Joint grad program builds skills, friendships

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Abstract
Biorenewable materials, biofuels and alternative clean technologies are gaining attention in the United States due to recent economic, political and scientific developments, but these issues have been seriously investigated for many years in Western Europe. A recent educational innovation jointly funded by the U.S. Department of Education's Fund for the Improvement in Post Secondary Education (FIPSE), and the European Union's Directorate for Education and Culture (DG EAC) has enabled the creation of the EU/U.S. Curriculum on Renewable Resources and Clean Technology program.

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Joint grad program builds skills, friendships

Students on both sides of the Atlantic Ocean work on renewable resources and clean technology.

Andy Procter and Larry Johnson

B iorenewable materials, biofuels and alternative clean technologies are gaining attention in the United States due to recent economic, political and scientific developments, but these issues have been seriously investigated for many years in Western Europe. A recent educational innovation jointly funded by the U.S. Department of Education’s Fund for the Improvement in Post Secondary Education (FIPSE), and the European Union’s Directorate for Education and Culture (DG EAC) has enabled the creation of the EU/ U.S. Curriculum on Renewable Resources and Clean Technology program.

Three universities in the United States—the University of Arkansas at Fayetteville, Iowa State University at Ames and the University of Washington at Seattle—have partnered with three European Union (EU) universities—University of Ghent in Belgium, The National Polytechnic Institute of Toulouse in France and the Karl Franzens University of Graz in Austria—to develop a consortium for transatlantic movement of American and European graduate students to gain experience in using biorenewable materials, biofuels and clean technology at an overseas university for one semester. In addition to the availability of a two-week intensive program of study, an extended stay up to six months permits further studies in the desired area.

Each of the three U.S. universities is a world leader in developing technologies to utilize renewable materials. The University of Arkansas is serving the nation’s largest rice and poultry industries, while Iowa State is servicing the largest corn and soy industries in the United States, and the University of Washington is utilizing its state’s forestry and marine resources for industrial use.

AOC5 members Andy Proctor of the University of Arkansas and Larry Johnson of Iowa State University, as well as Barbara Krieger-Brockett at the University of Washington, are providing the U.S. leadership and are working with Roland Verhe, University of Ghent, who was the pioneer of the program and has extensive experience of developing international educational programs. The other EU leaders are Carlos Vaca-Garcia, The National Polytechnic Institute of Toulouse, and Anton Huber of Karl Franzens University. All three European universities have recognized expertise in biorenewables and/or biofuels.

“The program is generating a lot of excitement on both sides of the Atlantic,” says Proctor. “This opportunity allows our student to learn how to live and understand cultures and make friends outside the U.S. Furthermore, the international experience and awareness that this program provides is becoming a valuable asset that employers wish to see in the graduates they hire.”

Student experiences

In Fall 2005 the first U.S. student, Devon Cameron, a University of Arkansas carbohydrate chemistry student, went to Graz to study starch modification under the guidance of Huber. She also took courses in biopolymers, self-organizing systems and environmental protection.

“The objective of my project was to generate and characterize polymers created by the action of phosphorylase,” Devon said. “I also learned a technique introduced by Dr. Werner Praznik’s lab for labeling polymers called aminopyridyl derivatization.”

She added, “I analyzed the SEC-separated elution profiles based on simultaneously monitored mass and molar fractions by refractive index and fluorescence detection to determine de facto molecular weights of the polymers. Data analysis is still ongoing, but it will be interesting to see the results.” She also had the opportunity to develop novel carbohydrate polymers at BOKU [Universität für Bodenkultur] in Vienna and then conducted the structural analysis in Graz. That was also an opportunity for developing cultural awareness and integration.

University of Arkansas student Brian Mattingly is spending Spring 2006 semester at the University of Ghent working on biodiesel production and Daniel Skipper is studying biodiesel economics. “Studying in Ghent has been a great experience so far,” said Brian. “I began my studies here with a two-week intensive course on biorenewables technology. The course broadened my knowledge of biorenewable materials and green chemistry, and gave me the opportunity to meet people from many different parts of Europe and the U.S. Currently I am working on a research project that is a joint effort between Ghent University and De Smet Ballestra, a lipid [oils and fats] technology company based in Brussels [Belgium]. This semester I will be taking courses on clean technology. It hasn’t been all work, though. Since I’ve been here I’ve managed to explore Belgium a little. I’ve already been exposed to many new and unique opportunities, and I am looking forward to a very rewarding experience.”

University of Arkansas food science student Caroline Lovely is currently in Toulouse studying novel soybean products and has also taken short courses in Ghent and Budapest as part of her program.

