter</i>	-
12:30	Lunch	Dining Room	-
-	<i>Free Afternoon</i>	<i>Optional Powis Castle trip 13:00-16:45</i>	-
16:00	Afternoon Tea	Blayney Room	-
17:00	Kim Kenobi	Characterising differences in root system architecture of low versus high nitrogen uptake efficiency wheat plants	16
18:00	Maggie Chen	Flash Crashes, Jumps and Running Jumps: A New Method of Jump Detection	15
19:00	Dinner	Dining Room	-
20:15	Gareth Peters	Asymptotic Approximations and Monte Carlo Approximations for Risk and Insurance	16
21:15	Bar	Basement	-

4.3 Sunday 19th April

All talks will take place in the Seminar Room, 2nd Floor.

Time	Speaker	Title	Pg
08:00	Breakfast	Dining Room	-
09:00	Philip Protter	Liquidity theory and high frequency trading	14
10:00	Idris Eckley	Locally stationary time series methods: making sense of sensor data	14
11:00	Coffee Break	Blayney Room	-
11:20	Group Photo	Location weather dependent	-
11:30	Paul Jenkins	Statistical and computational challenges from genomic data	15
12:30	Lunch	Dining Room	-
13:30	Departure	-	-
13:30	<i>Warwick Minibus</i>	<i>Departure from dining room immediately after lunch</i>	-

5 Abstracts

5.1 Short Course Abstracts

Locally stationary time series methods: making sense of sensor data

Idris Eckley / Tim Park

Lancaster University / Lancaster University & Shell UK

The use of sensors for data collection is now ubiquitous in modern industrial systems and consumer devices. Such sensors can unobtrusively record time series, potentially at very high rates. As such they can be a rich resource, but are not without their statistical challenges! For example, problems can arise due to the volume of data, data structure or the environment in which the data is collected. In this series of talks we will introduce some of these challenges and describe how recent time series approaches are being developed to address such data realities. In the first talk we will motivate and introduce the locally stationary time series paradigm, focussing in particular on the seminal work of Nason, Von Sachs and Kroisandt (J. Royal Stat. Soc B, 2000) who introduced a wavelet-based modelling framework for such time series. We will then explain how such frameworks can be extended to a multivariate setting and introduce the concepts of local coherence and partial coherence. We also show how these methods can be used to derive insight in various applied settings. The third (tutorial) session will be a problem solving activity with the aim of developing ideas and strategies to solve a current sensor-based problem encountered by Shell. In the final session we will discuss some recent research which focusses on key questions related to the sampling of (discrete) time series.

Liquidity theory and high frequency trading

Philip Protter

Columbia University

In 1998 the Securities and Exchange Commission (SEC) of the United States authorized the existence of electronic stock exchanges, and high speed trading began shortly thereafter. In the beginning, the trading was fast, in seconds, but today it is very fast, in microseconds. It has evolved to the point where speed is tantamount to profits, often referred to as liquidity profits. In this series of three talks we first review a little stochastic calculus for semimartingales, and then explain the liquidity model of Umut etin, Robert Jarrow, and the speaker (Finance and Stochastics, 2004). We will then verify the model's applicability via a data study, including a movie of the supply curve made by Marcel Blais. We will then explain what liquidity profits are, who used to get them and why, and who now gets them and how. This involve what is known as high frequency trading, a practice that is controversial. We will explain, via a mathematical model, a more sinister side of what is transpiring. This mathematical analysis provides, inter alia, a method for quantifying the amount of profits obtained, and at whose expense they are obtained.

5.2 Talk Abstracts

Flash Crashes, Jumps and Running Jumps: A New Method of Jump Detection

Maggie Chen
Swansea University

Jumps are often observed and widely discussed in context of modern complex financial system, but yet without a universal definition. Further, the classic ARCH/GARCH or Poisson jump models are limited in interpreting important financial effects such as contagion and clustering. We propose a new jump detection method to identify both inter-day and intraday jumps as separate components to the underlying volatility process. Not only do we apply such methods to a long history of intra-day two-minute level dataset of S&P 500, we also examine closely the Mini flash crash that occurred on May 06, 2010, in order to detect jumps. We found multiple jumps on the day and argue that the most commonly used bi-power method by Anderson et al. (2010), which found no jumps on that day, has fundamental flaws in capturing jumps. To enhance the robustness, we utilise a median approach to reduce the masking effects and introduce the concept of running jumps in order to capture significant jumps and jump runs when there are significant market events triggering sharp volatility variations.

