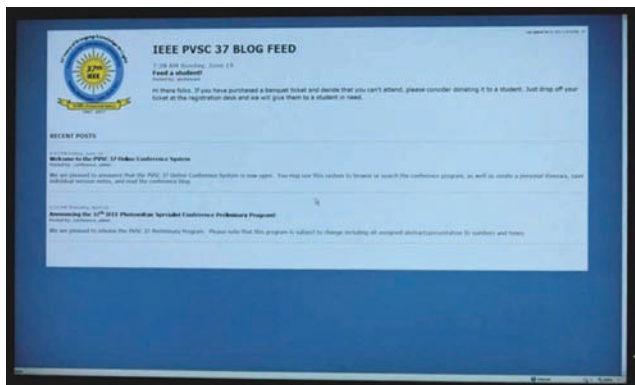




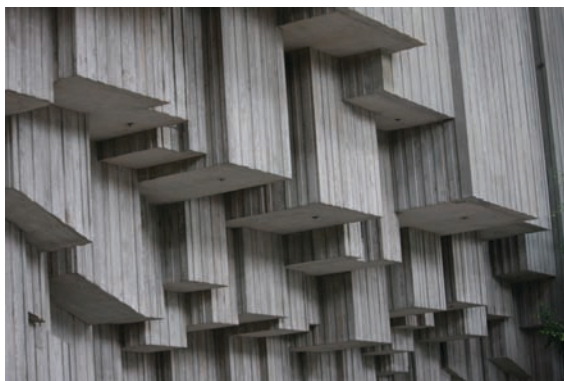
Sunday June 19<sup>th</sup> marked the beginning of another great year of photovoltaics research and development highlighted by a very exciting program at the IEEE Photovoltaic Specialists Conference. Excitement is in the air, the conference continues to grow and develop, and recent successes in PV technology make 2011 another banner year in the community.

One of the new additions to the PVSC this year is a display at the top of the main escalators from the registration area on level 6 that presents a blog that organizers and session moderators will be contributing to the blog. If you are relaxing in the 6<sup>th</sup> floor lobby keep an eye on the blog for some of the great highlights of the meeting.



Sunday is typically a quieter day as things get started with tutorial lectures. Much of the day registration was peaceful but surely by Monday morning things will be jumping. The tutorials in the morning were very well attended. Jim Sites gave an excellent introduction to photovoltaics with his PV 101/201 which helps people new to PV to understand the basic physics that underlies the device operations. The course goes on to describe how to understand current/voltage curves and how to diagnose a device performances. Bill Mulligan of Sunpower,

Continuous display of the conference blog on Level 6.



The Seattle convention center in the registration area.

one of the leaders in high performance solar cells, presented a description of the production and operation of silicon devices and systems. Vijit Sabnis and Geoff Kinsey described the complex field of multijunction devices, their integration in concentrator systems, and how to design the optimal multijunction device. Bill Brooks gave a tutorial on PV system installation and how to interface with the grid from codes to design, installation and inspection. I needed to have taken that one as I am just getting my first PV array and had to pay a premium to have it installed for me.



Dr. Ned Ekins-Daukes answers a question of a participant during a break in the next generation PV tutorial.

Rounding out the morning, Keith Emery of NREL and one of the world leaders in characterization of PV devices described how to measure the output of PV from individual small cells to large scale systems. All in all it was a great morning of tutorials.

The tutorials went on after a brief break for lunch with more excellent presentations. Bulent Basol gave an update of his Thin Film Solar Cells course. Even though I only had time to drop in briefly I learned that inclusion of oxygen during heat treatment of CdTe devices was discovered at

Kodak. This sort of historical perspective and current state of the art are only available from someone with the amazing history and broad knowledge of thin film PV that Dr. Basol possesses. He and I split the first tutorial I gave on thin film photovoltaics many years ago his course continues to improve. Sean Shaheen of the University of Denver gave an excellent and detailed description of the very difficult topic of organic photovoltaics. This is exceptionally hard for most PVSC attendees because of their backgrounds in inorganic devices. More and more we need to understand both the organic and inorganic devices. The discussion considered the remarkable progress that has been made in these systems with efficiencies now exceeding 8% verified efficiency and some reports of performances exceeding 9% unverified. The tutorial presented the basic models for operation of the devices, carrier generation and separation, degradation pathways, and the potential impact of OPV on the field.



John Wohlgemuth described issues in reliability. Very large projects are now being planned and constructed and reliability becomes an increasingly critical aspect of the technology. He described how local shunts can lead to local hot-spots in Si diodes that can cause failures and degradation of the device performances. In discussing module failures he noted that a thin film module partially covered in snow can experience enough of a thermal gradient from one edge to the other to crack the glass. The high processing temperature required to produce some of these devices removes any tempering in the glass and makes the module more susceptible to crack formation. All aspects of the module lifetime prediction and analysis were described. Dr. Ned Ekins-Daukes of

Imperial College described future generation technologies. For example, he discussed how quantum dots have been incorporated into III-V semiconductor structures and can improve quantum efficiency below the energy gap of the matrix material. Novel concepts are being studied in hopes of discovering completely new ways of capturing the energy in sunlight. The potential of these remains to be seen but the topics are exciting and are classic high-risk high-reward questions that science always strives to answer. To complete the afternoon list, and complementary to the question of next-generation technologies, James Rand and Ed Witt presented a tutorial on how to write winning proposals. From university research to start up companies much of what we do revolves around finding the financial resources to do the investigative research that brings new technologies to fruition. As you can tell from the broad range of topics presented, the tutorials lived up to their reputation. If you have not taken a tutorial yet you should do so. They are informative even for seasoned industry professionals and there is always something great to learn and experience.

It was not all about intense study of details of the field. There were things even for the community and for those not attending the tutorials, both attendees and their companions. In the afternoon the companions program helped organize those interested to go see the Mariner's Baseball team beat Philadelphia 2-0 on their home turf just walking distance from the convention center and near the international district.



Students from the University of Washington at their Solar Day booth.

Solar Day provided an opportunity for locals and attendees to gain an understanding of both photovoltaics in general and the opportunities for PV in the Pacific Northwest. Three High Schools participated with a number of interesting displays including a solar powered vehicle. Enphase energy described their microinverter technology to participants while Puget Sound Energy, Snohomish County Public Utility, Seattle Light and Power, and others described how renewable energy is being implemented in the Washington area. It is clear from discussions that renovations to the energy grid on a national scale are needed. Power is being generated in the region on a massive scale this year with record snowfalls filling the dams on the local rivers to capacity. A high power grid capable of transferring this energy to the eastern half of the nation would have allowed much more efficient and complete use of the bounty of energy available this year. There were



Discussion with representatives of the Puget Sound Energy at Solar Day.

There were



demonstrations by students from the University of Washington on photovoltaics as well as several displays on solar thermal systems. Many other organizations were represented, too many to mention all by name. There were also speakers giving brief presentations on photovoltaics, women's contributions to the community, and many other topics. It was informative. The challenge next year will be to bring more of the community into the session.

It has been a long and tiring process bringing the PVSC to this point. One of the major contributors to that development, Brent Nelson, took a break to watch golf in the lobby of the Sheraton. Others talked in the halls, developing new networks or re-connecting with old acquaintances and colleagues from around the world. Sunday was a great way to begin the 37<sup>th</sup> PVSC. I hope that all of you enjoyed it as much as I did.



Brent Nelson relaxes at the end of the day on Sunday, glad to have a minute to breathe after a lot of work helping to organize the conference.