A Periodic Newsletter about the Sciences at Albright College

Winter 2008 | VOL. 6 • NO. 1

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GIS Mapping
to better analyze and understand the world

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Albright College
What’s the best placement for a biological corridor in Los Tuxtlas, Mexico? How many creek restorations have there been in Berks County, Pa., this year? And, what’s the best way to map the Albright campus for future master planning? Geographic information systems (GIS) is the way to find the answers to all of these questions and it’s becoming a standard tool at Albright.

GIS is a collection of computer hardware, software and geographic data for capturing, managing, analyzing and displaying all forms of geographically referenced information. The collection of data is taken using a global positioning system (GPS) and then integrated into a GIS. Albright currently owns three GPS units, two handheld units and one backpack unit.

Biology professors Stephen Mech, Ph.D., and David Osgood, Ph.D., are leading the pack in incorporating GIS into the curriculum. “We use GIS in almost every lab to orient students to where they have been in the field,” says Osgood. “It’s important for them to know where samples have been collected and to place them in the context of the field.”

Mech, who teaches a course on GIS in addition to using it in his other classes, says GIS is becoming a standard technique in the industry. “Undergraduates are much more employable if they know GIS,” he says.

Marissa (Moyer) Hartzler ’05 agrees. As program coordinator for the Office of the Duke Forest at Duke University where she will soon receive a master of environmental management degree, Hartzler maintains a database on Duke’s 7,050-acre forest and uses a handheld GPS unit to document locations such as research plots, historical or archaeological sites, and forestry operations such as harvest or prescribed burns. She then uses GIS to assist researchers in selecting sites for their projects and to help inform decisions about management.

“I was first introduced to GIS in my ACRE [Albright Creative Research Experience] project and honors thesis with Dr. Osgood,” she says. “My project at the Angelica wetland [a waterway in Reading, Pa.] had me using GPS to locate my sampling transects at the site, as well as the location of wells in the wetland.” Once loaded into the GIS software, Hartzler made maps for presentations and completed spatial analysis to make predictions about Angelica’s water table.

“GIS at Albright played a lot of important roles: it introduced me to the field and got me interested in it as a career; allowed me to not only work with spatial data, but create and work with my own; and to gain experience with a very practical and increasingly popular tool.”

Marci Nawrocki ’09, an environmental science major, not only took on an ACRE project using GIS, but an independent study as well. In her ACRE project, Nawrocki studied Los Tuxtlas, a bioreserve in Mexico, to determine the best placement for a biological corridor. The reserve focused in three core areas. The corridor placement would connect these core regions and allow for species to move freely to any of the given areas. By using GIS, Nawrocki was able to analyze vegetation that helped to determine placement of the biological corridor.

As the fall 2007 semester came to a close, she was also finishing up an independent study that began when she went to Peru last summer. “I am using GIS to analyze deforestation rates from three time periods in the area we visited,” she says. “I will be able to look at a statistical analysis to see how the rates have changed throughout the specific years.”

Beginning last spring, Osgood led students on a project in cooperation with the Berks Conservation District and Berks Conservancy on cataloging all of the creek restorations around the county. “These groups can now have a comprehensive tabulation of how much area has been preserved,” he says. “When they go for future planning or funding they can use the data. It gives them fodder to plan projects.”

And, this spring, Mech will enlist the assistance of students in his work as GIS coordinator for Pennsylvania’s Important Mammal Areas Project (IMAP). IMAP’s main objective is to help ensure the future of Pennsylvania’s wild mammals, both game and non-game species by analyzing habitats that have high mammalian diversity.

Mech, Marissa (Moyer) Hartzler and Carrie Veety ’08 have even put GIS to work for Albright. When Hartzler was a student she began a map of the Albright campus as part of a GIS class project.
Last year, Veety and Mech continued that work as an ACRE project. Mech says the digital map “allows the administration to plan future building needs and Information Technology to see where cables and such are buried.” He adds, “It also helps to create maps of where things are located such as the Wi-Fi coverage on campus.”

GIS is a very interdisciplinary tool and has the potential to play a role in most fields, Mech says. In fact, professors in economics and sociology have also put the tool to work.