Statistical and computational challenges from genomic data

Paul Jenkins
University of Warwick

Advances in DNA sequencing technologies are providing a wealth of data on genetic variation, but making sense of this information raises many statistical and computational challenges. In principle we could write down an evolutionary model and compute a likelihood for the data under this model, allowing us to perform statistical inference on numerous biological and demographic processes: mutation, natural selection, migrations, population structure, and so on. In practice such likelihoods are intractable for all but the simplest models, and we must resort to computationally intensive Monte Carlo approaches, summary statistics, heuristic model simplifications, or a combination of these. In this talk I will describe a new analytic method for the purposes of inference about the process of recombination. Recombination is a fundamental aspect of reproduction which causes the shuffling of genetic variants, or alleles, along a chromosome so that the genetic makeup of an offspring differs from that of its parent. It is therefore important to quantify recombination in for example locating genes associated with complex diseases. I will show how an application of the martingale central limit theorem can be used to derive an accurate model of recombination with a key property: its likelihood is entirely tractable. The result is illustrated by embedding the likelihood in a reversible jump Markov chain Monte Carlo algorithm, and applying this to genomic data from the model fruit fly *Drosophila melanogaster*. We construct the first genome-wide maps of fine-scale recombination rate variation in this organism.

Characterising differences in root system architecture of low versus high nitrogen uptake efficiency wheat plants

Kim Kenobi

Aberystwyth University

The problem of registering and comparing the shapes of wheat roots and extracting geometric differences in root system architecture based on nitrogen uptake efficiency is considered. A novel distance measure between two-dimensional images of wheat roots is introduced. This geometric information is combined with quantitative traits obtained from a software package to identify important traits that distinguish between low and high nitrogen uptake efficiency wheat lines. By eye it is difficult to discern any differences in the root system architectures of the different types of plant, but with the aid of linear discriminant analysis it is possible to highlight substantive differences dependent on the nitrogen uptake efficiency of the wheat lines.

Bias in parametric estimation: reduction and useful side-effects

Ioannis Kosmidis

University College London

In this talk we present some recent work on a unified computational and conceptual framework for reducing the bias in the estimation of statistical models from a practitioners point of view. The talk will discuss several of the shortcomings of classical estimators (like the MLE) with demonstrations based on real and artificial data, for several well-used statistical models including Binomial and categorical responses models (for both nominal and ordinal responses) and Beta regression. The main focus will be on how those shortcomings can be overcome by reducing bias. A generic algorithm of easy implementation for reducing the bias in any statistical model will also be presented along with specific purpose algorithms that take advantage of specific model structures.

Asymptotic Approximations and Monte Carlo Approximations for Risk and Insurance

Gareth Peters

University College London

In this presentation a tutorial type overview of some basic results in risk and insurance related to risk measure estimation will be discussed. In particular the class of spectral risk measures (Value-at-Risk, Expected Shortfall etc.) will have first order asymptotic approximations explained. These approximations will be compared to alternative approximations for the estimation of these risk measures based on the Panjer recursion and also Monte Carlo path-space Importance Sampling methods.

5.3 Poster Abstracts

Hawkes Processes to predict the success of movies

Francois-Xavier Briol

University of Oxford & University of Warwick

Hawkes process are a generalisation of the Poisson Point Process which allows for temporal dependence of events. In practise, this means that events will be clustered in time and such models are therefore used when there is some sort of self-excitation in the data. Some existing application areas include volcano eruptions, crime prevention and financial time series. This poster will introduce Hawkes processes from a theoretical point of view and will present their use in the modelling of the success of movies. Joint work with Dr. Elke Thonnes (Warwick).

Probability Measures on Numerical Solutions of ODEs and PDEs for Uncertainty Quantification and Inference

Patrick Conrad

University of Warwick

Deterministic ODE and PDE solvers are widely used, but characterizing the error in numerical solutions within a coherent statistical framework is challenging. We successfully address this problem by constructing a probability measure over functions consistent with the solution that provably contracts to a Dirac measure on the unique solution at rates determined by an underlying deterministic solver. The measure straightforwardly derives from important classes of numerical solvers and is illustrated on uncertainty quantification and inverse problems.

