

Meeting Minutes

2008 Annual General Meeting of the NCERA-101 USDA Committee on Controlled Environment Technology and Use

Held at the 2008 International Meeting on Controlled Environment Agriculture, 8 – 12 March, 2008, Cocoa Beach, Florida

March 10, 2008

Participants

NCERA-101 Members: Tony Agostino (CSIRO Plant Industry), Angela Beaman (Iowa State Univ), Wade Berry (UCLA), Mark Blonquist (Apogee Instruments), A.J. Both (Rutgers Univ), David Brault (Greenhouse Engineering), Bruce Bugbee (Utah State Univ), Gerald Deitzer (Univ. Maryland), Ron Evans (CEA Technologies Intl), Bruno Faucher (Greenhouse Engineering), David Fleisher (USDA-ARS), Julian Franklin (Rothamsted Research), Jonathan Frantz (USDA-ARS), Gary Gardner (Univ. Minnesota), Richard Gladon (Iowa State Univ), Dennis Greer (Charles Sturt Univ.), Bernie Grodzinski (Univ. Guelph), Edward Harwood (Great Veggies LLC), Alec Hay (Utah State Univ), Henry Imberti (Percival Scientific Inc), Lynton Incoll (Leeds Univ), Ramesh Kanwar (Iowa State Univ), Meriam Karlsson (Univ. Alaska), Rob Kerslake (Kerslake & Associates), Bruce Kettner (BioChambers Inc), Marcia Kirinus (Duke Univ), Chieri Kubota (Univ. Arizona), Ron Lacey (Texas A&M Univ), Bob Langhans (Cornell Univ), Alec & Marlene Mackenzie (Argus Control Systems), Gioia Massa (Purdue Univ), Richard McAvoy (Univ. Connecticut), Cary Mitchell (Purdue Univ), Robert Morrow (Orbitec), Joey Norikane (Fraunhofer CMB), Andrew Ogden (Univ. Georgia), Robert Pauls (Biochambers), Ellen Peffley (Texas Tech Univ), Jeff Richards (Dynamac Corp. Kennedy Space Center), Reg Quiring (Conviron), Sharon Reid (Conviron), Mark Romer (McGill Univ. Phytotron), Theresa Rondeau Vuk (Univ. Guelph), A.O. Rule (EGC), Erik Runkle (Michigan State Univ), John Sager (NASA, Kennedy Space Center), Carole Saravitz (North Carolina State Univ), Daniel Schmoldt (USDA-ARS), Gary Stutte (Dynamac Corp. Kennedy Space Center), Gary Taylor (Weiss-Gallencamp), Marc Theroux (BioChambers), Ted Tibbitts (Univ. Wisconsin), David Tremmel (Duke University), Alex Turkewitsch (Greenhouse Engineering), Mark van Iersel (Univ. Georgia), Jeff Werner (Univ. Alaska), Ray Wheeler (NASA, Kennedy Space Center), Dave Wilson (NASA, Ames Research Center), Neil Yorio (Dynamac Corp. Kennedy Space Center). Other attendees: Jeff Richards (Dynamac Corp. Kennedy Space Center), Adel Zayed (Monsanto), Fred T. Davies (Texas A&M Univ), Roberto Lopez (Purdue Univ), Daniel Kiekhaefer (Percival Scientific), George Waimann (Rothamstead Research), Teruaki Shimazu (Gifu Univ), Murat Kacira (Univ. Arizona), Qian Ling (Univ. Arizona), Ryo Matsuda (Univ. Arizona), Xiaofeng Qian (Beijing Kooland Company), Lane Patterson (Univ. Arizona).

Meeting was called to order at 12:20pm. See Appendix 2 for the meeting program.

Erik Runkle, 2008 chair, made some opening remarks.

The chair recognized and thanked the following members for their contributions to this meeting:

- Dave Fleisher for the meeting program

- hosts Gary Stutte, Neil Yorio, Ray Wheeler and John Sager
- the Program Committee, especially Lynton Incoll for his interest in the working group and constructive input
- the continuing membership secretary – Mark Romer for providing a cohesive communication service year-round

General Announcements were made by Chieri Kubota.

Three conferences that may be of interest to this group will be held in the next year or so:

- Greensys 2009, June 14 – 19 2009, at Laval University, Quebec City, Canada
- ISHS International Workshop on Greenhouse Environment Control and Crop Production in Semi-Arid Environments, October 20 – 24 2008, at Tucson, AZ (Abstract submission April 8, 2008)
- International Symposium on Light in Horticulture, ISHS, November 15 – 19 2009, at Tsukuba, Japan.

