

SPRING 2010

ideation

RESEARCH & SCHOLARSHIP AT WILLIAM & MARY

Geospatial analysis

A new research tool that promises to be
as versatile & powerful as the microscope

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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 a \$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



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On the cover: “X” marks the confluence of two streams in western France on a copy of a Napoleonic tax map. The numbers correspond to the data entered in a hand-held GPS unit. Read about our GIS-driven research on page 6.

Map courtesy Archives départementales de Maine-et-Loire.

Photo illustration by Joseph McClain.

it’s about the work

The College of William & Mary in Virginia

Chartered February 8, 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.

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Ideation is the crystallization and conceptualization of ideas. It is part of the process through which thought ultimately becomes deed.

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AidData—a web site that takes the lid off the shadowy world of foreign aid

AidData, a new public web site and search engine, will bring an unprecedented degree of transparency to the complex—and often shadowy—world of development finance.

AidData is a collaborative effort 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 currently 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 search AidData go to www.aiddata.org.
—Joseph McClain

Blakey’s research featured at New York African Burial Ground visitor center

Years of work by a William & Mary faculty member and his students went on display in February when the National Park Service opened the New York African Burial Ground’s interactive visitor center in Lower Manhattan.

Michael Blakey, National Endowment for the Humanities Professor at the College of William and Mary, served as the lead scientist at the burial ground, which is the first national monument dedicated to Africans of early New York and Americans of African descent. The site’s visitor center showcased much of the research that was done as a result of the work that Blakey and his students have completed.

During his decade of work at the burial ground, Blakey coordinated research of the site and its remains among teams of archaeologists, biological anthropologists and historians, among others. The archaeological and



Anthropologist Michael Blakey



The PLAID team prepares to go to Oxford to launch AidData. From left: Ben Arancibia ’11; Rob Hicks, associate professor of economics; Brooke Russell, project manager; Michael Tierney, institute director and associate professor of government; Ishita Ahmed ’11; Ryan Powers, visiting research associate; Daniel Nielson, associate professor of political science at BYU.

historical contexts of the remains were analyzed by Howard University research teams and the Institute for Historical Biology (IHB) at William & Mary, which Blakey directs.

Over the last few years, a comparative database on the bioarchaeology of the African Diaspora was developed at the IHB. That database, which has been used by about a dozen William & Mary undergraduates for research projects, provided much of the information that was used to design the permanent exhibit in the new visitor center.

Blakey and a group of four William & Mary graduate students assisted the firm that was hired to design the visitor center. The firm met with Blakey and other specialists to come up with drafts of what the exhibition would look like. Those drafts were then brought to the students who examined everything from the language to the data, using the IHB’s database.

According to a press release from the National Park Service, the new visitor center will seek to “tell the story of free and enslaved Africans in early New York and the role of the African descendant community in preserving the burial ground following its 1991 rediscovery.” The new center includes four exhibit areas, a 40-person theatre and a store.

For more on the IHB, visit <http://www.wm.edu/as/anthropology/research/ihb/index.php>. For more on the New York African Burial Ground, visit www.nps.gov/afbg/index.htm.

—Erin Zagursky



Matthew Haug

A recent grant from the National Science Foundation could help 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

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 geosciences faculty.

AAAS awarded the group its *Science* Prize for Online Resources in Education (SPORE) for the group’s website “On the Cutting Edge.” In addition to Macdonald, Chancellor Professor of Geology at William & Mary, the group includes David Mogk of Montana State University, Barbara Tewksbury of Hamilton College and Cathryn Manduca of Carleton College.

Macdonald notes that the SPORE-winning web site is based at Carleton’s Science Education Resource Center, where Manduca 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 \$6.2 million in grants from the National Science Foundation.

“The web site is built from the workshops,” Macdonald explained, “but it also extends the reach of the workshops, to make materials and ideas and resources accessible to geoscience faculty, both current and future.”

Since 2002, the Cutting Edge initiative has conducted around six workshops a year across the country and

of this project will likely be of interest to neuroscientists, cognitive psychologists, psychiatrists, and behavioral geneticists, as well as philosophers.”

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 uncommon, Haug knew it was still a possibility. Haug also received an NSF grant while a graduate student at Cornell University. But this was the first time he applied for a Scholar’s Award.

“I’m delighted to have won the grant,” Haug said. “I didn’t expect it.”

Haug intends to use the grant money to fund his research throughout the 2010-2011 academic year. The funding will support his work as well as the hiring of a part-time undergraduate assistant who will assist in a literature review of the research.

—Isshin Teshima

Macdonald says the group is offering several virtual and face-to-face workshops this coming year. A story in *Science* magazine announcing 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,” she said. “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.

“If you are going to teach a class on, say, landslides or earthquakes or tsunamis—or even the Iceland volcano—you can go to our web site and look for resources,” Macdonald said. “As you prepare for the class, on a specific event, such as the you can see what other geoscience faculty have done on that topic.”

