WET Weather 2022

Workshop on Extremal Trends in Weather

19 - 21 September 2022

Gregynog Hall

Cross-disciplinary learning to address challenges in forecasting the likely nature of future extreme events



Water Research Institute Sefydliad Ymchwil Dŵr



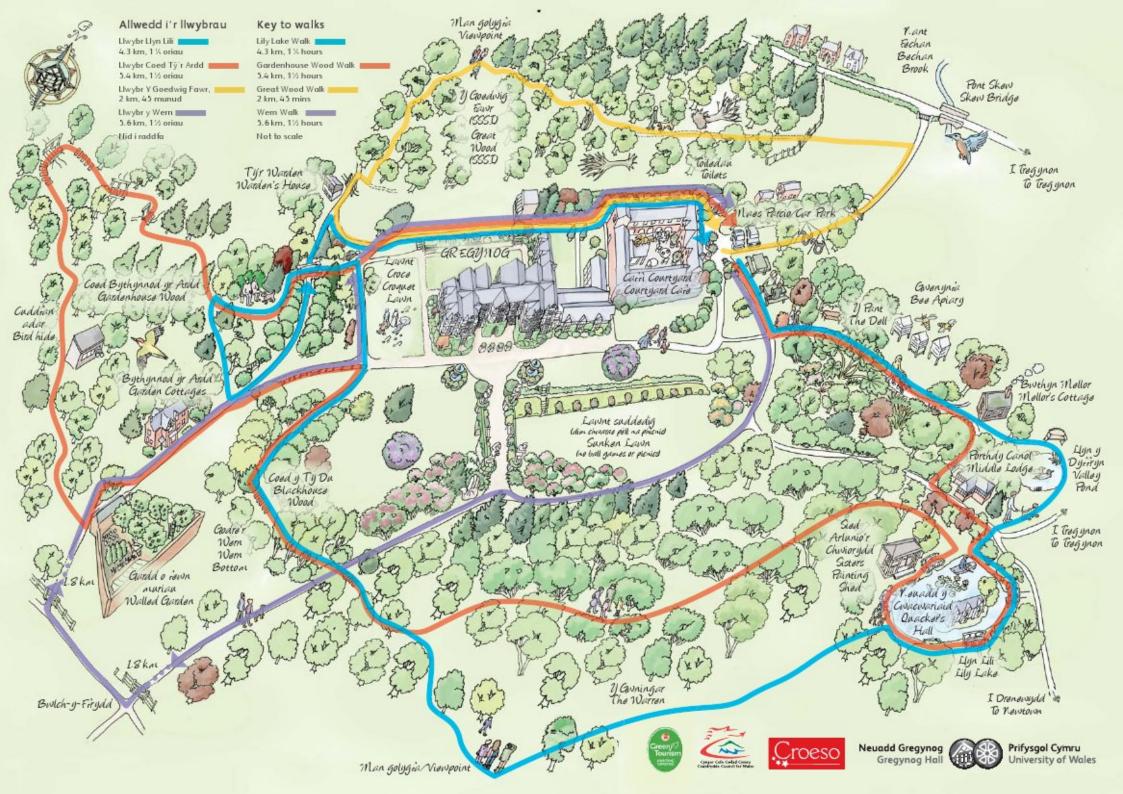
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1 About

The second "Workshop on Extremal Trends in Weather" will take place from Monday, 19th September 2022 (15:30am) to Wednesday, 21st September 2022 (13:30pm) at Gregynog Hall, in the Welsh countryside.

The most hazardous weather events are by nature rare and one of the greatest challenges for climate researchers is the societal request for information about changes to the frequency and magnitudes of extreme events and consequential risks to communities and the environment in decades to come. For instance, windstorms and flash floods are expected to become more damaging in an increasingly warming climate. To manage increasing financial and physical risk, it is critical that the public and private sectors have robust guidance on the plausible range of change. However, when climate is shifting, traditionally applied statistical methods that assume stationary behaviour in observations become difficult to use.

With the release of the new UK climate projections it is timely to cultivate a deeper interdisciplinary relationship between environmental researchers, statisticians, stakeholders and authorities with an interest in rare and hazardous events. With a geographical focus on Wales, we aim to bring together relevant perspectives to build a shared understanding of challenges at hand and elucidating opportunities and working relationships. We hope to create a positive forum for discussing the suitability of data and methods to answer questions around future extreme events.