Ramesh Kanwar, Administrative Advisor to the NCERA-101, addressed the meeting with his Administrative Advisor's Report.

- Registration for this meeting is 150 people, from the USA, Canada, the UK, Australia, Japan and other countries.
- The committee structure consists of collaboration by all members, with other contacts and strong industry support. The presentations at this meeting are impressive. For example, the Australian presenters indicated funding of \$40M for facilities, and \$4M + funding for staff. The committee is very successful and has a high impact. It is also well placed for the future. Older members, Ted Tibbitts, Bob Langhans and others, remain active and provide valuable training for newer members. In the 10 years that Ramesh Kanwar has been administrative advisor, we have met at a new location every year.
- Upcoming milestones are as follows:
 - Annual report and impact statement to be posted on the NCRA website within 60 days
 - Midterm review is on a 5 year cycle and is now 3 years old
 - Impact statements are different from last year and should include;
 - Impact nugget – a one-sentence abstract of the Impact reported,
 - Issue – who cares and why,
 - Progress during the past 3 years,
 - The impact statement itself; economic, social, health or environmental consequences derived as benefits for the intended users, and
 - Research needs for future projects.
- Ramesh Kanwar also handed to Gary Stutte a submittal form for NCERA Impact Statements, a link to example impact statements, a link to the formal NCERA mid-review instructions, and a letter from the Office of the Executive Director of the NCERA regarding mid-term review. The NCERA is the North Central Regional Association of Agricultural Experiment Station Directors.
- Ramesh Kanwar stated, “We have started a tradition in this group to travel overseas every 4 to 5 years. Don't lose this tradition. In the past we have met in the UK and in Australia.”

Question: Ron Lacey requested electronic copies of these documents.
Mark Romer requested that Ramesh Kanwar send these to him for distribution to the members.

Daniel Schmoldt, National Project Leader, Plant and Animal Systems, presented the CSREES Representative Report. The CSREES is the Cooperative State Research, Education and Extension Service of the USDA.

- Daniel Schmoldt showed some slides, illustrating the USDA structure and FY 2008 funding. He reported that CSREES funding saw a 0.75% increase before a 0.7% across the board rescission, to \$1,198.8M. NRI (the USDA National Research Initiative) is funded to \$ 190.8M. Up to 26% of NRI funds can be used for integrated projects. NRI bio based products program will have increased funding. Congressional earmarks are back – probably more, but with 25% reduction in funds from 2006. Bio energy and bio based products are up.
- Farm bill legislation expired at the end of last year, but has been extended to March 15. This authorizes USDA expenditures.
- Specialty crops are of interest. These are defined as those that contribute to healthy diets, and are major components of USDA food recommendations. Food security is also of interest.
- Title VII research - \$1BN for mandatory study areas. Five areas are identified: plant breeding and genetics, invasive pests, optimization of use of water and fertilizers, robotics and mechanization, and production and sustainability.
- The SCRI (the USDA Specialty Crops Research Initiative) Implementation Plan is presented in a white paper, which is available on the website (http://www.csrees.usda.gov/funding/rfas/specialty_crop.html).
- The 2007 Farm Bill exists in 2 versions – one in the House and the other in the Senate. It establishes a national institute for the NRI. High priority research is bio-based research, with \$15M per year mandated funding. Things you can do:
 - Talk to your program director,
 - Volunteer for review panels,
 - Collaborate with bio processing scientists, molecular biologists, horticultural scientists and geneticists,
 - [HTTP//grants.gov/](http://grants.gov/).

Gary Stutte and Mark Romer presented the Minutes of the 2007 meeting in Tuskegee. The members recognized Mark Romer's work on behalf of the committee, which goes far beyond his role as Membership Secretary, with a round of applause.

Gary Stutte reported that the 2007 Meeting Minutes, consisting of 10 pages, are posted on the USDA website (<http://www.nimss.umd.edu/homepages/saes.cfm?trackID=7936>).

Motion to accept the Minutes of the 2007 meeting in Tuskegee: Bruce Bugbee. Seconded: Ron Lacey. All were in favor.

Mark Romer gave a Membership and Website Report.

