



University of
Leicester

Date as postmark

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CEUG 2004
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Dear CEUG member

**Workshop on "Understanding and measuring light in controlled environments"
University of Leicester Sunday 12th to Wednesday 15th September 2004**

The 2004 Annual Meeting of the United Kingdom Controlled Environment Users' Group (UK CEUG) will be held at Beaumont Hall, University of Leicester on 12th to 15th September.

This year we are trying a new venture - a three-day workshop that will include lectures and practical sessions, with hands-on exercises and demonstrations of light sources and measuring equipment by manufacturers. The workshop will begin on the afternoon of Sunday 12th September with registration followed by a buffet supper, reception and an exhibition by manufacturers.

The meeting venue is set within sixteen acres of landscaped grounds at the Botanic Garden which is situated about 3 miles south-east of Leicester city centre, opposite Leicester Racecourse and close to glasshouses and CE facilities. We do encourage you to stay in the University accommodation which is of a very good standard. All bedrooms are single and are provided with a toiletry pack, towels and bed linen, and have direct dial telephones. En-suite rooms include a personal tea-coffee making facility, shower, washbasin and toilet. The food is superb and all dietary needs are catered for. A regular bus service from the venue will take you into Leicester city centre and the railway station. There are plenty of car parking spaces for those coming by car. A commitment has had to be made to guarantee accommodation, so I hope that group members will support the meeting as well as they have in the past.

As with previous CEUG meetings this will be an opportunity to meet, discuss and share experiences with researchers, technicians, engineers, facility managers and commercial representatives.

A Booking Form is enclosed together with a copy of the provisional programme. Please return the Booking Form with your payment by 23rd July to the above address. If you will not be attending please fill in the top of the booking form and return the form to me.

Items you wish to put forward for the business meeting agenda should also be forwarded with the booking form.

Confirmation of booking along with further details of the programme and directions to Leicester will be sent to participants in due course.

Yours sincerely

Carol Webster

**The mailing of these papers has been sponsored by
The Cambridge Glasshouse Company Limited**



“Understanding and measuring light in controlled environments”

**Beaumont Hall, University of Leicester, Stoughton Drive South, Leicester
Sunday 12th to Wednesday 15th September 2004**

BOOKING FORM

I will / will* not be attending the 2004 meeting of the UK CEUG (delete as appropriate)

Please **retain/remove/add** my name **on/from/to** the mailing list of the Group (delete as applicable)

Title and Name:		Name for Badge:	
Postal Address:			
Post Code:			
Tel:	Fax:	E-Mail:	

Please fill in your requirements:

	Cost per person	Sub total
Registration	£15	£15
3-day ‘Residential Delegate’ rate Ensuite bedroom Includes all meals from buffet supper Sunday evening through to lunch on Wednesday including Conference Dinner, morning coffees and afternoon teas	£190	
For booking after 23rd July	£30	
Please make cheques payable to: ‘University of Leicester’ For other methods of payment see overleaf.	TOTAL	

Special dietary requirements:

Please contact Carol Webster direct for information on 3-day ‘Non-residential’ delegate rates.

PLEASE RETURN THIS FORM BY FRIDAY 23rd JULY 2004 TO

Mrs Carol Webster, Department of Biology, University of Leicester, Leicester LE1 7RH
Tel:0116 252 3381 Fax: 0116 2522791 E-Mail: cw17@le.ac.uk

**PLEASE NOTE: A charge of £30 will be made for any forms returned after the closing date.
Refunds for cancellations will not be possible after 1st August**

BOOKING FORM (continued)

METHODS OF PAYMENT

Credit or Debit Card: Payment by credit or debit card will be accepted. Please complete the enclosed form and return it with your Booking Form.

Bank Transfer : Payment by bank transfer will be accepted, in **pounds Sterling ONLY** via

Account Name University of Leicester

Bank HSBC Plc
 Granby Street
 Leicester
 LE1 6EP

Account No 80829595

Sort Code 40 28 06

Swift Code MIDLGB22

IBAN No: GB75MIDL40280680829595

In order that the payment can be easily identified when it reaches the University bank account, please ask your bank to ensure that your name is mentioned on the payment. It would also be appreciated if you could advise Carol Webster that the payment has been made.