The conference will comprise a number of plenary lectures, sessions which explore the perspectives of producers and users of risk-related information and ample time for discussions. The focus lies on cross-disciplinary learning, exchange of experiences and ideas and is aimed at a cross-disciplinary audience with a special interest in understanding the likely nature of extreme events.

There will be lots of opportunities to get to know one another, while also exploring the walks around the hall.

Alongside the meeting we will draft a **synthesis report** about the cross-disciplinary and cross-sector learning. Everyone will have the opportunity to contribute to this report and its finalization during autumn 2022. Naturally, it will be shared among all participants and the final version made publicly available.

- Organising Committee: Kirstin Strokorb (Cardiff University), Marie Ekström (AJ Gallagher), Owen Jones (Cardiff University).
- We would like to thank the Royal Statistical Society and Cardiff University / Research Wales Innovation Fund (Innovation for All) for their financial support for these meetings as well as the School of Mathematics and the Water Research Institute at Cardiff University for their administrative and financial support.
- We would also like to **thank** Murray Pollock (Newcastle/Warwick) for sharing his experience and resources as former lead organizer of the Gregynog Statistical Conferences. **Gregynog** is also home to the yearly Welsh Mathematics Colloquia.

1.1 Webpages

• https://www.cardiff.ac.uk/water-research-institute/events/ wet-weather-workshop-on-extremal-trends-in-weather

1.2 Internet Access

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

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 Cardiff University, School of Mathematics, at 10.10am sharp on Monday going to Gregynog Hall. Details for when they leave from Gregynog Hall on Wednesday returning to Cardiff are to be confirmed (aligning with the train schedule for departures). Please let us know in advance if you would like a place on the minibus.

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 McDonald's. 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 £18 taxi journey from Gregynog Hall. There are direct trains to Newtown (Powys) from Birmingham Int'l and Birmingham New Street.
- We will organise a minibus **pick up from Newtown (Powys)** or **coordinate taxi sharing** on the day of arrival if you let us know your arrival time in advance. On the day of departure we will organise bringing you back to the station of Newtown in a similar way.

2.5 Local Taxi Companies

• **Ahmed Cabs:** mobile 07749 642197

• Newtown Cars: 01686 621818

https://www.newtowncarsmidwales.co.uk/

• Ross Cabs: 01686 627600 / mobile 07776 375342

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 Montgomeryshire's 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 Gregynog's 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 they've 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 Mellor's 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 important 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 Reader's 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.

Gregynog's 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

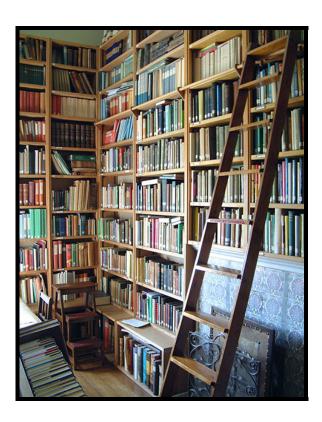
The Thomas Jones library houses a collection of reference books, encyclopaedias, dictionaries, atlases etc., including some useful horticultural reference books. A section of the Fine Art Collection is also housed in this room, which is in regular use for meetings and seminars.

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 Grove's 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 Librarian's 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.

