SUMMARY:
As part of the NCAR-funded Careers in Science (CiS) program, representatives of NCAR’s Earth Observing Laboratory (EOL), the Center for Severe Weather Research (CSWR) and UCAR/Spark conducted two targeted education and outreach programs in Fall 2010 and 2011 with the intent to expose students of accredited post-secondary minority serving institutions to career opportunities within the areas of science and science support. Under the motto “science needs more than just scientists,” events consisted of a mix of videos, presentations, hands-on demonstrations, Q&A activities and small group interactions with the CiS team that all emphasized the need for a wide range of skill sets, backgrounds and job categories in support of scientific research. In addition to support from the NCAR Diversity Funds, the CiS team also obtained funding from the NSF Deployment Pool to take along one of the Doppler On Wheels (DOW) for hands-on demonstrations. The CiS team visited three colleges in the greater Chicago from 27 to 29 October 2010, and five colleges in the greater Front Range and Southeastern Wyoming area between 27 October and 18 November 2011. All in all, the CIS team reached approximately 450 high school and college students in the course of eight days.

EVENTS:

<table>
<thead>
<tr>
<th>College</th>
<th>Visit</th>
<th>Location</th>
<th>Student Numbers</th>
<th>CiS Team</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elmhurst College</td>
<td>27 Oct 2010</td>
<td>Chicago, IL</td>
<td>50 College Students</td>
<td>Rockwell, Daniels, Salazar, Tsai, Barnes, Kosiba, Walker</td>
</tr>
<tr>
<td>College of DuPage</td>
<td>28 Oct 2010</td>
<td>Chicago, IL</td>
<td>81 College Students</td>
<td>Rockwell, Daniels, Salazar, Tsai, Wurman, Kosiba, Walker</td>
</tr>
<tr>
<td>Wilbur Wright Community College</td>
<td>29 Oct 2010</td>
<td>Chicago, IL</td>
<td>52 College Students</td>
<td>Rockwell, Daniels, Salazar, Tsai, Wurman, Kosiba, Walker</td>
</tr>
<tr>
<td>Front Range Community College</td>
<td>27 Oct 2011</td>
<td>Boulder, CO</td>
<td>17 College Students 2 Teachers</td>
<td>Baeuerle, Daniels, Lim, Ranson, Schwenz, Wurman, Walker</td>
</tr>
<tr>
<td>Western Wyoming Community College</td>
<td>8 Nov 2011</td>
<td>Rock Springs, WY</td>
<td>125 High School Students 5 College Students 10 Teachers</td>
<td>Rockwell, Daniels, Barnes, Brown, Gobulieski, Wurman, Kosiba, Arnold</td>
</tr>
<tr>
<td>Arapahoe Community College</td>
<td>18 Nov 2011</td>
<td>Littleton, CO</td>
<td>20 College Students 1 High School Student 7 Teachers</td>
<td>Rockwell, Baeuerle, Barnes, Brown, Tudor, Wurman, Kosiba, Arnold</td>
</tr>
</tbody>
</table>

Each visit followed a general script but was also adjusted to accommodate the expressed interests and needs of each school, the targeted audience and any lessons learned during previous interactions. Events usually started with the showing of the UCAR introductory video to put CiS activities into a larger context and to describe the importance and relevance of atmospheric sciences. The video was then followed by two presentations - the first one given by EOL staff with focus on scientific platforms and instruments and the people who design, develop, and build them; the second one given by CSWR staff with focus on hurricane and tornado research, and an in-depth look into carrying out observational research under adverse weather conditions. After a short break, students were split into smaller groups to explore the radar truck, deploy tornado pods, watch a balloon launch and follow the collection of soundings data, as well as inspect a variety of meteorological instruments that are routinely used in atmospheric research. Several of the schools offered lunch after the event to encourage additional interactions between the students and the CiS team. A concerted effort was made to have a mix of gender, ethnic backgrounds and education among the CiS team members to represent NCAR as a diverse organization and reach a wide range of students.

For a more detailed description of each event, see Appendix I and II of this document.

ASSESSMENT AND LESSONS LEARNED:
The team has mixed feelings about the CiS activities and success of the program for several reasons:
(1) The diversity of EOL, UCAR and CSWR staff represented during CiS had positive impacts in that we were able to connect with a wide variety of students. It was clear that students were more easily drawn into small group discussions with someone they could relate to, be it gender, race, age, or career path. Having a diverse staff represent CiS was a key to its success.

(2) Providing a variety of learning styles – videos, multi-media presentations, hands-on demonstrations, and small group or one-on-one discussions – allowed for the CiS team to connect with a variety of learners, resulting in a more effective learning experience for the students.

(3) Several students expressed interest in exploring the field of research meteorology and atmospheric science and conveyed their appreciation for having the opportunity to explore career options and to see research instruments for themselves. A 17-year-old high school student said, “I want to be a research meteorologist. I wanted to see the actual stuff they use to do the research”.

