Geospatial analysis
A new research tool that promises to be as versatile & powerful as the microscope
The College of William & Mary
in Virginia
Chartered January 3, 1693, by King William III and Queen Mary II of Great Britain. Phi Beta Kappa, the nation’s premier academic honor society, and the honor code system of conduct both were founded at William & Mary.

CHAMPION
Sandra Day O’Connor
RECTOR
Henry Clay Bullard ’64, J.D. ’66
PROFESSOR
Taylor Reveley
VISITING PROFESSOR
Michael All Hallerman
DEAN OF ARTS & SCIENCES
Carl Strikwerda
VICE PRESIDENT FOR STRATEGIC INITIATIVES
James R. Golden
VICE PROVOST FOR RESEARCH & GENIUS/PROFESSIONAL STUDIES
Dennis Manos

AidData is a collaboration of the College of William & Mary, Brigham Young University and Development Gateway, an international nonprofit organization. The first version of the AidData web portal was launched in March at an international conference held in Oxford, UK. AidData is the result of a merger between the databases of Project-Level Aid (PLAID) and Development Gateway’s Accessible Information on Development Activities (AIDA). Project-Level Aid is a collaboration between William & Mary’s Institute for the Theory and Practice of International Relations and Brigham Young University’s Political Economy and Development Lab. PLAID was formed after scholars at William & Mary and Brigham Young University found that existing foreign-aid sources did not include enough comprehensive and detailed aid project information to perform their research on aid allocation and aid effectiveness. The PLAID initiative has received financial support from the Bill & Melinda Gates Foundation, the William and Flora Hewlett Foundation, the National Science Foundation and other sources.

Michael Tierney, director of William & Mary’s Institute for the Theory and Practice of International Relations, says that AidData is designed to be an “accessible portal” to be used by scholars, personnel in donor governments and organizations, advocacy groups, people in countries that receive foreign aid, journalists and ordinary citizens. Open access to aid records will have a beneficial effect across the foreign-aid spectrum.

“Citizens in democracies are happy to see some of their taxpayer dollars go to help people who are starving or dying,” Tierney said. “They are not happy to see their money spent to prop up officials in corrupt governments. Shining a light on aid transfers reduces opportunities for waste and corruption.”

The AidData team notes that each year, governments and international organizations provide nearly $160 billion to finance development projects in the world’s poorest countries. But large bureaucracies and complicated reporting often make these transactions difficult for citizens to follow. AidData, by providing innovative web tools and access to the largest collection of development finance activities in the world, hopes to shed light on both the triumphs and failures of aid.

AidData nearly doubles the amount of money in development finance tracked by a single source, from $2.3 trillion since 1945 to $4.1 trillion. It makes available nearly one million individual foreign aid transactions, including detailed, paragraph-long narratives of multilateral aid projects.

In the coming months, Tierney explained, AidData plans to incorporate new types of foreign aid transactions, provide social networking tools, data visualization tools and also will attempt to broaden the database to cover other emerging donor countries such as Turkey, Cuba, Russia, Czech Republic, Libya and Iran.

If you would like to learn AidData go to www.aiddata.org.

—from Joseph McClain

FROM THE DEAN OF ARTS & SCIENCES
All across the William & Mary campus, discovery and learning go on in myriad ways. Many of our new initiatives are made possible by generous support from private individuals and from foundations. Our new Center for Geospatial Analysis (page 6) uses computers to connect spatial components of data, allowing our faculty and students to look at their work in new, compelling ways.

The center was made possible by a grant from the Andrew W. Mellon Foundation to our Environmental Science and Policy academic program. That same grant is partly funding an innovative postdoc program in Environmental Science and Policy, where a recent Ph.D. graduate comes to campus for two years to mentor students, conduct original research, and design and teach new courses. One of those postdocs is currently focused on our AidData project (page 1). The Mellon grant comes with $1.6 million challenge match to private donors—another connection that helps to make all of this possible. Thank you for your interest in the exciting research done by our students and faculty.

Best,
Carl J. Strikwerda
Science honors Macdonald and colleagues for ‘On the Cutting Edge’

A consortium led by William & Mary geologist Heather Macdonald has been honored by the American Association for the Advancement of Science (AAAS) for its web-based compendium of professional-development resources for geoscientists. The group is offering several virtual and face-to-face workshops this coming fall. A story in Science magazine announced the prize notes that approximately 1,400 faculty members from more than 450 colleges and universities have participated in Cutting Edge workshops.

“From the very beginning we wanted to have an integrated program that included both the web site and the workshops,” said Macdonald. “We now require workshop participants to contribute something that will be a part of the online resources.”

Cutting Edge, the web site, contains information and materials organized into 33 topical sections. The resources include 1,200 activities contributed by teachers in the geosciences. The activities include ideas for interactive classroom discussions, field exercises and lab activities.

“Treat a classroom like a workshop,” Haug said. “It might reveal a relationship that our students will benefit from learning about.”

Haug intends to use the grant money to support the 12 workshops being offered this fall. Each workshop will focus on a topic ranging from climate change to physical and biological oceanography. Haug says the workshops will be an opportunity for geosciences faculty to learn and apply techniques that can be used in their own classrooms.

When completed, Haug’s research will benefit other philosophers as well as philosophers.

Matthew Haug

A recent grant from the National Science Foundation has helped researchers gain a better understanding of how to properly treat mental disorders.

Matthew Haug, assistant professor of philosophy at William & Mary, recently received the NSF Scholar’s Award grant in the amount of $137,297.

“One of the coolest things about being at William & Mary is being surrounded by superb professors like Matt Haug, who can reach out to the National Science Foundation and bring home major funding for research in philosophy,” said Dennis Manos, vice provost for research at the College.

Haug’s research aims to further investigate the relationship between the mind and body of an individual researching the trends between the philosophies and the natural sciences.