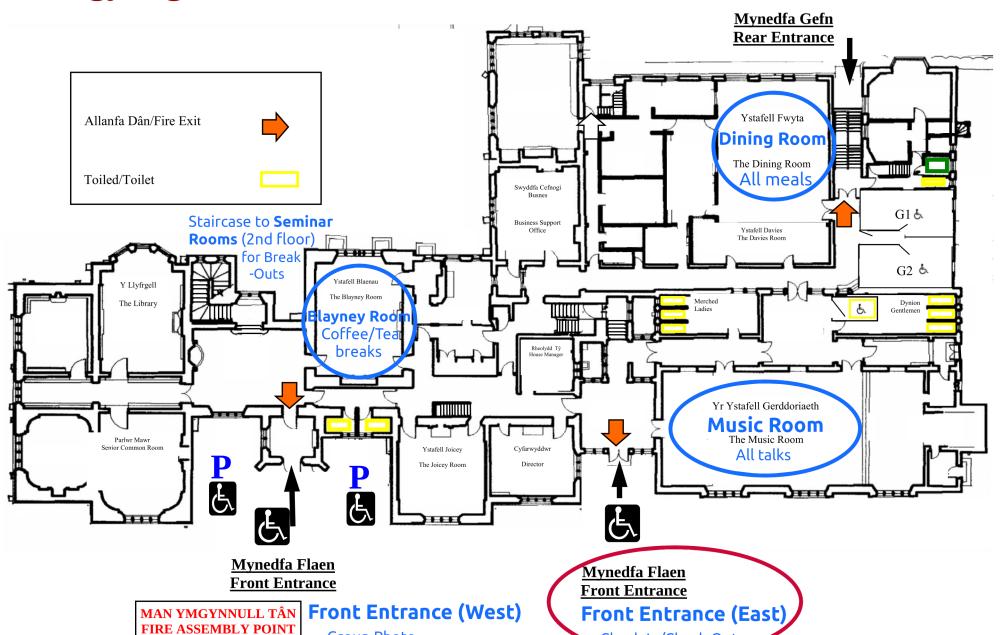


Gregynog

CYNLLUN O'R LLAWR ISAF

Group Photo

GROUND FLOOR PLAN



Check-In/Check-Out

4 Timetable

All talks will take place in the Music Room (Groundfloor).

4.1 Monday, 19th September

Time	Event	Detail	Pg
		Pick-up or taxi-sharing from Newtown (Powys) will be organised	
		Those arriving by car will be given a parking permit for the car park.	
14:00	Arrival & Check-In	Front Entrance (East)	
15:30	Afternoon Tea	Blayney Room	
16:15	Welcome & Information Kirstin Strokorb	Music Room	
16:30	Lecture 1 + Q&A Claudia Neves	Music Room Extreme value statistics born out of domains of attraction	15
17:25	Scientific/Stakeholder "Speed-Dating"	Explanation 17:35-17:55 Round 1 18:00-18:20 Round 2	
18:30	Dinner	Dining Room	
19:30	Lecture 2 + Q&A Douglas Maraun	Music Room Generating trustworthy regional climate change information	15
20:25	Bar	Location TBC (next to Dining Room or in the Courtyard)	

4.2 Tuesday, 20th September

Time	Time Event Details		
08:00	0 Breakfast Dining Room		Pg
	Perspectives exchange	Music Room	
	Climate/Extreme weather-rela		
	,		
09:00	Part 1a	Producers of information	
	Simon Brown (\sim 20) Adam Griffin (\sim 20)	UK MetOffice Centre for Ecology & Hydrology	
	Q&A (~15)	Centre for Ecology & Trydrology	
	~		
09:55	Part 1b	Risk management consultancy	
	Alison Poulston (\sim 15) Hugo Winter (\sim 15)	JBA-RML RMS	
	Q&A (~10)	KIVIO	
10:35	Coffee Break	Blayney Room	
	Perspectives exchange	Music Room	
10:55	Part 2a	Wales in focus	
	Clive Walmsley (\sim 15)	Natural Resources Wales	
	Gwilym Owen (∼15)	Cardiff Council (Interview)	
	Simon Boyland (~20) Q&A (~15)	Dwr Cymru Welsh Water	
	Q&A (~13)		
12:00	Part 2b	Finance & Insurance	
	Tom Perkins (\sim 20)	Bank of England	
	Chris Allen (\sim 15) Q&A (\sim 15)	Gallagher Re	
	Q&A (~13)		
12:50	Group Photo	Front Entrance (West)	
13:00	Lunch	Dining Room	
	Free afternoon	Optional Walk 14:00-16:00	
16:00	Afternoon Tea	Blayney Room	
16.20	Lacture 2 + Of-A	Music Room	
16:30	Lecture 3 + Q&A Petra Friederichs	Prediction of extreme events in the climate	15
	Tetta Titeaericis	system and attribution of driving forces	10
		·	
17:25	Break-Out Workshop 1	Seminar Rooms, Second Floor	
		Identifying gaps and challenges	
18:30	Dinner	Dining Room	
10.20	I actura 1 + Of-A	Music Room	
19:30	Lecture 4 + Q&A Holger Rootzén	A discussion of 3 claims with illustrations (re-	16
	1101501 110012011	lated to the use of extreme value statistics)	10
20:25	Bar	Location TBC	

4.3 Wednesday, 21st September

Time	Event	Details	Pg
08:00	Breakfast	Dining Room	
08:45	Room Check-Out	Front Entrance (East)	
09:05	Lecture 5 + Q&A Thordis Thorarinsdottir	Music Room Consistent estimation of extreme precipitation and flooding across multiple durations	16
10:00	Coffee Break	Blayney Room	
10:20	Break-Out Workshop 2	Music Room (start & end) & Seminar Rooms, Second Floor Learning outcomes & opportunities	
12:00	Closing Kirstin Strokorb	Music Room	
12:15	Lunch	Dining Room	
13:10	Departure	Minibus / Taxi to Newtown will be organised	

