

CONTROLLED ENVIRONMENT USERS GROUP

MEETING AT THE JOHN INNES CENTRE 22ND - 23RD SEPTEMBER 1992

"CO₂ ENRICHMENT FOR CLIMATE CHANGE RESEARCH"

PROGRAMME

22nd September 1992

- 12.00 - 14.00 *Buffet lunch and registration (JI Common Room via Reception)*
- 14.00 - 14.05 *Opening Remarks (JI Rec Centre)*
- 14.05 - 14.35 *D W Hand (Horticultural Research International, Littlehampton). Measurement and control of CO₂ in daylight cabinets and greenhouses.*
- 14.35 - 15.10 *R Baxter and C R Rafarel (Institute of Terrestrial Ecology, Bangor). Exposure facilities for climate change research - CO₂ and temperature control.*
- 15.15 - 15.45 *Afternoon Tea (and collect room keys)*
- 15.45 - 16.15 *A McLeod (Institute of Terrestrial Ecology, Monks Wood). Problems of controlling gases in the open air.*
- 16.20 - 16.50 *J Townend (Division of Biological Sciences, University of Lancaster). Attempting to simulate natural rooting environments in controlled atmosphere chambers.*
- 16.55 - 17.25 *C Barton (Institute of Ecology & Resource Management, Edinburgh). Comparative studies on elevated CO₂ using open topped chambers, tree chambers and branch bags.*
- 18.30 *Dinner at UEA in Top Floor Restaurant (above Diner)*
- 20.00 *Business Meeting*
- As Required *Accommodation in Suffolk Terrace UEA*

23rd September 1992

- 08.00 - 09.00 *Breakfast at UEA in Diner*
- 09.00 - 10.00 *Assemble in Rec Centre (and return room keys)
Guided tours of CE facilities at JI Centre*
- 10.00 - 10.30 *Coffee in JI Rec Centre*
- 10.30 - 12.00 *Guided tours (continued)*
- 12.00 *Buffet lunch in JI Common Room, and disperse*

-o0o-

Organising Committee:

*Lynton Incoll
Mike Crawley
Joe Aldous
Alan Nichols
Sue Riches*

**MINUTES OF THE 1992 BUSINESS MEETING OF
THE CONTROLLED ENVIRONMENT USERS GROUP**

The annual meeting of the CE Users Group was held on Tuesday 23rd September 1992 at the University of East Anglia. The meeting opened at 2045 hrs.

Chairman: L D Incoll

1. MINUTES OF PREVIOUS MEETING.

The minutes of the 1991 meeting at Lancaster University were approved.

2. MATTERS ARISING.

a. The address of Balzers, referred to in the PAR sensor notes appended to the previous minutes, is now as follows:

BALZERS HIGH VACCUUM Ltd.,
Bradbourne Drive,
Tillbrook,
MILTON KEYNES. MK7 8AZ

Tel. 0908 373333
Fax. 0908 377776

b. The Chairman reported that the group was funded by the Tansley Fund of the New Phytologist Trust. His report of the 1991 meeting, being the 25th Anniversary of the CE User Group, was published in the New Phytologist and he offered reprints of the report to those who had attended that meeting.

3. MANAGEMENT, STAFFING, RUNNING COSTS.

No points were raised.

4. MAINTENANCE, SERVICING, SPARES.

a. J. Franklin said IACR, Rothamsted, have spare Envirocon II boards available, also new mouse operation software for G/H system.

b. A. Nichols reported that JII had suffered communications system damage by electrical storms, not as direct hits but electro magnetic pulses (EMP). It was concluded after discussion that fibre optic links would best minimise this.

J. Franklin said IACR had also used opto-isolated lines to good effect; Richard Lefevre at Rothamsted could give further details.

A. McLeod (ITE, Monkswood) noted that a simple device is available (c. £400) to fit at each end of a comms line. These are optic fibre modems for RS-232, RS-422, current loop and voltage connections. The names of UK suppliers of US equipment are as follows:

Lightwave Communications Inc. Equipment

available from: Britcomp Sales Ltd.,
17 Bridge Street,
Leatherhead, Surrey, KT22 8BL.