In a branch of the NSF in which 75 percent of proposals get rejected initially and first-time proposal rejection rates are even higher, Haug said that the notification of an award was breathtaking. While NSF grants in philosophy are limited, Haug explained, “but it also extends the reach of the workshops, to make materials and ideas resources accessible to geoscience faculty, both current and future.”

Macdonald notes that the SPOR Ed website has been a benefit to Carleton’s Science Education Resource Center, where she is director. Several staff members of the center were honored as well. The web site is an integral part of the professional development program, also called On the Cutting Edge, which has received considerable support, including a total of $62 million in grants from the National Science Foundation.

“The Site,” she said, “is based at Carleton’s Science Education Resource Center, where I have worked for several years. Members of the staff and myself were honored as well. The site is an integral part of the professional development program, also called On the Cutting Edge, which has received considerable support, including a total of $62 million in grants from the National Science Foundation.”
Ecoshorfiiesta Root to preside at Ixel Moda

Regina Root, Class of 1965 Term Distinguished Associate Professor of Modern Languages and Literatures at the College of William and Mary, has accepted an appointment to serve as president ad honorem of Latin America’s largest fashion congress, Ixel Moda.

Root spent a week in Cartagena, Colombia, last December as a guest of Ixel Moda. The event, attended by some 10,000 people annually, features runway shows by prominent Latin American designers. During the day, academic sessions draw crowds of designers, historians, entrepreneurs and journalists.

An expert in Latin American fashion, Root was one of the main speakers, invited to present on sustainable design practices and the award-winning Latin American Fashion Reader, which she edited.

“At this congress we addressed the kinds of questions that designers have about ecofashion and its representation of our culture. It is now widely recognized that the ecological crisis is also a crisis in design. Our discussions were relevant to the future of the fashion industry,” says Root.

The presentation generated a buzz in the media, including Viste la Calle of Chile and InFashion TV.

“With professional designer collections alongside the work of students from some of Latin America’s premiere design institutions, one could see a learning process also modeled.”

Werowocomoco exhibit will feature first public showing of artifacts

After 400 years, copper traded by English colonists to the Indians will be coming back to Jamestown.

The copper pieces were recovered in the last several years by archaeologists at Werowocomoco, the capital city of Chief Powhatan, father of Pocahontas. They are among the artifacts to be displayed at “Werowocomoco: Seat of Power,” a new exhibit at Jamestown Settlement, and members of the contemporary Virginia Indian community.

“Nothing like Werowoocomoco: Seat of Power,” a new exhibit at Jamestown Settlement to open in May.

William and Mary archaeologist Martin Gallivan notes that the copper is significant in the Werowocomoco-Jamestown Research Group, based at the College, have been excavating the Gloucester County site since 2003. They are collaborating on the exhibit with Thomas Davidson, senior curator at Jamestown Settlement, and members of the contemporary Virginia Indian community.

“The Werowocomoco exhibit presents an opportunity to expand public knowledge of Virginia’s past by looking at Virginia Indian cultures from a new perspective. Conventional exhibits that deal with Virginia before 1607 emphasize changes in the material culture record, but ignore the political, social and cultural significance of these changes,” said Davidson.

“The exhibit demonstrates in a dramatic fashion that Virginia’s Indian heritage is not built up of pots and stone tools, but of belief systems, family and community relationships, evolving political systems, and a world view that was not derived from, or shared by, the early English settlers at Jamestown,” Davidson said.

Joseph McClain

East Coast loggerhead sea turtles proposed for endangered species list

Two federal agencies have proposed to list the East Coast population of the loggerhead sea turtle as an endangered species. Loggerheads are the most common sea turtles in the Chesapeake Bay.

The proposal, filed jointly by NOAA’s National Marine Fisheries Service and the U.S. Fish and Wildlife Service, is informed by research conducted by VIMS emeritus professor Jack Musick and the six other members of the joint NMFS/USFWS Loggerhead Recovery Team. Musick terms the team’s four-year effort “one of the most thorough endangered species studies ever done.”

The entire worldwide population of loggerheads is currently listed as threatened, with federal protections in place in U.S. waters since 1978. The recent proposal would divide the worldwide population into nine geographic sub-populations, with seven of those proposed for an endangered listing (the other two would retain their threatened status).

These turtles nest mainly along the southeastern coast of the U.S. juveniles then ride the Gulf Stream into the North Atlantic, where they spend 6-12 years before returning to U.S. coastal waters. These older juveniles migrate seasonally along the continental shelf and come enter the Chesapeake Bay each spring to feed on crabs, snails, fish and sea grasses.

The proposed endangered-species listing reflects clear evidence of population declines across northeast Atlantic loggerhead habitats. Musick and other members of the Loggerhead Recovery Team report that nest numbers in Florida declined by 26 percent between 1989 and 2008. Data from the last decade shows an even steeper rate of decline, with 41 percent fewer nests now than in 1998.

Aerial surveys of loggerheads in the Chesapeake Bay—taken by Musick and his graduate students during the 1980s, in 1994, and again between 2001 and 2004—confirm the Florida trend. The surveys, part of VIMS’s ongoing Sea Turtle Stranding Program project suggest that the Bay’s loggerhead population has fallen by at least 70 percent during the last 30 years.

Musick notes that the recent decline in nesting females could have its origins in events that began 15-20 years ago, when today’s nesting females first left their home beaches for open-ocean waters where a major long-line fishery operates for tuna, swordfish and blue sharks.

“Numerous countries are involved in this pelagic long-line fishery,” says Musick, “with Spain having the largest fleet. Bycatch in this fishery is the single biggest threat facing these turtles.”

Musick expects that an endangered-species listing would further strengthen these protections. Future protections would likely involve more stringent enforcement of current regulations, decreases in the number of incidental turtle captures, and protections for other species, and seasonal limits on dredging operations along the U.S. Atlantic coastline.