5 Abstracts of Invited Lectures

Prediction of extreme events in the climate system and attribution of driving forces

Petra Friederichs *University of Bonn – Climate Dynamics*

The BMBF-funded project ClimXtreme (climxtreme.net) aims at understanding and statistically assessing extreme weather events in past, present and future climate. The presentation will provide an overview of meteorological extremes and discuss the challenges in defining, describing, and predicting weather and climate extremes and attributing driving factors. Attribution of extreme events aims to assess the role of climate change on the probability of occurrence of an extreme event.

The difficulty of the topic arises from the complexity of the climate system and from the very different perspectives from which weather and climate extremes are viewed. Their description and prediction requires a rigorous statistical component, and so the talk takes a look at the role of extreme value statistics in this context.

Generating trustworthy regional climate change information

Douglas Maraun

University of Graz – Wegener Center for Climate and Global Change

While users of regional climate projections often require reliable information as a basis for climate risk assessments and decision making, the generation of such information is in fact still a matter of basic research. The recent IPCC's 6th assessment report has therefore, for the first time, a specific focus on regional climate change, extreme events and information for climate risk assessment. In particular Chapter 10 addresses the methodological issues of generating trustworthy climate information. Starting from this chapter, this presentation gives a brief overview of (1) the models, model experiments and statistical post-processing approaches to generate regional information, (2) their performance at representing phenomena driving regional climate and climate change, (3) the concept of fitness for purpose, in particular in a climate change context, and (4) the integration of multiple lines of evidence. The presentation closes with a personal account of how statistical modelling could be used specifically to generate regional climate information.

Extreme value statistics born out of domains of attraction

Claudia Neves King's College London

Extreme value statistics is essentially concerned with the modelling of rare events which are hard to predict and occur with only little warning. In this talk, I will address a number of challenges highlighted in the literature and how these align with the domain of attraction characterisation for extremes. Such a characterisation stems from a suite of mildly restrictive conditions, qualitative in nature, which not only provide computational convenience but also furnish sharp approximations to asymptotically justified models for extreme values, a key aspect to any statistical testing procedure as well as interval estimation methodology in a nonparametric setting.

A discussion of three claims with illustrations:

Extreme value statistics provide the default models for weather extremes; PoT models are more informative than block maxima models; one should never use phrases like the 100 year flood

Holger Rootzén Chalmers and Gothenburg University – Mathematical Sciences

During this talk we (you and I) will discuss three claims.

The first claim is that the PoT and block maxima methods from Extreme Value Statistics are the default models for statistical analysis of extreme weather events. I will provide two examples, modelling of extreme windspeeds and prediction of windstorm losses to illustrate this and will also discuss how statistical goodness of fit methods and prediction scoring rules can be used to catch situations where one should not use the default – and what one perhaps could do then.

The second claim is that PoT models are more useful than block maxima models: they estimate both frequencies and sizes of extreme events. Perhaps (or perhaps not) surprisingly it is possible to fit a PoT model even if one only has measurements of block maxima. This will be illustrated by an analysis of yearly maxima which indicates that extreme rainfalls events in Northeastern USA become more frequent with rising temperatures, but that their intensity distribution remains stable. Naturally, increases in frequency also increase the yearly or decadal risks of very extreme rainfall events.

The third claim is that one never should use concepts such as "the 100 year flood". They do not make any sense in a non-stationary climate, and even in a stationary climate they are not understandable for non-experts.

The discussion will mainly be in terms of one-dimensional examples. However, there is intense and important ongoing work on developing Extreme Value Statistics for multidimensional and highdimensional data. The claims apply also to these models, and in fact become even stronger for the second claim since multidimensional block maxima models do not tell if nearby extremes occur at the same time, or at different times.

Joint work with David Bolin, Erik Broman, Richard Katz, Helga Olafsdottir, Roger Taessler, Nader Tajvidi.

Consistent estimation of extreme precipitation and flooding across multiple durations

Thordis Thorarinsdottir Norwegian Computing Center

Infrastructure design commonly requires assessments of extreme quantiles of precipitation and flooding, with different types of infrastructure requiring estimates for different durations. This requires consistent estimates across multiple durations to ensure that e.g. the 0.99 quantile of annual maxima of 2 hour precipitation is larger than that for 1 hour precipitation. We discuss alternative approaches to ensure this consistency, both parametric and semi-parametric, which all assume that the annual maxima of a given duration follow a generalized extreme value (GEV) distribution.