Kennon Rice, Ph.D., assistant professor of sociology, is using GIS to look at crime in the city of Reading. “I can create risk maps for particular areas as well as...identify characteristics (variables) that are associated with crime and the amount of risk they add.” For example, Rice says, “I could tell you the additional risk you’d likely be exposed to if a bar, fast-food restaurant or middle school were built in your neighborhood. I could also tell you the additional risk that might be added/reduced with changing poverty rates, education levels, or residential mobility rates in a neighborhood.”

Rice has recently begun an analysis of the locations of gang activity in the city and hopes to analyze the effectiveness of community programs for their influence on both crime and neighborhood property values over time. Mech says GIS has the potential to play a role in most fields. From art to psychology, GIS can be applied “anywhere spatial information can be applied,” he says.
DEVELOPING NEW DRUGS THAT

CHANGE LIVES
Working on both the discovery and development stages of a drug’s evolution, Higgins’ staff of 12 researchers focuses on compounds designed for use in the therapeutic areas of cancer, schizophrenia, depression, asthma, pain and inflammation.

The first step is to determine what they’re dealing with. “You can’t make an effective drug if you don’t understand the disease mechanism,” Higgins says. So, during the early part of the discovery phase, biochemists and pharmacologists study the mechanism behind the particular disease and devise cell-based or enzyme-based tests that model that disease. Once the disease mechanism is understood, organic chemists design molecules that are equipped to interrupt that mechanism.

“One of my groups’ jobs is to help determine which compounds are best suited for development,” Higgins says. “We might start out by looking at hundreds of anti-cancer compounds that work by a certain mechanism, but as we study them further we narrow the field down to two or three candidates.”

Ultimately, animal disease models are developed for use in studying the compounds. At the same time, toxicologists use another set of animal models to study the potential toxic effects of the compound.

“Virtually every aspect of a drug’s safety is evaluated in cell and animal models before a drug is even considered for development, let alone use in humans,” Higgins says. Once a compound goes into development, Higgins’ groups study the properties of the compound to help them understand how stable it is chemically and how well it might be absorbed, and to identify any sort of problems that might occur when the compound is formulated into a capsule or tablet dosage form. “A lot of what we do in development involves trying to understand the properties of our compounds early so we don’t get any surprises further along the road,” he says.

Many of the drugs that Higgins’ teams have worked on are currently undergoing clinical testing, which comes at the end of the development stage. On average, he says, it takes about 12 years for a new drug to go from conception to discovery to development to use as a safe and effective treatment for humans.

For Higgins, the most gratifying part of the job may be in knowing that he’s working to make people’s lives better. “Very few drugs that are discovered ever make it onto the market,” he says, “and very few scientists are fortunate enough to have been able to contribute to the ones that do. It’s a battle that’s being fought by a huge group of scientists from many different areas, and it’s very rewarding to be a part of it.”
The Development of Carbon Nanotubes: Focus of Senior Thesis

Mark Steger ’08, a physics major and honors student, never thought that his paper, “Raman Spectroscopy and the Analysis of Single Walled Carbon Nanotubes,” would lead to his next venture into research. While writing the paper, Steger came across the concept of carbon nanotubes, the topic of his senior thesis.

Carbon nanotubes, also known as cylindrical fullerenes, are allotropes of carbon. Steger was intrigued by the strength of nanotubes and their possible use in the fields of nanotechnology, electronics, optics, and other fields of material science.

There are two main types of nanotubes, single-walled and multi-walled. Single-walled nanotubes are made up of an atom thick layer of graphite rolled up into a cylinder. Multi-walled nanotubes consist of multiple layers of graphite rolled in on themselves to form a tube shape.

Carbon nanotubes allow students to be able to work on projects such as creating or revamping everyday items like clothes and sports gear to combat jackets. Because of the variety of carbon nanotube electrical properties, there is also a good chance that they could be used as components of tiny electrical circuits. But when Steger decided to tackle the project, nanotubes were not available on Albright’s campus, so they had to be ordered specifically for the project.

