



College of Agricultural Sciences

INTERNATIONAL PROGRAMS

Fall 2010 E-Newsletter

Index of Articles

- [1\) College's Graduate Students Global Ready](#)
- [2\) Penn State Food Science Students Win 2010 "Developing Solutions for Developing Countries" Competition](#)
- [3\) Penn State, ECHO Asia, and Maejo University Receive Horticulture CRSP Grant](#)
- [4\) Honey Bees in Africa: Back to the Future](#)
- [5\) China Study Tour Supported by New Gift to the College](#)
- [6\) Penn State Professors Teach at China Agricultural University](#)
- [7\) Historical Links to India's Maharashtra State](#)
- [8\) Penn State Cooperative Extension Reaches Out to Africa](#)
- [9\) New Interns in the Office of International Programs](#)
- [10\) Upcoming International Study Opportunities](#)

1. College's Graduate Students Global Ready

The International Agriculture Graduate Student Forum was formed for students in the College of Agricultural Sciences interested in international agriculture and rural development issues. Students meet monthly for discussions about current topics, conducting research and working in the field of international agriculture and rural development. We hope to provide an opportunity for those who research in areas of social science and the life sciences to come together to discuss interdisciplinary research. We welcome any graduate student in the university interested in these issues to join us for our discussions. If you would like to join our listserv to receive email announcements for our gatherings, related seminars, and articles of interest to our focus, please send a blank message to: L-InternationalAgForum-subscribe-request@lists.psu.edu. To send a message to the group please use: L-InternationalAgForum@lists.psu.edu.

In the first meeting, the group hosted Dr. Jonathan Lynch, Professor of Plant Nutrition, and Dr. Jill Findeis, Distinguished Professor of Agricultural & Regional Economics, who discussed their interdisciplinary work in crop improvement in China and Mozambique.

Upcoming events for the Fall 2010 semester include:

November 4th – Nicole Webster, Associate Professor of Agricultural and Extension Education will discuss challenges and opportunities for graduate students interested in international research as well as her own extensive experiences in Africa. Location TBA, RSVP kmb513@psu.edu.

December 2nd – Ricky Bates, Associate Professor of Ornamental Horticulture, will lead a discussion on using horticultural crops as poverty alleviation tools drawing from his experiences in international development work. Location TBA, RSVP kmb513@psu.edu. ([Return to Index](#))

2. Penn State Food Science Students Win 2010 “Developing Solutions for Developing Countries” Competition

By Wladir Valderrama, Angela Richard, and Julius Ashirifie-Gogofio; Reprinted courtesy of Interinstitutional Consortium for Indigenous Knowledge (ICIK)

Each year, the Institute of Food Technologists (IFT) sponsors the “Developing Solutions for Developing Countries Competition.” At this year’s IFT Meeting in Chicago, the Penn State Food Science Department’s international team of graduate students, Angela Richard (USA), Wladir Valderrama (Peru), and Julius Ashirifie-Gogofio (Ghana) received first prize in this prestigious competition to develop a solution that would “Provide Sustainable, Nutritional and Affordable Food for Families with Small Children”

With input from faculty members Greg Ziegler, J. Lynne Brown, and Audrey Maretzki, the Penn State team developed a novel concept for producing and distributing a confectionery product in Peru where traditional diets are extremely low in calcium. The students named their product “CalciMelo” (“Calci” for Calcium and “Melo” from Caramelo, the Spanish word for a confection or candy).

The ingredients used in making CalciMelo are panela (unrefined cane sugar produced in Peru), calcium carbonate (an inexpensive and readily available source of calcium), corn starch (used as a thickener and to prevent CalciMelo from sticking to the mold while it is cooling), and yacon syrup (made from the root of a native Andean plant, *Smallanthus sonchifolius*, that contains an unusually high concentration of FOS (fructo-oligosaccharides). FOS are reported to significantly increase the absorption of calcium from the digestive tract into the blood stream, where it is available for forming bones and teeth. The team calculated that a single 9.4 gram piece of CalciMelo (about the size of a Kraft caramel) would contain approximately the amount of calcium a child between one and eight years of age should consume daily. Two pieces of CalciMelo, providing 1000 mg. of calcium and eight grams of FOS, approximates the recommended calcium intake for older children and women of child-bearing age.