—David Malmquist, VIMS

Muscarelle Museum scores a coup in Michelangelo exhibit exclusive

Leonardo da Vinci drew his iconic Vitruvian Man to demonstrate the ideal geometric proportions of the human figure. A close look at Michelangelo Buonarroti’s equally iconic sculpture David, on the other hand, reveals peculiarly oversized head and hands—features that appear perfectly proportionate when the statue is installed and the observer is looking up at it.

“Michelangelo always said that an artist should keep his compass in his eye, not his hand—because it’s the eye that judges,” explained Aaron De Croft ’88, director of William & Mary’s Muscarelle Museum of Art. The Muscarelle scored a coup this spring by being the only U.S. venue this year of a showing of original Michelangelo drawings, a context-filled exploration of the artist as anatomist-architect.

The 12 drawings on loan from the Fondazione Casa Buonarroti in Florence were the core of an exhibit titled Michelangelo: Anatomy as Architecture, curated by De Croft. The exhibit also contained selected 16th-Century prints of ancient sculptures—including a Laocoön that Michelangelo himself saw unearthed from a vineyard—known to influence the artist’s concept of human anatomy. (See http://web.wm.edu/muscarelle/exhibitions/michelangelo.html)

“What we did at the Muscarelle was to run the thread of architecture-as-anatomy through these drawings and these prints,” De Croft said. “By doing that, we then illustrate how Michelangelo studied anatomy.”

De Croft stresses that the show was a display of the work of experts and primary sources. It included the account of an eyewitness to the unearthing of the Laocoön, for instance, as well as descriptions by contemporaries, such as artist-biographer Giorgio Vasari and a cardinal who worked closely with Michelangelo.

“We’re not saying that we’re the experts here at the Muscarelle,” De Croft said, “but we were able to add two, three, maybe four new things. When you add new findings to Michelangelo studies, that’s a very serious thing.”

One such addition to Buonarroti scholarship concerns Two Studies for Two Legs, a circa 1530 work long catalogued as a double study of a left leg. However, De Croft points out in the exhibit catalog that the difference in the picture indicates the study is actually a pair of legs, left and right.

“It’s a small addition to scholarship,” he said, “but then again, people have been looking at this for 500 years and no one has seen this before.”

—Joseph McClain
GIS is making new types of research possible at William & Mary. It’s also allowing researchers to look at work in progress in new, compelling ways.

GIS uses computers to connect the dots among the often-neglected spatial components of data. The term itself is an acronym for “geographic information system.” Rather than a single system, GIS refers to a variety of techniques and tools. Stuart Hamilton, director of the College’s Center for Geospatial Analysis (CGA), says Google Earth and other data-rich, interactive features on the internet have made people familiar with the products of GIS, even if they’re unfamiliar with the technology itself. In the past few years, researchers and scholars have discovered the world of GIS—and the world through GIS.

“Between five and eight percent of all collected data has some spatial component,” Hamilton said. “A lot of people weren’t even looking at the spatial component of the data sets. Then GIS came along and people found that it’s applicable to not just geographers and geologists but also social scientists, education researchers, public-policy people and more.”

A NEW HOME FOR THE CGA

The William & Mary Center for Geospatial Analysis is settling into its new permanent location on the second floor of Swem Library. The birth of the CGA was made possible by a grant from the Andrew W. Mellon Foundation to the College’s Environmental Science & Policy program. In addition to the Mellon grant, the center gets support from a number of other sources, including the Charles Center, Swem Library, Provost Michael Halleran and Dean of Arts & Sciences Carl Strikwerda. Gene Roche, from the College’s Department of Informational Technology, made certain that the CGA had the technology it needed.

As the center gets support from a wide variety of sources, it provides support to a wide range of disciplines. The CGA itself dates to 2008, but Hamilton notes that individual programs and researchers at the College have been using GIS for years.

“It was ad hoc, here and there, without any real organization,” Hamilton said of pre-CGA use of GIS. “You had some people in social sciences, like Professor Saporito, dipping their toe into GIS. You had the Center for Archaeological Research and the Center for Conservation Biology, using it on an as-needed basis. Geology and environmental studies hired adjuncts over the years to teach undergraduate courses.”

Hamilton was referring to Salvatore Saporito, who worked with fellow sociologist Deneeth Saliou to build GIS-driven maps showing the impact of magnet

Purging the past: A data-driven story

Stuart Hamilton: “It’s hard to predict the future, but I don’t think we are going to return to an analog society. I think we are going to need people who know how to manipulate that data.”

GIS techniques open new research horizons

by Joseph McClain

Prehistoric megalithic dolmens and menhirs dot the landscape of Denezé-sous-Doué. At certain times of year, the fields reveal lines that are congruent with boundaries of the narrow farm plots shown on 1800-year-old maps.

It’s a place that has been continuously populated for millennia. Barbara Watkinson says that even the place names in this part of France have changed very little from medieval times to the present. Watkinson brings together a collection of documents including 9th-century monastic land records, Napoleon Bonaparte’s tax maps, aerial photographs, satellite imagery and modern maps to chart and explain the transformation of the landscape in this particular area of western France.

Watkinson, an associate professor in William & Mary’s art and art history department, enlisted the Center for Geospatial Analysis for help in “stitching together” the various media using various GIS techniques to reveal historic patterns of land ownership in the melded data.

LESSONS IN DATA STITCHERY

At William & Mary’s CGA, Stuart Hamilton taught Watkinson and her student, Cassandra Prena ’12, how to stitch their data, using rubberstitching and other relevant GIS techniques. They’re focusing their research on the transfer of property from lay to ecclesiastical ownership during the 11th and 12th Centuries. Watkinson explained that landowners were regularly prompted to donate real estate to religious authorities in exchange for prayers to relieve the suffering of dead family members in the afterlife.