Tel: 0372 377779
Fax: 0372 376848

Math Associates Inc. Equipment

available from: L-TEQ Ltd.,
Lapwing 440,
Frimley Business Park,
Frimley, Surrey,
GU16 5SG.

Tel: 0276 686566
Fax: 0276 686550

c. D. Dickinson (PEL Reading) warned that if using double glazing panels as replacements in Saxcil cabinet ceilings, each location should be measured to ensure a fit. Lighting in Saxcil cabinets has been hard wired to obviate problems with plugs /sockets.

d. D. Dickinson asked for any ideas on replacement coolant pumps for Saxcils. Leicester and Wellesbourne both use standard domestic heating accelerator pumps, checking port-to-port dimensions (usually 130 mm).

5. CONTROL SYSTEMS

J. Franklin said the ENVIROCON III was being marketed by IACR (Rothamsted) and included a Windows type software.

6. HUMIDIFICATION & IRRIGATION.

A. Nichols reported that JII use ultrasonic humidification which, although expensive, was reliably effective. C. Dudley (DowElanco) asked what water was used, JII said they use RO water. A. Roylance said VSL had made a reasonably priced humidifier using imported TDK ultrasonic unit (c.£50) running on tap water.

G. Taylor (Sanyo Gallenkamp) warned that tap water salts were likely to be carried on the air stream and deposited elsewhere. A. McLeod (ITE) reported that National Power had rejected ultra-sonic systems for Solardomes after a Dutch report that they generated hydrogen peroxide.

LIGHTING.

a. C. Dudley (DowElanco) reported that sodium vapour lights had suffered degradation (either thermal or UV) of plastic parts of luminaries with both GEC & Philips SON-T Agro lamps. R. Hughes (IACR, Long Ashton) had experience of luminaire parts and even chokes melting. J. Franklin said more failures of ballasts occurred with integral control gear than with externally fitted gear and A. Nichols confirmed that JII tend to mount all ballasts externally to overcome overheating problems. J. Sinclair (EPS) reminded that the heat generated by the ballast must also be considered.

b. D. Southworth (ICI) reported fluorescents flickering on/off, which had been cured by the makers renewing the ballasts. R. Woodfin (Imp. Coll.) asked if there was a universal ballast for all types of fluorescent? No answer was forthcoming. JII recommended Tridonic as their best suppliers of lamp control gear.

c. A. Nichols warned of water dripping through G/H vents onto HQI lamps in top-vented luminaries causing cracked lamp envelopes, thus giving rise to UV radiation.

d. D. Dickinson asked if anyone had changed to HF fluorescents; J. Franklin said Rothamsted had. G. Crowhurst (HRI, Wellesbourne) said they had tried slimline tubes with traditional control gear but had experienced early tube failures. Others agreed.

INSTRUMENTATION, SENSORS, MONITORING.

a. K. Stevenson (Staefa) asked what sensor accuracy do users really require? P. Schon (Weiss) agreed customers often ask for impossible conditions eg 0.5 deg C both temporal and spatial in large volume chambers. The chairman suggested users should relate their engineering requirements to their experimental parameters. A. Gay (IGER) added that temperature repeatability was important for CO₂ work.

It was obvious that greater accuracy or finer control must cost more. It was agreed that published papers often quoted conditions which were probably impossible to achieve but were single point or instantaneous values interpreted as continuous homogenous conditions and that others, in trying to repeat such work, were unable to find equipment to achieve it.

R. Randall (HRI, Littlehampton) iterated that good housekeeping and regular calibration were essential. A. Roylance (VSL) reminded users that BS5750 required suppliers to quote only what they could actually achieve.

b. J. Franklin (Rothamsted) said their IRGAs tended to drift and needed frequent recalibration for which IGD charge approx one third of the instrument cost. They were changing to PP systems for reliability. The chairman said that K. Parkinson (PP) had offered to provide details of his products available for this field.