Workshop on Extremal Trends in Weather (from 19th to 21st September 2022 at Gregynog Hall)

Schedule (Print version) (Last Update: September 7, 2022)

Monday 19th September		Tuesday 20th September		Wednesday 21st September	
		08:00 Breakfast	Dining Room	08:00 Breakfast	Dining Room
		Stakeholder perspec	tives Music Room	08:45 Check-Out	Front Entrance (East)
		Climate/Extreme we	ather-related risks	09:05 Lecture 5	Music Room
Trains Birmingham Int'l-I	Newtown (Powys)	09:00 Part 1) Producers · Consultancy		10:00 Coffee Break	Blayney Room
1	0:06 –12:03 (0 chg.)	10:35 Coffee Break	Blayney Room	10:20 Break-Out 2	
1	2:06 –14:05 (0 chg.)	10:55 Part 2) Wales · I	Finance & Insurance	Music R	oom & Seminar Rooms
1	4:06 –16:06 (0 chg.)	12:50 Group Photo	Front Entrance (West)	12:00 Closing	Music Room
Check-In (from 2pm) Front Entrance (East)		13:00 Lunch	Dining Room	12:15 Lunch	Dining Room
15:30 Afternoon Tea	Blayney Room	14:00 Free Afternoon /	Optional Walk	Departure (from 1:1	0pm)
16:15 Welcome & Info	Music Room	16:00 Afternoon Tea	Blayney Room	Trains Newtown (Po	owys)–Birmingham Int'l
16:30 Lecture 1	Music Room	16:30 Lecture 3	Music Room		13:40 –15:50 (1 chg.)
17:25 "Speed-Dating"	TBA	17:25 Break-Out 1	Seminar Rooms		14:41 –16:50 (0 chg.)
18:30 Dinner	Dining Room	18:30 Dinner	Dining Room		16:42 –18:51 (0 chg.)
19:30 Lecture 2	Music Room	19:30 Lecture 4	Music Room		
20:25 Bar	Location TBA	20:25 Bar	Location TBA		

6 Participants

See also: https://padlet.com/joneso181/6cirg3y3gghxpe5q

#	First name	Surname	Affiliation
1	Christopher	Allen	Gallagher Re
2	Anna Maria	Barlow	University of Stuttgart
3	Simon	Boyland	Dwr Cymru Welsh Water
4	Michaela	Bray	Cardiff University
5	Simon	Brown	MetOffice
6	Daniela	Castro-Camilo	University of Glasgow
7	Jennifer	Catto	University of Exeter
8	Richard	Chandler	University College London
9	Michela	Corradini	Cardiff University
10	Eleanor	D'Arcy	Lancaster University
11	Lambert	De Monte	University of Edinburgh
12	Marie	Ekström	AJ Gallagher
13	Carolin	Forster	University of Stuttgart
14	Hayley	Fowler	Newcastle University
15	Petra	Friederichs	University of Bonn
16	John Paul	Gosling	Durham University
17	Adam	Griffin	Centre for Ecology and Hydrology
18	Owen	Jones	Cardiff University
19	Thomas	Kjeldsen	University of Bath
20	Douglas	Maraun	University of Graz
21	Christina	Meschede	Technical University Dortmund
22	Callum	Murphy-Barltrop	Lancaster University
23	Claudia	Neves	King's College London
24	Marco	Oesting	University of Stuttgart
25	Gwilym	Owen	Cardiff Council
26	Ioannis	Papastathopoulos	University of Edinburgh
27	Matthew	Pawley	University of Bath
28	Tom	Perkins	Bank of England
29	Alison	Poulston	JBA-RML
30	Jordan	Richards	KAUST
31	Christian	Rohrbeck	University of Bath
32	Holger	Rootzén	Chalmers and Gothenburg University
33	Reinhard	Schiemann	University of Reading
34	Emma	Simpson	University College London
35	Harry	Spearing	Lancaster University
36	Kirstin	Strokorb	Cardiff University
37	Svenja	Szemkus	University of Bonn
38	Max	Thannheimer	University of Stuttgart
39	Thordis	Thorarinsdottir	Norwegian Computing Center
40	Clive	Walmsley	Natural Resources Wales
41	Hugo	Winter	RMS