The FOS in CalciMelo enhances the absorption of calcium from the confection as well as from other food items. This increased calcium absorption is important because Peru is not a milk-producing country and the small amount of dietary calcium normally obtained from a non-dairy source means that a high proportion of Peruvians, particularly children and women who are pregnant or breast-feeding, are unlikely to be getting enough of this essential nutrient. The problem of insufficient dietary calcium is exacerbated in low-income communities where residents cannot afford an adequate diet.

However, it is in these poor communities where women’s cooperatives have existed for more than 25 years with the mission of improving the quality of life of young children. The women accomplish this feat in a creative way by cooking and delivering food to members of the community. The Penn State team identified these cooperatives as a potentially useful way to produce and deliver CalciMelo to the target population most in need of dietary calcium supplementation and least likely to receive it.

CalciMelo is very easy to make by combining panela, yacon syrup, corn starch, and calcium carbonate, then boiling the mixture until sufficient liquid has been evaporated to allow the mixture to form a firm thread when a spoonful is dropped into cold water. The thickened mixture is poured into simple molds to produce standard size pieces which are allowed to cool, coated lightly with oil, wrapped, and then stored in an airtight container.

The Penn State team believes local women’s cooperatives in Peru could produce CalciMelo inexpensively for sale to the public as a way to help finance its free distribution to low income children and women who are pregnant or breast feeding. They also believe the CalciMelo concept could be replicated in other developing countries where the special nutritional needs of a target population could be addressed through the involvement of women’s groups in the creative use of local resources.

To learn more about the team’s award-winning concept, contact Wladir Valderrama at wbv1@psu.edu. [\(Return to Index\)](#)

3. Penn State, ECHO Asia, and Maejo University Receive Horticulture CRSP Grant

Thomas Gill

The Pennsylvania State University (PSU), along with partners ECHO Asia Regional Office and Maejo University, has been awarded a 2010-2011 USAID CRSP Horticulture Exploratory Project for a collaborative grant entitled, "Strengthening Indigenous Informal Seed Saving Systems in Southeast Asia." The three institutions will carry out a year-long exploratory study of household seed saving practices, and related challenges, in hilltribe communities along the Thai-Burma border as well as Khmer farming communities in Cambodia.

Dr. Ricky Bates, Associate Professor of Horticulture at PSU and Principal Investigator for the exploratory grant, explains that the funding will enable the CRSP grant partners to conduct an inventory of horticultural crop varieties being grown by households and small farms in the study areas. The study will seek to determine seed sources, whether from local seed saving efforts or commercial. Additionally, household seed saving challenges will be explored as well as possible storage options for households to improve seed viability. Expected benefits include a greater understanding of regional germplasm, possible access to new regional varieties for evaluation, production and distribution, as well as the opportunity to host seed swap events in Thai and Cambodian communities where the surveys will be implemented.

Other Co-principal Investigators include Dr. Tom Gill at PSU, Dr. Yongyuth Srigiofun at Maejo University, Dr. Laura Yoder and Dr. Abram Bicksler at the International Sustainable Development Studies Institute in Chiang Mai and Rick Burnette at the ECHO Asia Regional Office. Other key logistical partners in the study are the Upland Holistic Development Project, based in Chiang Mai, as well as the Wholistic Development Organization in Phnom Penh. ([Return to Index](#))

4. Honey Bees in Africa: Back to the Future

By Maryann Frazier; Reprinted courtesy of Interinstitutional Consortium for Indigenous Knowledge (ICIK)

It surprises many people to learn that honey bees are not native to the New World. The earliest records indicate that honey bees, *Apis mellifera*, were brought to North America from Europe in 1621. However, today, honey bee populations, as well as the populations of other pollinators, are declining. This decline is documented in a 2007 report by the National Academies of Science, *The Status of Pollinators in North America*. Due to this report and the mapping of the honey bee genome, as well as the phenomenon known as colony collapse disorder (CCD) and the media's response to it, there has been a lot of attention paid to this tiny creature.

Worldwide, honey bees are a critical player in the pollination of many native plants as well as in the production of important food, fiber and seed crops. The loss of honey bee colonies could result in lower quality, higher priced foods or the total absence of some foods from the marketplace. There may be a number of reasons why honey bees are declining including loss of habitat, poor nutrition, exposure to pesticides, diseases, and the introduced parasitic mite, *Varroa destructor*, that is considered to be the most devastating pest of *A. mellifera* worldwide. The race is on to understand what is happening to our bees and what can be done to save them.

