

54th Gregynog Statistical Conference 23rd–25th March 2018



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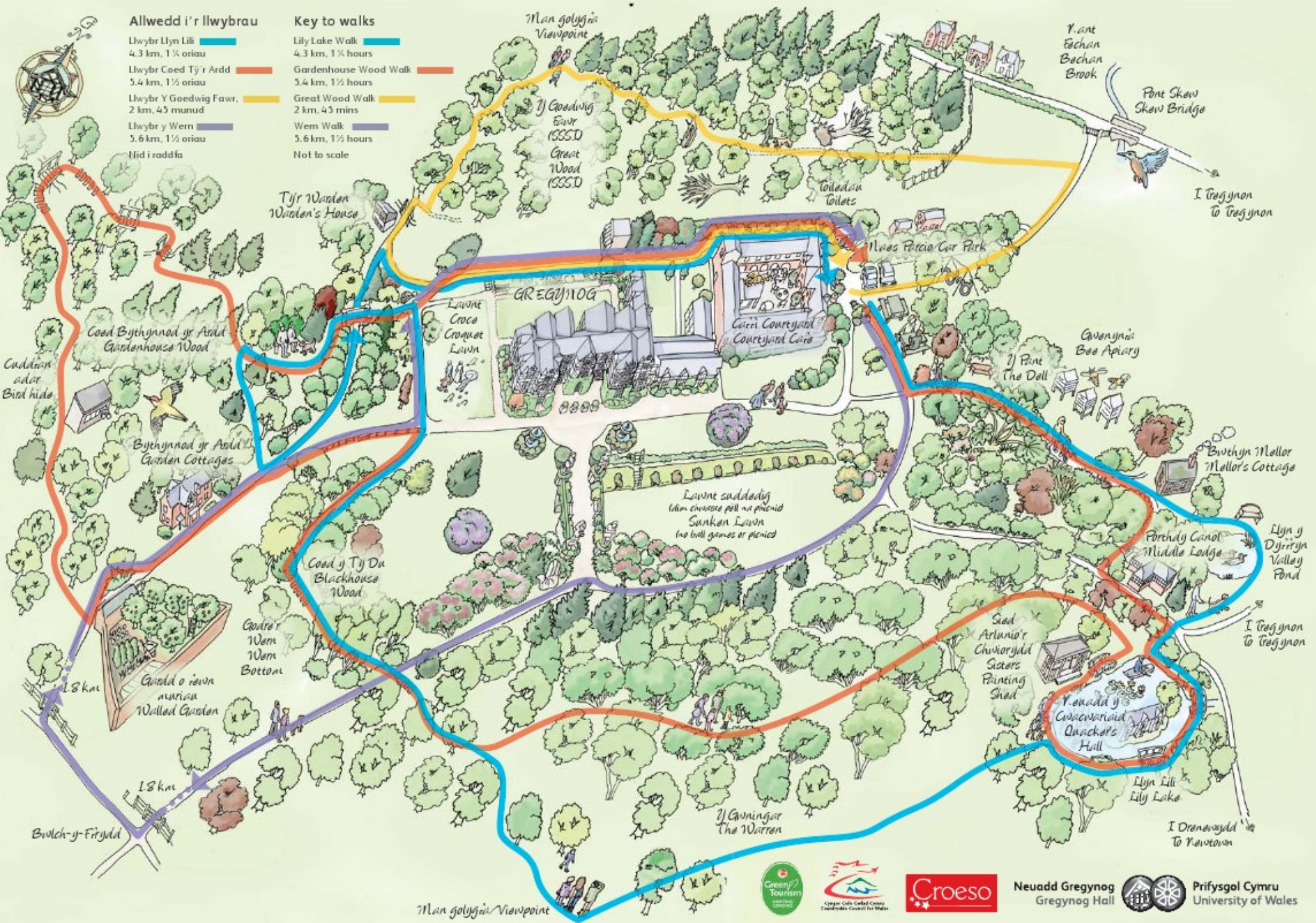
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Allwedd i'r llwybrau

- Llwybr Llyn Lili 4.3 km, 1½ oriau
- Llwybr Coed Tŷ i'r Ardd 5.4 km, 1½ oriau
- Llwybr Y Goedwig Fawr 2 km, 45 munud
- Llwybr y Wern 5.6 km, 1½ oriau
- Nid i raddfa

Key to walks

- Lily Lake Walk 4.3 km, 1½ hours
- Gardenhouse Wood Walk 5.4 km, 1½ hours
- Great Wood Walk 2 km, 45 mins
- Wern Walk 5.6 km, 1½ hours
- Not to scale