Steger’s science advisers including his senior thesis adviser, Assistant Professor Brian Buerke, Ph.D., helped him narrow down his options as to what to do with the nanotubes and how to set future students up for work in the same area.

Steger’s goal is to try and artificially make the nanotubes so they will be available for future students. He hopes to make a synthesis apparatus, which will allow students to create their own nanotubes, and he hopes his senior thesis paper will be a manual for students on how to use the synthesis apparatus.

Steger is no stranger to research. During the summer after his sophomore year he participated in the Research Experience for Undergraduates (R.E.U.) in Towson, Md., where he studied photonic crystals. In the project, he illuminated a thin film of crystals with a laser and examined how it would change from an insulator to a conductor. Most recently, he worked with James Scheirer, Ph.D., emeritus professor of chemistry and biochemistry, on a research project studying ionic liquids.

With graduation rapidly approaching, Steger hopes that every bit of research experience he has had will help him become better rounded as a scientist.

He plans to attend graduate school, and is currently applying to such universities as Cornell, Carnegie Mellon and the Massachusetts Institute of Technology. His future career goals are still unclear, but he is considering a career in astronomy or cosmology, maybe even working for NASA.

As for carbon nanotubes, Buerke says that he can foresee a future special topics course for physics and chemistry concentrators about carbon nanotubes and their applications, as well as a research program in carbon nanotubes that other undergraduates can work on in future Albright Creative Research Experience (ACRE) grants.

The Albright College Board of Trustees hosted a ceremonial groundbreaking for the College’s planned new Science Center in October.

This celebratory event was timed to coincide with the fall meeting of the Albright Board of Trustees, whose members have provided a substantial portion of the funds raised for the facility so far. Construction is expected to begin in early 2008.

The new Science Center will include construction of a four-story addition to the existing Merner-Pfeiffer Hall of Science and renovation of the original historic building, constructed in 1929 and added to and renovated in 1965.

The complex will include 41,635 square feet of new state-of-the-art lab space added to the 37,019 square feet of renovated space, for a total of 78,654 square feet. The new construction will wrap the west and north sides of the 1965 addition to the original Science Hall. Construction costs are currently estimated at $27 million.

Construction will take 28 months. Architects for the project are Lord, Aeck and Sargent of Atlanta. Pre-construction services
Q & A with

Pamela G. Artz, Ph.D. ’87, professor of chemistry and biochemistry

What brought you to Albright as a student?
A: The atmosphere. I grew up in Lancaster County and after I visited Albright I was convinced this is where I wanted to go. I gave a little consideration to F&M and Elizabethtown but was certain I would wind up here. It was a great experience. I got married in Sylvan Chapel between my junior and senior year and my husband worked at Lucent right up 13th Street.

What brought you to Albright as a professor?
A: In 1994 a friend of mine told me there was a job opening at Albright. I wasn’t really even looking yet since it was a strange time of the year but I interviewed with the search committee and started on a temporary basis. I switched over to a tenure-track status the next year. I became a full professor in February 2006.

What’s it like teaching with professors you had as a student?
A: I wouldn’t have made it without them. They really mentored me and guided me a great deal. I remember Dr. Scheirer telling me to call him Jim, that was just weird. I couldn’t get used to calling my professors by their first names.

How has Albright changed since you were a student?
A: Now that Lex [McMillan] is here I am encouraged for the future; but when I first arrived as a faculty member things didn’t look very good.

The Science Department though still remained a great place. They were always pushing to do better. This department is really good at advancing students, especially those that may not start out as well as others. We can take the time to guide students who need the extra help and it’s great to see them be successful.

What do you like best about teaching?
A: Even the small victories are important. I love to watch the success of the students and alumni. I like to watch students move on to the next level of courses or become successful in their careers after college. I love to see students get excited about research or internships. We have some wonderful students and graduates who are doing great things.

What do you like to do during your free time?
A: What free time? I have five children, three boys and two girls. They range from five years old to 17 years old. I had two while I was in graduate school and three since I have been here at Albright. It was a real challenge to have an infant while writing a thesis.

