CONTROLLED ENVIRONMENTS IN THE NEW MILLENNIUM

A joint international meeting of the UK CEUG and North American NCR-101

9th - 12th September, 2001

at

The John Innes Centre, Norwich, UK

PROGRAMME

	SUNDAY 9 SEPTEMBER 2001: EVENING
17.00-19.30	**Registration and Buffet Supper at the Sainsbury Centre, University of East Anglia**
20.00	**Welcome Reception at the Sainsbury Centre, University of East Anglia**

	MONDAY 10 SEPTEMBER 2001: MORNING
SESSION 1	**GENETICALLY MODIFIED ORGANISMS (GMOs) IN CONTROLLED ENVIRONMENTS**
Chairman:	**P. Mullineaux** (Disease and Stress Biology, John Innes Centre, Norwich, UK)
08.45 - 09.15	**D. Adair** (Plant Pathology, University of Minnesota, USA) *Legislation for GMOs in North America: Design of Containment Facilities*
09.15 - 09.45	**P. Logan** (Health & Safety Executive, Bootle, UK) *Legislation for GMOs in the UK and Europe*
09.45 – 10.15	**S. Millam** (Scottish Crop Research Institute, Invergowrie, UK) *Working within the Legislation*
10.15 – 10.45	**Panel-led Discussion** Above speakers plus **J. Franklin** (IACR Rothamsted, Harpenden, UK) and **R. Denis** (Agritechnove, St Anselme, Canada**)**
10.45 - 11.15	**Morning Coffee**
SESSION 2	**REPORTING GUIDELINES FOR CONTROLLED ENVIRONMENTS**
Chairman:	**J.C. Sager** (Spaceport Engineering & Technology Directorate, Kennedy Space Center, Florida, USA)
11.15 - 11.40	**D.T. Krizek** (Sustainable Agricultural Systems Laboratory, USDA, Beltsville, MD, USA) *Reporting and Monitoring for Diagnostic Purposes*
11.40 – 12.05	**T.W. Tibbitts** (Horticulture, University of Wisconsin, Madison, USA) *Reporting and Monitoring for User Records*
12.05 – 12.30	**L.D. Incoll, D.J. Pilbeam and J. Williams** (Biology, University of Leeds, UK) *Reporting Guidelines in Practice: A Good Idea, But Does Anyone Take Any Notice?*
12.30 – 12.45	**Panel-led Discussion** Above speakers
12.45 - 13.45	**Lunch**
	MONDAY 10 SEPTEMBER 2001: AFTERNOON and EVENING
13.45 - 17. 00	**Tour of John Innes Centre, Poster Session and Trade Displays** Introduction to the John Innes Centre - Talk in the Auditorium by **R. Mathias** and **M. Crawley** 1. Tour of the John Innes Centre • Small Sanyo Controlled Environment Rooms • Large Sanyo Controlled Environment Rooms • Weiss Technic and In-house Controlled Environment Rooms

	• South Glasshouses • Containment Glasshouse Complex • Walk-through Major Laboratories • Library - Rare Books Room 2. Trade Displays and Posters
18.30	**Dinner on the Balcony, Lecture Theatre Auditorium, John Innes Centre** **Revisit Trade Displays and Posters**
21.00	**Business Meetings of UK CEUG and NCR-101 and concurrent Bar**

	TUESDAY 11 SEPTEMBER 2001: MORNING
SESSION 3	**ENERGY, CONSERVATION AND RECYCLING: I. TECHNOLOGICAL CHOICES FOR CONTROLLED ENVIRONMENTS IN RELATION TO ENERGY**
Chairman:	**J. Franklin** (IACR Rothamsted, Harpenden, UK)
08.45 - 09.15	**S. Pot** (Philips Lighting BV, Eindhoven, The Netherlands) *Lighting Choices for Plant Growth in Horticulture*
09.15 – 09.45	**R. Quiring** (Conviron, Winnipeg, Canada) *Choices for Temperature and Humidity: Control Systems*
09.45 – 10.15	**F. Steimle** (Universität Essen, Essen, Germany) *Refrigerators and Refrigerants - the Future*
10.15 - 10.45	**Morning Coffee**
10.45 - 11.15	**Q. Mabbutt and A. Brown** (Advantica Technologies Ltd, Loughborough, UK) *The Microturbine: Why a Gas Engine May at Last Be of Benefit to the Horticulture Industry*
SESSION 4	**ENERGY, CONSERVATION AND RECYCLING: II. POSITION STATEMENTS AND PANEL-LED DISCUSSION ON ENERGY POLICIES AND PRACTICE IN RELATION TO CONTROLLED ENVIRONMENTS**
Chairman:	**G. Taylor** (Sanyo Gallenkamp PLC, Loughborough, UK)
11.15 - 11.25	Position Statements on Energy Policy and Practice **M.J. Hadlow** (IACR Rothamsted, Harpenden, UK) *The European Position*
11.25 – 11.35	**J.C. Sager** (Kennedy Space Center, NASA, Florida, USA) *The North American Position*
11.35 – 11.45	**L.J. Hoare** (South Australian Research & Development Institute, Adelaide, Australia) *The Australian Position*
11.45 – 11.55	**Y. Kitaya** (College of Agriculture, Osaka Prefecture University, Osaka, Japan) *The Japanese Position*
11.55 – 12.45	**Panel-led Discussion** Above eight speakers
12.45 - 13.45	**Lunch**