Cuddion adar
Bird hide

Coed Bythynnad yr Ardd
Gardenhouse Wood

Bythynnad yr Ardd
Garden Cottages

Coed y Tŷ Du
Blackhouse Wood

Gardre'r Wern
Wern Bottom

Gardd o'r awn narian
Walled Garden

Bwlch-y-Ffridd

Man golygfa
Viewpoint

Y Goedwig Fawr (SSSD)
Great Wood (SSSD)

Lawnt Croca Croquet
Lawn

Lawnt suddedig
lawn chwastio pell na phicnig
Sunkon Lawn
No ball games or picnics

Y Gwningar
The Warren

Man golygfa
Viewpoint

Toiledau
Toilets

Maes Ffario Car Park

Gwynnfa
Bee Apiary

Pont y Ddall

Porchdy Canal
Middle Lodge

Ynodd y Gwacwariad
Quackers Hall

Llyn Lili
Lily Lake

Yr Ant Fychan
Bechan Brook

Pont Skew
Skew Bridge

I Tregynon
To Tregynon

Bwthyn Mollor
Mollor's Cottage

Llyn y Dyrffryn
Valley Pond

I Tregynon
To Tregynon

I Dronavydd
To Newtown





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1 Administrative Details

1.1 About

- The “54th Gregynog Statistical Conference” will take place from Friday, 23rd – Sunday, 25th March 2018 at Gregynog Hall, in the fantastic Welsh countryside. The conference will comprise short courses, a number of 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 (or hikes!) around the hall, and take an excursion to Powis Castle and Garden.
- Organising Committee: Jane Hutton (Warwick), Owen Jones (Cardiff), Kim Kenobi (Aberystwyth) and Murray Pollock (Warwick).

1.2 Webpages

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

1.3 Key Dates & Times

- **Arrival & Check-In:** From 2pm, Friday (Gregynog Hall Shop).
- **Welcome:** 2.55pm, Friday (Seminar Room, 2nd Floor).
- **First Talk:** 3pm, Friday (Seminar Room, 2nd Floor).
- **Poster Session:** 4.45pm, Friday (Weaver Room).
- **Breakfast:** 8am (Saturday / Sunday – Dining Room).
- **Coffee Breaks / Afternoon Tea:** 11am / 4pm (Blayney Room).
- **Lunch:** 12.30pm on Saturday; 1pm on Sunday (Dining Room).
- **Dinner:** 6.30pm (Friday / Saturday – Dining Room).
- **Bar:** From 8.45pm (Friday / Saturday – Joicey Room).
- **Departure:** 2pm, Sunday.

1.4 Internet Access

- Wireless access is available in the lecture rooms and public areas. *Note that from experience the wireless can be extremely poor.*

1.5 Powis Castle Excursion

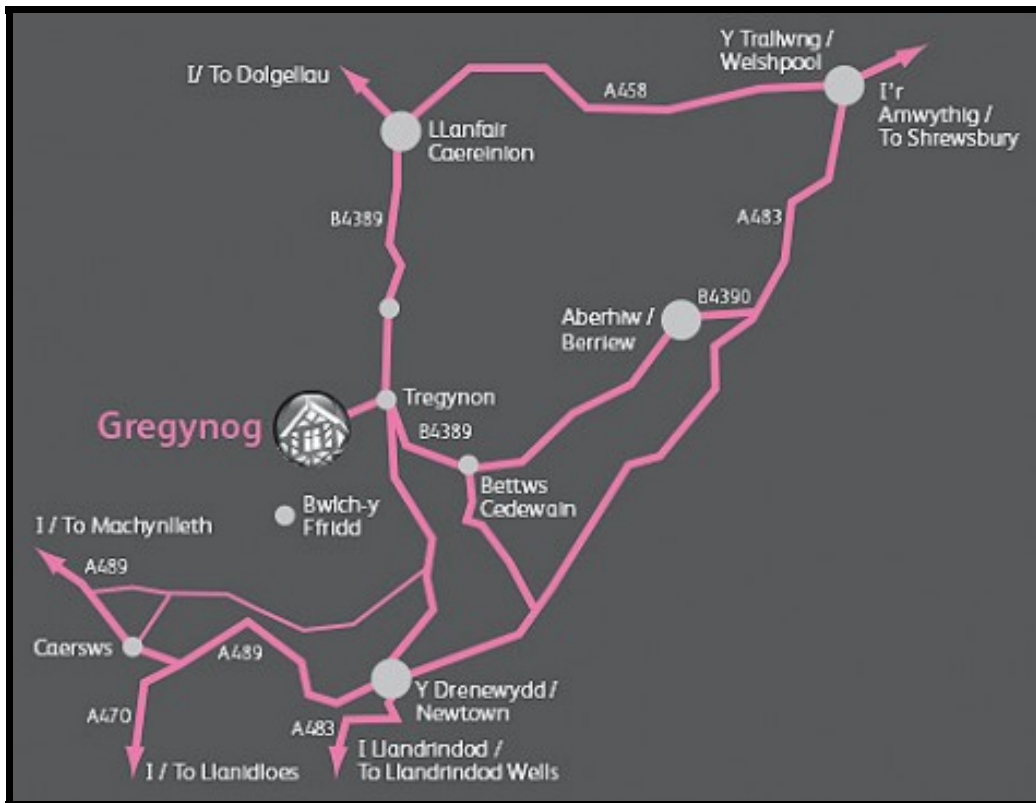
- An optional excursion to Powis Castle will take place on the Saturday after lunch. Please speak to Jane Hutton for further details and to register your interest.