“Purgatory is where you go to be purified of your earthly sins. About the middle of the 12th Century, purgatory started to be spelled with a capital ‘P’. To them, it was a real place,” Watkinson explained. “Monks wrote and talked a lot about purgatorial torments. They used it as a lever to motivate people to make donations to get the souls of their parents and ancestors—and themselves—transferred out of the tormenting waiting place to the nice waiting place. There are all these stories about spirits of the dead returning to their children, telling them all these horrible details about their suffering and pleading for them to go to the monks and follow through on a gift of a farm or even a church.”

Even though Watkinson had spatial data from several eras, her work with the CGA revealed that her project required a greater degree of accuracy. To this end, Watkinson and Prena walked the fields and roads of Denezé-sous-Doué about a year ago. Armed with a notebook, a handheld GPS plotter and practical advice from Hamilton, professor and student nailed down the x, y and z coordinates of the Denezé commune.

“Stu told us to use something pretty immutable to make our plots,” Watkinson said, “not necessarily the kinds of things we’re interested in, but churches and roads. Their locations have hardly changed over hundreds of years. What was a main road in the Napoleonic era is still there, but now it’s a dirt path.”

Sowing seeds of resement

The redistribution of wealth in medieval France has enormous cultural and historical significance, Watkinson said. Through the lever of purgatorial paranoia, churches and abbeys gained more than agricultural land, accumulating mills, tanneries and other industrial properties—including. Watkinson says, “related indenured workers, the kinds of people we came to call serfs.” And of course, abbots, bishops and religious orders grew richer and more powerful.

Watkinson points out that while the church was reaping the benefits of the landed gentry’s concern for their ancestors’ afterlife, it was also sowing the seeds of resentment that grew into the social and political upheaval of the French Revolution.

“The church became even more hated than, perhaps, the monarchy,” she said.
Center for Geospatial Analysis creates a new research hub

SABINS MOVES IN

The CGA has incorporated virtually all of the College’s ongoing GIS work into its own operations. Russell is now the coordinator of the center’s workshops. Saporito has literally moved into the CGA, after receiving a $1 million grant from the National Science Foundation to expand his GIS study of school boundaries into a more ambitious project called SABINS—the School Attendance Boundary Information System. Saporito is now working on the two-year SABINS project from office space in the CGA, with a staff that includes Ashwin Waakhaure, a GIS programmer; Jeff Han, spatial database engineer; and a number of William & Mary undergraduate researchers.

Both Hamilton and Saporito believe the establishment of the CGA at William & Mary was instrumental in bringing the million-dollar NSF grant to William & Mary. Hamilton says he expects the center to serve as a prime feature. The work is an integral part of a 280-page set of findings that have been sent to every school superintendent in Virginia, as well as to every state legislator.

“Those will also end up on the SCHEV web site,” Alleman said. “They are developing an interactive map of the state where you will be able to click on an area and see all the providers based on that data. That is going to be a nice resource.”

WRESTLING DATA INTO SHAPE

The CGA helped the researchers take what Alleman described as “a fairly convoluted set of data” and convert it into a format accessible by, and helpful to, a number of lay users. Hamilton brought one of his GIS students, Ashwin Waakhaure, into the project. She worked over the summer with the team, producing data-rich maps of Virginia.

In November, Alleman presented his report, with some of the CGA maps, to SCHEV and other state and university officials. The GIS component is an ongoing aspect of the project, with “bleeding edge” as a prime feature. The work is an integral part of a 280-page set of findings that have been sent to every school superintendent in Virginia, as well as to every state legislator.

“Those will also end up on the SCHEV web site,” Alleman said. “They are developing an interactive map of the state where you will be able to click on an area and see all the providers based on that data. That is going to be a nice resource.”

Doctoral Student Neal Holly (left) and assistant professor Nathan Alleman of the William & Mary School of Education used GIS to map the locations of Virginia’s college access providers for SCHEV.

Virginia is dotted with resources that Nathan Alleman describes as “all the college access providers,” entities that are at challenging as it is for them to define.

Broadly defined, “college access providers” are people or groups that help young Virginians to navigate the college selection and admission processes. Such resources tend to be richer in areas that have a generally higher college attendance rate.

“They’re pieces of the sort of cultural-social capital that people just don’t grow up with if they aren’t around people who go to college,” he said.

Alleman, a visiting assistant professor at William & Mary’s School of Education, leads a group charged with assembling a report showing where the scores of college access programs are across the state. More important, the study also was to identify the Commonwealth’s underserved areas.

$1.1 MILLION IN FUNDING

The study, commissioned by the State Council of Higher Education for Virginia (SCHEV), was funded through a $1.1 million federal College Access Challenge Grant.

Many resources can fit under the umbrella term “college access provider,” Alleman said, from grass-roots “college nights” to sophisticated, multi-site initiatives such as Project Discovery or the 128 Commonwealth-sponsored career coaches around the state. SCHEV has a position that they are not shy about making more money from a state initiative.

“Early on, mapping seemed like a great idea,” Alleman said, “but we weren’t sure how to go about it until someone referred us to Stu and the GIS program.”

Alleman sat down with Stuart Hamilton at the Center for Geospatial Analysis to discuss his data and his desired result. For instance, it was easy to pinpoint the locations of each provider, but not so simple to show the area that each provider served.

“Stu was very good in helping us to think through what our unit of analysis should be,” he said. “It turned out to be the school district, even though there are some severe limitations there, but in terms of demographic information that we could link to our own data, it was the smallest unit that made sense.”

MORE THAN ONE APPROACH

“Sal didn’t know much about raster data, he had to find a vector solution to his problems and it all could become quite convoluted. He came to me and I said, ‘Well, that’s a raster problem. We can do that relatively simply.’” Hamilton explained. “Sal was limited to a set of solutions, often the correct solutions, but sometimes they were very convoluted solutions. With knowledge of only one data model, he had only a single path to go down. Now he’s got a number of options.”