- There is no real change in the total number of members. Current membership is posted on the website (<http://ncr101.montana.edu/members.htm>). The membership report can be found in Appendix 1.
- Mark Romer had asked for volunteers to update the website. Ted Tibbitts has done this and updates will be posted soon. Mark Romer gave details on the new website.
- The group is now 33 years old.
- Mark Romer suggested that each member site should have one contact person listed on the website. Lynton Incoll supported this. Gary Stutte questioned whether there is a privacy issue associated with naming a contact person. Ramesh Kanwar said he thought a single contact person was acceptable.
- Since 2002, the contributions of selected members have been recognized by the group during the annual meeting. This year, Bruce Bugbee (Utah State University) and Ray Wheeler (Kennedy Space Center) were presented with the “20 Year Member Award” while Dave Tremmel (Duke University) and L.D. Incoll (Leeds University, UK) received the “Significant Contributor Award”. NCERA-101 awards are documented on the group website at <http://ncr101.montana.edu/awards.htm>

Bruce Bugbee raised a question about universities and states that are not represented here, for example the University of Missouri. If parties wish to attend, their funding would have to be approved by their Agricultural Experiment Station Director. We do not have a formal avenue to send an invitation. Bruce Bugbee moved that a form letter be written, inviting participation in the NCERA-101. The letter should be signed by the Chair of the committee. Mark Romer volunteered to write this letter. This discussion led to a call to members to approach individuals and institutions that are presently not represented. Lynton Incoll pointed out that the CEUG (the UK Controlled Environments Users’ Group) poster has an application form attached. Ted Tibbitts said that the formal letter should include the name of a contact person. Gary Stutte suggested we have a small group of the executive committee to work on this. Bruce Bugbee volunteered to work on this issue with Mark Romer. Ramesh Kanwar commented that the model of this committee is to encourage the participation of the private sector in public/private partnerships.

Mark Romer revisited the proposal from 2007 of forming an E-mail forum (discussion group). Over the winter, several sites had been tested and Mark proposed that Google groups be used. The next step would be to send out an invitation letter to the full membership. The option of participating would then be up to individual members. This topic will be deferred due to lack of time.

Bruce Bugbee gave his Instrument Package Report.

- Bruce Bugbee announced the poster on the instrument package and handed out copies.
- The instrument package circulates among the members and it could be sent to the UK or Australia. It contains (among other instruments), the following:
 - Photosynthetic radiation calibration package,
 - Net radiometer (Eppley),
 - Spectroradiometer (very popular),

- Humidity package for calibrating humidity instruments.
- Annual Report – NCERA-101 Instrument Package

Opening Balance	\$ 962
Income (rentals for 2007 – 2008)	\$ 1,800
Expenses (2007 – 2008)	\$ 1,928
Closing Balance	\$ 834.
- A sign-up sheet for those expressing interest in the instrument package was passed around.
- The spectroradiometer has been improved to be more accurate in the UVB.

The surplus from the past meeting at the Kennedy Space Center to buy instruments. Gary Stutte and Neil Yorio are looking at using this year's surplus again for that purpose. The package is stated to be a calibration package but it now contains specialized instruments for "test drives" or one time characterization for growth chambers. Industry could also contribute, eg. Licor.

Bruce Bugbee asked what additional instruments would be useful. Lynton Incoll suggested a discussion group with a question circulated in advance of the meeting so attendees could have a chance to respond. Ted Tibbitts suggested that the rental schedule be posted on the web page and asked whether we could reduce the rental costs if there is a surplus balance in the account. Bruce Bugbee asked if the package would get more use if the cost were reduced. Gerry Deitzer said he thought it would. Ted Tibbitts said that the experiment station director should be approached to pay for the rental. Gary Gardner said that the committee executive should send letter to agricultural experiment station directors offering the instrument package for rental, as an official service of the NCERA-101.

A.J. Both gave a Report on the ICCEG.

- A.J. Both stated that he is actually reporting on a subcommittee of the ICCEG (International Committee on Controlled Environment Guidelines), namely the Tissue Culture Guidelines subcommittee. He requested more interest from the membership, as "new blood" for this committee. There was discussion on the number copies of the Tissue Culture Guidelines (Guidelines for Measuring and Reporting Environmental Parameters for Experiments in Plant Tissue Culture Facilities) brochure that should be printed, and A.J. Both suggested 5000 copies for NCERA-101. Also, 175 small posters should be printed (2 or so per organization). Also, 1 large poster should be printed and made available to the membership to take to meetings.
- A.J. Both asked for funding for the printing costs, specifically if part of the present meeting's surplus could be used. A fallback position would be to go to the industry members for support. This funding approach was already approved at last year's meeting.
- The NCERA-101 website will be updated with the Tissue Culture Guidelines (<http://ncr101.montana.edu/Guidelines/TC-guidelines.htm>). We also need to publicize the guidelines to other organizations and A.J. Both asked for suggestions from the membership.
- On the continuation of the committee, the Tissue Culture subcommittee will be dissolved. Existing members will likely become a part of the ICCEG. A new subcommittee will be formed on Measuring and Reporting Environmental Parameters for Experiments in

Greenhouses. The committee is open to ideas on guidelines development and for other topics. A.J. Both remains chair of the international committee and is asking for new members to participate.