There are approximately seven known honey bee species. All are native to Asia, except the one species brought to the Americas, *Apis mellifera*, which is native to Africa and Europe, but may have originated in Africa. Its presence for thousands of years on a continent where ecosystems range from desert to savannah to tropical rain forest has resulted in a highly diverse population of unique subspecies, each well adapted to its specific habitat. The subspecies have unique mechanisms that equip them to thrive, even in places that appear unsuitable for honey bees. One such mechanism is defensive behavior: these bees are, after all, the parent population of the Africanized (aka "killer") bee, now ubiquitous throughout

most of South America and all of Central America and Mexico as well as the southern United States. In addition, African bees reproduce (swarm) and abscond (leave the nest) more often than do their European counterparts and they are able to migrate long distances to find the nectar and pollen resources they need. African bees also appear to be better equipped to deal with the diseases and pests that plague nearly all keepers of *A. mellifera* in other parts of the world.

A 2009 United States Department of Agriculture, International Science Education grant awarded to Penn State's Center for Chemical Ecology in collaboration with the International Center for Insect Physiology and Ecology (icipe), enabled Jim and Maryann Frazier, Jim Tumlinson, beekeeper Tom McCormack, and graduate students, Dan Schmehl and Tracy Conklin, to visit Kenya. The goal was to study the biology and behavior of African bees and learn how they are kept by beekeepers in East Africa. What was discovered on this trip was a surprise not only to us, but also to icipe colleagues, Elliud Muli and Baldwyn Torto. Varroa mites, thought not to be present in East Africa, were discovered in all the icipe colonies, yet the bees did not appear to be suffering from the infestation. This initial discovery led us, and later our icipe colleagues, to survey additional colonies. It is now clear that the mite is widespread throughout much of Kenya and is also present on the coast of Tanzania as well as in Ghana.

In 2010, an expanded Penn State/icipe team that included Christina Grozinger and Harland Patch from Penn State, and Dan Masiga from icipe, returned to Kenya with funding provided by a Gates-NSF-BREAD grant (Basic Research to Enable Agricultural Development). Also joining the team was visiting scientist Diana Sammartaro (USDA/ARS). The 2010 goal was to identify the geographic distribution of the four known *A. mellifera* subspecies in Kenya, to characterize their Varroa mite and disease loads and to look for certain behavioral characteristics. We also hoped to learn what impact Varroa mites are having on the honey bee populations and whether or not different subspecies are responding differently to the Varroa infestations. We spent the month of June visiting beekeepers, collecting samples and measuring honey bee colony health parameters at fifteen different locations in central Kenya and along the eastern coast. We also conducted extensive interviews with twenty-seven beekeepers.

Based on the colonies that we inspected, the beekeeper interviews we conducted, and the experience of the icipe beekeeping staff, the health of honey bee populations in Kenya appears to be declining. In general, there are fewer hives being colonized by swarms or migrating colonies of bees than in the past. Hives containing bees are small and are not producing much honey. Colonies in areas where beekeeping has traditionally thrived due to abundant nectar and pollen resources seem to be less affected than are those in areas with poor or limited resources. Potential factors contributing to the decline in health may include loss of foraging areas (deforestation and increased clearing of land for farming), drought and climate change, pesticide use, and, of course, the presence of the parasitic mite, Varroa destructor, and the viruses it can transmit. Over the next year, we and our icipe counterparts will analyze the samples we have collected, monitor the health of the colonies we visited and conduct additional experiments to increase our understanding of these bee subspecies and their abilities to withstand many of the same pressures that are causing bees to decline in other areas of the world.

We learned from the beekeepers we interviewed that there is an unlimited market for honey. Individuals have the potential to generate income from keeping bees and producing honey, but access to good-quality beekeeping equipment and adequate training is limiting their success. It is important to understand why Kenyan honey bees are not thriving and to find out what needs to be done to ensure healthy, productive populations. We are hopeful that what we learn in Africa will provide clues to help ailing honey bee populations around the world. ([Return to Index](#))

5. China Study Tour Supported by New Gift to the College

Four undergraduate students in the College of Agricultural Sciences at Penn State University participated in a study tour to Beijing China, May 10-20, 2010. The students and their majors were Rachel Avila (Food Science), Chelsea Fitzpatrick (Environmental Resource Management), Leah Kofmehl (Toxicology),

and Cara Nordberg (Toxicology). The study tour was led by Dave Abler, a Professor of Agricultural, Environmental & Regional Economics and Demography at Penn State. The goal of the study tour was to learn about China's economic development; its international trade, particularly trade in food and agricultural products; how economic development is affecting its natural resources and environment; and educational and cultural issues in China.