(4) When we first set out to implement the CiS program, we were targeting accredited post-secondary minority institutions in the Eastern and Southeastern part of the United States. From the start, this turned out to be more difficult than anticipated – most of our inquiries were received with little to no interest, in many cases because the CiS focus on atmospheric sciences didn’t fit well into existing school curricula. In the end, we only visited one school – Wilbur Wright Community College – that truly represented our original target audience; the remaining schools had ethnically, racially or socio-economically diverse student bodies but did not fall into the category of minority serving institution.

(5) Despite a one-year extension, we had a hard time scheduling CiS events during the academic calendar that also worked well for CSWR and EOL staff. Our original goal to align CiS activities with other DOW educational deployments to the East Coast for efficiency and cost reasons, however this was only successful in 2010. Additionally, a large number of high priority activities across the lab in 2011 significantly limited our flexibility and the window during which CiS activities could be implemented.

(6) From the beginning, the CiS team was well aware of the fact that communicating with high school and college students can be a challenge. As we gained experience and received honest feedback from students, teachers and observers, we continuously adjusted the CiS presentations to move away from the more traditional information deficit mode to a more engaging and interactive approach. Additionally, CiS team members participated in the NSF Workshop “Communicating Science: Tools for Scientists and Engineers” to further improve and practice science communications. Nevertheless, we noticed more than once that we had misjudged our audience and that issues we personally considered relevant were of little to no relevance to the students we tried to reach. This was especially apparent when the audience consisted of primarily high school rather than college students.

(7) At the onset of CiS we agreed to frame our message in a way that would show that careers in science are interesting and rewarding and are carried out by a wide range of people with different skill sets and interests. Over time though the message changed and became more focused on internship and career opportunities for students at NCAR, of which there are not many. As a result, we were not successful in describing a clear pathway to the types of careers and internships we presented. The majority of students we reached out to were not qualified to apply for any of the UCAR/NCAR opportunities we promoted. The EOL Technical Internship Program (TIP) was a direct result of the 2010 CiS activities and now provides a limited number of career opportunities to college students in the wider Front Range area.

(8) During both tours, the DOW proved to be the main attraction for most students, many of which had seen the radars on either the Weather Channel (VORTEX II) or the Discovery Channel (Storm Chasers). We all agree that without CSWR participation, the number of students reached would have been much lower.

(9) The success of CiS was also dependent on a number of factors that were seemingly beyond our control but could have been addressed ahead of time. In hindsight, we would have benefitted from a more active involvement in the promotion of an event that goes beyond phone calls and email and a preliminary site visit to each school to determine their set-up and multi-media availability as well as face-to-face interactions with teachers to get to know the environment and student population.

(10) The success of E&O events such as CiS is hard to evaluate and it will take years to establish close relationships with some of these schools. WWCC is the most active in seeking such a relationship. After the visit, we were asked by the college to provide a speaker for their March 2012 “Wyoming Math, Statistics and Physics Conference”, where Rich Loft presented on the NCAR-Wyoming Supercomputing Center. In addition, Mike Daniels was asked to speak at their May 2012 “Computer Science Showcase”. Finally, WWCC has expressed interest in working closely with NCAR on cyber infrastructure developments in the near future. Last year we had two separate groups of students from DuPage visit NCAR as a result of the CiS tour to Chicago in 2010 and the personal connection that some of the team members made with teachers and students there.

**CONCLUSION:**

Even with an overall positive experience, the CiS team decided to end Careers in Science activities in their current form and return the remaining funds to the NCAR DO. While we had very high hopes for this program, each CiS event required significant time and effort by many people but didn’t translate into significant and tangible results that justified such efforts. As discussed above, the assessment of how successful the event proved to be quite challenging but the feedback from students and teachers was indispensable. The next generation workforce clearly has unique communications requirements in a fast-paced, highly technical and online world. CiS hopefully planted a seed for the next generation of students entering the workforce, and we will need to continue cultivating relationships with target institutions to see results. A positive outcome of this is that rather than only pursuing focused, stand-alone events, EOL has learned that we need to integrate CiS elements as part of other E&O events carried out during future field campaigns. Much of the material has been developed and can be customized as needed, and staff will already be in the field to participate in
events on site. We expect the lessons learned and materials developed over the course of CIS proposal to be an integral part of future opportunities to reach the next generation workforce in the important area of scientific support. As another follow on to CIS, three technical interns in EOL will be hired and perhaps these materials and connections can lead to a continuation of the Technical Internship Program as an annual event that will result in sustainable connections to this new workforce in the future.
APPENDIX I - CAREERS IN SCIENCE – CHICAGO – FALL 2010

The Careers in Science team visited three colleges in the greater Chicago area during a three-day period from October 27-29, 2010. The objective of the event was to visit several minority institutions in the area to provide information about and encourage students to enter various careers in atmospheric sciences. During each visit we showcased a variety of jobs that are essential to support field campaigns, illustrated the nature of field campaigns by using VORTEX II as an example, and provided hands-on demonstrations of the Doppler on Wheels (DOW) after the initial presentation and discussion.