Determining the expected site frequency spectrum associated with Xi-coalescents

Mathias Cronjager

University of Oxford & University of Warwick

We generalize results from Birkner et al. (Genetics, 2013) for computing the expected site frequency spectrum of a coalescent from the case of Lambda-coalescents to the more general class of Xi-coalescents.

Lambda-coalescents allow for events where one group of arbitrary size of of ancestral lineages merges into one lineage; Xi-coalescents allow for events where an arbitrary number of groups of ancestral lineages of arbitrary size merge into single lineages. The derived formulas for the expected marginals of the SFS are potentially interesting from a theoretical perspective, but in the general case infeasible to evaluate for large sample sizes, as they involve evaluating a very large set of recursions. We give bounds of the complexity of solving these recursions both in the general case and in a specific case of relevance to modelling highly fecund diploid populations (where bounds not much worse than for Lambda-coalescents can be established).

This work constitutes the masters thesis of the author in mathematics at the Technical University of Berlin under the supervision of Prof. Dr. Jochen Blath.

Interpolating Polynomials for Staged Trees and Chain Event Graph

Christiane Gorgen

University of Warwick

I am interested in the formal way in which methods from algebra and algebraic geometry can be used to analyse different non standard model structures in statistics. In particular, my research focuses on the Chain Event Graph (Smith & Anderson 2008) which has been shown to be a powerful statistical tool. While results from graph theory have been applied in order to characterise the implicit conditional independence structure and equivalence classes of these models (Thwaites & Smith 2015), an alternative algebraic approach provides us with even more promising findings. I will outline how a polynomial associated to the model graph enables us to represent known properties more elegantly and to reach a deeper understanding of the model, also with respect to a causal interpretation.

Is Pseudo-Marginal Always the Best?

Felipe Medina Aguayo

University of Warwick

The Metropolis-Hastings (MH) algorithm is a useful and powerful simulation tool for solving problems in many areas. However when we do not have an analytic expression for the target density, we may need to appeal to an algorithm on an extended space. The use of unbiased estimators for the intractable target within a MH algorithm provides a different alternative. Even though this noisy chain introduces a bias, a simple modification gives rise to the pseudo-marginal (PM) algorithm, where such error disappears. Unfortunately, the PM may have an undesirable property that leads to poor mixing and slow convergence towards the target. Therefore, settings where a noisy algorithm may be preferred are plausible, as long as we are comfortable with the inexactness of the draws.

Approximating the normalizing constant in sparse graphical models

Helen Ogden

University of Warwick

There are many situations in which we want to compute the normalizing constant associated with an unnormalized distribution. If we know that some of the variables are conditionally independent of one another, we may write this distribution as a graphical model, and exploit the structure of the model to reduce the cost of computing the normalizing constant. However, in some situations even these efficient exact methods remain too costly. We introduce a new method for approximating the normalizing constant, controlled by a "threshold" parameter which may be varied to balance the accuracy of the approximation with the cost of computing it. We demonstrate the method in the case of an Ising model, and see that the error in the approximation shrinks quickly as we increase the threshold.

Algorithmic Design for Big Data: The ScaLE Algorithm

Murray Pollock
University of Warwick

This poster will introduce a new methodology for exploring posterior distributions by modifying methodology for exactly (without error) simulating diffusion sample paths. This new method has remarkably good scalability properties as the size of the data set increases (it has sub-linear cost, and potentially no cost), and therefore is a natural candidate for Big Data inference. Joint work with Paul Fearnhead, Adam Johansen and Gareth Roberts.

Improving the Efficiency of the Parallel Tempering Algorithm

Nick Tawn
University of Warwick

Bayesian inference typically requires MCMC methods to evaluate samples from the posterior, however it is important that the MCMC procedure employed samples correctly from the distribution for the sample estimates to be valid. For instance, if the posterior distribution was multi-modal then by running an MCMC procedure for only a finite number of runs it is possible that the chain can become trapped and not explore the entire state space. Well known algorithms to aid mixing in multimodal settings are the Parallel and Simulated tempering algorithms. The poster will introduce these and demonstrate their powers and weaknesses for sampling in such situations, and then describe the way in which these algorithms can be setup to achieve optimal efficiency when sampling.

The key feature of these algorithms is the ability to share information from the mixing in the hotter states to aid the mixing of the chain in the hotter states. This poster also presents a new approach based on reparameterisation that could potentially enhance the algorithms efficiency. Empirical evidence is illustrated to show that this new algorithm appears to vastly enhance the trade of mixing information between temperature levels when targeting certain posterior distributions.