- 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 11.45am *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

- Gregynogs 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 23rd March

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

Time	Presenter	Title	Pg
11:30	Warwick Minibus	Departure from Statistics Common Room 11:45 sharp	-
14:00	Arrival & Check-In	Gregynog Hall Shop	-
14:55	Murray Pollock	Welcome and Information	-
15:00	Owen Jones	Stochastic Simulation and Optimisation (Talk 1 of 3)	14
16:00	Afternoon Tea	Blayney Room	-
16:45	Poster Session	Weaver Room	-
	Francois-Xavier Briol	Bayesian Quadrature for Multiple Related Integrals	-
	Mathias Cronjager	How many ways can we explain the same set of genetic sequences?	-
	David Hartley	A Bayesian approach to structured expert judgement	-
	Jack Jewson	Robust Bayesian Updating	-
	Kim Kenobi	The dolphins of Cardigan Bay - modelling dolphin sightings 2005-15	-
	Giulio Morina	From a Bernoulli Factory to a Coin Enterprise via Perfect Sampling of Markov Chains	-
	Francesco Sanna Passino	Bayesian methods for separating human and automated activity in large computer networks	-
	David Selby	Ranking influential communities in networks	-
	Alex Terenin	Polya Urn Latent Dirichlet Allocation: using sparsity to accelerate MCMC in natural language processing	-
	George Vasdekis	The Zig-Zag Process	-
	Rachel Wilkerson	A Suite of Bayesian Diagnostics for the Chain Event Graph	-
18:30	Dinner	Dining Room	-
19:45	Louis Aslett	Cryptography & Statistics: a short introduction (Talk 1 of 3)	14
20:45	Bar	Joicey Room	-

4.2 Saturday 24th March

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

Time	Speaker	Title	Pg
08:00	Breakfast	Dining Room	-
09:00	Louis Aslett	Cryptography & Statistics: a short introduction (Talk 2 of 3)	14
10:00	Owen Jones	Stochastic Simulation and Optimisation (Talk 2 of 3)	14
11:00	Coffee Break	Dining Room	-
11:30	Christian Robert	ABC convergence and misspecification	15
12:30	Lunch	Dining Room	-
13:30	<i>Free Afternoon</i>	<i>Optional Powis Castle trip 13:00-16:30</i>	-
16:30	Afternoon Tea	Dining Room	-
17:30	Mark Briers	Statistical Challenges in Cyber Security	15
18:30	Dinner	Dining Room	-
19:45	Patrick Rubin-Delanchy	Mathematical progress on the connection between spectral embedding and network models used by the probability, statistics and machine-learning communities	16
20:45	Bar	Joicey Room	-

4.3 Sunday 25th March

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

Time	Speaker	Title	Pg
08:00	Breakfast	Dining Room	-
09:00	Room Check-Out	Gregynog Hall Shop	-
09:15	Owen Jones	Stochastic Simulation and Optimisation (Talk 3 of 3)	14
10:15	Louis Aslett	Cryptography & Statistics: a short introduction (Talk 3 of 3)	14
11:15	Coffee Break	Blayney Room	-
11:45	Group Photo	Location weather dependent	-
12:00	Sara Wade	Pseudo-marginal Bayesian inference for supervised Gaussian process latent variable models	16
13:00	Lunch	Dining Room	-
14:00	Departure	-	-
14:00	<i>Warwick Minibus</i>	<i>Departure from dining room immediately after lunch</i>	-

5 Abstracts

5.1 Short Course Abstracts

Cryptography & Statistics: a short introduction

Louis Aslett

Durham

The security of our data is an ever present and growing concern. Since at least 1500BC humans have turned to methods of cryptography to protect sensitive information, but the modern demands of statistical modelling require more than simply storage or transport of sensitive information: we must also be able to compute on the underlying data. The first part of this short course will carefully introduce cryptography in a manner accessible to statisticians and explain how recent homomorphic encryption schemes can provide the kind of security required to facilitate model building with strong security guarantees, as well as how shared computation can improve this to provide information theoretic levels of security. This will be followed by a brief overview of how these methods have been deployed to solve statistical problems in the literature, with a deeper treatment of recent research that develops new statistical methodology to enable model building within these constrained cryptographic environments.