Each of the three schools was different with respect to their familiarity with atmospheric sciences and the departmental support we received. The schools covered ranged from a 2 year college to a 4 year college; private college to a community college; a school with a well developed meteorology program to a school with only an introductory class to a community college with no meteorology classes. Only one school already had a working relationship with a university with a strong atmospheric science program.

We learned very quickly that we needed to customize our presentation each time to meet the needs of those varying audiences, and to get additional background information about the student body ahead of time:

- Is there a meteorology program at the school?
- How many and what classes are offered?
- Is it a two-year or four-year school?
- Do they offer bachelors degrees?
- Do our internships apply to the student body? Do they have the credentials needed in order to apply to our programs?
- Does the school already have a working relationship with an atmospheric science program at an accredited university?

The Careers in Science team requested and obtained funding from the NSF Deployment Pool to take along one of the Center for Severe Weather Research (CSWR) DOWs for show and tell. A large part of the excitement and draw to each event was due to the “fame” associated with Discovery’s Channel Stormchasers series, which involves CSWR and the mobile radars. Without a doubt, the events would not have been as successful if the DOW and CSWR staff were not present. Having Karen Kosiba and Josh Wurman (both CSWR Scientists) talk about the VORTEX field campaign and having the DOWs available for the students to see and explore brought the event nicely together. The students were exposed to one of NSF’s most “famous” observational facility right after the EOL presentation that covered NCAR, field projects, the facilities we support and the careers it takes to support atmospheric field campaigns. Without the hands-on demonstration, some of the material may have been lost on the students.

The diverse group of people from NCAR who visited these colleges and participated in the presentation was also an integral part of the success. Peisang Tsai, Vidal Salazar, Mike Daniels, Tim Barnes and Alison Rockwell not only shared their enthusiasm and excitement for atmospheric sciences, but also showcased NCAR’s diverse work force. During the DOW demonstration when the NCAR staff had the opportunity to mingle with the students there were obvious self-groupings of students to staff. Students seemed much more comfortable approaching and talking with someone who they could relate to. For example, several women came to Alison and Pei to ask questions, Latino students seemed more comfortable talking with Vidal, and Tim Barnes was surrounded by African American students. The social time, whether during the DOW demo or when the team had lunch with the students, was also an important facet of the event as it provided the opportunity for students to talk with the NCAR and CSWR staff one on one. The two components of having the time to talk with the students on a more personal basis, plus having the diversity of staff for the students to choose from, was an essential aspect of the success of the event.

ELMHURST COLLEGE: WEDNESDAY, OCTOBER 27, 2010
Elmhurst is a 4-year private liberal arts college, with one Introduction to Meteorology class. Justin Hampton, the instructor who helped set up this event, was a former student of Dr. Bob Rauber of the University of Illinois, which is how the contact was made.

A total of 36 students came to the indoor presentation on Careers in Science and VORTEX/DOW, and about 50 students attended the outdoor DOW Hands-On Demonstration. The team attracted a few more people during the DOW demo due to the large gathering of people at the trucks. The majority of the students at the indoor presentation were students from the Introduction to Meteorology class. The student base is only about 8 weeks into their meteorology class, and most of the students were English majors. There were some high school students who attended but it was not clear how they had heard about the event or how many high schools they represented.

The announcement email was sent out to 11 Elmhurst College instructors in related departments. Twenty posters and 20 fliers were sent out to Justin Hampton to be distributed around the school. Alison spoke with many Elmhurst College staff in the weeks prior to the visit with hopes that they could help promote the event including the Director of Career Education; Associate Dean of Students; Director of Multicultural Groups; and Director of Communications & Public Affairs. The posters were posted outside of the cafeteria at the school, and theoretically in many other locations around campus. Additionally, a mass email went out to the entire student body announcing the event the day before the event.

While the school only offers one meteorology class right now - Introduction to Meteorology - Justin Hampton plans to work on developing a meteorology minor in the school’s Geosciences Department. We are hopeful that this event served as a stepping stone to help with this process.

The following articles were written about the event in the local news sources:

- http://beautyfuljobs.com/tag/doppler
- http://home.cod.edu/newsEvents/newsDetails.aspx?Channel=%2FChannels%2FAdmissions%20and%20Campus%2FWide&WorkflowItemID=c671ac4e-8d7f-4de1-a0f0-21159b273d1c

Summary: This 4-year private college with no developed meteorology minor or major provided a great opportunity for EOL to engage students early on in their college careers, and describe opportunities that they may have not considered before. While the school does not have many socio-economically disadvantaged students, there were many from minority groups, both ethnicity and gender.
Once the Elmhurst event was finished, the group got together later that afternoon to revisit how the day went, made adjustments to the presentation, and assigned additional points that each individual speaker would cover in each of the presentations.