Just as there is more than one way to approach a GIS problem, Hamilton says when it comes to addressing the GIS needs of each of the individual research projects at William & Mary, flexibility is the order of the day. Quite often, he says, he trains student researchers to use the necessary GIS techniques to apply to the research of their faculty mentors.

“There’s no one way of working with people. It really depends on the scope of the project, what their needs are and what their levels of familiarity are,” Hamilton said. “A lot of the faculty are just not going to have the time to learn the GIS concepts and then apply them in the software. So it’s good to work through their students and have students that become skilled and can do the GIS for them—or teach the faculty how to do it.”

Outside the entrance to the CGA facility in Swem stands a display dedicated to GIS-based research on campus papers on the effectiveness of Central American shrimp farms, real estate price change and a number of others.

Hamilton says even he is surprised by the breadth of applications for GIS techniques.

“I’m always amazed by users coming up that I don’t expect,” he said.
A Greg Bowers performance typically includes a projection screen fed from his laptop that depicts the digital component of this presentation.

An apple on the piano
Greg Bowers’ work blends the digital with the analog

By Lillian Stevens

Greg Bowers performs, it’s often at a grand piano, but there’s usually an Apple laptop perch next to the music stand. When he composes, he sits down at a piano, but, when appropriate, he uses a variety of computer-driven multimedia options—audio and visual—to help unlock the expression from within.

“Computer music—or digital art—is a great platform to do that because you can’t rely on the same things. It doesn’t matter what the media is anymore—whether music or visual,” he said. “In the digital world, which is binary, everything is all ones and zeros. It’s an ideal interdisciplinary platform. There is no distinction to the computer.”

Bowers, an assistant professor of theory and composition at William & Mary, says he can be inspired by just about anything. “I just came from a musical analysis class on the dead German guys,” he says, referring to, among others, Johann Sebastian Bach. “And I can listen to Britney Spears or Lady Gaga and understand that too. I don’t see them as pop artists. Instead, I see the producers, because the producer is the one who is manipulating all of the sound.”

In today’s digital age, Bowers has a choice. He can write a musical score by putting pencil to page, just like one of the dead German guys. Or he can tell a computer to perform a series of instructions. Then, the computer actually generates the score. He explains that both approaches involve the same creative process, but the computer can execute a variety of compositional techniques very quickly. When he is teaching, Bowers tries to help his students to understand that the software is making choices for them, and those choices are limited by the software itself.

THE COMPUTER IS A FANCY PENCIL

“When you approach a computer as a creative instrument, you have to realize that the software designer is a part of that process, and so your creative thinking is affected. We get into this ethical argument about who’s telling who what to do,” Bowers says. “The computer is just a fancy pencil. Ultimately, as a composer you have to be in control because your name goes on the piece. You don’t want to get into a situation where you’re expecting the computer to behave for you, because it is not a person.”

Students in Bowers’ Introduction to Computer Music class are exposed to the same digital techniques he uses in composition and performance.

“We learn how to edit things, how to cut up sound and put it together,” he said. “We learn how to record, how to choose a microphone and where to place it. We will run a recording session and edit that recording together. We also learn how to build sounds in the computer—sound synthesis—and then at the very end we do things that are interactive, like performances driven by sensors and multimedia.”

The students use a program called Max to design their own interface.

“Using Max, they can decide how they are going to react with the computer and how their reaction is going to cause the computer to output sound,” Bowers said.

Still, Bowers said all the digital technology and the bells and whistles of the multimedia experience hasn’t been able to replace the feeling delivered by a live performance.

DIGITAL CAN’T REPLACE LIVE—YET

“There are parts of the concert experience that cannot be imitated—at least not yet. You cannot sit in front of a cellist playing for you and have it sound the same as it will on a CD, that is a physical phenomenon,” he explained. “Our hearing sensitivity can hear about one trillion different frequencies—or timbres. On a CD you’re getting a significantly reduced sample of that. So there’s actually a physical sensation as well as the psychic sensation of being in front of somebody who wants to personally perform for you and seeing them physically make the sound.”

“The emotional content and the connection between audience and performer—and anyone who performs lives—will always be a connection, the feel for the audience, so those elements aren’t going to go away,” he added. “We’re not going to lose our human need.”

Indeed, most of Bowers’ compositions are traditionally written and executed. One such work was commissioned by the Children’s Educational Theatre in Salem, Oregon—a musical based on the novel Alice in Wonderland and the life of its author, Charles Dodgson, better known as Lewis Carroll.

“That was a musical that I wrote and directed, based on the Alice story, but also keeping in mind the relationship between Carroll and the real Alice, the daughter of Christ Church College in Oxford, where Carroll worked,” he said.

Bowers was interested in the well-known work, but also wanted to explore the story behind Alice and has become a bit of a Lewis Carroll scholar as a result.

“TRADITIONAL MUSIC IS NOT DEAD

Bowers’ Alice is a traditional musical, written the traditional way and performed by live musicians and actors. He believes that such traditional vehicles—including serious music in the vein of Bach, Mozart and Beethoven—will always have its niche. “But I do believe that change is inevitable,” he adds.

“Like everything else, we must ask ourselves what the reasons are for seeking out live musicians, as opposed to the reasons we might not need live musicians, especially with the technology constantly changing. I think you constantly have to reevaluate what the place is for each of these different forms of expression,” he said.

Bowers does a lot of multimedia performance where the show is just him, a keyboard, a computer, and projections. “My next project involves a show being premiered in Philadelphia in June, where I’ll be singing into a computer and the computer will manipulate my voice live.”