Gerry Deitzer asked if the new Tissue Culture Guidelines brochure will be made available online. A.J. Both responded that the brochure will be mailed out to the membership first and then will be made available online.

Ted Tibbitts asked if 2 small posters per institution are enough and asked for 4 small posters for the University of Wisconsin. Lynton Incoll stated that there may be some institutions that have no members who are interested. A.J. Both stated that he has had no requests for additional copies of the minimum guidelines (Minimum Guidelines for Measuring and Reporting Environmental Parameters for Experiments on Plants in Growth Rooms and Chambers) (<http://ncr101.montana.edu/Guidelines/minimum-guidelines.htm>). Ron Evans suggested that the print version could be made available for download online.

Lynton Incoll gave a report on the offer from Miguel Gimenez, a member of the UK CEUG from Spain, to translate the Plant Growth Chamber Handbook (http://ncr101.montana.edu/Growth_Chamber_Handbook/Plant_Growth_Chamber_Handbook.htm) into Spanish. Miguel Gimenez has sent a letter with his detailed proposal. Lynton Incoll proposed that this letter could be posted on the Google discussion group and that it would also be available to interested parties in Latin America. Ted Tibbitts proposed that the board of directors make a decision on the translation proposal. Mark Romer stated that the translation must be validated. Alex Turkewitsch asked if there is a copyright issue. Mark Romer responded that the Handbook is available on the website, so he doesn't feel there is a copyright issue. Gary Gardner asked who the copyright holder is. It is Iowa State University. A.J. Both stated that NRAES had a similar request from Japan and that the NRAES gave permission but asked for money and asked if we could also ask for funding. Mark Romer asked if the translated book was intended for print publication or for download from a website only. Marc van Iersel suggested that the translation should be made available free of charge. Alex Turkewitsch agreed in that the copyright should be granted subject to the document being freely available. A.J. Both stated that we have talked about updating the book, by going through it chapter by chapter and developing a new edition. Lynton Incoll stated that Miguel Gimenez has already suggested this. Erik Runkle proposed that the executive send a response to Miguel Gimenez accepting his proposal.

Erik Runkle proposed that the meeting be adjourned for dinner and be reconvened tomorrow morning. This could be accomplished by cutting Session F short and working through the break. General discussion followed. Ramesh Kanwar made a motion to adjourn and this was seconded by Ted Tibbitts. All were in favor.

Meeting adjourned March 10, 2008 at approximately 18:00.

Meeting reconvened March 11, 2008 at 09:45.

Discussion started on the distribution of the presentations of this meeting. Several members suggested "sanitized versions", that is, versions of the presentations that would be suitable for

uncontrolled distribution. Lynton Incoll proposed to post abstracts on the website, with clickable pdf links to the author, and that the author would be responsible for and control distribution. Dave Fleisher said the presentations could be web based or distributed on CD. Gary Stutte said that presentations in pdf can be bundled and linked to the existing website meeting program page. Dave Fleisher said he would send an email to all presenters requesting a forward of the presentation in a format suitable for public viewing.

New business:

New business began with the selection of the 2008 – 2009 Incoming Secretary. The nominating committee consisted of Erik Runkle, Gary Stutte and Alex Turkewitsch. The nominating committee nominated Jonathan Frantz, who has accepted the nomination. The nominating committee requested additional nominations from the membership. Ted Tibbitts moved that nominations be closed. Bruce Bugbee seconded. All were in favor. Jonathan Frantz was acclaimed Incoming Secretary of the NCERA-101.

Bruce Bugbee and Utah State University has accepted to host the 2009 Meeting of the NCERA-101. The meeting is to be held at Park City. If we wish to have the meeting in March as usual, this coincides with the end of the ski season and hotel rates are at a minimum \$200 per night. In April, the hotel rates change to \$150. Mid March is OK for most members, and available dates are 7 – 11 March 2009 or 14 – 18 March 2009. Bruce Bugbee described the AERGC (Association of Education and Research Greenhouse Curators) funds and retained money as being in excess of \$40K. Mark Romer asked who manages the money. Gary Deitzer proposed ASPP as a host. Frank Salisbury is still in Salt Lake City and we could ask him to do a keynote address. General consensus was that the 2009 meeting should be held 14 – 18 March 2009. Note: Following the meeting, Bruce confirmed the date of the next meeting to be April 4 to 8, 2009. Erik Runkle asked members who had not yet submitted Station Reports, to do so soon. Alex Turkewitsch requested copies by E-mail.

