Table of Contents

Overview.................................................................................................................................. 2
International Conference on Materials for Energy – Karlsruhe, Germany............................... 2
Renewable Energy World Europe – Vienna, Austria...................................................................... 3
International Youth Conference on Energy – Siófok, Hungary.................................................. 4
Advanced Automotive Batteries Conference – Strasbourg, France........................................... 5
TUM Institute of Astronautics – Exploration Technologies.......................................................... 5
TUM Institute of Aerodynamics and Fluid Mechanics................................................................. 6
Münster Electrochemical Energy Technology (MEET) Center..................................................... 6
Energy in Germany....................................................................................................................... 7
Sightseeing.................................................................................................................................... 7
Overview

In May 2013, as part of the National Science Foundation’s (NSF) Integrative Graduate Education and Research Traineeship at the Cockrell School of Engineering at The University of Texas at Austin, Robert Crawford and Sean Wood traveled to Munich, Germany for a summer outreach internship. The goals of the internship were to:

i. Provide exposure to the energy and social culture of Germany and the surrounding European countries.
ii. Network at engineering and power generation technical conferences.
iii. Network with research groups at Technical University of Munich (TUM).

International Conference on Materials for Energy – Karlsruhe, Germany

Sean attended the International Conference on Materials for Energy in Karlsruhe, Germany at the beginning of the summer. The focus of the conference was to bring together scientists and engineers from all over Europe who research and develop materials that are geared towards energy applications: energy conversion, energy storage, transport, efficiency, and fundamental aspects. The conference featured many interesting lecture sessions with topics on electrochemical energy storage, fuel cells, fossil and nuclear power plants, H₂ and chemical storage, biomass and biofuel, photovoltaics, gas-to-liquid, and conductor materials. Between lecture sessions, students and professionals were able to present posters so that they could display their work to the public. There were also networking dinners to give everyone a chance to make relevant contacts with others in their field for possible future collaborations.
Robert and Sean attended the Renewable Energy World Europe Conference and Expo held in conjunction with POWER-GEN Europe at the Messe Wien in Vienna, Austria. The event offered the largest and most comprehensive conference and exhibition for the European electricity and power technology sector, including various perspectives from the political, industrial and academic worlds. Topics included renewable energy markets, renewable energy technologies, and smart grid design and integration. The combination of conferences and exhibitions across the entire spectrum of power generation is unique and serves the vital move towards integrating the traditional fossil fuel and fast-growing renewable generation sectors. The high points of the conference included a plenary panel discussion with a group of industry and government experts as well as a keynote speech by Russian Deputy Energy Minister Yuri Sentyurin.
Sean and Robert attended the International Youth Conference on Energy in Siófok, Hungary. The participants were graduate students and young professionals from around the world. The hotel and conference venue, located on the shores of the beautiful Lake Balaton, allowed for close interaction and networking with professionals our own age. Research seminars and presentations were given exclusively by students, and their topics included energy policy and electricity markets, distributed generation, renewable energy sources and energy in buildings. The conference included a great mix of social events, such as making use of the hotel’s “wellness center”, and professional networking events, such as a dinner and wine tasting during a boat tour of Lake Balaton.
Sean attended the Advanced Automotive Batteries Conference in Strasbourg, France. This event brought together battery experts from all over Europe and the world. Although the conference was geared mostly towards industry professionals, a large number of the sessions were devoted entirely to the new and interesting science behind the technologies of future batteries. Participants were also able to sign up to test drive a variety of electric vehicles (such as the Nissan Leaf and Tesla Model S, as well as experimental models) through the streets of Strasbourg. There were also daily networking events during which time students and professionals could present their research via posters. These events included tastings of samples of wine and foods from the Strasbourg region of France.

TUM Institute of Astronautics – Exploration Technologies

The Exploration Technologies group at the Institute of Astronautics is under the direction of Alexander Höhn, Ph.D. The focus of this group is current and future concepts of manned and unmanned solar system exploration. Several of their projects were discussed, including the TherMoS, V-SUIT and V-Hab. In the TherMoS project, they are dynamically simulating thermal loading on moving lunar surface-crafts. The V-Suit project looks at thermal environmental modeling of space suits with human sensitivity in mind. For large habitats, the V-Hab project simulates “physio-chemical, bioregenerative life support technologies, the habitat environment, as well as the human physiology.”
The Institute of Aerodynamics and Fluid Mechanics group is under the direction of Albert Pernpeintner. This group investigates unsteady aerodynamic loads on aircraft wings, automotive aerodynamics and fluid flow in the atmospheric boundary layer.

Münster Electrochemical Energy Technology (MEET) Center

Sean visited the Münster Electrochemical Energy Technology (MEET) Center in Münster, Germany. This building is a three-story facility dedicated entirely to researching electrochemical energy technologies such as lithium-ion batteries and supercapacitors, hoping to achieve higher energy density, longer durability, and maximum safety at the lowest possible cost. The team of over 150 researchers is part of Münster University, and they have collaborations with many universities and companies throughout Europe. Sean was able to tour the facility and meet with one of their scientists, Dr. Shahmahmood Obeidi. The facility has many of its own tools for characterizing the batteries they make, such as XRD, XPS, SEM, etc. In a normal university setting, these types of equipment are shared by many different departments, but the MEET facility has them all for its own uses.
Energy in Germany

Germany, and Europe in general, are very focused on their energy usage. They strive to reduce energy usage in every way possible and use greener forms of energy wherever they can, and this is obvious just by touring around the country. On a simple train ride from one part of Germany to another, one can see things like those shown in the pictures below and get a sense for where Germany places emphasis on specific technologies. Wind turbines seem to be by far the most commonly seen form of energy; they are everywhere, all throughout Germany. Nuclear and coal seem to be next common. And solar didn’t seem very common at all. Solar panels were only seen near Berlin. The commitment to clean energy is also seen in the auto-makers. Smart cars are very common. Also, at the BMW World Museum, there was an entire section of the building dedicated to electrification of vehicles, such as the concept car shown above.

Sightseeing

Being in Germany afforded the chance for Sean and Robert to do some sight-seeing as well. They were able to take many trips to areas near Munich, including Salzburg, Austria; Vienna, Austria; Bratislava, Slovakia; Berlin, Germany; Budapest, Hungary; and Prague, Czech Republic. Traveling to all of these foreign places allowed them to gain great insight into the cultures and mindsets of various countries around Europe and was a lot of fun.