Macdonald’s emphasis in the project is directed toward new faculty in the geosciences. The web site holds a prominent section containing a wealth of information and advice on subjects ranging from finding the first job to setting up a research program to getting tenure. Much of the subject matter deals with classroom technique and other instructional skills.

“We want to promote teaching that is student-centered,” she said. “That might range from ideas about how to teach large lecture courses—which many faculty have to do, especially when they’re new to thinking of what you want students to know and be able to do after they take your course.”

The web site contains ideas for keeping a research seminar fresh and techniques for engaging students. The Teaching Large Classes section contains a wealth of tested best practices involving collaborative learning techniques, the use of technology and instructional techniques, many of which were explained in detail at Macdonald’s workshops for early-career faculty.

“For instance, at our workshop last year, Greg Hancock—a faculty member in the geology department—led a session on interactive lectures,” Macdonald said. “He demonstrated a way to incorporate questioning students in a way that the whole class winds up working on the answers to the questions that are posed—even in a large lecture class.”



Heather Macdonald

Hancock’s demonstration was videotaped for inclusion on the Cutting Edge web site, among the other resources there. “The participants in the workshop heard it live,” Macdonald explained, “but through the web site, the larger world of geoscience faculty can also benefit.”

Macdonald has been recognized before for her outreach work on behalf of geoscience instruction and faculty. In 2009, she was the recipient of the Neil Miner Award, an honor bestowed by the National Association of Geoscience Teachers.

—Joseph McClain

New VIMS-W&M marine science minor is expected to be popular

The College of William and Mary, partnering with the Virginia Institute of Marine Science, is now offering a new undergraduate minor in marine science.

The minor, designed to meet a strong and growing interest in marine science among William & Mary undergrads, features courses taught by faculty in William & Mary’s School of Marine Science at VIMS and in natural-science departments at the College’s Williamsburg campus.

Faculty in the School of Marine Science at VIMS have previously offered courses primarily to graduate students. VIMS has awarded more than 800 master’s and Ph.D. degrees in marine science since 1943.

The new undergraduate minor program is initially being offered as a three-year pilot program for 20 students per year. The new minor features a field-studies course held at VIMS’ Eastern Shore Laboratory in Wachapreague, Va., where students will receive two-weeks of hands-on instruction in and around the coastal lagoons of Virginia’s barrier-island ecosystem.

VIMS Professor Elizabeth Canuel, a leader in establishing the new minor, says the program meets a clear need. “Undergraduate students have wanted greater access to marine science courses and faculty for years,” says Canuel. “Over the past decade, we have witnessed a growing number of William & Mary undergrads interested in pursuing research projects with our faculty, participating in our summertime Research Experience for Undergraduates program, and enrolling in undergraduate- and graduate-level courses taught by VIMS faculty.”

An existing Introduction to Oceanography course taught by VIMS faculty on the Williamsburg campus has been consistently over-enrolled. The new Introduction to Marine Science course reached its 50-student maximum shortly after being opened to enrollment in November.

VIMS Dean and Director John Wells says the minor represents “an exciting new chapter in VIMS’ long history of providing an exemplary education in marine science, and will help satisfy the growing national demand for qualified marine-science professionals.”

The program is administered by the Marine Science Minor Advisory Committee, co-chaired by Canuel and Heather Macdonald, Chancellor Professor of Geology at William & Mary.

—David Malmquist, VIMS

Ecofashionista Root to preside over Ixel Moda

Regina Root, Class of 1963 Term Distinguished Associate Professor of Modern Languages and Literatures at the College of William and Mary, has accepted an invitation 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 large crowds of designers, students, scholars, 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 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,”



Regina Root

says Root. She added that she would love to take a small delegation of her own students to the next congress.

“Fashion-studies scholars have to analyze the designer’s vision as it gets represented on the runway,” she said. “Sitting right beside me were prominent fashion journalists and pioneers like Susan White, now CEO of Whitespeed, who once served as vice president of marketing for Calvin Klein and president of DKNY Jeans. The insights shared and gained throughout the week were tremendous.”

—Lillian Stevens

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 to open in May.

William and Mary archaeologist Martin Gallivan notes that the copper is significant in the Werowocomoco-Jamestown story. Researchers have chemically linked the “Wero” copper to Jamestown. Also, copper had a socio-economic and spiritual significance to the Powhatan Indians. Copper, he said, is part of the evidence pointing to Wero as a place of political and spiritual

power that was important for centuries before Jamestown.

“Nothing like Werowo—comoco exists on the East Coast of America. Telling

that story at an exhibit that’s located elsewhere presents a serious challenge,” Gallivan said. The exhibit centers around a three-dimensional model of 1607 Werowocomoco. Narrative panels will convey how the place was organized and how it served as the center of a chiefdom, known as Tsenacommacah, which encompassed the Virginia coastal plain and much of the Eastern Shore.