The study tour included meetings and plant tours with three food companies to help the students learn more about China's food and agricultural sector. One company was Simplot China, a joint venture between Simplot, McDonald's, and a Chinese partner that supplies nearly all of the French fries and hash browns served by McDonald's throughout China. Simplot China executives discussed their company's operations, including their work with potato growers in China to produce potatoes in sufficient quantities and at the level of quality required to meet McDonald's standards. Another company was Beijing Yanjing Beer Group Corporation, which has a market share of over 60% in the market for beer in northern China. Company officials discussed the growing market for beer in China and their strategy of offering a more diverse product line to meet changing consumer demands. The third company was Shun Xin Agriculture, a Chinese food conglomerate. They gave tours of two of their plants, one a pork processing plant and the other producing a Chinese alcoholic beverage known as baiju.

The study tour also included meetings and farm tours at three agribusinesses. One of them, Chao Lai Agriculture, grows fruits and vegetables for the Beijing market. A second, Xiaotangshan Modern Agriculture Science & Technology Park, produces a wide range of horticultural products, including flowers, for sale in China and abroad. The third, Liu Minying Ecological Farm, is a village-owned agribusiness that produces organic crop and livestock products for the Beijing market. Discussions were held with the manager of Liu Minying Ecological Farm about some of the environmental and natural resource issues facing China, particularly those connected to agriculture.



The official Chinese host for the study tour was China Agricultural University (CAU). CAU provided guides for the study tour who served as interpreters and had many discussions with the Penn State students about China's society, culture, and economy. The Penn State students also met and socialized with several students from CAU's MBA program. They met with CAU officials and toured the CAU campus, learning about research being carried out at CAU and how the Chinese educational system works.

Cultural activities on the study tour included visits to the Great Wall, Forbidden City, Tiananmen Square, Temple of Heaven, Ming Tombs, Lama Temple, Summer Palace, and the Olympic Village. Cultural activities also included visits to local markets for bargaining and shopping. Unlike the U.S., where bargaining between buyers and sellers is usually limited to expensive items such as cars and houses, bargaining is common in China on goods of all price ranges. The study tour offered the students the opportunity to eat different types of authentic Chinese cuisine, which is different in flavor, ingredients and cooking styles from the food served in Chinese restaurants in the United States.

The students on the study tour all felt that it was a life-changing experience. Financial support for the study tour provided by the Harbaughs is greatly appreciated, and made it financially possible for the students, who were all on limited budgets, to participate in the study tour. The students and Dave Abler enjoyed meeting with the Harbaughs prior to the study tour. ([Return to Index](#))

6. Penn State Professors Teach at China Agricultural University

Two College of Agricultural Sciences professors were invited to teach at China Agricultural University, China's premiere agricultural university, this past summer. Drs. Jude Liu (ABE) and K.C. Kim (Entomology) each spent 3-4 weeks in Beijing teaching short courses to graduate students.

Dr. Liu taught Advanced Design of Agricultural Machines to 17 students and faculty and Dr. Kim taught Principles of Biodiversity Science to 15 graduate students.

The invitation to U.S. professors to teach in China is part of the Chinese government's policy to expand the educational system and graduate greater numbers of students. In some cases, it is an effort to update outdated courses and introduce new teaching techniques, such as multi-disciplinary inquiry, student-centered learning and interactive classrooms. In some cases, Drs. Liu and Kim report that the fact that you could achieve significant learning outcomes with this style of instruction was quite a shock to their Chinese counterparts.

In both cases, the experience also yielded benefits for Penn State with new funded research opportunities identified and new sources of funded graduate students.