Erik Runkle opened discussion on participation in GreenSys 2009. One option is to coordinate our meeting at their meeting. The membership has already approved Utah State University in April 2009 as the meeting venue. Chieri Kubota is on the scientific committee of GreenSys 2009. Mark Romer asked if there might be the possibility of organizing an NCERA-101 hosted session. A poll of hands suggested that 25 NCERA-101 members would attend GreenSys 2009. Instead of formal presentations, we could have Station Report type presentations. Marc van Iersel proposed that we pick three topics of interest and have a discussion on each. Erik Runkle proposed to set up a subcommittee to carry discussion of our participation in GreenSys 2009 forward. Erik Runkle, Mark Romer, A.J. Both, Jonathan Frantz and Alex Turkewitsch volunteered as subcommittee members.

Future meetings:

Lynton Incoll presented a proposal for a 4th International Controlled Environments Meeting, to be held at the University of Cambridge in the UK, in 2012. This meeting would be held in September, while avoiding the Labor Day week, possibly the 2nd or 3rd week of September. For example, registration could occur on Sunday September 9, 2012. The presentations would consist of invited papers. Pricing would be about £138 per person for dinner, bed/breakfast and meeting facilities. The meeting would need representation from the NCERA-101 membership.

Erik Runkle asked for comments of concern or endorsement and supports the meeting. Jonathan Frantz asked if this meeting would take the place of our regular meeting for 2012. The proposal is that the meeting would be similar to the 1st International Controlled Environments Meeting, held in September 2001 at the John Innes Institute in Norwich, UK and that it would replace our regular meeting for 2012. Ray Wheeler moved to accept the proposal. Bruce Bugbee seconded. All were in favor.

No other meeting sites were brought forth for 2010 and 2011. Dick Gladon mentioned that Iowa state was working on new facilities and would offer to host the group following their completion.

Erik Runkle handed the gavel over to Gary Stutte as the new Chair of the NCERA-101 committee.

Gary Gardner moved that the 2008 Meeting of the USDA NCERA-101 be adjourned. Ray Wheeler seconded. All were in favor.

Meeting adjourned at approximately 10:15

*Minutes prepared by Alex Turkewitsch, Secretary
November 11, 2008*

Appendix 1

NCERA-101 Membership Summary March 2008

Mark Romer, *List Curator*

Membership NumberApril 2007139
March 2008137

- Additions5
- Deletions7
- Net Gain(Loss) (2)

<u>Membership Composition</u>	<u>Institutions</u>	<u>Members</u>
• Phytotrons & Controlled Environment Facilities	13	17
• University Departments, Agr. Exp. Stations	49	69
• Government Organizations & Contractors	13	17
• Industry Representatives	21	33
• Independent		1
•		
Total Number of Institutions	96	
Total Number of Members		137

New Institutions

Australia

- Kerslake & Associates Pty Ltd

Canada

- McGill University – Department of Bioresource Engineering

USA

- University of Texas A&M – Dept of Biological and Agricultural Engineering
- University of Illinois - Institute for Genomic Biology
- Paragon Space Development Corporation
- Fraunhofer - Center for Molecular Biotechnology
- CETS Tech, LLC

Appendix 2 – Meeting Program

2008 International Meeting on Controlled Environment Agriculture Organized by the North American Committee on Controlled Environment Technology and Use (NCERA-101)

Saturday, March 8

Time	Title
12:00 – 6:00 pm	On-Site Registration (Manatee Ballroom Foyer)
1:00 – 6:00 pm	Poster and Exhibit Setup (Manatee Ballroom D)
3:30 – 5:30 pm	ASHS CEWG Business Meeting (Heron Room)
6:00 – 9:30 pm	Reception (Observation Deck, Oceanside Café)

Sunday, March 9

Time	Title	Author(s)
7:00am – 5:00pm	On-Site Registration (Manatee Ballroom Foyer)	
8:00 – 8:15 am	Opening Remarks (Manatee Ballroom)	Gary W. Stutte David H. Fleisher

Session A: New Approaches for Control and Monitoring Environmental Conditions

Moderator: Tony Agostino

(Manatee Ballroom)

8:15 – 8:35 am	Changing the way light is delivered to plants in controlled environments: Novel practices with LED lighting	G.D. Massa , C.M. Bourget, R.C. Morrow, C.A.Mitchell
8:35 – 8:55 am	Comparing photoperiodic lighting strategies in controlled greenhouse environments	S. Padhye, E. Runkle
8:55 – 9:15 am	Transmission and distribution of photosynthetically active radiation (PAR) from solar and electric light sources for crop production	T. Nakamura , A.D. Van Pelt, D.C. Rossi, B.K. Smith, N.C. Yorio, A.E. Drysdale, R.M. Wheeler, J.C. Sager
9:15 – 9:35 am	Effect of light quality on production of bioprotective compounds in red leaf lettuce	G.W. Stutte , I. Eraso, P. Bisbee, C. Ledeker , T. Skerritt
9:35 – 9:55 am	Integrated light and CO2 control to optimize commercial greenhouse plant growth and energy efficiency	T.J. Shelford , L.D. Albright, D.S. de Villiers
9:55 – 10:15 am	Plant performance monitoring via non- invasive image acquisition and processing	F. Gilmer , A. Walter, A. Ulbrich