**College of DuPage:**

**Thursday, October 28, 2010**

- Alison Rockwell
- Peisang Tsai
- Vidal Salazar
- Mike Daniels
- Karen Kosiba
- Justin Walker

The College of DuPage is a 2-year college that offers Associate’s degrees and many certificate programs. The school has a very well developed meteorology program within their Associate’s of Science Degree / Earth Science Program, including two well-equipped storm chasing vans. Paul Sirvatka, who was referred to by Raj Pandya of the SOARS program, was EOL’s contact there.

The students were all very enthusiastic about us being there, and clearly had a strong understanding of atmospheric science judged by the level of questions that they were asking during the presentation.

The presentations were held in a large classroom. Students were sitting on the floor and standing in the back, which definitely made it crowded, but also helped to create a more informal atmosphere. The EOL presenters seemed a bit more relaxed that day and the students were quite comfortable asking lots of questions. A total of 81 students attended the presentations on Careers in Science and VORTEX/DOW, and 50 students were at the DOW Hands-On Demonstration. It was quite chilly that day, so the cold weather may have deterred some people from attending.

The school helped promote the event extensively, as seen from the list of advertising venues below:

1. LED signs
2. Plasma screens
3. News release to local publications (local, regional and national)
4. Public Service Announcement (PSA) to local cable/radio stations
5. Posting on College’s web site
6. Posting on College’s online Events calendar
7. Posting on student portal
8. Green Sheet (internal weekly publication)
9. COD This Week Good News (President’s weekly newsletter)
10. Arranging for photography of event
11. COD Happenings radio program (weekly on WDCB – Fridays at 6:20 p.m.)
12. Social media outlets (as applicable) [http://home.cod.edu/newsEvents/SocialMediaCOD.aspx](http://home.cod.edu/newsEvents/SocialMediaCOD.aspx)
13. Follow-up photo caption to media/posted on web site
One person (http://www.nctv17.com/) came to take pictures and potentially write an article about the event.

There was a high level of interest in the EOL internship opportunities. We also went out to lunch with about 18 students, which gave us additional opportunity to talk with students one on one about other ways to get involved in EOL and atmospheric science. We encouraged them to request the DOW for an educational deployment since they have a well-developed meteorology department, and followed up upon our return to provide the necessary documentation and instructions.

The following articles were written about the event in the local news sources:

• http://www.pioneerlocal.com/elmhurst/news/2846892,em-doppler-102910-s1.article
• http://www.chicgonow.com/section/news-opinion/weather/Doppler/
• http://home.cod.edu/newsEvents/newsDetails.aspx?Channel=%2fChannels%2fAdmissions+and+Campus+Wide&WorkflowItemID=c671ac4e-8d7f-4de1-a0f0-21159b273d1c

Summary: The level of interest and knowledge, lead by a strong Earth Sciences & Meteorology program, made this a good school to promote not only the Careers in Science program and EOL internships but also the opportunity to promote the educational deployments of NSF Observing Facilities such as the DOWs.

At least 20 females attend the presentation, and about as many students from a variety of underrepresented ethnic backgrounds - African American, Indian, Pakistani, and Asian. While this may not have been the most ideal school for our target audience for the proposal, there was definitely a large percentage of minority students present at both the presentations and DOW demonstration.
degree. Still others come to improve their ability to speak and write in English, to develop specific job skills, or to take a new career direction. As a result, a large percentage of the students who attended the presentations were adult learners, most likely taking classes to enhance their careers or earn a certificate to enter the work force with credentials.

The event was held on a Friday, a day when most students do not have classes and therefore allowing more people to attend. Fifty-two people attended the presentation in the auditorium, and about 40 people attended the DOW demo. The presentation was given in a large auditorium with a large projector screen and a microphone. This more formal setting possibly created a less approachable environment for the students, which is perhaps why fewer questions were asked and why we had less interaction with the students at this event than the others. Five high school students plus a teacher came from the Chicago High School for Agricultural Science for the entire event. Breakfast and lunch were provided to those students who signed up for the event.

This presentation was more focused on technical aspects of jobs within atmospheric science rather than the actual science being done. The audience asked many questions afterwards about the types of degrees or skills needed for such jobs. We promoted the NCAR internships that we offer, which in hindsight was probably less useful since most of Wilbur students are not going to enroll in a four-year undergraduate program.

There was a surprising sense of skepticism coming from the students as they asked questions. At times it was hard to completely understand what they were actually asking – the reasons ranged from obvious language barriers to students not getting the answers they were looking for to uncertainty about how they could take advantage of some of our opportunities.

Summary: Wilbur was our original target audience for the Careers in Science diversity proposal - it was the only accredited minority institution that we visited. Pretty much everyone in the audience came from a socio-economically disadvantaged background.