Gallivan and other members of the Werowocomoco 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 belief contexts within which these changes occur,” 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; some 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 among northwest Atlantic loggerheads. 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 findings. The surveys, part of VIMS’ ongoing Sea Turtle Stranding Program, suggest that the Bay’s loggerhead population has fallen by almost 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 allowed during fishing 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: *Study for a Soldier in the Resurrection of Christ*, ca. 1532

“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 Groft ’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 Groft. 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 Groft said. “By doing that, we then illustrate how Michelangelo studied anatomy.”

De Groft stressed 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 Groft 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 1520 work long catalogued as a double study of a left leg. However, De Groft points out in the exhibit catalog that the difference in musculature indicates the study is actually of 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



Martin Gallivan shows the technological advancement apparent in a comparison of the larger Late Archaic Holmes point of circa 1000 B.C. and the smaller, more aerodynamic Late Woodland/Early Contact-era Clarksville point. The Clarksville is typical of the projectile points found at Werowocomoco.

OFF THE MAP

GIS techniques open new research horizons

by 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 60 and 80 percent of all data collected 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

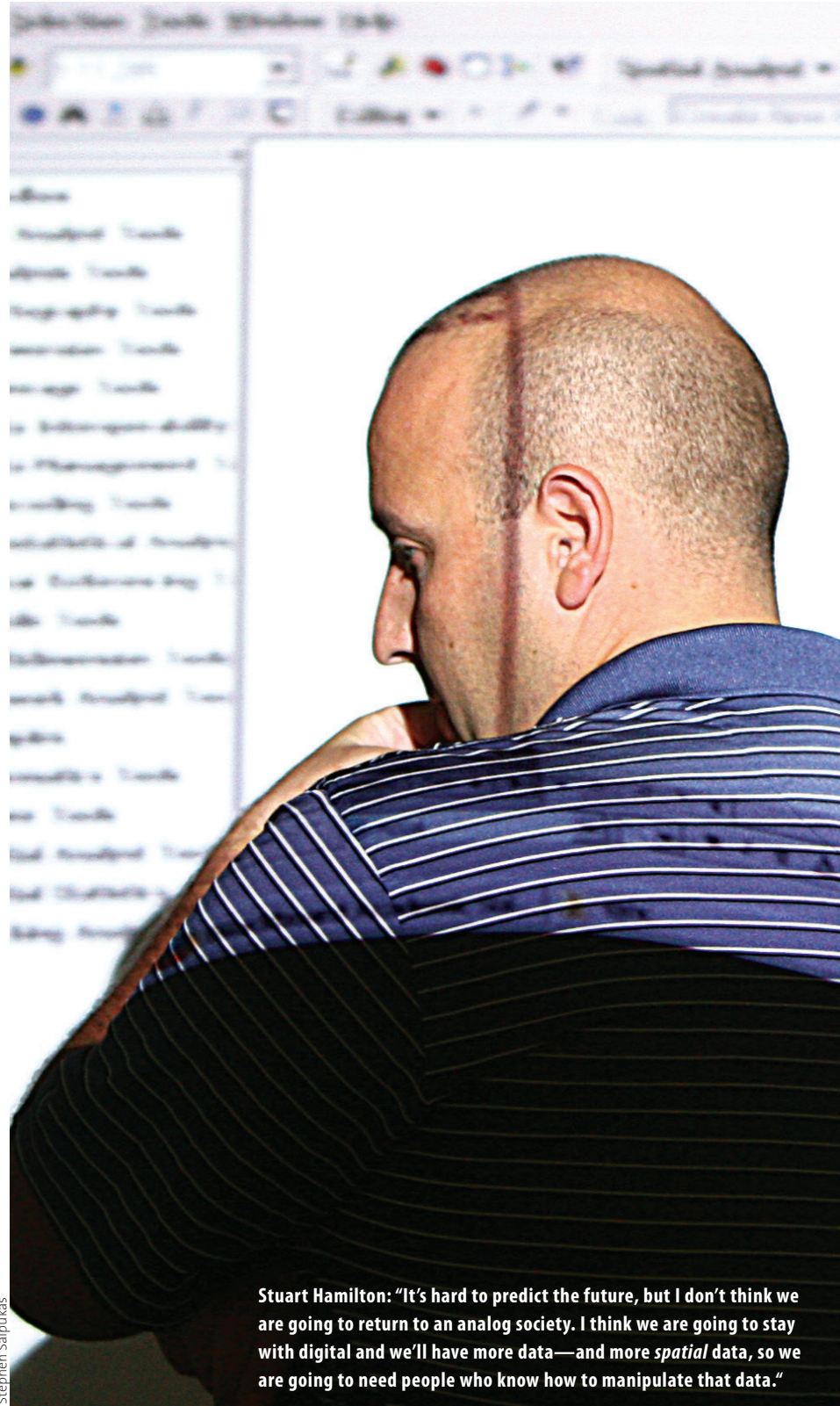
The William & Mary Center for Geospatial Analysis is settling into its new permanent location on the second floor of Swem Library. The birth of the CGA was made possible by a grant from the Andrew W. Mellon Foundation to the College's Environmental Science & Policy program. In addition to the Mellon 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 Deenesh Sohoni to build GIS-driven maps showing the impact of magnet

