Minutes of the 2010 NCERA-101 Business Meeting
(Sunday, March 21, 2010 8:00 am to 12:30 pm)

NCERA-101 Members and Conference attendees:

Curtis Adams (Utah State Univ.), George Adamson (Ontario Scientific), Tony Agostino (CSIRO Australia), Lou Albright (Cornell), Edward Ashworth (Univ. Maine), Matt Blanchard (Mich. State Univ.), Ganesh Bora (North Dakota State Univ.), A.J. Both (Rutgers Univ.), Melissa Brechner (Univ. Cornell), Bruce Bugbee (Utah State Univ.), Stephanie Burnett (Univ. Maine), Hannah Carey (Univ. Wisconsin-Madison), Dick Christensen (Bayer Crop Science), Kristen Curlee (Dow Agrosciences), Michael Doyle (PP Systems), David de Villiers (Cornell), Maryanne Fisher (St. Mary's Univ.), David Fleisher (USDA-ARS), Jonathan Frantz (USDA-ARS), Gary Gardner (Univ. Minn.), Martin Gent (CT-AES New Haven), Richard Gladon (Iowa St. Univ.), Robert Hansen (Ohio State Univ.), Blair Harlan (Michigan State Univ.), Ed Harwood (Aero Farm Systems), Alec Hay (Utah State Univ.), Stephen Hess (Monsanto), Douglas Hopper (Colorado State Univ./Achieving Solutions), Lynn Hummel (Univ. Wisconsin-Madison), Henry Imberti (Percival Scientific), Murat Kacira (Univ. Arizona), Laura Kalambokidis (Univ. Minnisota), Meriam Karlsson (Univ. Alaska), Bruce Kettner (BioChambers), Ananda Kraemer (Rough Brothers), Andre LaForge (Stanford Univ.), John Lea-Cox (Univ. Maryland), Mark Lefsrud (McGill Univ.), Arvid Lekies (Univ. Wisconsin-Madison), Peter Ling (Ohio State Univ.), Gioia Massa (Purdue Univ.), Neil Mattson (Cornell), Cary Mitchell (Purdue Univ.), Bob Morrow (ORBITEC), Michael Mucci (Guelph Univ.), Joey Norikane (Fraunhofer CMB), Mike Nuccio (Syngenta), David Oconnor (Syngenta), Ellen Paparozzi (Univ. Nebraska), Chris Parry (Utah State Univ.), Reg Quiring (Conviron), Sharon Reid (Conviron), Mark Romer (McGill Univ.), Erik Runkle (Mich. State Univ.), John Sager (EGC), Carl Sams (Univ. Tennessee), Carole Saravitz (NCSU Phytotron), Keith Sauter (Apogee Inst.), Tim Shelford (Cornell Univ.), Philip Sheridan (Cycloptics), John Snider (Univ. Arkansas), Arny Stankus (EGC), David Story (Univ. Arizona), Richard Straub (Univ. Wisconsin-Madison), Doug Sturtz (USDA ARS Toledo), Gary Stutte (NASA-Kennedy), Marc Theroux (Biochambers), Ted Tibbitts (Univ. Wisconsin-Madison), Richard Tuck (Cycloptics), Alex Turkewitsch (Greenhouse Engineering), Peter Vanderveer (Univ. Wisconsin-Madison), Marc van Iersel (Univ. Georgia), Yuxin Wang (Cornell Univ.), Ray Wheeler (NASA-Kennedy), Thomas Whitten (Univ. Wisconsin-Madison), John Wierzchowski (EGC), Dave Wilson (independent), Andy Witherell (Univ. Wisconsin-Madison), Yang Yang (Dow Agrosciences), Neil Yorio (NASA-Kennedy), Wayne Zimmerman (Conviron),

Executive Officers :

Chair: Alex Turkewitsch (Greenhouse Engineering), Vice-Chair: Jonathan Frantz (USDA ARS Toledo), Secretary: Marc van Iersel (Univ. Georgia)

Alex Turkewitsch called the meeting to order at 8:15 am and welcomed the members of the NE-1035 group. Stephanie Burnett, chair of NE-1035 was not present to introduce NE-1035.

Peter Vanderveer welcomed everyone on behalf of the program committee. He announced that a group picture will be taken on the rooftop at noon. For the evening's dinner, there will be shuttle buses in front of the hotel.

Alex Turkewitsch thanks Peter Vanderveer and Bob Morrow for organizing this meeting and announces that Ted Tibbitts will give a talk on the history of NCERA-101 in the afternoon, when NE-1035 members will be present. Tony Agostino from Australia will give a presentation on the development of a new CSIRO facility on Monday.