Unfortunately it became obvious that we were not prepared with the right responses or the right opportunities for this demographic. There was an obvious gap between the student’s skill base and offerings at the school and the internships we offer and the career types that we promote. Perhaps NCAR and/or EOL could develop a different type of internship that is more closely focused on technical/mechanical aspects needed, for example, in the machine shop or in the radar development group. We also realized that the individual presenters have to know more details about available internships within the organization that are outside of EOL.

CAREERS IN SCIENCE: LESSONS LEARNED

1. We need to be sure that we connect the right opportunities with the appropriate groups, or offer additional opportunities for the targeted student base of a school. For example, we went to a 2-year community college that specializes in certifications and some Associate’s degrees, but very few if any of our opportunities are open to those students.

2. We may want to consider developing a pilot program for a truly technical internship – either in DFS or in the technician group (radar, aircraft). The focus of the Careers in Science proposal is to attract students from accredited minority institutions into the field of meteorology. Most of the students at these schools are there because it is within their means and interests. The students at these colleges are primarily looking at technical and mechanical degrees and
certifications but most of them are probably not going to pursue an advanced degree in meteorology. It would be great to have them continue on that track but steer them into considering working in the field of atmospheric science.

3. We need to be able to describe a clear path of opportunities and possibilities that students can take in a technical career. We can offer them a summer engineering internship, but what would be next?

4. While focusing primarily on NCAR and EOL, the presentation could be expanded to also include career opportunities at other types of organizations, such as forecasters at NOAA/NWS, EPA, Weather Channel, Military, TV/Radio, Education and Universities, Private Companies (Excel etc).

5. While the EOL staff is intimately familiar with the opportunities offered by EOL, the same cannot be said for other NCAR-offered internships and programs. Some familiarization and homework can take care of this.

6. The focus of the presentation and demo should not be to promote the EOL/NCAR internships, but really to promote the careers in science - truly as an outreach event.

7. The background of each school needs to be investigated in greater depth. For instance, we should find out what type of meteorology program the school offers? Do they already have a feeder school? What are the backgrounds (educational path) of the students who will most likely attend the event?

8. We should investigate whether there are ways we can encourage these schools to request educational deployments even if they have very little experience in meteorology. What help could EOL provide to make this successful?

9. Incorporate a balloon launch or MGAUS along with DOW for educational deployment.

10. We need to collaborate with other non-NCAR (e.g., CSU CHILL, CSWR, Storm Peak) organizations when developing a technical/mechanical internship program

11. The overall flow of each day worked well, but it became apparent that an informal session (whether it be lunch or coffee/snacks) where students and presenters could interact one-on-one also should be included in the formal schedule. Without such informal sessions, this one-on-one questioning/interaction took place during the DOW show-and-tell, which worked fine, but at the College of DuPage, an impromptu lunch with the students/professors was much more productive for answering questions and/or directing students to opportunities.

12. Include other opportunities such as ASCENT (too advanced?), GRASP, etc.
APPENDIX II- CAREERS IN SCIENCE – FRONT RANGE – FALL 2011

SUMMARY:
The Careers in Science (CiS) team visited four schools in the greater Front Ranges area, including one school in Southern Wyoming, during the month of November 2011, reaching close to 300 people. One of the objectives of the Careers in Science program is to visit accredited post-secondary minority institutions, however there are none located in Colorado. The reason for targeting Colorado students was to encourage them to apply to a new EOL internship that was created to attract and inspire young adults into a technical career. The Technical Internship Program (TIP) was developed in response to a lack of opportunities for this type of student, and to create an opportunity for them that is not currently offered.

While there are no accredited postsecondary minority institutions in Colorado, there is no lack of diversity. We targeted diverse schools in the greater-Denver area in order to attract a qualified applicant pool for the TIP. We found the student body of the schools to be ethnically, racially and socio-economically diverse, as well as well-prepared to enter the work force in a vocational or technical career.

The main message of the CiS presentation was that science needs more than just scientists, with an emphasis on the critical jobs in order to conduct atmospheric science field campaigns. We wanted to take the mystique away from science, and let the students know that they do not have to be scientist to be involved in science.

The CiS events each started with at least an hour-long presentation, then followed by the hands-on demonstration. The presentation portion prepared the students for the upcoming demonstration, and the demonstration helped to reinforce what they had just heard in the presentation, therefore both the presentation and demonstration were enhanced by the other. The demonstration of the instruments certainly helped to seal-the-deal, so to speak.

The presentation consisted of the new UCAR introductory video Air. Planet. People., followed by a talk that focused on EOL, the instruments that we use and the types of people that we need to design, develop, and maintain them. The remaining time of the presentation was for the Center for Severe Weather Staff to talk more specifically about a field project, namely VORTEX, to give the students an in depth look at doing atmospheric science field research.