10:15 –	Catered Break (Manatee Ballroom D)	
10:40 am		
10:40 –	ENVIRONET®: the next advancement in control technology	H. Imberti [*] , D. Kiekhaefer
10:55 am		
10:55 –	Six highly specialized walk-in chambers with atmospheric gas composition control. A discussion of the challenges and possibilities of multiple atmospheric gas control in walk-in chambers	R. Quiring
11:10 am		

Session B: New Responses / Research Results from Experiments in CEA

Moderator: Erik Runkle

(Manatee Ballroom)

11:10 –	Plant growth and flavonoid content in a red-pigmented <i>Lactuca sativa</i> variety as affected by different light conditions	A. Ulbrich [*] , H. Behn, C. Wieland, S. Tittmann, F. Gilmer
11:25 am		
11:25 –	Supplemental UV radiation differentially increases phenolic acid esters and flavonoids in cultivars of greenhouse-grown red and green leaf lettuce (<i>Lactuca sativa</i>)	C. Caldwell [*] , S. Britz, R. Mirecki, J. Slusser, W. Gao
11:40 am		
11:40 –	Changes in the concentration of some secondary metabolites after treatment with ultra-violet light on St. John's wort, <i>Hypericum perforatum</i>	M.L. Brechner [*] , L.D. Albright
11:55 am		
11:55 –	Enhancing nutritional value of fresh tomato under controlled environments: a summary of collaborative research effort	C. Kubota [*] , C.A. Thomson
12:10 pm		
12:10 –	Catered Buffet Lunch (Manatee Ballroom D)	
1:25 pm		
12:20 –	ICCEG Meeting (Heron Room)	
1:25 pm		
1:25 –	Photosynthetic characteristics and growth of rice plants under red light with or without supplemental blue light	R. Matsuda [*] , K. Ohashi-Kaneko, K. Fujiwara, K. Kurata
1:40 pm		
1:40 –	Effects of duration of temperature perturbations during flowering on tomato fruit	A.J. Both [*] , L.S. Logendra, D.L. Ward, T. Gianfagna, H.W. Janes, T-C. Lee
1:55 pm		
1:55 –	Grapevine physiology in controlled environments	D. Greer
2:10 pm		
2:10 –	Hypobarica, hypoxia and ethylene influence growth and gas exchange of lettuce plants	F.T. Davies [*] , C. He, R.E. Lacey
2:25 pm		
2:25 –	Session B General Discussion	E. Runkle
3:00 pm		

Session C: Non-traditional Applications in Controlled Environments

Moderator: L.D. Incoll

(Manatee Ballroom)

3:00 – 3:25 pm	Guidelines for measuring and reporting environmental parameters in controlled environments used for plant tissue culture experiments	M.P. Fuller [*] , S. Millam, L.D. Incoll
3:25 – 3:40 pm	Biopharmaceutical production under controlled environments: photosynthetic rate, soluble protein concentration and growth of transgenic tomato plants expressing a <i>Yersinia pestis</i> F1-V antigen fusion protein	R. Matsuda [*] , C. Kubota, L.M. Alvarez, J. Gamboa, G.A. Cardineau
3:40 – 4:10 pm	Catered Break (Manatee Ballroom)	
4:10 – 4:25 pm	Plant-made pharmaceuticals: scaling up production	J.H. Norikane
4:25 – 4:40 pm	Waste-energy-leveraged CEA for year-round specialty-crop and bio-fuel feedstock production in temperate climates	C.A. Mitchell [*] , G.D. Massa, C. Alexander, R. Turco, J. Dennis, A. Murphy, S. Weller, B. Bordelon, R. Lopez
4:40 – 4:55 pm	Commercial aeroponic farming of baby leafy greens	E.D. Harwood
4:55 – 5:10 pm	Climate change and controlled environments	M. Stenning
5:10 – 5:30 pm	Session F General Discussion	L.D. Incoll
6:30 – 9:30 pm	Hosted Dinner (Tiki Lawn, Holiday Inn)	

* Denotes presenter.