Gary Stutte announces the 1st Meeting of the American Council for Medicinally Active Plants, which will be held at Rutgers (20-23 July 2010). Gary Stutte also gives a brief history of this council. There is overlap in the interests of this council and NCERA-101, for example in the area of biologically active compounds in plants.

Marc van Iersel announces GreenSys 2011, Greece. This meeting focuses on greenhouse production and engineering issues. Abstracts are due this summer.

Jonathan Frantz announces the upcoming lighting conference. Information about this meeting has already been sent out to the group.

Richard Straub (University of Wisconsin), on behalf of Ramesh Kanwar, gives the administrative advisor's report. He commends the group on holding a joint meeting with the NE-1035 group and recommends doing this periodically to tap into synergy between these two groups. He also announces that the NCERA-101 project expires in 2011 and needs to be renewed. The new project proposal to continue this project is due this fall. Several deadlines need to be met to renew the project. The most important deadline is December 1, 2010, when the complete proposal is due. This is a hard deadline. Richard Straub mentions changes in USDA-NIFA. NIFA is increasingly interested in big science type projects, with an emphasis on larger synergetic, broad projects.

Dan Schmoldt was not able to attend and to give the CSREES Representative Report. John Lea-Cox made some comments for Dan Schmoldt and mentions that there have been changes USDA. NIFA (National Institute for Food and Agriculture) is a new USDA institute. USDA hopes that NIFA will raise the profile of its research programs and that this will result in larger research budgets. Mandatory USDA spending is decreasing, with more money going to AFRI, USDA's large competitive grant program. Other programs are being rolled into AFRI. There likely will be more of an emphasis on large multi-institutional grants, with budgets of $5 - 10 million. The Specialty Crops Research Initiative will remain as a separate program at least for next few years, while other programs are combined in AFRI.
USDA has five new areas of emphasis: agricultural competitiveness, nutrition and obesity, climate change, food safety, and energy security. The expected 2011 budget

for AFRI is expected to be $262 million, with a long–term goal of up to $800 million. All programs are going to be trans-disciplinary. The new AFRI RFPs are now coming out and there may be very short timelines for proposal development.
The Specialty Crops Research Initiative program has been funded for $230 million over 5 years, and there already are discussions about renewing it in the next farm bill. SCRI does not get as many food safety projects as they would like, so this may be a promising area for proposal development. SCRI proposals need whole system approaches, trans-disciplinary, and stakeholder involvement. There also needs to be a strong extension/education component.
The number of SCRI applications was down in 2010 and it was not clear why. Many of the funded projects have been resubmissions, so it is important to not give up if you do not get funded.

John Lea-Cox then gave an overview of his funded SCRI project and provided some tips and tricks for putting a successful grant together. The website for this project is www.smart-farms.net, which hopefully will become interactive. John Lea-Cox gave a general overview of project, and emphasized that this project is an integration of engineering, plant science and economics with co-operators from various universities, companies, greenhouses and nurseries. The project is trans-disciplinary and multi-institutional.
A good plan of governance is essential and needs to be included in the proposal. Such a plan is easy to write, but harder to actually implement. PIs from each institution are responsible, since they have their own funding. Accountability is critical.
It is critical to work closely with advisory panels. A good advisory panel can be very valuable.

1:1 matching is required and has to be from non-federal sources. The USDA office of management and budget goes over the matching funds to identify any lacking or incorrect matching issues. There was very little time to fix these matching issues, due to USDA deadlines. These matching issues are very complicated, but can include foregone indirect cost by universities. Faculty salaries are important part of match, as well as industry contributions, which can be in-kind. John Lea-Cox advises to include a project manager into the grant to ease the burden for the PI. The project manager can help with communications, both internally and externally. John's group uses Adobe Connect for internal communications. Traction is used as virtual work environment for discussions and information exchange. An on-line knowledge center is already in place and allows for interactive learning. The use of this site can be tracked using Google analytics, which helps to quantify use and impact.

Gary Gardner asks for examples of matches not allowed. John Lea-Cox answers that it is not always clear why some matches get rejected, since USDA's OMB doesn't give a clear reasoning. Grower matches have to be clearly defined, for example with a per square foot charge for greenhouse and nursery space.

John recommends that when you put teams together for SCRI projects, work with people you trust.

Cary Mitchell seconds the comments about the importance of partnerships. Such partnerships need to be established well in advance.

Gioia Massa asks how long the application process takes.