Payment by Bank Draft, Bank Cheque or Personal Cheque: Payment must be in pounds Sterling and drawn on a UK bank. Payment by Non-Sterling Cheque is not a preferred method of payment.

Please indicate which method of payment you will be using by ticking one of the following:

Cheque Debit/Credit Card Bank Transfer

Signature: Date:

Please return to:

Mrs Carol Webster
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Department of Biology
University of Leicester
Leicester LE1 7RH
UK

<p>AVOID THE LATE BOOKING FEE: HELP US TOO BY BOOKING BY FRIDAY 23RD JULY 2004</p>
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CREDIT CARD AUTHORISATION FORM (Cards Accepted Visa, Mastercard, Visa Delta, Solo and Switch)

PAYMENT FOR

CARD NUMBER

TYPE OF CARD

VALID FROM

EXPIRY DATE

AMOUNT

CARD HOLDER'S
FULL NAME
(Mr/Mrs/Miss/Ms

CARD HOLDER'S
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HANDLING
TRANSACTION



**University of
Leicester**

Workshop on “*Understanding and measuring light in controlled environments*”

Programme

This programme is provisional. We expect there to be variations in the final programme but they will not be major ones.

Elements

- a) A number of **Lectures** on light (not necessarily one per bullet point) covering:
- Light - terminology, units and measuring instruments for energy and photons
 - Light - spectral distribution in relation to plants, visible spectrum, red/far red ratio and their measurement
 - Light - spectral distribution in relation to sources, natural and artificial and its measurement (manufacturer)
 - Light - spatial distribution in relation to sources and sinks, leaf area index in canopies, distribution in glasshouses and controlled environment rooms and its measurement
 - Light - sources for various purposes: discharge, incandescent, LED
 - Light - UV: sensors, sources and safety
 - Light - calibration of measuring instruments
 - Light - what should a CE manager record for monitoring purposes?
 - Light - what should a CE manager or user record for future publication by users?
 - Light - what are the guidelines for reporting measurements of light?
 - Light - the future?
- b) **Demonstrations** of light sources and measuring equipment by manufacturers and/or distributors.
- c) **Hands-on instrument sessions** for delegates under various light sources and in various environments (e.g. cabinets and glasshouses) using their own instruments and demonstration instruments supplied by manufacturers:
- Full spectrum, PAR and UV light sensors - energy and quanta
 - Spectrometers for spectral distribution of light
 - Spectral ratio measurements
 - Spatial distribution in CE spaces or canopies - hemispherical photography, line sensors
 - Calibration of sensors (using the North American Committee on Controlled Environment Technology and Use - NCR-101's Instrument Package)

Lecturers

There will be five sessions of lectures. Lecturers will include

- a) Prof. Garry Whitelam, University of Leicester
- b) Dr Lynton Incoll, University of Leeds
- c) Mr Sander Pot, Philips Lighting, Eindhoven
- d) Dr Bruce Bugbee, Utah State University, Logan
- e) Dr Nigel Paul, University of Lancaster
- f) Someone from Applied Optotech, Cork
- g) Mr Edmund Potter, Delta-T Devices, Burwell, Cambridge

Practical exercises

There will be five practical sessions involving manufacturers and delegates.

1. Measuring instruments - sensors of photons and energy

Using a) a range of sensors - quantum sensors, spherical (omnidirectional) sensors, solarimeters, pyranometers, etc.,
and b) various sources of light - natural and artificial: incandescent, discharge, fluorescent, LED, red/far red, UV, etc.,
do exercises on: c) beneath lighting rigs and in CE spaces - cabinets, rooms and glasshouses,
1. Measuring light and energy;
2. Comparing different types and makes of sensors.