DIGITAL CAN’T REPLACE LIVE—YET

“You have to know—or learn—the abilities of the performers so that you can write something that they can execute. In this case, there were 45 performers,” he explained. “And then the other part involves the needs and stipulations of those who are commissioning you in the first place. What is their interest? Their interest is in selling box office tickets.”

For Alice, Bowers was charged with creating a musical which would appeal to children and adults alike.

“And, yes, there were kids in the audience so I definitely did take some risks,” he said. “But overall it went really well, the production sold out and a great video was made which is being edited now.”

THE BEST OF BOTH WORLDS

Greg Bowers is a composer first, and a “computer guy” second.

“You’re a typical computer guy might not be into Beethoven or Bach; they just want to program and innovate. And that’s great because programmers are able to come up with new tools that can be used,” explains Bowers.

“I spent a year in a class learning Csound, a major music programming language,” he said. “Learn that and you can write the code and make the choices yourself.”

Some large institutions have entire computer music programs outside of the music conservatory. Bowers says he is happy at William & Mary because here he has ample opportunities to nurture his traditional musical side while also exploring his multimedia, interdisciplinary side.

“I’m not a computer scientist. Part of my job as a composer is to explore the possibilities of technology as they tie into artistic expression,” he said. “Bach did it with pipe organs. I do it with EKG sensors.”
ALTERTATIVE ENERGY

A Bright Idea

Your first fuel cell-powered car just moved a little closer

by Joseph McClain

Problems with the PEM cells, Lüpke said, center around their only fuel: hydrogen. Production costs for hydrogen are high and storage of the gas poses its own set of problems. Not least, he said, is the virtual lack of hydrogen fueling systems.

On the other hand, solid-oxide fuel cells are more versatile, being able to run on hydrogen or just about any hydrocarbon—propane, butane, many biofuels and even gasoline—readily available fuels.

HEAT’S THE PROBLEM

The problem is that the solid-oxide fuel cells have to run at very high temperatures of about 600 to 1,000 degrees Celsius. Instead of running at 600 to 800 degrees, the enhanced cells could run much cooler. Their invention could put solid-oxide fuel cells back into consideration for automotive and other portable uses. Cooler operating temperatures would make solid-oxide fuel cells less expensive to manufacture. Lüpke explained that their invention would allow cells to be constructed with steel electrodes, rather than using platinum, as required in current solid-oxide cells.

“Would also decrease the startup time, which is a big issue for automotive applications,” Spahr said. “If you can make these hydrogen ions mobile order of a microwave oven. A conventional oven, he said, “has the chemistry, Spahr said. The anode breaks down the fuel into hydrogen ions and electrons. Then, the ions diffuse through the solid-oxide electrolyte, while the electrons travel around the outside of the cell, and as Lüpke says, do all the work, or make electricity.

The electrons can’t get to work until the ions pass through the electrolyte, completing the chemical reaction. “Heat fact the ions can move through the material is a limiting factor,” Spahr explained. “Solid-oxide fuel cells must be run at high temperatures in order for the ions to move through the electrolyte with relative ease.”

REPLACING HEAT WITH LIGHT

Heat speeds up the ion passage, but Lüpke and Spahr have found a way to get the same effect optically. They use infrared light to excite the hydrogen, which then becomes mobile, allowing the hydrogen ions to complete their trip through the electrolyte more easily. In the lab, they’ve shown the effect of the infrared light to increase the ion conductivity by seven to nine orders of magnitude.

It’s a huge effect, Lüpke said, and that corresponds to a reduction in operating temperature of 200 to 300 degrees Celsius. Instead of running at 600 to 800 degrees, the enhanced cells could run much cooler.

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SOCIAL COGNITION LAB

facing RACE
What brain waves reveal about stereotyping and prejudice

By Erin Zagursky

A professor at William & Mary and her students have been examining the way our brains react when we're shown a variety of races. They are finding that although the idea of our society as a “melting pot” may be a popular idea, deep inside our minds don’t work that way. Our brains perceive more differences than we realize.

“It’s good to research people’s differences,” said Cheryl Dickter, assistant professor of psychology. “That’s how our brains work—we see differences in people. But what you do with those differences is the real important and interesting part of the equation.”

Dickter and her students look at social cognition: how we think about social things and how people react to prejudicial comments about those things.

Dickter heads up the Social Cognition Lab in William & Mary’s Integrated Science Center. In the lab, Dickter and her students—both graduate and undergraduates—look at the attentional and cognitive processing that people go through when they categorize a face.

“One of the basic processes we engage in is social categorization. So when we see a face, we categorize the face on race, gender and age—those are the three categories that pop out, and that’s something we do automatically,” said Dickter. “And it’s something we have to do. Putting people into categories helps us conserve cognitive resources and lets us pay attention to other things that are more important.”

To look at those processes, the lab uses EEG to measure the brain’s electrical activity. Volunteer spectators—students at the College—are shown a series of target faces on a computer. Each face is only shown for about a half of a second at a time. Neural reactions are recorded by the EEG.

HALF A SECOND TELLS A LOT

What’s unique about Dickter’s lab is that they’ve begun looking at this effect among other races.

“When you look at a black individual categorizing a black or white target, they actually pay more attention to the white faces,” said Dickter. “So, it’s more of an outlier. You pay more attention to groups that you’re less familiar with, that you have less experience with.”

Dickter has found that this early attention leads people to activate stereotypes associated with the race one sees.

“It’s not necessarily that you believe the stereotypes, but rather that you just know them,” said Dickter. “So whether you are looking at a white, black, or other-race face, you are activating stereotypes associated with that group. That’s why it’s important to look at these automatic processes.”

As stereotypes are activated, it can affect the way we interact with people, she explained. The whole process from attention to interaction takes mere seconds: A man sees a face; he pays more attention to it because the person is of a racial group he’s not used to seeing; paying attention to it leads his mind to bring up stereotypes associated with that race; and those stereotypes cause him to act differently toward that person.