John Lea-Cox: In year 1, it took 3 months to write the proposal. The team received very thorough reviews with a fast turnaround. In year 2, the proposal was submitted April 15, and he heard about funding early July. USDA's OMB waited till September to discuss budget issues, with an Oct. 1 deadline to finalize the funding. Thus, there was little time to resolve budgetary issues.

Alex Turkewitsch mentioned that the NCERA-101 renewal process has to be started. We have the previous renewal proposal, which can be used as starting point. However, that proposal needs to be updated. Someone needs to spearhead this task. The previous proposal was written mainly by David Fleisher.
David Fleisher volunteers to help with doing this and mentions that getting all the paperwork together is hardest part.
Erik Runkle mentions that the format of the station reports has been changed to make it easier to get all the information together.

Marc van Iersel mentions some of the deadlines that need to be met. The first deadline, submission of a request to write a new proposal, is on September 15, 2010. The entire, completed proposal and all renewal participant Appendix E forms are due no later than December 1, 2010. The proposal will be reviewed during the winter and spring of 2011. If approved, it will start on October 1, 2011.

Alex Turkewitsch goes over the format of the last proposal. It is not quite clear whether the format of the proposal has changed.
John Lea-Cox suggests that the opening narrative of the proposal should fit into the five global USDA objectives.
Gary Stutte mentions that a lot of the required information can be cut and pasted from station reports, consolidating them into a single report and volunteers to help.
Gary Gardner suggests emphasizing industry involvement in NCERA-101, including possible mention of how equipment designed been impacted by these meetings. And how has extension been impacted by these meetings, since participation goes well beyond researchers?
Alex Turkewitsch mentions that this meeting is very important to him, since it really helps with his continuing education.
Gioia Massa suggests that the renewal proposal mentions that many others (non-USDA reps) attend this meeting, so the impact goes well beyond actual USDA reps.
Mark Romer agrees. Since the whole group contributes, many people or groups who are non-USDA representatives submit station reports. Many industry members participate in the process as well.

Alex Turkewitsch mentions that we need a leader to take on the task of writing the renewal proposal. Dick Gladon volunteers to head up this effort. He is the official rep from Iowa, Ramesh Kanwar's home institution. Jonathan Frantz volunteers Marc van Iersel and himself to help with proposal.

Bruce Bugbee suggests that we should develop an eloquent statement that describes the unique capacity of this group, which can be used in other contexts as well.

Jonathan Frantz presents the minutes of the 2009 meeting in Park City to the group. The draft minutes have been on the website. He asks for corrections to minutes, and there are none.
A.J. Both moves to accept minutes, Ray Wheeler seconds, and the minutes are approved unanimously by hand vote.

Mark Romer gives the annual membership report. There currently are 150 members, from 104 institutions, 29 states, and 8 countries, with several new people attending this year (see attachment). We now have a letter of invitation, which can be used to recruit new members for this group. The chair is responsible for sending these letters. If someone has a need for such a letter, they should contact the current chair.

Mark Romer than gives an update on Google Groups. This discussion group is currently functional, started in May 2009. 68 people signed up for this group as to date. There has been very little activity in this group. One of the problems is to make sure that people are aware of new postings. Currently the Google Groups site is not very effective. Often postings to this group get e-mailed to the general membership as well, so there is a duplication of effort. One of the things that has been discussed on Google groups is potential topics for the 2012 meeting in England and Lynton Incoll sends his thanks for this input. To participate in Google groups, people need to send an e-mail to Mark Romer who will add them to the group. Everyone can set up what digests they receive. Mark Romer asks whether all group members should be added to Google groups, whether they want to or not. Some e-mails communications would continue, but especially for topics where feedback is required Google Groups is a better tool.
Erik Runkle suggests that perhaps official reps from each station/company/institution should be included in Google Groups.
Gary Gardner motions that 1) everyone should initially be part of group, 2) people can opt out, 3) and official announcements will be sent out by e-mail. Bruce Bugbee seconds the motion.
Peter Vanderveer asks whether Mark Romer would sign up everyone. Mark Romer replies that he would need to send out an e-mail telling people that they will be added. He can then add everyone's e-mail address to Google groups. Perhaps people can opt out after the initial e-mail.
The motion is approved by a show of hands.
Mark Romer will continue to moderate the Google group. Companies have been very good about not using site for advertising, and the goal of the group is information exchange.

Mark Romer announces that the Duke Phytotron has cleaned out their closets, and provided a variety of reports for people to take home.

Alex Turkewitsch asks who would like to give an oral station report. 20 members indicated they want to present. There will be enough time for 10-minute slots with 5

minute buffer. Those who want to give an oral report need to sign up for a time slot after the coffee break.

Coffee break.