R. Woodfin (Imp Coll) asked if PTFE tubing is suitable for CO₂, in view of the unsuitability of PVC, although nylon and stainless steel were apparently suitable. It was said that polypropylene was commonly used and R. Baxter (Bangor) confirmed that PTFE was suitable but expensive. The chairman informed the meeting that an SEB Symposium on Instrumentation included articles by Keith Parkinson and Paul Jarvis and also a table of permeabilities and absorbtivities for various materials with respect to CO₂ and water vapour.

J. Townend (Lancaster) was having to re-calibrate IRGAs daily and wondered if atmospheric air pressure was likely to affect calibration. It was suggested that it might have some effect on the instrument back pressure and therefore on the flow rate through the analyser. A. Gay (IGER) and J. Franklin (Rothamsted) suggested that water vapour should be eliminated as a possible cause of the problem.

9. **HEAT RECLAMATION & ENERGY MANAGEMENT.**

P. Schon said Weiss had successfully reclaimed surplus heat, using 'heat storage batteries' but at additional capital cost and with a pay-back period of about 5 years. A. Nichols said JI still reclaimed only low grade heat for space heating. R. Hughes (Long Ashton) found the system expensive to run and had discontinued its use. K. Stevenson said Staefa use 'Heat Machines' which were much more effective. G. Taylor said Sanyo had capabilities for reclaiming heat but they were not, at present, commercially viable, although environmental issues might change future attitudes.

10. FABRIC, GLAZING, REFLECTIVE MATERIALS.

J. Franklin (Rothamsted) asked for information on replacement for 'TEVLAR' film for roof panels, which was only available from the USA and had to be bought by the ton. R. Hughes said Long Ashton were trying UV stabilized, twin-walled polycarbonate. J. Franklin (Rothamsted) has tried polycarbonate but got yellowing and subsequent light attenuation. A. Nicols (JI) suggested UV degradation may have been due to use of 250 Watt HQI lamps which were single envelope & therefore not UV protective.

JI have successfully used single skin Perspex, Weiss have also used Makrolon at ICI with one side UV protected. It must be fitted the right way up. Initial overheating problems were due to spacers being omitted during installation. The minimum distance from 400 W HQI lamps was found, by experiment, to be 100 mm.

11. NEW EQUIPMENT, RECENT ADVANCES.

J. Franklin told the meeting that Rothamsted have 8 new CO₂ chambers, some 6 m², some 4 m², with a total floor area of 20 m². They are daylit chambers with supplementary lighting and are still being proved against their specification which includes a temperature variation of + or - 2°C (spatial) and + or - 1°C (temporal). The refrigeration plant is designed to cope with running temperatures -1 to +30°C. The Envirocon III control can achieve 15°C at full solar gain, in an ambient temperature of 30°C and can track ambient + or - 5°C.

12. PLANT GROWTH PROBLEMS.

No points were raised.

13. SAFETY.

J. Franklin (Rothamsted) asked what precautions could be taken to avoid danger to staff due to very high levels of CO₂ in rooms/chambers in the event of failed controls and wondered whether back-up IRGAs or personal monitors would be better. COSHH assessment of the rooms had been carried out. R. Rafarel (ITE) said they were considering Morganite personal sensors (at c. £400 each) because it is costly to double monitor at eight locations. R. Randall warned that agricultural inspectors of the HSE have insisted on precautionary measures. P. Schon (Weiss) advised that, in USA and Germany, suppliers are legally responsible for providing safe equipment.

14. ANY OTHER BUSINESS.

1. The chairman, on behalf of the group, thanked the John Innes Institute for hosting the meeting and especially Mike Crawley and his helpers (not forgetting Sue Riches) and for the local organisation of the meeting.

2. In order to minimise costs (for our very limited budget), the mailing list would be updated, adding new members and deleting those who had not kept in touch.

3. The chairman bade farewell to Dennis Dickinson of Reading for whom it was his last meeting, having attended for some 25 years and missed only one meeting. He would be welcome to attend future meetings as an ex-user.