Monday, March 10

Time	Title	Author(s)
7:00am – 5:00pm	On-Site Registration (Manatee Ballroom Foyer)	

Session D: Novel Instrumentation, Sensors, and/or Analysis Approaches

Moderator: Bruce Bugbee

(Manatee Ballroom)

8:00 – 8:20 am	Estimating carbon use efficiency, growth respiration, and maintenance respiration from canopy gas exchange measurements	M.W. van Iersel
-------------------	---	-----------------

8:20 – 8:40 am	<u>Hands-off sensors: applications of spectral devices to controlled environment agriculture</u>	* G.L. Ritchie , J. Frantz, C. Bednarz, B. Bugbee
8:40 – 9:00 am	<u>Evaluation of two new net radiometers</u>	J. M. Blonquist Jr*., B Tanner, B. Bugbee
9:00 – 9:15 am	<u>Effect of atmospheric pressure on wet bulb depression</u>	* R.M. Wheeler , M.A. Stasiak, J.Lawson, C.A. P. Wehkamp, M.A. Dixon
9:15 – 9:30 am	<u>Large high-output LED arrays for plant growth</u>	* R.C. Morrow , C.M. Bourget
9:30 – 9:45 am	Probing responses of plants by chlorophyll fluorescence under controlled environments	H.M. Kalaji
9:45 – 10:00 am	<u>Automatic and 3-dimensional phenotyping of complete plants in greenhouses</u>	* J. Vandenhirtz , M. Eberius, D. Vandenhirtz, H.G. Luigs, G. Kreyerhoff, U. Bonger, M. Radermacher, H. Lasinger, R. Schunk
10:00 – 10:30 am	Catered Break (Manatee Ballroom)	
10:30 – 10:45 am	<u>Uniformity in soil plant atmosphere chambers</u>	* D.H. Fleisher , D.J. Timlin, V.R. Reddy
10:45 – 11:00 am	<u>Real-time measurement of whole plant transpiration and stomatal conductance using electronic balances and infrared sensors</u>	* B. Bugbee , J. Chard
11:00 – 11:15 am	<u>Monitoring and controlling substrate water content in controlled environments</u>	M.W. van Iersel

Session E: Design and Development of New Facilities

Moderator: Alex Turkewitsch

(Manatee Ballroom)

11:15 – 11:45 am	<u>Engineering in sustainability and innovative development of controlled environments: a UK perspective on refrigerants, achieving efficient systems and energy management</u>	G. M. Waimann
11:45 – 12:00 pm	Description, operation and production of the South Pole Food Growth Chamber (SPFGC)	* R.L. Patterson , G.A. Giacomelli, P. Sadler
12:00 – 12:15 pm	<u>New Bioscience Complex at University of Maryland</u>	G. F. Deitzer

12:15 –	Session E Short Discussion	A. Turkewitsch
12:20		
pm		
12:20 –	Catered Buffet Lunch (Manatee Ballroom)	
1:50 pm		
1:50 –	The Biotron and Guelph's Plant Productivity	E.D. Leonardos, M.J. Iqbal, A.
2:05 pm	Model	Singh, N. Hüner, B. Grodzinski *
2:05 –	Containment level 3 facility for growing	J. Franklin *
2:20 pm	genetically modified plants and plant pathogens	R. Taberer
2:20 –	The Australian Plant Phenomics Facility	T. Agostino
2:35 pm		
2:35 –	Session E Short Discussion	A. Turkewitsch
2:45 pm		
2:45 –	General Poster Session with Break (Manatee Ballroom)	
4:10 pm		
4:10 –	NCERA-101 Business Meeting (Manatee Ballroom)	
5:45 pm		
6:30 -	Hosted Dinner (Mango Tree, Cocoa Beach, FL)	
10:00	Meet shuttle bus at Hotel Lobby	
pm	* Denotes presenter.	

Tuesday, March 11

Time	Title	Author(s)
Session F: Reliability and Quality Control for CEA Facilities		
Moderator: Mark Romer		
(Manatee Ballroom)		
8:15 – 8:40	Quality standards in CE; implications for the user	L. Benjamin
am		
8:40 – 9:00	Performance verification of new research	A. Turkewitsch *, D. Brault,
am	greenhouse facilities	B. Faucher
9:00 – 9:20	Energy efficiency and green technologies in	D. Kiekhaefer *
am	environmental chambers	H. Imberti
9:20 – 9:40	Supervisory control – implications for	A. Mackenzie
am	environmental control systems	
9:40 – 10:00	General Discussion	D.H. Fleisher
am		
10:00 – 10:20	Catered Break (Manatee Ballroom)	
10:20-10:45	Space Life Science Laboratory	S. Vangen
am		
10:45-11:30	Awards (Manatee Ballroom)	M. Romer
am		
11:30 – 12:30	Catered Lunch (Manatee Ballroom)	
pm		

12:30 am	Buses leave for Kennedy Space Center (Meet buses at the Hotel Lobby)
1:00 – 6:00 pm	Kennedy Space Center and Space Life Sciences Laboratory Tour
6:00 pm	Return to Hotel

* Denotes presenter.