Three students from the University of Ghent in Belgium, Dirk Aerts, Elke Vermoesen,
Five ISU students went to the two-week biorenewables intensive course at the Polytechnic Institute of Toulouse, France. (Left to right) John Schmitz, Carter Johnson, Abigail Hancock, Reed Oshel, and Michael Green toured the medieval city of Carcassonne on a day off from studies.

and Miet de Baere, were enrolled for the Fall 2005 semester in the biorenewable resources and technology graduate program at Iowa State. Upon their arrival in early August, the students were welcomed into laboratories which fit their research interests; Aerts and de Baere conducted research in plant genetics and molecular biology and Vermosen studied environmental engineering. Aerts’ major professor was Basil Nikolau in the Department of Biochemistry, Biophysics, and Molecular Biology. De Baere worked with Eve Wurtele in the Department of Genetics, Development, and Cell Biology, and Vermosen worked with Tim Ellis, associate professor in the Department of Civil, Construction, and Environmental Engineering.

All three took courses in addition to working on research projects. “The education system is different in Belgium from that in America,” de Baere said. “We usually take our classes and then spend a year in a laboratory at the university.” Each of the students is enrolled in a Master’s degree program at the University of Ghent.

Vermosen, de Baere, and Aerts all believe what they are learning about biorenewable resources will take them far in life. “Biorenewable resources are very important with the coming end of oil,” Vermosen said. “We have known in Europe for some time that the end of oil is coming. We have been talking about that possibility for years. Therefore, biorenewable resources are going to become very important in the near future to provide energy, fuels and products,” de Baere said.

Upon finishing their Master’s degrees in Belgium, these three students have big plans for the future. De Baere is interested in possibly working toward a Ph.D. or studying abroad in France or Brazil. Aerts hopes to work with cell and gene technology either at a Ph.D. level or for a corporation while Vermosen hopes to possibly study or work abroad. They all hope to continue their studies and research in biorenewable resources.

The reasons that drove Aerts, Vermosen, and de Baere to enroll at Iowa State University were as varied as they were. “I really wanted to improve my English skills,” Aerts said. De Baere decided immediately when approached with the idea of studying abroad. “I always wanted to study abroad and this was a great opportunity to attend school in the United States,” she said. For Vermosen, studying in Iowa fulfilled her dreams of experiencing life in the United States and making new friends.

In addition to working closely with their supervising professors, the students met with Johnson, director of the Center for Crops Utilization Research (CCUR) and the program contact person at Iowa State. “We really appreciated Larry Johnson. He worked so closely with us to ensure we have everything we needed while we were at Iowa State University,” de Baere said.

“This has been a really good experience for both the students and our BRT program,” Johnson said. “We have been fortunate to have these three outstanding students come this semester and we are looking forward to future exchanges. They exposed our students to new perspectives.”

Iowa State University also has one student who just left for Graz. Scott Bents, a graduate student in mechanical engineering is doing research in life-cycle analysis of biobased products.

Five EU exchange students joined the University of Washington, hosted by the Department of Chemical Engineering and Barbara Krieger-Brockett, to take courses and engage in research projects during the Autumn-Winter Quarters 2005–06. One of the ENSIACET French (Toulouse) students, Camille Romanik, took courses in biorenewable resource topics, and in particular biotechnology and molecular biology/biochemistry, to pursue her goal of having a career in which modern biotechnological techniques will be used. She worked with Professor Baneyx to modify a protein (MalE, a maltose binding protein) in order to be conjugated to a fluorescent dye. This will create hybrid molecules with enhanced one and two photon cross sections for optical detection applications.

The other four students, from the University of Ghent, took courses in Biochemistry, Waste Water Treatment, and Entrepreneurship, as well as performed research investigating innovative ways to supplement wood fiber for making paper. In Washington State, recycled paper must be supplemented with fiber residues, such as wheat straw and Arundo Donax (giant reed), to meet the demand for pulp to make paper. One student, Robin Van Landeghem working with Prof. McKean (Chemical Engineering and Paper Science and Engineering), developed methods to analyze pulp for fermentative and cormic acid content, undesirable outcomes of pulping annual plants wherein a green color results, Marie-Line Coppens, also working with Prof. McKean, investigated different pulping protocols for Arundo Donax and other annual plant residues. Another student, Filip Vercruysse working with Prof. Sharon Doty, used genetic modification to cause the Arundo Donax plant to produce less lignin, making it a better fiber candidate for paper-making. Karel Vervisch investigated the fate of lignosulfonates, a co-product of the acid sulfitization of pulping processes used in soil applications including dust suppression, road base stabilization, and as fertilizer additives. He performed experiments to measure irreversible adsorption to the soil as a function of soil pH.

The students arrived 2–3 weeks “early” to take advantage of the extensive social, cultural, and advisory orientation activities sponsored by FITTS, Foundation for International Understanding Through Students. This group eases the entry into Seattle, aids in finding lodgings, and greatly increases the students’ understanding of Americans.

The universal verdict was that the research projects were invaluable to the students. They learned to refine and focus a problem statement, learned laboratory techniques, and wrote up and presented their research findings. This type of independent study, with an open-ended framework greatly to their liking, was embraced as very important to their future studies and potential careers. Each student has returned to his or her home institution to become an enthusiastic ambassador for the US-EU FIPSE Exchange program on Biorenewable Resources and Clean Technologies.