continued on page 8



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 stay with digital and we'll have more data—and more *spatial* data, so we are going to need people who know how to manipulate that data."

PURGATORY, WITH A CAPITAL P

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 200-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 11th-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 rubbersheeting and other relevant GIS techniques. They're focusing their research on the transfer of property from lay to ecclesiastic 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 RESENTMENT

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 indentured 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.

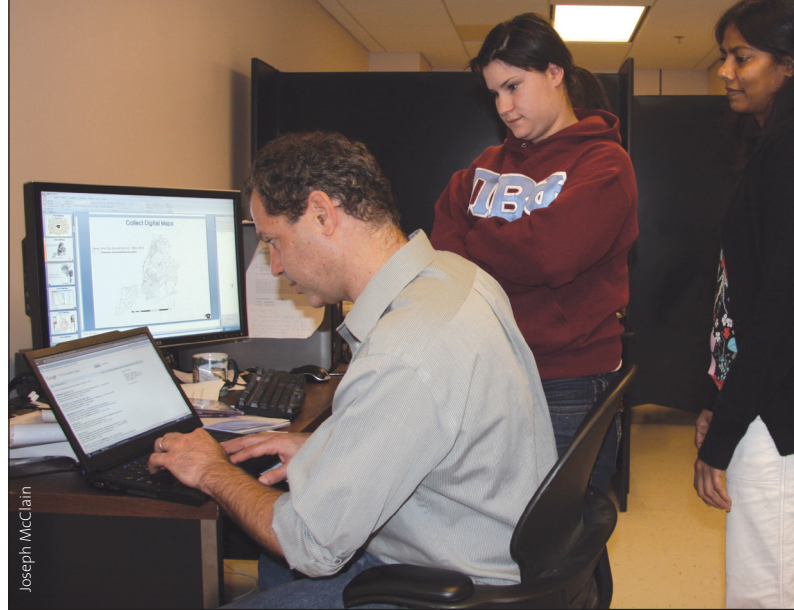
"The church became even more hated than, perhaps, the monarchy," she said. **i**



Cassandra Prena '12 and Barbara Watkinson examine a printout of a 19th-Century map of the Denezé region of France. The original was prepared by the tax collectors of Napoleon Bonaparte. GIS helps them explore the transfer of land from lay to ecclesiastic ownership.



Stuart Hamilton juggles a laptop on a cold day near Virginia's South River as he shows GIS techniques to a group of undergraduates monitoring mercury in songbirds. Class projects will be based on the GIS data collected on site.



Sociologist Salvatore Saporito works on an ambitious school boundary GIS project with Roxanne Lepore '10 (center) and Ashwini Wakchaure, chief GIS programmer at the CGA. The project has received \$1 million in NSF funding.

Center for Geospatial Analysis creates a new research hub

continued from page 6

schools and private schools on the racial and economic integration of public schools. The W. M. Keck Environmental Field Lab also brought Tim Russell on as GIS technician; he taught classes in GIS software and contributed to a number of research projects.

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 Ashwini Wakchaure, a GIS programmer; Jeff Han, senior 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 increasingly as a research hub for the College.

"A lot of granting institutions look very favorably on GIS technology," he said. "They're looking for proposals that offer a way to incorporate it into their curriculum and into their grants."

When Hamilton first arrived at William & Mary, he found that there was substantial pent-up demand for GIS services here.

"There were an awful lot of people waiting

for someone like me to come to campus," he said. "There was a backlog of jobs waiting to be done, people who know what they want to do, but who don't possess the GIS skills or the tools to do it."

Some of Hamilton's first work, naturally enough, involved research done by faculty in Environmental Science and Policy, which had secured the Mellon grant that made the CGA possible. He introduced a GIS element into the studies of some graduate students who were working under biologist John Swaddle to understand the relationship between land use and the health of birds. He got involved early—and remains involved—with Dan Cristol's s-GIG investigation of mercury in songbirds of the Shenandoah Valley.

There are almost as many approaches to GIS tools and techniques as there are potential applications. Hamilton is a faculty member himself, and therefore often works as a collaborator, cited as a co-principal investigator on academic papers. In other instances, he is a teacher-trainer, imparting GIS skills and knowledge formally and informally. Researchers come to the CGA with all levels of experience, from absolute novices to long-time GIS users, such as Saporito. No matter the level of familiarity, all benefit.