15. DATE & PLACE OF NEXT MEETING.

The next meeting is planned to be held at the Department of Botany, Leicester University when the theme is hoped to be "Light, spectral sensitivity, photosynthesis, photoperiodics, etc."; suggestions for subjects or speakers would be welcomed by the chairman.

The meeting closed at 2235 hrs.

Recorders: G.E. Crowhurst, A. Morgan
Recorders
23 October

**LIST OF PARTICIPANTS
CE USERS GROUP MEETING 1992
AT THE JOHN INNES CENTRE, NORWICH**

1. K.H. Agar	ECS, Norwich
2. J.R. Aldous	JI Inst, Norwich
3. B.J. Bailey	Silsoe Research Institute
4. C.V.M. Barton	IERM, University of Edinburgh
5. G.R. Batts	Dept. Meteorology, University of Reading
6. R. Baxter	ITE, Bangor
7. K. Burcham	JIC
8. P.S. Byner	NFL, Brighton
9. K.E. Chivers	Dept. Agriculture, University of Reading
10. S. Cranston	HRI, Wellesbourne
11. M. Crawley	JI Inst, Norwich
12. S.H. Crothers	Dept of Agriculture, University of Belfast
13. G.E. Crowhurst	HRI, Wellesbourne
14. P.A. Curtis	JI Inst, Norwich
15. D.Dickinson	Dept. Agriculture, University of Reading
16. C.L. Dudley	DowElanco, Letcombe Regis
17. C.F. Eagles	IGER, Aberystwyth
18. T.J. Flowers	School of Biology, University of Sussex
19. J. Franklin	IACR, Rothamsted
20. A.P. Gay	IGER, Aberystwyth
21. P.A. Gill	SCRI, Dundee

22. D. Gray	SCRI, Dundee
23. W. Hamilton	Agricultural Genetics, Babraham
24. D.W. Hand	HRI, Littlehampton
25. R.F. Hughes	IACR, Long Ashton
26. L.D. Incoll	Pure & App. Biology, Leeds University
27. G.M. Jackson	Botany Dept., Leicester University
28. I.D. Leith	I T E, Edinburgh
29. P. Lucas	IEBS, Lancaster University
30. A.R. McLeod	ITE, Monkswood
31. A. Morgan	HRI, Wellesbourne
32. S. Naeem	Centre for Pop Bio, Imperial College
33. C. Newell	Agricultural Genetics, Babraham
34. A.C.H. Nichols	JI Inst, Norwich
35. R.G. Parkinson	IACR, Long Ashton
36. N.S. Pechurkin	Institute of Biophysics, Russia
37. R.G. Peirce	HRI, Littlehampton
38. W.K. Pentelow	Richings Scientific
39. M.L. Pratt	Botany Dept., Leicester University
40. R.E. Rafarel	ITE, Bangor
41. R.E. Randall	HRI, Littlehampton
42. B. Roberts	HRI, East Mailing
43. J. Ross	HRI, Littlehampton
44. A. Roylance	Vindon Scientific Ltd.
45. J. Roylance	Vindon Scientific Ltd.
46. P. Schon	Weiss Technik Ltd.
47. A. Sim Macaulay	Res. Inst., Aberdeen
48. J.R. Sinclair	ECS, Norwich
49. D.I. Southworth	ICI Agrochemicals, Jealots Hill
50. D.A.W. Steed	Crown Cottage, Kent
51. K.C. Stevenson	Staefa Control Sysytems Ltd.
52. G.K. Taylor	Sanyo Gallenkamp, Leicester
53. Gail Taylor	School of Biology, University of Sussex
54. J.T. Townend	Lancaster University
55. P.R. Turner	IACR, Long Ashton
56. P.L. Walton	Staefa Control Sysytems Ltd.
57. J.A.C. Weir	Farm Electric, Stoneleigh
58. L. Welling	School of Biology, University of Sussex
59. J. Wilkinson	IEBS, Lancaster University
60. B.J. Wilson	Wye College
61. R.M. Woodfin	Centre for Pop Bio, Imp Coll.
62. P. Zhang	Nottingham University