Poster Presentations
 (Manatee Ballroom D, March 9 - 11)

Title	Author(s)
Session A: New Approaches for Control and Monitoring Environmental Conditions	
Evaluation of a humidity insensitive sorbent-based air sampling system	* A. Flanagan , D. Braithwaite, T.S. Topham, G.E. Bingham, O. Monje
Predicting night-time low temperatures in unheated high tunnels	* A. Ogden , M. van Iersel
Session B: New Responses / Research Results from Experiments in CEA	
Development of a production system for basil on the International Space Station	* A.R. Beaman , R.J. Gladon
Harvest index of 'Rocky' cucumber plants (<i>Cucumis sativus</i> L.) grown in elevated CO₂ is not different from 'Rocky' cucumber grown in ambient CO₂	* L. Crosby , E. Peffley, L. Thompson
Modified field environments for high latitude crop production	* M. Karlsson , J. Werner
The potential for autotoxicity of root exudates in commercial hydroponic lettuce (<i>Lactuca sativa</i>) production	* N.S. Mattson , L.D. Albright, M.L. Brechner
Research plants in controlled environments – does green waste compost make a reliable alternative substrate to peat?	* G. Pitkin , R. McHutchon
Effect of light quality on growth of <i>Salvia miltiorrhiza</i> Bunge	* Q. Li , Z.-S. Liang
Effects of a new cyclical lighting system on flower induction in long-day plants: a preliminary investigation	* M.G. Blanchard, E.S. Runkle
Session C: Non-traditional Applications in Controlled Environments	
Isotopic labeling of red cabbage anthocyanins with atmospheric ¹³CO₂ in closed environments	* C. Charron, S. Britz , R. Mirecki, D. Harrison, B. Clevidence, J. Novotny
Effect of elevated CO₂ and harvest schedule on <i>Allium</i> biomass and sensory quality of <i>Allium fistulosum</i>	* A. Broome , E. Peffley, L. Thompson, D. Wester
How to measure and report growing conditions for experiments in plant tissue culture facilities	ICCEG

Session D: Novel Instrumentation, Sensors, and/or Analysis Approaches

Maintaining and quantifying drought stress in containers J. Chard, B. Bugbee*

Session E: Design and Development of New Facilities

[Energy saving measures in controlled environments at Rothamsted Research](#) I. Pearman, J. Franklin, G. Waimann*

Session F: Reliability and Quality Control for CEA Facilities

[Containment of quarantined insects](#) R. Natt

[Growth chamber maintenance costs and factors influencing equipment longevity, reliability and operating quality](#) M. Romer*, C. Cooney, F. Scopelleti, G. Orr

[A risk analysis of the production of hydroponic babyleaf spinach with respect to *Pythium aphanidermatum*](#) T.J. Shelford*, L.D. Albright

* Denotes presenter.

Wednesday, March 12

Post Meeting Tour of Central Florida Foliage Plant Industry

Guide: Wayne Makay, Ph.D. Director and Professor

**University of Florida, Mid-Florida Research and Education Center,
Apopka, Florida**

7:45 am	Buses leave for Apopka (Meet buses at the Hotel Lobby)
8:00 – 9:30 am	Transit to Mid-Florida Research and Education Center, Apopka, FL
9:30 – 10:30 am	Mid-Florida Research and Education Center, Apopka Florida http://mrec.ifas.ufl.edu/
10:30 – 11:00 am	Board buses/Transit
11:00 – 12:00 am	Hermann Engelmann Greenhouses, Ranges # 8/9, Apopka Florida www.exoticangel.com
12:00 – 12:30 pm	Board buses/Transit
12:30 – 1:30 pm	Lunch at Hermann Engelmann Greenhouses, Range # 6, Apopka, Florida www.exoticangel.com
1:30 – 2:00 pm	Board Buses/Transit
2:00 – 3:00 pm	Delroose Plants, Apopka, Florida www.derooseplants.com/en/over_us.asp
3:00 – 3:15 pm	Board Buses/Transit
3:15 – 4:15 pm	Agristarts, Inc, Apopka, Florida www.agristarts.com
4:15 – 6:00 pm	Board Buses and return to Holiday Inn, Cocoa Beach, FL