"As far as faculty, Sal is the most skilled on campus. He's worked in areas in which he made the discoveries himself," Hamilton said. "He may even know more about the integration of census data with school data than almost anyone."

Still, Hamilton was able to show Saporito a new and more efficient way to solve problems, by using raster data rather than a vector data GIS approach.

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. There are academic papers on the effects 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 uses coming up that I don't expect," he said. **i**

BLANK SPOTS ON THE MAP

Virginia is dotted with resources that Nathan Alleman and his colleagues call "college access providers," entities that are as challenging to define as they are to identify.

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 a lot of people just don't grow up with if they are not 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 providers are across the state. More importantly, 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.

"They are anything from a state- or federally-sponsored program to something a local church or YMCA puts together," Alleman said. "That makes them very difficult to find and very disparate in their services and resources and in the type of activities that they aspire to."

Some providers, he said, focus more on the financial implications of going to college, while others get involved in SAT preparation or how to write an admission essay. "We wanted to get a better sense of what is really going on in the state," he said.

Working with Rachael Stimson of Western Carolina University and Neal Holly, a doctoral student in William & Mary's School of Education, Alleman started off with a survey of known access providers. "Snowballing" outward from the Virginia College Access Network list, the researchers identified nearly 450 individuals and organizations across Virginia as college access providers. (Their list did not include school counselors or teachers.) In questionnaires, they asked

each about logistics, staff, funding, training and other nuts and bolts information.

"Then we did a qualitative component where we interviewed 25 of the providers—we spent about an hour with them—to talk about the challenges they face," Alleman said. "We wanted to hear about the victories, the things that keep them going and to get a fuller picture of what it means to be a college access provider."

Once all the data were in, Alleman and his colleagues realized they needed a way to present the data so that SCHEV, legislators, educators and other officials could not only see the geographic distribution of the providers, but also the nature and distribution of the services.

"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 location 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."

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, Ashley Ingram '11, 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 Ingram's maps 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 our data. That is going to be a nice resource." **i**

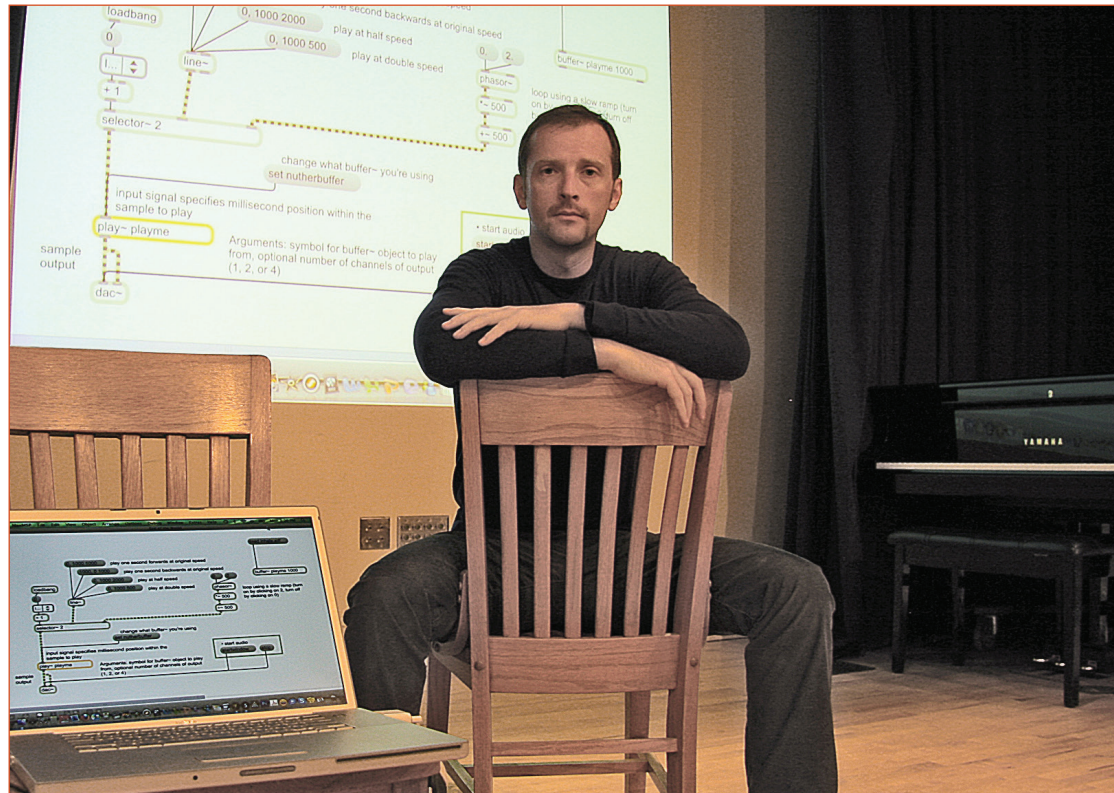


Doctoral Student Neal Holly (left) and assistant professor Nathan Alleman of the William & Mary School of Education used GIS to map the locations of Virginia's college access providers for SCHEV.