Mark Romer gives a brief history of the website, which was started by Dave Tremmel. The website has the group's history, as well as a separate page for each member, which can be updated by the members. The website has been expanded to include guidelines for growth chambers and tissue culture. The growth chamber handbook is on-line as well. The website was initially hosted by Duke, but transferred after Duke was no longer a national facility. Tracy Dougher (Montana State) took over the web site at that point. She has been adding station reports and member information. A major upgrade was made several years ago to include the last international meeting at KSC and more history. Tracy Dougher has requested that we find someone to take over website. A volunteer is needed to take over these responsibilities, and we need a new host for the website. Perhaps we should consider our own domain? The current site is 400 MB, not very large. Mark Romer opens the floor to discuss new domain site.

John Lea-Cox asks about costs of domain name. George Adamson mentions that he paid $119 for a 10 year renewal. Bruce Bugbee mentions that this money can easily be found and suggests that an '.org' name (perhaps www.controlledenvironments.org) may be best.

Bruce Bugbee suggests that site should be managed through a university and John Lea-Cox mentions that he already has an '.org' site that he runs at the University of Maryland.

Bruce moves that we set up an '.org' website and proposes that we name it www.controlledenvironments.org. John Lea-Cox mentions that www.controlledenvironments.org is available.

A.J. Both mentions that our USDA project number may change, and perhaps a more permanent name, without referring to our NCERA-101 project number, may be needed. Mark Romer suggests that the original NCR101 name be maintained, because of the history associate with it.

Bruce Bugbee amends his own motion: the group will get its own domain name, ending in '.org'. The exact name will be determined later. The motion is approved by hand vote.

Bruce Bugbee then motions that we get multiple URLs that all go to the same site. Mark Romer suggests perhaps ncr101, ncera101, and controlled environments.

Erik Runkle mentions that current website already comes up as #7 in Google search for controlled environments.
Dick Gladon asks whether 'plant' should be in name since that's our focus. George Adamson indicates that info is relevant beyond plant environments. Gary Gardner

suggests that name and pointer web sites should wait until we have someone who will take over websites.

Mark Romer asks for volunteers to take over the website and Carole Saravitz at NC State volunteers. This gets approved by unanimous vote.

Bruce Bugbee gives the instrument package report (see attachment) and reviews the purpose of this package. It is a revolving instrument calibration package, and users should use it to calibrate their own sensors. There are four different packages available. Traditionally the cost has been $300/package, but it now has dropped to $100/package. Alec Hay administers the instrument package. There are two groups of users: industry members who don't contribute much to the groups as a whole and others (group members).
There is an issue with *PPF* calibration package which currently consists of three Li-Cor quantum sensors, which are 10 years old. The sensors suffer from 'blue drift', reading too low in response to blue radiation (see attachment). This appears to be a general problem with Li-Cor *PPF* sensors as they age and can result in inaccurate measurements. *PPF* sensors can be rebuilt by replacing the photodiode ($220/sensor). Calibration issues with Li-Cor sensors can be detected by comparing measurements under metal halide versus HPS lights. When Li-Cor recalibrates, they do not take 'blue drift' into account. If the error is less than 5%, Li-Cor simply recalibrates rather than suggesting photodiode replacement. When getting sensors recalibrated, people should ask specifically about blue drift.
Cary Mitchell asks about terminology, whether it should be called blue drop, rather than drift. Bruce Bugbee agrees and mentions that this problem may be common to all photovoltaic cells. Even if the cell is not being used, this happens. This simply results from sensor aging, not UV or other environmental conditions. This is an insidious problem when the sensor is used as reference standard. Light measurements are very important because plants are very responsive to differences in light (much more so than other environmental conditions). Even sensors with blue drift can be used for relative measures, or light on/off measurements.
Bruce Bugbee also mentions the 'clear sky calculator' (www.clearskycalculator.com) that can be used to calculate outside light on clear days. These calculations are accurate to within 1-2 %. Those data can be used to check whether sensors need to be recalibrated.
The spectroradiometer is the second most used package, popular to characterize light sources, filters, etc.
The third most used package is the net radiometer which can measure shortwave and longwave radiation.
The least used is the relative humidity package.
The instrument package had a balance of about $477 one year ago, but the surplus from the KSC meeting has now been transferred into this account. The surplus from the Park City meeting also been added to account. The current balance is $13,792.22.
Cary Mitchell asks about how long a sensor is 'new', i.e. when does blue drop start.
Bruce Bugbee isn't sure, but suspects it may be after 7-8 years.
George Adamson asks if sensors should be dated so it's easier to track their age.
Bruce Bugbee mentions that currently the serial number is the only way to track sensors. However, Apogee has the calibration date on the cable.