	TUESDAY 11 SEPTEMBER 2001: AFTERNOON and EVENING
SESSION 5	**CONTROLLED ENVIRONMENTS IN SPACE**
Chairman:	**R. Wheeler** (Biological Sciences Branch, Kennedy Space Center, NASA, Florida, USA)
13.45 - 14.10	**W. Zhou** (Wisconsin Center for Space Automation & Robotics, University of Wisconsin, Madison, USA) *Development of the Commercial Plant Biotechnology Facility for the International Space Station*
14.10 – 14.35	**R.E. Fortson** (Lockheed Martin Space Operations, Houston, USA) *Ground-based Demonstration Chambers In NASA's Advanced Life Support Project*
14.35 – 15.00	**C. Lasseur** (European Space Agency, Noordwijk, The Netherlands) *The Melissa Project: Waste Recycling with Plant Production*
15.00 – 15.30	**Panel-led Discussion** Above speakers plus **C.A. Mitchell** (Horticulture, Purdue University, USA), **A. Hoehn** (University of Colorado, Boulder, USA) and **Y. Kitaya** (College of Agriculture, Osaka, Japan)
15.30 - 16.00	**Afternoon Tea**
SESSION 6	**SIMPLE VERSUS COMPLEX CONTROLLED ENVIRONMENTS: A DEBATE**
Chairman:	**L.D. Incoll** (Biology, University of Leeds, UK)
16.00 - 16.30	**Proposer – T.A. Mansfield** (Biological Sciences, Lancaster University, UK) *In Support of Real Environments*
16.30 – 17.00	**Proposer – B. Bugbee** (Crop Physiology Lab., Utah State University, Logan, USA) *In Support of Simple Environments*
17.00 – 17.30	**Panel-Led Discussion** Above speakers plus **P. Austin** (Palmerston North Research Centre, New Zealand) and **M. Romer** (McGill University Phytotron, McGill University, Montreal, Canada)
20.00	**Conference Dinner at the Sainsbury Centre, University of East Anglia**

	WEDNESDAY 12 SEPTEMBER 2001: MORNING
SESSION 7	**SHORT PRESENTATIONS** In multiple authored papers the name of the presenting author is underlined
Chairman:	**D. Tremmel** (National Phytotron, Duke University, Durham, NC, USA)
08.45 – 08.50	**G.D. Goins, G.W. Stutte, R.M. Wheeler and J.C. Sager** (Kennedy Space Center, Florida, USA) *Light Interception and Canopy Coverage of Lettuce and Radish Grown under Different Wavelengths of Red Light-Emitting Diodes (LEDs)*
08.55 – 09.00	**J.M. Frantz*, Changhoo Chun**, R.J. Joly and C.A. Mitchell** (Department of Horticulture and Landscape Architecture, Purdue University, West Lafayette, USA, *Dept. of Plants, Soils & Biometeorology, Utah State University, Logan, USA, **Laboratory of Environmental Control Engineering, Chiba University, Chiba, Japan) *Intracanopy Lighting as a Sole Source of PAR and PHAR for Planophile Crop Canopies in Controlled Environments*
09.05 – 09.10	**J. L. Cuello, Y. Yu, S. Kuwahara, E. Ono, K. Jordan, T. Nakamura* and H. Watanabe**** (Department of Agricultural and Biosystems Engineering, The University of Arizona, Tucson, U.S.A, *Physical Science, Inc., San Ramon, U.S.A, **Mitsubishi Chemical Corporation, Yokohama, Japan) *Hybrid Solar and Electric Lighting to Alleviate Power Crunch for Bioregenerative Advanced Life Support*
09.15 – 09.20	**M. Romer** (McGill University Phytotron, McGill University, Montreal, Canada) *Carbon Dioxide within Controlled Environments; the Commonly Neglected Variable*
09.25 – 09.30	**B. Bugbee** (Crop Physiology Laboratory, Utah State University, Logan, USA *Temperature Measurement: a Review of the Advantages and Disadvantages of the 4 Most Common Types of Thermocouple Wire.*
09.35 – 09.40	**S. Klassen, T. Tibbitts and B. Bugbee** (Crop Physiology Laboratory, Utah State University, Logan, USA) *Calibration Standards for Controlled Environments: History and Use of the NCR-101 Instrument Package*
09.45 – 09.50	**J.M. Frantz [1], M.W. van Iersel [2], and B. Bugbee [1]** ([1] Crop Physiology Laboratory, Utah State University, Logan, USA, [2] Department of Horticulture, The University of Georgia, Griffin, USA. **J.M. Frantz as Winner: UK CEUG / NCR-101 Graduate/Postgraduate Travel Award** *Design and Operation of a Multiple-Chamber Gas-Exchange System for Plant Communities*
09.55 – 10.00	**M. Pratt, W. Stoddart and G.C. Whitelam** (Biology, University of Leicester, Leicester, UK) *Using LEDs to Manipulate Red:Far-Red Ratio and Photomorphogenesis in Controlled Environments*
SESSION 8	**LARGE SCALE CONTROLLED ENVIRONMENTS**
Chairman:	**J. Lea-Cox** (Natural Resource Sciences and Landscape Architecture, University of Maryland, College Park, USA)
10.05-10.30	**W. Bopp** (National Botanic Garden of Wales, Llanarthne, South Wales, UK.) *Working with Designers on the Great Glasshouse*