AN APPLE ON THE PIANO

Greg Bowers' work blends the digital with the analog

By Lillian Stevens



A Greg Bowers performance typically includes a projection screen fed from his laptop that depicts the digital component of his presentation.

WHEN GREG BOWERS PERFORMS, it's often at a grand piano, but there's usually an Apple laptop perched 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 a 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 a tool, 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 haven'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 live—will say there's 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 we all know, but also keeping in mind the relationship between Carroll and the real Alice, the daughter of the dean 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.

“So I wrote a show that is a little edgy at times,” he says. “There was gossip at the time about the nature of Carroll's relationship with this girl. Modern Lewis Carroll historians say there was nothing inappropriate there, but there remains this perception of Carroll being an eccentric, and so I introduce that.”

The musical takes place in two worlds—with Alice and Lewis Carroll on one part of the stage, while the other part of the stage is Wonderland. “As Carroll is conceiving the stories, they are happening on the Wonderland part of the stage, so we're watching as it comes to life basically,” Bowers explained. The composer has to consider a large number of facets involved in the production—from the size of the cast to the audience.

“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.”

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, essentially. And 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.” **i**

THE BEST OF BOTH WORLDS

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

“Your typical computer guys 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 I can use,” 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 music 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 aid in artistic expression,” he said. “Bach did it with pipe organs. I do it with EKG sensors.”

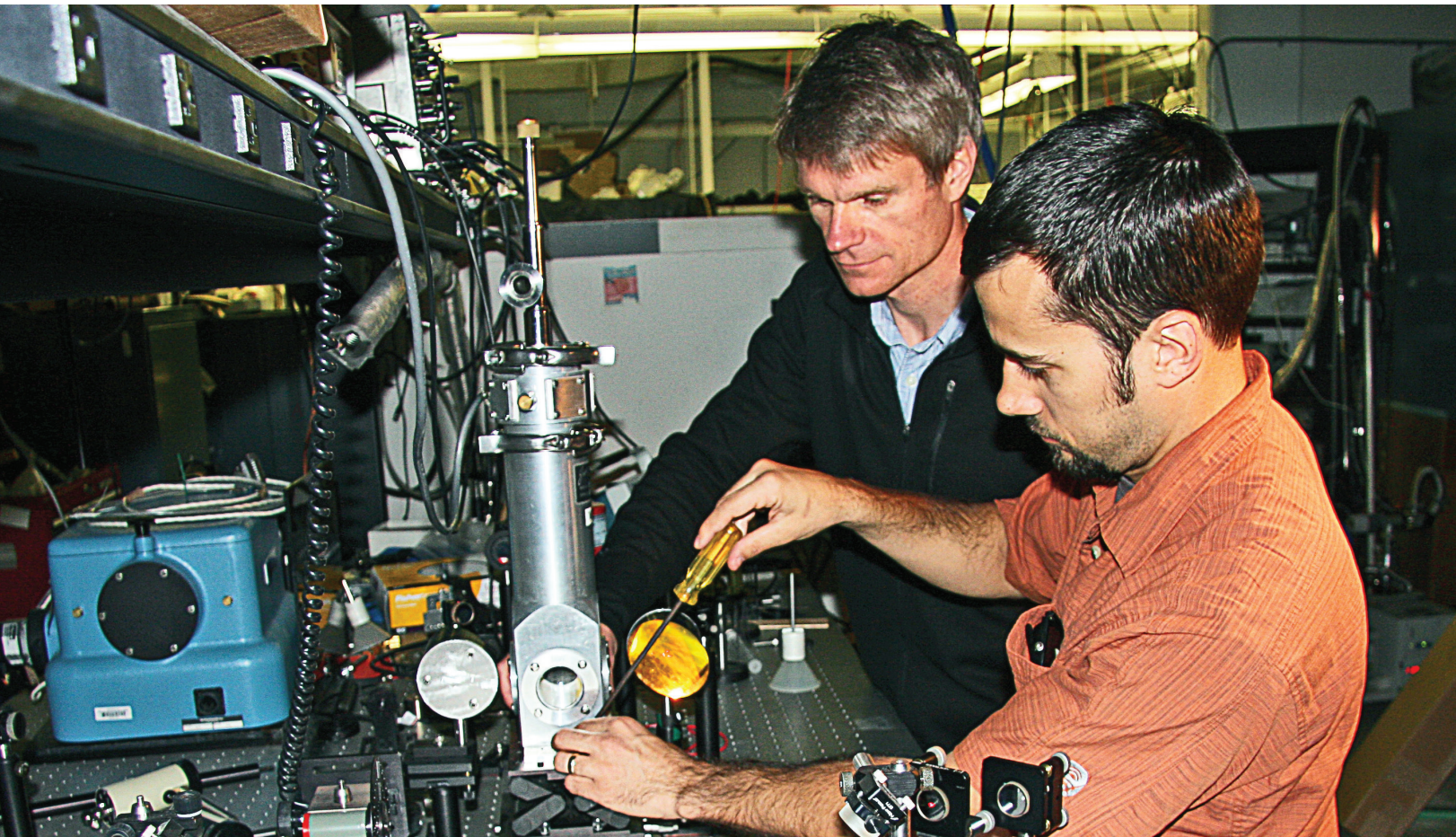
Greg Bowers' office is a long, narrow space adjacent to Ewell Recital Hall. It's filled with numerous keyboards—computer, electric and, of course, an “old school” hammer-and-wire upright.