Gary Gardner asks about the required repair of the spectroradiometer. Bruce Bugbee explains that this was related to a problem in the fiber optic cable, which got damaged. There is a question about adding CO2 to the calibration package. Bruce Bugbee mentions that the easiest way to calibrate CO2 sensors is to use a NIST traceable CO2 mix. Nitrogen gas or CO2 scrubbers can be used for 0 ppm. There does not seem to be a need to add a CO2 sensor to the calibration package. Ted Tibbitts mentions that CO2 standards are not always reliable. Bruce Bugbee feels that CO2 standards have gotten much better in recent years

Alex Turkewitsch asks whether Bruce Bugbee is comfortable maintaining these funds in Utah State University account. Bruce Bugbee does not mind doing this. The main work for Bruce is to do the annual accounting.

Alex Turkewitsch states that the question of what to do with the current surplus needs to be addressed. Mark Romer mentions that there is a related issue under new business and this discussion should wait till then.

Bruce Bugbee points out that the real money flux in group is associated with organizing the meetings, which have total budget around $25,000. Bruce suggests that some of the money in the current account could be used as buffer for future meetings, in case a meeting has a budget shortfall. Ted Tibbitts points out the importance of corporate sponsorship for the annual meetings. Gary Stutte explains that strong corporate contributions helped to produce the surplus of the KSC meeting. Those contributions show that industry values these meetings. Bruce Bugbee explains that the corporate contributions allow organizers to pay for some things that would otherwise not be possible. Mark Romer states that he does not want to make it an obligation for organizers to give a detailed accounting of the meeting. We should be grateful that people are willing to organize this meeting.

Peter Vanderveer indicates that the overall budget for the 2010 is pretty similar to that of previous meetings. Signing the contracts last April was daunting, because there was no guarantee that the required income would actually materialize.

Update on the activities of the international committee for controlled environment guidelines (ICCEG) by A.J. Both. A.J. Both mentions that this committee was started in 2001, to develop minimum reporting guidelines for growth chambers, which were completed in 2004. Brochures with these guidelines are still available. In 2004, tissue culture guideline project was started, and these were published 4 years later. In 2008, a suggestion made to start developing greenhouse guidelines. The goal is to have these guidelines in place for the 2012 meeting in the UK. This topic has been discussed at previous NCERA-101 meetings, as well as GreenSys 2009. At GreenSys, the decision was made that the outline at that point was too much focused on engineering and a new outline has been developed. This new outline is based on Royal Heins' suggestion to focus on five areas (see attachment). A.J. Both asks people to look at this outline and

asks for people to volunteer to work on one of these five areas. Five groups will be formed with a lead to internally discuss guideline development. Later this will be integrated into one set of guidelines. There also needs to be an individual to lead overall project and communicate with all five groups to assure a coherent outcome. Activities need to start soon to meet 2012 deadline.
Ray Wheeler asks whether we are also soliciting people from the UK and Australasia.
A.J. Both: yes, we already have people from UK, not yet from Australasia
Richard Straub asks whether these guidelines could be written under auspices of ASHRAE or ASABE.
A.J. Both: Likely not, since that would add considerable complexity

New Business

<u>New incoming secretary</u>
The nominating committee (Alex Turkewitsch, Jonathan Frantz, Marc van Iersel) nominates Peter Ling for incoming secretary. Peter has agreed to accept. Alex Turkewitsch asks for nominations from the floor. There are none.
Ray Wheeler moves to accept Peter Ling's nomination. Dick Gladon seconds. Approved by hand vote.

<u>Use/management of surplus funds from meetings</u>
Gary Gardner emphasizes that we would lose money without corporate membership and that it may be hard for universities to transfer funds from one university to another. He feels we need good representation in Cambridge and suggests the use of surplus funds to support student and post-doc travel to the UK meeting. This would support organizational goals of group.
Alex Turkewitsch mentions that he would like to keep about half of the current balance as a buffer for future meetings.
Mark Romer explains that the UK meeting will have a different model, with a more solid scientific program. We have been asked to supply funding for invited speakers coming from our group. Some of our current surplus may be required to support American speakers.
Ted Tibbitts mentions that official experiment station representatives may get travel funding from their experiment stations. Bruce Bugbee states that experiment stations may not support international travel. Richard Straub explains that experiment stations can support international travel if they wish to do so. Erik Runkle points out that different stations have different approaches.
Alex Turkewitsch mentions that there is no need to make decisions at this stage since UK meeting is 2 years away. Bruce Bugbee reiterates that there is no problem in keeping surplus funds at USU.