2. Spectral distribution of sources and in relation to sinks (plant canopies)

Using a) a range of sources - incandescent, discharge, fluorescent, LED, red/far red,
and b) digital spectroradiometers,
do exercises on: c) beneath lighting rigs and in CE spaces - cabinets and glasshouses,
d) with and without plants,
1. Measuring spectral distribution;
2. Measuring spectral ratios;
3. Integrating light over specified wavebands.

3. Spatial distribution beneath sources and in relation to sinks (plant canopies)

Using a) a quantum sensor,
or b) hemispherical cameras, line sensors and line scanners
do exercises on: 1. Describing spatial distribution inside a CE space, vertically and horizontally;
2. Describing the quantity and distribution light penetrating a plant canopy.

4. Calibration of quantum sensors

Using a) the NCR-101 instrument package,
and b) a light source,
calibrate your own quantum sensor.

5. Synthesis of results

There will be evening sessions for analysis and synthesis of results and one concluding session for participants to report to the workshop on the results of the practical sessions.

Manufacturers - participants and sponsors

	Company	Products	Field of expertise	Name of contact
1	Apogee Instruments	Sensors	Measurement	Bruce Bugbee
2	Delta-T Devices	Sensors and hemispherical lens cameras etc	Measurement	Aline Clark (Edmund Potter)
3	LiCOR	Sensors	Measurement	Jon Welles
4	Macam Instruments	Sensors	Measurement	Tom Greig
5	Ocean Optics	Spectroradiometers	Spectral distribution	Nick Barnett (Kees van de Steeg)
6	Philips Lighting	Lamps (incandescent and discharge)	Sources	Bob Cox (Sander Pot)
7	PP Systems	Sensors	Measurement	Keith Parkinson Michael Doyle
8	Skye Instruments	Sensors	Measurement	Belinda Trotter
9	Astranet Systems	Spectroradiometers	Spectral distribution	Mike Mills
10	Applied Optotech	LED lamps	Sources	Tony Morrissey
11	Kipp & Zonen	Solarimeters	Measurement	Lesley Redgrave
12	Glen Spectra ?	Spectrometers (and sensors) (Distributor/agent)	Spectral distribution (and measurement)	Adam Holland (Gerard Freeman)
13	NCR-101 Instrument package	<i>Sensors:</i> Eppley radiometers, Skye Dual 660/730 radiation sensor, TSI Anemometer, LiCOR quantum sensors, Apogee hand-held total UV meter, StellarNet spectroradiometer <i>Data logger:</i> Apogee	Calibration package	Bruce Bugbee (Alec Hay)

Note: ? = Not yet either replied or confirmed participation.

NCR-101 = NCR-101 Committee on Controlled Environment Technology and Use (sponsored by the USDA)

Summary of Timetable (provisional): UK CEUG Workshop 2004

Sunday 12 th September	Monday 13 th September	Tuesday 14 th September	Wednesday 15 th September
	<i>Breakfast</i>	<i>Breakfast</i>	<i>Breakfast</i>
	Morning <i>Session 1: Lecture 1: Terminology, units etc. Demonstrations Session 2: Hands-on session</i>	Morning <i>Session 5: Lectures 4, 5 & 6: Spatial distribution. Sources. Session 6: Demonstrations and Hands-on session</i>	Morning <i>Session 9: Synthesis: Groups to report Session 10: Lecture 8: Recording and reporting Concluding address</i>
	<i>Lunch</i>	<i>Lunch</i>	<i>Lunch</i>
Afternoon <i>Arrival and Registration (Exhibition mounted)</i>	Afternoon <i>Session 3: Lectures 2 & 3: Spectral distribution Session 4: Demonstrations and Hands-on session</i>	Afternoon <i>Session 7: Lecture 7: Calibration Demonstrations Session 8: Hands-on session</i>	Afternoon <i>End of workshop: Delegates depart. Provisional additional period for calibrating sensors</i>
<i>Buffet supper</i>	<i>Dinner</i>	<i>Conference Dinner</i>	
Evening <i>Welcome Reception Exhibition by manufacturers</i>	Evening <i>AGM: UK CEUG Synthesis of Hands-on results</i>	Evening <i>Discussion: Synthesis of Hands-on results Concurrent sessions</i>	Evening