Schools in the Colorado Front Range were located using Google searches for local vocational and technical colleges, and were initially contacted in August 2011. Several responded so there was no need to continue searching for interested schools in the area. Boulder TEC was selected due to prior contact with them regarding the Technical Internship Program, and Western Wyoming was contacted due to having a prior relationship with them and EOL’s Summer Undergraduate Engineering Internship Program.

ASSESSMENT
Measuring success for outreach events has historically been a challenge. There are so many factors that are beyond our control that influence how many people even attend an event like this, such as how well it was marketed to whether the event was a class requirement or not. Once someone has participated in the event, it is still difficult to ascertain precisely how it did or did not influence them.

We can simply provide numbers as far as how many attended each event, and how many applicants we get for the various internships that we offer. Even that is not an accurate assessment of whether or not the event was impactul or not. Perhaps the event struck a chord with a student however it is not realized in a tangible manner for many years to come. So much of assessment relies on immediate outcomes and results that the lasting long-term effects are often overlooked. It is important to keep in mind that education and outreach efforts can not always be measured quantitatively, but need to be assessed and monitored over a period of time. If we reached 10% of the students and they get involved with geoscience in some way, the CiS team would consider that to be a success.

If the Technical Internship Program gets a participant from the CiS events that were held in the greater-Denver area, that would be a mark of success.

EVENTS:
### Break-Out Group Stations

**Up, Up, and Away! Balloon Launch Data :: Bill Brown**  
Students looked at real-time data of the balloon that was just launched. This proved to be an effective way to have students look at data and graphs. The connection between the balloon that was just launched from their school parking lot to seeing the data that it was collecting was very real to them.

**Interesting Instruments :: Chris Golubieski & Laura Tudor**  
Students had the opportunity to get close to and touch some of the instruments used to collect data. This provided them with the opportunity to get up close and personal with research tools and get a better handle of what engineers and technicians design and develop on a daily basis.

**Computer Geeks At Work :: Mike Daniels**  
Mike Daniels gave a summary of the types of different computer related jobs that are needed to support atmospheric science - from software engineering to radar display. His main message was that it really isn't as hard as it looks, in an effort to let the students know that they can do this!

**Explore the Doppler On Wheels :: Josh Wurman & Andrew Arnold**  
The Doppler on Wheels proved to be the main attraction for most participants, which is why it was requested for the Careers in Science events. The excitement, for some, was having seen it on the Discovery Channel's Storm Chasers reality TV show, some found the big truck with a radar on the back to be cool, others simply like the excitement of chasing tornados. Regardless of why the students collectively thought the DOW was one of the best parts of the event, the CiS team hopes that it made a lasting impression and that the students now have a better understanding of what instruments and technology is involved with conducting atmospheric science.

**What's a Tornado Pod? :: Karen Kosiba & Andrew Arnold**  
Tornado pods are a great piece to show students during the hands-on demonstration because they really can experience them. After the presentation of how they work, when and why they use them, students who want can try to lift them and see what it’s really like to deploy them. Understanding how the pods work in conjunction with the DOW, along with intensity that surrounds their deployment, the students certainly learned about this array of instruments.

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### Western Wyoming Community College | Tuesday, November, 8

Rock Springs, Wyoming

**Staff:**
- Alison Rockwell
- Mike Daniels
- Tim Barnes
- Bill Brown
- Chris Golubieski
- Josh Wurman
- Karen Kosiba
- Andrew Arnold

The event at Western Wyoming Community College (WWCC) was the first stop on the CiS Front Range tour, and where we had the largest group and the longest event. About 130 students from two local high schools, Rock Springs and Green River, electively came to the event, with 10 of their teachers, and only about 5 WWCC attended.

When the initial CiS email went out, this school responded in minutes, indicating that they would love to host an event for their students. EOL has had a positive relationship with this school in the past in that they provided the first students for the Summer Undergraduate Engineering Internship Program. For that reason, it was hopeful that there would be a strong interest from their student body. Unfortunately only about 5 WWCC students attended all or part of the event.
The morning portion of the event lasted about 2 hours, consisting of several speakers, multi-media presentations, and question and answer sessions. We knew that 2 hours would be a long time for students to sit and watch presentations, so we tried to keep the presentation moving along with several videos, different speakers, and provided ample opportunities for them to be engaged and ask questions. The questions that they asked indicated that they were interested and paying attention:

- How do you name tornados? Hurricanes?
- Do you love your job? What is your favorite part of your job?
- Where do you mainly go to collect data?
- How much does your smallest sensor cost?
- Have you ever lost anyone? Rescues anyone?
- How long until you get results from when you collect data?
- Were you able to collect data from the Joplin tornados?
- What kind of computer programs do you write to make this research happen?
- Would an applied mathematics major be a good background for me to pursue a career in atmospheric science?
- How long can the planes fly? How long are they in the hurricane?

Lunch was designed to be casual, in an effort for the EOL/CSWR to mingle and talk with the students. The hands-on demonstrations lasted for two hours after lunch. With the amount of people, the Cis staff found it difficult to mingle and sit with groups. It was noted that the high school students are not as willing or eager to sit and talk with adults during their free time.