A Bright Idea

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

by Joseph McClain



Erik Spahr (right) and Gunter Lüpke make an adjustment as they set up an infrared laser array in their old lab in the basement of Small Hall.

A pair of researchers may have brought the affordable fuel cell-powered car a step or two closer to reality.

Gunter Lüpke and Erik Spahr are working to perfect their invention, a process designed to reduce the operating temperature of one type of fuel cell. Cooler operating temperatures remove some of the barriers to fuel-cell use.

Fuel cells work by converting chemical energy into electricity. The chemical energy comes from a fuel that could be hydrogen, or hydrocarbons or fossil fuels, said Gunter Lüpke, professor of applied science at William & Mary. But the most common class of fuel cells, proton-exchange membrane (PEM) cells, run only on hydrogen.

Lüpke and Spahr, a Ph.D. student in applied science, are focusing on solid-oxide cells, a less-common technology. When it comes to potential for automobiles or other portable uses, each fuel-cell technology comes with its own set of yet-unsolved problems.

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, Lüpke explained. That requires a long start-up time. You turn them on and it takes an hour for them to reach operating temperature.

The high operating temperature of solid-oxide fuel cells has other implications. Hot-running fuel cells are subject to degradation, he said, which is aggravated by turning the cell off and on.

“In a car, you don’t want to have to run the fuel cell

all the time, because you will burn up the fuel,” he said. “For a car or any portable application, you would like to have short start-up times. You want to turn it on and in a few seconds, have it up and running. That requires that you reduce the operating temperature.”

Today’s solid-oxide fuel cells run hot to facilitate 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. “How fast 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.

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.

“It would also decrease the startup time, which is a big issue for automotive applications,” Spahr said. “If you can make these hydrogen ions mobile optically, startup time will be much quicker. With our invention, startup will probably drop from hours to minutes—possibly seconds.”

Lüpke likes to compare the process to the operation of a microwave oven. A conventional oven, he

explains, heats up the entire oven space, including the food. A microwave, by comparison, heats only the water molecules in the food. “Here, we’re using infrared radiation to heat up just the hydrogen,” he said.

Spahr and Lüpke say their invention also could work the other way, enhancing the efficiency of the production and storage of hydrogen, which can be used in solid-oxide or PEM fuel cells.

“Hydrogen production is just a fuel cell in reverse,” Spahr explained. “You apply an electric current to a fuel like methane and the process re-forms it and you get hydrogen out of one end. There’s a similar process for making hydrogen from water—water splitting.”

Their work has been funded for the past 12 years by the National Science Foundation. Now, Lüpke and Spahr are ready to take their work to the next level. They have started a company called Phenom—the name is a kind of acronym for photo-enhanced oxide membrane. Working with Jason McDevitt, the College’s director of technology transfer, they’ve filed for patent protection for their invention.

“This startup company has great potential,” McDevitt said. “It’s a tremendously innovative approach that could provide a solution to a very important problem. Obviously, development of a commercial product is a long way off, with many challenges to overcome, but we are very excited about the prospects for this technology.”

PHENOM SEEKS FUNDING

As Phenom, Lüpke and Spahr are seeking support from the U.S. Small Business Administration Office of Technology. They’ve applied for Small Business Innovation Research (SBIR) funding of \$1 million for three years to continue their investigation. They’ve done their work so far using low-power infrared lasers in their lab in the basement of Small Hall. With the SBIR funding, they will move their investigation to the Free Electron Laser at the Thomas Jefferson National Accelerator Facility (the J-Lab) in Newport News.

“At the J-Lab, we’ll be able to use the high-powered laser to sort things out and the project should move along more quickly,” Lüpke said. “While a commercial product is years away, it is possible that the first fuel-cell car you buy may be based on this technology developed at the College of William and Mary.” [i](#)

A FUEL CELL THAT RUNS ON GASOLINE?