10.30-11.00	**Morning Coffee**
11.00 - 11.25	**P. Thoday** (Thoday Associates, Corsham, Wiltshire, UK) *The Eden Project, Cornwall - the Humid Tropic and Warm Temperate Biomes*
11.25 – 11.50	**A. Wright** (Biosphere 2, Columbia University, Oracle, Arizona, USA) *Modifications and Upgrades for the Biosphere 2 Laboratory*
	CONCLUDING ADDRESS
11.50 – 12.30	**D.H. Greer** (HortResearch, Palmerston North, New Zealand) *Controlled Environments: Past Achievements and Future Directions*
12.45 - 14.00	**Lunch before departure. Start of Post-Conference Tour**

	POSTERS
	Some of these posters, designated * are also being presented as short presentations in Session 7.
1.	**T. Agostino** (CSIRO Plant Industry, Canberra, Australia) *Modernisation of the Canberra Phytotron: Recent Major Modifications Allowing the Facility to Operate as a PC2 (Planthouse) Facility for Work with Transgenic Plants*
2.	**P.T. Austin, D.H. Greer and H.N. Wiggins** (HortResearch, Palmerston North, New Zealand) *A Comprehensive Format for Specifying and Reporting Controlled Environment Regimes*
3. *	**B. Bugbee** (Crop Physiology Laboratory, Utah State University, Logan, USA) *Temperature Measurement: a Review of the Advantages and Disadvantages of the 4 Most Common Types of Thermocouple Wire*
4. *	**J. L. Cuello, Y. Yu, S. Kuwahara, E. Ono, K. Jordan, T. Nakamura* and H. Watanabe**** (Department of Agricultural and Biosystems Engineering, The University of Arizona, Tucson, U.S.A, *Physical Science, Inc., San Ramon, U.S.A, **Mitsubishi Chemical Corporation, Yokohama, Japan) Hybrid Solar and Electric Lighting to Alleviate Power Crunch for Bioregenerative Advanced Life Support
5.	**I.D. Flitcroft, R. Kuchenbuch* and K.T. Ingram** (Department of Crop and Soil Sciences, University of Georgia, Griffin, USA.,* Center for Agricultural Landscape and Landuse Research, Institute for Primary Production, Muencheberg, Germany) *Nesting Multiple Controlled Environments for Independent Manipulation of Shoot and Root Temperatures*
6.	**I.D. Flitcroft, K.T. Ingram and G. Hoogenboom*** (Department of Crop and Soil Sciences, and *Department of Biological and Agricultural Engineering, University of Georgia, Griffin, USA) *The Georgia Envirotron: Multi-Disciplinary Studies of Plant Stresses using Controlled Environment Chambers*
7. *	**J.M. Frantz [1], M.W. van Iersel [2], and B. Bugbee** [1] ([1] Crop Physiology Laboratory, Utah State University, Logan, USA, [2] Department of Horticulture, The University of Georgia, Griffin, USA. **J.M. Frantz as Winner: UK CEUG/NCR-101 Graduate/Postgraduate Travel Award** *Design and Operation of a Multiple-Chamber Gas-Exchange System for Plant Communities*
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9. *	**M. Pratt, W. Stoddart and G.C. Whitelam** (Biology, University of Leicester, Leicester, UK) *Using LEDs to Manipulate Red:Far-Red Ratio and Photomorphogenesis in Controlled Environments*
10.	**A. Hoehn and J. Clawson** (BioServe Space Technologies, University of Colorado, Boulder, , USA) *Plants in Space - Transition from Space Shuttle to Space Station and Beyond*