9:30am-11:30am Presentations
- Air. People. Planet.
- Careers in Science presentation
- Q&A
- CSWR presentation
- Q&A

11:30am-12:30pm Lunch

12:30pm-2:30pm Hands-On Demonstrations
- Everyone watched Weather Balloon Launch
- Students broke up into 5 groups and rotated through the stations at 20 minute intervals
- Computers Geeks at Work
- Tornado Pods
- Interesting Instruments
- Up, Up, & Away! Balloon Launch Data
- Tour the DOW

Notes:
WWCC was initially contacted with the idea of offering the CiS event to their college students, as that was who the program was targeting. The school did put forth effort in order to attract their students such as posters about the event throughout their campus, however the end result was not as expected. Only about 5 WWCC students came to the hands-on portion of the event. From observing the crowd in the presentation there were no CCWW students present.

CCWW did however contact two local high schools who brought many interested students to the event. The high school students were not exactly who we were trying to reach, however they are a population who we like to engage with, and they certainly benefitted from the event. Perhaps we should explore this approach for future efforts a a way to connect with high school students, which has proven to be difficult in the past.

The CCWW auditorium for presentation left nothing to spare. The sound system group helped to set up the computer and audio in the sound booth in the back of the auditorium, while the screen on the stage went from the floor to the ceiling and spanned the width of the stage. The production team that they provided was outstanding, which made for a great delivery of the presentation.
The CiS event was clearly not promoted or marketed well at ITT Tech. The Thursday before the event, the person coordinating the event indicated that he just got permission from the administration to hang the posters around the single building campus, after having had the poster in his possession for several weeks. Having spent a short period of time in their building, I only saw one black and white photocopy of the poster hanging in the women’s bathroom. He also tried to go around to individual classroom on Thursday evening to tell students about the upcoming Monday event. Additionally, ITT Tech only holds classes in the evenings and our event was from 9:30am-11:30am, so there were no students already at the campus, they would have had to make a special trip for the event. However, 2 ITT Tech students did attend the event.

Fortunately we did have a class of 28 students from a local Hispanic high school, Escuela Tlatelolco. A few of the students were very interested in our program, and one student had worked for the National Weather Service launching weather balloons the summer before, so this event was particularly exciting for him.

The CiS event was scheduled for two hours with a lunch afterwards, so we had the presentation for the first hour followed by the hands-on demonstrations. The presentation in the classroom was a bit altered due to lack of audio connection from the computer to the speaker system, therefore no videos could be played.

The hands-on demonstration consisted of everyone watching the balloon launch, then breaking up into 3 groups and visiting three stations:
1. DOW & tornado pods
2. Looking at the balloon launch data
3. Table of instruments

Lunch was kindly provided by ITT Tech for everyone back in the classroom. This provided time for the students to ask additional questions, however we still had the classroom structure of “teachers” standing up front and students sitting facing the front of the room. The students asked some great questions like “what brought you to where you are today”, and the three school teachers seemed to dominate the Q&A session with their questions. The lead teacher did a great job relating some of the topics that we talked about to what the students are currently learning in their science class.

Notes:
Overall, I would have to question the effectiveness of this particular event. Perhaps more communication with the school staff who is setting up the event to ensure it is being marketed and promoted would have helped. Asking to have someone to help with A/V set up would have made the presentation smoother. Asking more questions about the high school population would have been good too. Some of the students from the high school were ESL learners, so they had a teacher shadowing them to translate.
8. Josh Wurman
9. Karen Kosiba
10. Andrew Arnold

The 75-minute presentation was held in the school cafeteria, with 78 students and 13 teachers in attendance. The presentation followed a similar flow from the other events: Air. Planet. People. video, CiS talk, CSWR talk and then Q&A session. The students were from a variety of classes such as automotive repair, cosmetology, and computer science.

The hands-on demonstration followed the presentation, with everyone watching the balloon launch and then breaking up into three rotation groups - the DOW tour, interesting instruments, and observing the balloon launch data. Many of the students did not come prepared with a coat or warm clothes, so several went inside early due to the cold and windy weather, while other groups simply rotated through the stations at their own pace.

However, there was a noticeable draw to Chris Golubieski’s display and talk about the various instruments that he brought. His talk was very engaging, enthusiastic, and clearly resonated with many of the students. Students were less likely to leave his station and move on to the others.

ARAPAHOE COMMUNITY COLLEGE | FRIDAY, NOVEMBER 18
Littleton, Colorado

Staff:
1. Alison Rockwell
2. Mike Daniels
3. Tim Barnes
4. Brigitte Baeuerle
5. Bill Brown
6. Laura Tudor
7. Josh Wurman
8. Andrew Arnold

The ACC event followed the same structure as the previous events by starting with the Air. Planet. People. video, then moving onto the CiS & CSWR presentations. However this event stood out for several reasons. The first being the 20 people who attended the event were very career focused students and teachers from the college, with one high school student and his parents. Right from the start they asked very targeted questions and displayed a level of interest during the presentation not seen at other events, perhaps due to their age and maturity level.