Gary Gardner proposes that next year's executive committee should present a proposal on how to use some of these funds to support the UK meeting and expresses the opinion that these funds should not be used to help plan our annual meeting, but rather as a buffer if a particular meeting has a shortfall.
John Lea-Cox states that in the past student travel awards have been tied to short proposals.

Ray Wheeler reminds everyone that for the Australian meeting, there was grant funding available. Chieri Kubota took the lead on these grant applications.
John Lea-Cox mentions that there has been support for meetings through SCRI, but such meetings need to be tied to SCRI proposal development.
Gary Gardner points out that USDA and NSF have grant programs to support travel to international meeting. Perhaps such proposals can be submitted. Some of the information from the renewal proposal could be used for these travel grant applications.
Mark Romer points out that some of this NSF/USDA funding can be used for international participants as well, since he has received NSF travel funds in the past.
The effort to do develop proposals needs to start now. Chieri Kubota's counsel would be very valuable.
Peter Ling asks whether these proposals are for groups or individuals, and Gary Gardner explains that these proposals would be for groups, but each proposal has a single PI.
Gary Stutte explains that Chieri Kubota wrote the proposal on behalf of the NCERA-101 group. The funds were then distributed through the University of Arizona.
Toni Agostino mentions that in Australia there is considerable money for international scientific exchanges. There may be similar programs in UK and the group should contact Lynton Incoll.
John Lea-Cox asks whether there is overhead associated with such grants and Gary Gardner replies that there is not.
Alex Turkewitsch mentions that the executive committee will follow up on these issues and look into funding opportunities.

Future Meetings

Mark Romer starts with an update on the 2012 meeting and relays information he got from Lynton Incoll. They have booked a venue in Cambridge (Downing College) in East Anglia, which is easy to reach from London. This site is within walking distance of CE facilities and the new plant science facility. The meeting also will be close to the botanic garden. The cost to delegates will be: B&B accommodation and meals: $550-700 and a registration fee of about $125, so the price seems to be very reasonable.
The program will follow the format of 2001 meeting, with invited review talks, about 25 minutes long. There will be eight sessions with 20 speakers, who will cover the historic background of topics. There will also be poster sessions and a trade exhibit. The full scientific program still needs to be developed.
The plan is to pay the expenses of all speakers ($15,000), excluding their travel. To pay for these expenses, the contributions from exhibitors will be used. NCERA-101 has been asked to help provide funding for American speakers.
The post-conference tour will visit modern commercial facilities, botanical gardens, and hopefully Kew gardens. Lynton thanks us for contributing discussion topics.

Jonathan Frantz discusses potential discussion topics for the UK meeting. The group was asked last year to provide topic ideas, which were then discussed in our Google group. There were lots of suggestions as part of this discussion. Jonathan Frantz consolidated these topics into several key issues. Lighting was the hot topic, perhaps split into two topics. Jonathan Frantz provided a handout consolidated listing; eight different, sometimes related, topics. Jonathan Frantz then asked people to vote for their

top three topics. He will tally votes and report back to the group. If people have additional topics, they can add them to the voting sheet.

Gary Gardner mentions the increasing emphasis on growing plants in high tunnels and asks whether there are any reporting standards related to high tunnels.

John Lea-Cox supports this as an important topic, and would like to expand this to monitoring in outdoor environments as well.

Gary Stutte asks what will happen after the votes are tallied. Will there be additional discussion?

Jonathan Frantz replies that yes, after voting, there will be additional discussion, including speakers to invite, as well as discussion of creative new ideas that may come up. But at this stage the UK CEUG simply wants ideas and suggestions.

Gary Gardner mentions that there are lots of issues related to neutral versus foliage shade. This topic would fit under lighting issues. Ultra-violet would be of interest as well.

A.J. Both mentions that focusing on review presentations favour the invitation of more senior people. It would be nice to include some younger speakers as well.

2011 Meeting

Mark Romer mentions that we currently have no host for next year's meeting and calls for volunteers.
Dick Gladon volunteers to host the 2011 meeting. They will have new greenhouses going up, which could be toured. Meeting perhaps would be co-hosted by Percival Scientific.
Alex Turkewitsch mentions that the 2012 meeting will be in fall and asks whether we should move the 2011 meeting to May, just after end of semester. That would decrease the duration between subsequent meetings.
Dick Gladon suggests the 2nd weekend in May as a possible date.
Alex Turkewitsch asks for a show of hands of who would like those dates for the next meeting. There is general agreement that this would be a good date. Marc van Iersel mentions that he likely would not be able to attend. Mark Romer volunteers to take over the role of vice-chair for this meeting, if Marc van Iersel cannot attend.