“By understanding those automatic parts of processing, we can understand how perception leads to differences in people’s behavior,” she said.

“Though much of the focus of Dickter’s lab is on automatic stereotypes—things we can’t help from popping into our minds—the lab members are also looking at prejudicial behaviors over which people do have control. Over the last few years, Dickter has been looking at how people react to the prejudicial comments of others.

“What I’m interested in is your reaction to a prejudicial remark: what you’re going to say and what factors are going to influence what you say,” she said. “Especially if you’re not the target of the comment.”

PREJUDICE & RACISM ON IM

The lab members have begun to simulate a social situation in which the participant hears a prejudicial remark. Currently, the lab is doing this experiment with participants via Instant Messenger. IM works well, Dickter said, because IM-ing participants usually assume that the interaction of a racially charged remark is not part of the experiment. IM also allows the researcher to examine people’s reactions when the social costs of responding are minimized.

“We’ve taken away some of the social costs, but the benefits are still there,” said Dickter. “The participants may reason, ‘if I confront this person, then maybe they’ll think about it next time when they go to say something racist.’”

Dickter said students are particularly interested in this experiment because they see it as immediately relevant to their own lives.

“They hear these kinds of comments all the time, and it’s hard to know how to act,” said Dickter. “So a future direction of these studies will be how to train people or how to give them some sort of direction on how to act in these situations. This has applications for diversity training.”

Although the lab’s research mainly focuses on race, its researchers are also interested in other social categories. For instance, Dickter recently submitted a paper for publication with graduate students Kyle Gagnon and Ivo Gyurovski focusing on both race and gender. They found that black people pay more attention to gender and white people pay more attention to race when they are shown faces and asked to do a task that does not involve social categorization.

Dickter is also working with a researcher from the University of Washington on a neurocognitive study of perception of gay and lesbian facial images. Previous research has found that people process the faces of gay men differently than the faces of straight men even when no information is provided about the sexual orientation of the faces they were presented with. Previous research has also found that people are better than chance at categorizing people’s sexual orientation based solely on seeing their faces for half a second.

“What we’re looking at now is trying to tease that apart,” said Dickter. “We’re examining potential neural differences between looking at a straight person versus a gay man or a lesbian, and whether this depends on the perceiver’s own sexual orientation.”

Dickter hopes the lab’s work will lead to better diversity training and will help individuals understand their own automatic biases and how they can confront prejudice.

“Helping us understand how automatic it is can help us combat the prejudice side of it,” said Dickter. “If we all automatically activate those stereotypes, the really important part of it is what you’re going to do with it later.”
Beyond the Standard
Department of Education funds texts stressing dialects in Arabic

By Jim Ducibella

In Washington Hall office the size of an average walk-in closet, the future of the Arabic language is being designed. Not the language itself, but the manner in which the language will be taught for years to come.

Close friends John Eisele and Driss Cherkaoui, both associate professors of modern languages and literatures at William & Mary, plan to devote much of their foreseeable future to producing seven textbooks. Three of them will focus on Modern Standard Arabic, the written form that is used across the Arab World. They also will write one volume each on the four major dialects of the language: Moroccan, Egyptian, Syrian and Iraqi. All will be supplemented with videos, CDs and other multimedia accompaniments.

The United States Department of Education is so enthused about this monumental project that it has awarded Eisele and Cherkaoui a three-year International Research and Studies grant totaling $528,000. The grant will support the development, testing, revision and production of a little more than half of the project. That would include two levels of Modern Standard Arabic, and the Moroccan and Iraqi dialect modules.

In spring, the professors were writing part one of the Modern Standard Arabic textbook, as well as working on the textbook on the Moroccan dialect.

Pearson Education is publishing the series. Although Pearson publishes in many different languages, the professors say this will be Pearson’s inaugural effort at publishing a textbook in Arabic.

A portion of their work has already been pilot-tested at the University of Arizona, under former student/new Arabic instructor Scott Brown. Brown reported that his students “really liked it, really thought it was excellent.” The professors are sounding out contacts at other universities about using their textbooks, particularly for summer programs. Cherkaoui, who founded the Arab-American Language Institute in Morocco in 2008, said he will start pilot-testing their work there this summer.

A DIFFERENT WAY TO TEACH ARABIC

“This is really different from anything Arabic has ever had,” Eisele said. “And it is really unusual for a major publisher to publish in a foreign language for which the audience is so small. This is a big step for them.”

The audience seeking to learn Arabic may be small by comparison, but seems to be growing like a teenage boy.

Eisele joined the College in 1994. Cherkaoui arrived two years later. In those days, they may have taught Arabic to between 60 and 80 students. Following the terrorist attacks of September 11, 2001, that number grew steadily. Now the two professors work with between 200 and 250 students. Relative to the size of the College, the William & Mary program is one of the most robust in the country.

“The market changed tremendously after 9/11,” Cherkaoui explained. “The number of students grew to four and five times more than before. The same thing happened with hiring. Before 9/11, all across America there were maybe two or three university teaching positions open per year. Now, there are universities that have so many openings they can’t fill them all, since hundreds of universities have started Arabic programs. The need is there for a more complete manner of teaching the language.”

The U.S. government agrees, and feels a more inclusive style of teaching Arabic can only help in the war against terrorism.

“The government actually has been trying to force the field to teach more dialects,” Eisele said. “It’s had a salutary effect on our project. It’s a shame it has to come this way, but it forces the field to deal with linguistic reality. The American government and military felt a tremendous demand for fluency in Arabic.”

For the past 15 years or so, there has been one dominant Arabic textbook used in the United States: Al-Kitaab. That’s it. Produced by Georgetown University Press, Al-Kitaab in three volumes long, supplemented by a host of videos.