- What kind of software programs do you use for data collection?
- What is the most common language used for technical discussions while abroad?
- What is a typical salary for someone who works at the lab?

The presentation was held in an auditorium style classroom, with a state-of-the-art audio/visual set up, which helped to make the presentation engaging, fun, and easy to give.

The weather was warm and sunny for the hands-on demonstration which helped make it a comfortable event for all, and was a welcome change for the CiS staff. ACC had sectioned off a parking lot for the CiS vehicles, so we had ample room, and with only 25 people, it was easy for everyone to rotate through the there stations at their leisure, and have time to talk with the CiS one-on-one.

Lunch was kindly provided by ACC, which provided time for the participants and the CiS staff to sit and connect more. Several of the CiS sat and talked with students individually during lunch which was very much appreciated by the students. This was a great time to answer additional questions and for the CiS staff to explain more about the available internships that EOL and UCAR offer.

The event was very well promoted by this school. There was an announcement in the local paper, not just the campus paper, a post on their facebook page about it, and even an email sent out to the Colorado Science Education Network email list. Despite their well-rounded and tenacious efforts to promote the event, only 20 people attended, however they were a very interested and driven group of 20!
CAREERS IN SCIENCE: LESSONS LEARNED

1. Be more involved in how the school is promoting the event. The person who gets tasked with it at the individual schools may not always be the most efficient at this type of thing, so some guidance and or suggestions as to where and how the event is promoted could help CiS in the long-run.
   i. School newsletter - email and print
   ii. Print and send posters rather then relying on them to do it, it also makes it easier for them to simply go around and hang them up
   iii. Student center display or monitor
   iv. Contact instructors and department heads individually
   v. Careers Services
   vi. President/Head of Student Body
   vii. School Facebook Page

2. Being adaptable to whatever presentation setting we walk into is a key factor, but also knowing when to ask for help setting up the equipment is important.

3. Debriefing after each presentation to see what worked and what didn’t work, and then making adjustments to the next presentation was helpful.

4. Target member universities in areas of diverse populations and arrange high school CiS events to take place at the university, creating that link or bridge between the two

5. Continue to offer CiS for Front Range area high schools and technical colleges so it develops a reputation, drawing more and more people to each event. Make it a destination event, rather than a high school requirement.

6. When doing outreach events for specific field campaigns, include a segment on CiS

7. Collaborate with Spark on ways to incorporate CiS into larger events that they do

8. CiS requires a lot of time and energy by many people to put on such an event, with seemingly little return. As discussed above, the assessment of how successful the event was proves to be quite challenging. We all need to remember that CiS is hopefully planning a seed for the next generation and we may not see immediate results. CiS and other methods to develop our workforce should be included in as many outreach events as possible. Now that we have a solid program many materials have been developed, we can customize them as needed.

9. Continue to foster the enthusiasm that we saw at the college level, continue to seek ways to engage and encourage high school students

10. Know the student population prior to the event and try to tailor the slides and presentation to them….know the audience.
### FY10 NCAR Diversity Funds Request - Budget Template

**NCAR Division:** EOL  
**Project Title:** Careers in Science  
**NCAR PI(s):** Brigitte Baeuerle, Mike Daniels, Wen Chau Lee  
**Period of Performance:** 5/1/10 - 4/30/11  
**Date:** 2/25/10  
**Matching Funds Lab Account Key:** 740210

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**PURCHASED SERVICES**

| Information Kits | 3,000 | 0 | 0 | 3,000 |
| **SUBTOTAL** | 3,000 | 0 | 0 | 3,000 |

**TRAVEL**

| Domestic trip (6 trips) | 6,300 | 6,300 | 0 | 12,600 |
| **SUBTOTAL** | 6,300 | 6,300 | 0 | 12,600 |

| Indirect Rate @ .491 | 9,787 | 3,093 | 0 | 12,880 |

**PARTICIPANT SUPPORT COSTS**

| 0 | 0 | 0 | 0 |

**TOTALS**

| 29,720 | 9,393 | 0 | 39,113 |

**Project Funding Percentages**

| 76% | 24% | 100.00% |

**Funds not used:** $25,213.21

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## Account Budget Summary

**Account:** 744220  
**Status:** Active

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### Notes:

- **Staff Supported:** GOLUBIESKI, CHRISTOPHER S
- **PEID:** 022410
- **Latest Term Date:** 800T2
- **Latest HR Profile %:** 32.0
- **Budgeted HR PY%:** 61.4%
- **Budgeted Hrs at 86%:**
- **Worked Hrs:**
- **Balance Hrs:**
- **% Budget Worked:**
- **Budget % of Yr Encumbered at 85%:**