What opportunities are out there today for students interested in studying chemistry and biochemistry?
A: There are a lot of opportunities for students to work in the pharmaceutical industry. We have many who work for Merck and other companies. They are primarily in the research and development areas but they also can work in drug testing and manufacturing. Most of the careers in this field have medical applications like stem cell research.

Is the program growing?
A: We are holding steady in our numbers right now. We’re right in line with the other schools that offer this field. The new Science Center will allow us better recruitment opportunities.

How will the Science Center affect your program?
A: It will help to improve a program that is already a high quality product. Construction will be very disruptive but the benefits far outweigh the inconveniences. It will be great for recruitment. It will also be nice not have squirrels running around the attic right over my head.

What do you like to do during your free time?
A: What free time? I have five children, three boys and two girls. They range from five years old to 17 years old. I had two while I was in graduate school and three since I have been here at Albright. It was a real challenge to have an infant while writing a thesis.

If you could give your students one piece of advice what would it be?
A: Life is all about perspective. Keep a realistic view on life. Students need to be realistic about their futures. Also keep learning, never let yourself get stagnant.

College’s Planned New Science Center

have been provided by Wohlsen Construction Company of Lancaster.

The new building will facilitate Albright’s hallmark ability to allow students to combine fields of learning to create an individualized education. Faculty also work collaboratively crossing disciplines and sharing instrumentation, and conducting collaborative research with students.

“Science at Albright has been one of the College’s pillars of excellence for a century and a half,” College President Lex McMillan said, “and Albright has produced more than 1,000 physicians, researchers and teachers in the sciences. Our new facility will support not only 21st century science, but the interdisciplinary teaching and learning of science that is a way of life at Albright. We have outstanding faculty, and instrumentation that exceeds many of our peers. Now we will have the kind of facility that will be commensurate with the high quality of our faculty, our program, and the sophisticated equipment which our students use.

“We are grateful for the magnificent support from our trustees for the Science Center, and the leadership of Sue Perrotty and Andy Maier for making this much needed facility a reality,” McMillan said. Trustees Perrotty and Maier, both of Reading, co-chaired Crossing Boundaries: The Campaign for Albright and the Berks County Capital Campaign for the Science Center.

Albright offers the following science programs: biology, biotechnology, chemistry, biochemistry, physics, optics, psychobiology, environmental science, environmental chemistry and environmental studies, and pre-professional programs in pre-medicine, pre-dentistry and pre-veterinary medicine.
BRAIN TEASERS

Time to brush up on your knowledge of physics. The first 10 readers to submit correct answers to the following questions will receive a prize! Answers will be provided in the summer 2008 issue.

1) What was the first evidence that our universe is expanding?

2) What recent Nobel Prize-winning discovery has enabled the development of products like TiVo and high-capacity MP3 players?

3) What is the main source of comets in the solar system?

4) What are particles like protons and neutrons made of?

5) What happens to metals like aluminum and lead when they are cooled to near absolute zero?

Brain Teasers Answers, Summer 2007

Unfortunately, no one was able to correctly answer all of the chemistry questions from the summer 2007 issue. Below are the answers.

1) What class of molecules in apocrine sweat causes body odor? Fatty acids (fatty acid esters is also an acceptable answer)

2) What is the atomic number of the heaviest element? 118

3) To which family of elements on the Periodic Table does this element belong? With the noble gases, below radon

4) Aromatase inhibitors block the synthesis of estrogen and are used to treat estrogen-receptor positive breast cancers in women and men. What chemical process is catalyzed by aromatase? Aromatization (the synthesis of an aromatic ring)

5) What classes of molecules used for breath strips are under investigation for orally-administered vaccines? Proteins and polysaccharides

6) Arthur Kornberg won the 2006 Nobel Prize in Chemistry for his studies of eukaryotic transcription. Between what two elements are covalent bonds broken and formed in the chemistry of this process? Phosphorous and oxygen

E-mail your answers to jstoudt@alb.edu or send them to Jennifer Stoudt, Albright College, 13th & Bern Streets, Reading, PA 19612-5234. You can also submit answers via the Albright web site: http://www.albright.edu/fusion/index.html.