The experience was also fun. All classes were taught in English and that resulted in some interesting exchanges. Dr. Liu tells the following story. One day I was talking about the efficiencies of screw conveyors. I said: "theoretically, the efficiency of a screw conveyor will not change when the inclination angle of the screw conveyor changes." One student asked, "What will be the efficiency when it screws up?" "Zero", I answered immediately. The student really meant conveying vertically. My react to "screw up" was "broken down". ([Return to Index](#))

7. Historical Links to India's Maharashtra State

Nikolay Boyadzhiev as found in Penn State Agriculture, Spring 1986 by Evelyn Buckalew – Penn State Archive materials

Soon after India gained independence from Britain in 1947, the Nehru government sought agricultural help from the United States. The response was a collaborative educational program, established in 1960 when six land-grant schools and nine Indian universities formed teaching and research ties. A quarter of century later, Penn State, along with the universities of Illinois, Missouri, Kansas, Tennessee, and Ohio is reaffirming and redirecting those cooperative efforts.

In the period 1968 to 1975 USAID provided funding to support a Penn State faculty member in international agronomy. This project was related to the other programs in Maharashtra with the objective of increasing the international orientation of faculty and graduate students in the Department of Agronomy at Penn State and to in training students for careers in international agriculture. Pennsylvania State University, under the auspice of a five-year USAID contract, developed and implemented a technical assistance project designed to assist in the development of an agricultural university in the State of Maharashtra, India. The main objectives were to assist the university in developing policies, plans, and programs; to advise on the organization, administration and operation of the university; to develop teaching, research and extension programs; and to assist in the planning for needed equipment and physical facilities.

Following along the lines of the project a central location was selected for a new campus in Maharashtra and buildings were constructed on the site. Including the development plans for an 8,000 acre

experimental station and farm for use in association with the new campus. Soon after all agricultural research and extension education programs in Maharashtra were shifted from the Ministry of Agriculture to the newly established university. Also, all postgraduate studies in agriculture were shifted to the central campus, and programs developed in agricultural engineering and food technology were established at the site of the university.

Faculty members from Penn State and their Indian colleagues conducted an intensive review of existing research, developed an updated curriculum for each discipline, and developed a priority listing of needs for additional research. As a part of those projects thirty Indian faculty members received graduate level training at Penn State and other United States universities. Penn State personnel worked closely with Indian counterparts in the Agricultural University as well as the Indian Ministry of agriculture, including the services of Penn State specialist in the areas of agricultural engineering, plants protection, soil and water management, crop improvement, grain storage, soil salinity, and seed certification. In addition to that through the years Penn State closely worked with its Maharashtra counterparts to help develop the area emphasizing on the comprehensive contacts between Penn State and the Maharashtra Department of Agriculture and Poona Agricultural College. ([Return to Index](#))

8. Penn State Cooperative Extension Reaches Out to Africa

Reprinted courtesy of Interinstitutional Consortium for Indigenous Knowledge (ICIK)

In May 2010, Penn State Cooperative Extension Educators, Bibiana Chestnut and Fran Alloway traveled to the Children and Youth Empowerment Center (CYEC) in Nyeri, Kenya, as part of the group led by faculty members Janelle Larson and Sjoerd Duiker. Their objective was to conduct training for CYEC staff and meet with local and district health educators to learn how Family and Community Science Extension educators might collaborate with the Kenyan Ministry of Health in providing outreach programs in Nyeri and communities near the CYEC. A community assessment, conducted by Penn State students helped to identify several issues of importance where collaboration might be developed. These issues included 1.) a lack of household food preservation knowledge and skills, leading to severe seasonal food insecurity when harvest stores are depleted in rural households and 2.) the contamination of ground nuts (peanuts) and grain by cancer-causing Aflatoxin spores.

At the request of the CYEC Director, Bibiana also provided staff training on child discipline through which CYEC staff learned appropriate new disciplinary techniques to supplement those they were currently using. Email communication with CYEC staff following the trip confirmed that the staff found the techniques taught to be effective in their work with the children. 4-H program materials were also shared with the CYEC after-school coordinator. In addition, a project was designed to enable tailoring classes to utilize donated clothing the Center had received that wasn't being worn by the children. Working together, students created a quilt top using fabric squares cut from the donated clothing. This pieced material could also be used instead of expensive new fabrics for skirts, blankets, backpacks, or other student sewing projects.

Fran and Bibiana will use these experiences to work with other Extension colleagues planning to travel to Kenya in 2011 to further develop the Penn State/CYEC collaboration.