Dick Gladon mentions that biofuels are an important topic in Iowa and wonders if the groups would be interested in touring biofuel facilities? Members indicate interest in such a tour.

Mark Romer moves that Iowa organizes a fantastic meeting for 2011. AJ Both seconds and the motion is unanimously approved.

Alex Turkewitsch asks for volunteers to organize the 2013 meeting. Cary Mitchell indicates interest at Purdue, perhaps together with Dow AgriSciences.

Alex Turkewitsch announces the graduate student poster session from 3 -5 pm on Monday during the wine and cheese reception. Jonathan Frantz mentions that there are four students in the competition one from the University of Arizona, two from Utah State University, and one from Arkansas (note: John Snider from Arkansas ended up winning the student competition).

Alex Turkewitsch hands over the gavel to Jonathan Frantz at 12:25 pm, and welcomes Peter Ling to executive.

Ted Tibbitts moves to adjourn the meeting, Henri Imberti seconds, and the motion is accepted unanimously.

Respectfully submitted,

Marc van Iersel

Selective blue drift of quantum sensors

Alec Hay and Bruce Bugbee

March 2010 NCERA-101 meeting

Silicon photodiodes are known to decrease more rapidly in response to blue light than to longer wavelengths (Korde and Geist, 1987). Older quantum sensors thus appear to calibrate accurately using the LI-COR 1800-02 Optical Radiation Calibrator, but may under-report radiation in the 400 – 500 nm wavelengths (blue) due to degradation of the silicon photodiode in the sensor.

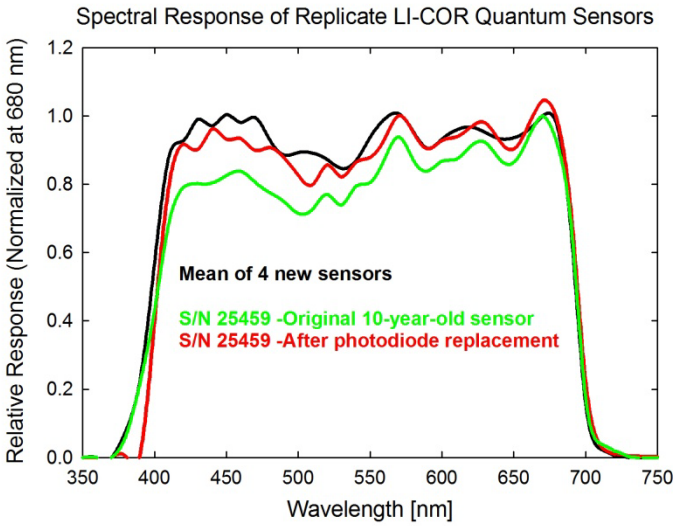
This has been observed in all three of the LI-COR LI-190 quantum sensors used in the NCERA-101 Quantum Sensor Calibration Package. These ten-year-old sensors (sn about 25000), have been stored under cool, dry laboratory conditions and are calibrated multiple times each year. Over time, we have observed that the sensors read low under fluorescent lights when compared to new LI-COR sensors. During the past two years all three of the original sensors have required replacement of the photodiode. We have also added a fourth, new sensor.

Silicon photodiode output is reduced over time in two ways:

1) General degradation, characterized by a reduction in output across the entire 400 - 700 nm bandwidth. To correct this, the calibration multiplier is increased.

2) Selective degradation in the blue (400–500 nm) wavelengths. This cannot be corrected by increasing the calibration multiplier.

Positive diagnosis of this blue drift must be made using a monochromator. However, a field diagnosis can be made by comparing the output of the sensor in question under light sources with a low and a high fraction of blue light. Compare the output under high-pressure sodium lamps to the mean of 3 newer, recently calibrated, quantum sensors. Then compare the sensors under cool-white fluorescent lamps. If the older sensor is more accurate under HPS than CWF it is likely due to selective blue drift.



A sensor with selective blue drift will need to have the photodiode replaced by LI-COR. You should clearly instruct LI-COR to check for blue drift and replace the photodiode if their monochrometer test indicates blue degradation. LICOR does not replace photodiodes until the overall error in calibration is greater than 5%. The sensor represented by the green line at the right, originally passed the LICOR calibration test, but was rebuilt at our request.

Korde R. and Geist, J. 1987. Quantum efficiency stability of silicon photodiodes. Applied Optics 26:24: 5284-5290.