Stochastic Simulation and Optimisation

Owen Jones

Cardiff

- Talk 1 / 3: "Stochastic Gradient methods" – We start with a brief taxonomy of stochastic optimisation methods, before having a closer look at Stochastic Gradient methods. In particular we look at the classic result of Kiefer and Wolfowitz and the Simultaneous Perturbation method of Spall. Finally we look at some refinements available when we apply these to simulated data.
- Talk 2 / 3: "Cross-entropy" – The Cross-Entropy (CE) method started as an adaptive importance sampling scheme for estimating rare event probabilities, before being successfully applied to a variety of combinatorial optimisation problems. It is a model based stochastic search technique and requires a parameterised sampling distribution. We look at some examples and discuss some convergence results.
- Talk 2 / 3: "Simulation based estimation" – Often we are faced with estimating a model with an intractable likelihood, but which we can none-the-less simulate. We look at how we can use simulations to carry out the equivalent of method of moments, maximum likelihood, or Bayesian estimation.

5.2 Talk Abstracts

Statistical Challenges in Cyber Security

Mark Briers

Alan Turing Institute

With the realisation that Cyber attack presents a significant risk to an organisation's reputation, efficiency, and profitability, there has been an increase in the instrumentation of networks; from collecting netflow data at routers, to host-based agents collecting detailed process information. To spot the potential threats within a Cyber environment, a large community of researchers have produced many exciting innovations, aligned with such data. Much of this research has been focused around "data driven" techniques, and does not often fuse data from multiple sources. Moreover, incorporation of threat actors' behaviours and motivations (as specified by Cyber security experts) is often non-existent. In this talk, I will present an overview of the statistical challenges facing the Cyber domain, and demonstrate the use of two-filter smoothing within a state-space modelling context for the characterisation of user behaviour within a point-process model.

ABC convergence and misspecification

Christian Robert

Dauphine / Warwick

Approximate Bayesian computation is becoming an accepted tool for statistical analysis in models with intractable likelihoods. With the initial focus being primarily on the practical import of this algorithm, exploration of its formal statistical properties has begun to attract more attention. In this paper we consider the asymptotic behaviour of the posterior distribution obtained by this method. We give general results on: (i) the rate at which the posterior concentrates on sets containing the true parameter (vector); (ii) the limiting shape of the posterior; and (iii) the asymptotic distribution of the ensuing posterior mean. These results hold under given rates for the tolerance used within the method, mild regularity conditions on the summary statistics, and a condition linked to identification of the true parameters. The issue of model mis-specification in ABC settings will also be considered. [This is joint work with D. Frazier, G. Martin, & J. Rousseau]

Mathematical progress on the connection between spectral embedding and network models used by the probability, statistics and machine-learning communities

Patrick Rubin-Delanchy

Bristol

In this talk, I give theoretical and methodological results, based on work spanning Johns Hopkins, the Heilbronn Institute for Mathematical Research, Imperial and Bristol, regarding the connection between various graph spectral methods and commonly used network models which are popular in the probability, statistics and machine-learning communities. An attractive feature of the results is that they lead to very simple take-home messages for network data analysis: a) when using spectral embedding, consider eigenvectors from both ends of the spectrum; b) when implementing spectral clustering, use Gaussian mixture models, not k-means; c) when interpreting spectral embedding, think of "mixtures of behaviour" rather than "distance". Results are illustrated with cybersecurity applications.

Pseudo-marginal Bayesian inference for supervised Gaussian process latent variable models

Sara Wade

Warwick

We introduce a Bayesian framework for inference with a supervised version of the Gaussian process latent variable model. The framework overcomes the high correlations between latent variables and hyperparameters by using an unbiased pseudo estimate for the marginal likelihood that approximately integrates over the latent variables. This is used to construct a Markov Chain to explore the posterior of the hyperparameters. We demonstrate the procedure on simulated and real examples, showing its ability to capture uncertainty and multimodality of the hyperparameters and improved uncertainty quantification in predictions when compared with variational inference.