For more information contact Fran Alloway at ffa2@psu.edu. ([Return to Index](#))

9. New Interns in the Office of International Programs

Beginning this Fall Semester, we are pleased to welcome two new and one returning intern to the Office of International Programs. We have asked each intern to write a short introductory paragraph about themselves as a way to introduce them to the College.



C. Sheena Sidhu, Doctoral student, Entomology:

My research interests include studying native bees and pollen utilization in agricultural ecosystems. Current projects include looking at squash bees in cucurbit fields (gourd plants). I am particularly interested in promoting and supporting native and wild bees as effective pollinators in agricultural systems, and I would like to pursue a career using my scientific background in policy and decision-making. I'm happy to be part a supportive department at Penn State and to be involved with the Office of International Programs. And I'm thrilled that my research involves being outdoors and working with insects!



Adelina Hristov, Doctoral student

I am a full-time doctoral student in the PSU's Adult Education program, University Park campus, and am seriously considering double majoring in Comparative and International Education. I joined the PSU's College of Agricultural Sciences (CAS) Office of International Programs as an intern in August, 2010. Originally from Bulgaria and trained in Russian language and literature, I will be working on a variety of Eastern European projects. One of my academic interests is in distance education, and as part of my Course Design and Development in Distance Education class, I will be involved in creating a distance and e-component of the INTAG 100 curriculum. I spends the rest of my time loving my family, socializing, traveling, watching soccer games, volunteering for fundraising events, playing ping-pong.



Paige Davis, Master's student, International Affairs

After working in the hospitality industry, I returned to Penn State to pursue my interests in international development. I have focused my studies on community and economic development in Central and South America. I am particularly interested in gender relations, food security, and policies that have encouraged trade liberalization. My internship with the Office of International Programs will allow me to learn more about international negotiations, which I can apply to my future career. I also speak Spanish and French and would like to learn more languages. I have a passion for international travel and love visiting new unique places. ([Return to Index](#))

10. Upcoming International Study Opportunities

College of Agricultural Sciences Short Term IEEEs (International Educational Embedded Experiences) for Spring Semester 2011

Location	Course Number	Course Title/Description	Travel Dates	Leader
Brazil	AGECO 499	Sustainable crop production, environmental and integrated pest management strategies course and study tour to Brazil, 3 credits Info Session: 10/6, 5:30pm, 504 ASI	spring break 2011	Kate Butler, klb157@psu.edu Melanie Gilbert, mds270@psu.edu
Chile	HORT 497	Global Trade of Horticulture Info Session: 9/27, 6:30pm, 116 Tyson	March 5-13, 2011	Rick Bates, rmb30@psu.edu
Costa Rica	ERM/CED 499	Learn about connections between communities, development, and the environment. Visit local integrated and organic farming operations, eco-friendly lodges, botanical gardens, experience tropical rainforest.	spring break 2011	Tarrah Geszvain, thg110@psu.edu
France	INTAG 470	Comparing US/French Agricultural Systems spring semester course and study to France, based in Paris, 3 credits Info Session: 10/14, 6:00pm,	May 14-28, 2011	Ted Jaenicke, ecj3@psu.edu Ketja Lingenfelter, ketja@psu.edu

		122 Ag Admin (Study Abroad Lounge)		
Germany	FOR 497C	German Forestry, 3 credits	End of Spring Semester, 2011	Eric Zenner, ekz3@psu.edu
Ireland	INTAG499A	Exploring Agricultural Leadership in Europe: Ireland, the Celtic Tiger, and Modern Agriculture for Ag Advocates and other student leaders in CAS, 3 credits	End of Spring Semester, 2011	Marianne Fivek, mafivek@psu.edu Mark Brennan, mab187@psu.edu
Italy	FDSC497F	Turin region	End of Spring Semester, 2011	Bob Steele, RSteele@psu.edu
Kenya	AGRO/CED 497C	Agricultural Systems in East Africa, Eco-village in Lamuria	End of Spring Semester, 2011	Janelle Larson, jbl6@psu.edu
Mexico	SPAN 107	Third level Spanish for the agricultural industry with three week Language Immersion Experience at Cuernavaca and Buenavista de Cuellar	End of Spring Semester, 2011	Alex Borys, afb3@psu.edu
Scotland	SOILS 497A	Soil and it's management thru time in Scotland, 3 credits	May 7-16, 2011	Patrick Drohan, patdrohan@psu.edu

[\(Return to Index\)](#)