“It’s well done, but it doesn’t really teach Arabic in a communicative fashion,” Eisele explained. “It doesn’t really get into the different dialects. It does have some excellent supplementary materials, but it can be improved upon.”

They also found that Al-Kitaab didn’t sustain or challenge third- and fourth-year students to their satisfaction. The two men were spending hours revising outside materials, getting videos for their class, making up question sets and accompanying reading assignments.

“Finally, you have a pile of materials and you ask yourself, ‘What am I going to do with all of this?’” Cherkaoui said. “And all you can think of is ‘Do something with it.’”

Several years ago, the men began meeting once a summer at a coffeehouse. They not only discussed the ancillary material they were creating, but also explored the different aspects of the Arab world, especially poetry and literature, themes that they could wrap into the textbook.

“We could not start this from scratch if we had not known each other for so long,” Cherkaoui said. “We have been talking about something like this for a long time.”

Eisele produced a book proposal that Pearson heartily endorsed. The prospectus for publication became the foundation for the grant application, which carries with it the possibility for renewal.

Convincing college educators that there is value in something other than the traditional approach taken by Al-Kitaab will be an obstacle for the professors. But it may be one they can live with. There are many hurdles to be scaled before all is said and done.

Arabs view their language differently from the way other cultures view their languages. To them, classic Arabic is a “sacred” language, since it is the language of the Koran, and it is valued above all other forms of the language. The modern version of this classical language, Modern Standard Arabic, is the language that is taught in schools throughout the Arabic world. It is used in most newscasts, as well as being the primary form of the written language used in literature and journalism.

THE TRADITIONALIST VIEW

Many involved in teaching Arabic, both native and non-native speakers, believe that Modern Standard Arabic should be the primary focus of Arabic language teaching in the first two to three years, leaving the learning of the everyday colloquial speech to a later point in time—if at all.

“This attitude is something we have to deal with,” Eisele said. “Hopefully, we can change some of those attitudes, but things have already begun to change. A generation has grown up on right now in the States, with regard to teaching the dialects, but in the Arabic world the traditional view still holds sway. This is despite the fact that the Arabic language is rarely used in the formal standard language for communicative tasks outside of a small circumscribed group. This is especially true in Egypt and Lebanon, where the dialect has been gradually taken over by some of the terms (such as news reading) usually assigned to the standard language. But even in these countries, many traditional language educators view the teaching of dialects as beneath them.”

“American students need to understand what this culture is all about,” Cherkaoui said. “Is language separate from culture? I don’t think so. Without understanding the culture, you may know some language, but that’s all you know. Someone who comes to America and knows English, but not our culture, feels really strange. That adds some weight to our shoulders. We really have to think clearly how to implement Arab culture into the textbooks.”

The plan is to film videos in several Arab countries, authentic scenes featuring authentic people employing everyday dialect. That work has been contracted out by Pearson, but there is a commitment to shoot in such a way as to “put” students into real situations.

“We hope,” Cherkaoui says, “to give an adequate accounting of both the colloquial dialects as spoken languages and of Modern Standard Arabic, as a written language, and how they function together in Arab society and culture. We are not partisans of one side or the other (colloquial versus Modern Standard), but believe that students should be exposed to the variation in the Arabic language situation as early as possible. This will serve to deepen their understanding of Arab societies, cultures and identities.”

Arab view classic Arabic—the language of the Koran—as a sacred language. Modern Standard Arabic is the formal version of the tongue, used in schools, newscasts and in documents, but throughout the Arabic world, a range of colloquial dialects dominates everyday speech.
CrimD wins recognition in microbiological circles

CrimD, William & Mary’s favorite bacteriophage, has become the microbiological equivalent of an Oscar nominee.

“We were contacted by the University of Pittsburgh—Graham Hatfull’s laboratory,” said Margaret Saha of William & Mary’s biology department. “They consider our ‘Oscar nominee’ so interesting and so unique that we have the opportunity to collaborate with them.”

CrimD was discovered last year by a group of freshmen participating in a special research experience for first-year students sponsored by the Science Education Alliance of the Howard Hughes Medical Institute (HHMI). Drawn from the mud of campus landmark Crim Dell, CrimD was determined to be a previously unknown variety of bacteriophage, a group of viruses that infect bacteria.

Some 30 first-year students were involved in last year’s HHMI phage lab, working with a faculty team comprising Saha and her fellow microbiologists Mark Forsyth and Kurt Williamson. Hatfull is an HHMI Professor at Pitt and has been interested in CrimD since the virus was sequenced.

There are a couple of things that make CrimD stand out from the crowd of new phages discovered in HHMI phage seminars at dozens of universities. As phages don’t reproduce sexually, they aren’t part of the Linnean “family-genus-species” classification, and, instead, are grouped in clusters.

“That’s what makes CrimD so interesting; it’s not in any previously existing cluster,” Williamson said. “It forms its own with a phage called TM4 that was sequenced many years ago—and just hanging out by itself, unclustered. TM4, CrimD and this other phage called Angelica have formed their own cluster.”

There’s more than academic interest in CrimD and its cluster mates. They all infect different species of mycobacteria, a family that includes the causative agents of a group of diseases that include tuberculosis and leprosy.

“There is a lot of excitement that CrimD might infect Mycobacterium tuberculosis and therefore have real benefit as a therapeutic agent or, more likely, doing genetic manipulations to help find better treatments of TB,” Williamson explained.

The team at William and Mary will continue to work with CrimD, cleaning up rough spots in the sequencing of the virus’s DNA and re-annotating the gene groups blueprint in the genetic sequencing. The students involved are Allison Perz, Hilary Whelan, Kobie Gordon, Jillian Walton, Arrykka Jackson and Jordan Bonz Hudson.

“The students are doing all the work. Everything! And we’re just overseeing it. They’re doing the re-annotating. They will do the experiment,” Saha said.