NCERA-101 Instrument Package Account

Budget Report March 2009 – 2010

Beginning Balance $ 477.36

Income

- Transfer from Dynamac for 2008 meeting in FL	$ 13,235.19
- Remainder from Park City meeting	$ 2,186.00
- Instrument Rental income	
Four rentals of one instrument	$ 400.00
Michigan State University	
University of Wisconsin	
Percival Scientific (x2)	
- One rental of two instruments	
University of Laval	$ 200.00
	$ 16,021.19

Expense

Instrument Package Maintenance / Repairs

• (LI-COR) Quantum sensor photodiode replacement	$ 617.15
• (Stellarnet) Spectroradiometer repair	$ 453.59
• (Campbell Scientific) Relative humidity sensor recalibration	$ 575.04
• Annual Credit Card service fee	$ 184.00
• Postage	$ 166.55
• NCERA-101 registration and plane fare (Alec Hay)	$ 710.00
	$ 2,706.33

Current Balance $ 13,792.22

NCERA-101 Membership Summary …… March 2010

Mark Romer, *List Curator*

Membership Number .....April 2009 145
March 2010 150

- Additions.....6
- Deletions 1
- Net Gain(Loss).....5

Membership Composition	Institutions	Members
• Phytotrons & Controlled Environment Facilities	13	17
• University Departments, Agr. Exp. Stations	53	79
• Government Organizations & Contractors	14	16
• Industry Representatives	24	37
• Independent		1

Total Number of Institutions .....……103
Total Number of Members 150

New Institutions

Canada

- Alberta Agriculture and Rural Development – Greenhouse Crops

USA

- University of Alaska – Department of High Latitude Agriculture
- University of Arkansas – Department of Crop, Soil & Environmental Sciences
- University of Tennessee – Department of Plant Sciences
- University of Wisconsin-Madison - College of Agriculture and Life Science
- Dow AgroSciences
- Cycloptics Technologies LLC

Guidelines for Monitoring and Reporting Environmental Parameters for Experiments in Greenhouses

Radiation

Definitions (e.g., waveband, intensity, integral)
Measurements (location, frequency, processing, recording)
Sensors (make, model, principle of operation, precision, accuracy, calibration)
Sources (sunlight, other sources, output, energy consumption)
Impact of the greenhouse structure (e.g., transmission, shadow bands)
Impact of the growing system (e.g., distribution, uniformity)
Impact of the environmental control strategy (e.g., supplemental lighting, shading)
Impact on plant growth (photosynthesis)
Impact on plant development (photoperiod)
Impact on plant morphogenesis (spectral characteristics)

Temperature

Definitions (e.g., heat transfer coefficient)
Measurements (e.g., location, frequency, processing, recording)
Sensors (e.g., make, model, principle of operation, precision, accuracy, calibration)
Heating, ventilation, and cooling systems (e.g., capacity, distribution, energy consumption)
Impact of the greenhouse structure (e.g., heat transfer rates)
Impact of the growing system (e.g., air movement)
Impact of the environmental control strategy (e.g., Day/Night, vernalization, DIF)
Impact on plant growth (e.g., photosynthesis)
Impact on plant development (e.g., flower induction)

Gases (including water vapor)

Descriptions (e.g., purity)
Measurements (e.g., location, frequency, processing, recording)
Sensors (e.g., make, model, principle of operation, precision, accuracy, calibration)
Enrichment/removal systems (e.g., concentrations, rates, mixing)
Impact of the greenhouse structure (e.g., tightness)
Impact of the growing system (e.g., distribution, uniformity)
Impact of the environmental control strategy (e.g., targets, frequency, quantity)
Impact on plant growth (e.g., photosynthesis, respiration)
Impact on plant development (e.g., pollutants)

Water

Specifications (e.g., composition)
Measurements (e.g., location, frequency, processing, recording)
Sensors (e.g., make, model, principle of operation, precision, accuracy, calibration)
Irrigation systems (e.g., overhead, drip, sub-irrigation)
Impact of the growing system (e.g., distribution, uniformity)
Impact of the environmental control system (e.g., frequency, quantity)
Impact on plant growth (e.g., leaf expansion)
Impact on plant development (e.g., uptake, translocation)

Nutrients

Descriptions (e.g., composition, form)
Measurements (e.g., location, frequency, processing, recording)
Sensors (e.g., make, model, principle of operation, precision, accuracy, calibration)
Distribution systems (e.g., application method, mixing, concentrations)
Impact of the growing system (e.g., distribution and availability in the growing media)
Impact of the environmental control system (e.g., targets, frequency, quantity)
Impact on plant growth (e.g., deficiency, toxicity)
Impact on plant development (particularly N and P)