It seems a bit counterintuitive, but electric cars powered by gasoline-fed fuel cells could be an important step in the direction of clean energy.

Gunter Lüpke says a solid-oxide fuel cell car could double the gas mileage of today’s internal-combustion engines.

“The efficiency of a fuel cell is very high; it’s on the order of

60 percent,” he explained. “The internal combustion engine is less than 30 percent. If you use a fuel cell, you would gain a factor of two or more in efficiency.”

The solid-oxide fuel cells can take a variety of fuels, including gaseous hydrogen and just about any hydrocarbon, too. The well-established global infrastructure to dispense gasoline gives the solid-oxide fuel cell

technology an immediate advantage for automotive use, too.

“The transition to very clean cars is going to be a very slow process,” Erik Spahr said. “If we can take advantage of the fuel infrastructure we have now, and do it more efficiently and slowly transition to cleaner fuels, that’s probably going to be a workable and realistic approach.”



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 faces from 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 such as race and gender. Using tools ranging from electroencephalography (EEG) to

reaction time, they examine the mind's perception of race, gender, sexual orientation and more 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 undergraduate—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 subjects—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

"In that half-second, we can actually tell a lot, from how much they are paying attention to a face to what they're encoding about that person based on their race or their gender," Dickter said.

Previous research has shown that white participants initially pay more attention to black faces than they do to white faces—this occurs at about 200 milliseconds after seeing



Inside the ISC's Faraday cage, Aline Roberts views a series of target faces of various races, each shown for half a second. Her reactions to each face are monitored by EEG. The cage isolates the subjects from data-polluting "noise" generated by the electric fields of the building's lights, wiring and appliances.

a face. 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 outgroup thing: 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," Dickter said. "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 prejudiced 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 interjection of a racially charged remark is not a 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."

STATE-OF-THE-ART EEG

Cheryl Dickter is not the only faculty member in the psychology department who is looking at people's brain waves. The department got a state-of-the-art EEG system this year, with help from Paul Kieffaber, an assistant professor of psychology who helped design it.

The new facility, located in the Integrated Science Center, is perfect for the kinds of studies that Dickter's lab does, she said. A lot can affect a person's brain waves and the measurement of them. The new system's Faraday cage, where test subjects sit, is lined with copper wire, which blocks electrical signals from the building's lights that can interfere with the readings.

"We get cleaner data," said Dickter. "We can look at people's brain waves and learn about how they process the various stimuli that we present to them."

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 neurological 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 these stereotypes, the really important part of it is what you're going to do with it later." **i**

Aline Roberts '10 gets fitted with a cap in preparation for an EEG session. Graduate student Ivo Gyurovski applies contact gel through the holes, while Cheryl Dickter, assistant professor of psychology, connects the wires.



Photos by Stephen Salpukas

BEYOND THE STANDARD

Department of Education funds texts stressing dialects in Arabic

By Jim Ducibella

IN A 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 \$728,000. 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/now 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. So 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 250 and 300 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 salutatory effect on our project. It's a shame it has to come through this channel, 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 in Washington, D.C., *Al-Kitaab* is 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 to accompany 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 weekly at a coffeehouse. They not only discussed the ancillary material they were creating, but they also explored the intellectual 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 of the less imposing. There will be 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 generational shift is going 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 Arabs themselves rarely use 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 taking over some of the tasks (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.



Driss Cherkaoui (left) and John Eisele discuss the "linguistic reality" of teaching dialects of Arabic. The number of students seeking to learn the language has skyrocketed and the U.S. Department of Education is supporting their efforts to reshape Arabic language instruction around dialects.

Eisele continued: "We believe there's room for us to establish a base of support, and to say 'You know, we're not against the literary language. We want to teach it and teach it well. But we also want to teach some of the common, everyday language, and that means we have to take in some of these dialects as well.'"

Eisele and Cherkaoui argue that any language that dates back almost 2,000 years carries a lot of culture with it. Previous texts have not done a good job of incorporating information on that cultural background, which they consider a serious drawback, and one which they are taking great pains to avoid.

"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." **i**

Arabs 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.



Photos by Stephen Salpukas



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RESEARCH & SCHOLARSHIP AT WILLIAM & MARY

update...

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 three William & Mary biologists will work with six alumni of last year's freshman phage lab. Forsyth explained that the work is being done at Pitt because Hatfull's lab has the Biosafety Level 3 designation necessary to

work with pathogens, such as tuberculosis, that are dangerous to humans.

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 blueprinted 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. **i**



Lab-coated participants in the CrimD phage lab Kobie Gordon '12 (left) and Jillian Walton '11 initiate a procedure while the faculty involved in the HHMI phage lab, (from left) Margaret Saha, Mark Forsyth and Kurt Williamson, discuss the day's work.