FALL 2006

ideation

RESEARCH & SCHOLARSHIP AT WILLIAM & MARY

Seize the Bay!

GRAPPLING WITH THE ISSUES OF THE CHESAPEAKE

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GENETICS OF GLOBAL WARMING

EVALUATING FOREIGN AID

some help for our scholars & researchers

Teaching, in all its forms, has been our lodestar at the College of William and Mary. At the same time, we are also a university with high scholarly aspirations and accomplishments.

When I came to Williamsburg a little over a year ago, I feared that we were providing inadequate assistance for the scholarly work that is both expected and celebrated within our halls. It seemed to me, that although we have every bit as powerful a set of research aspirations as our competitors, we have frequently been unable to match the infrastructure of research support available at those institutions. I worry that continuing on such a path will threaten both the quality of our faculty and our historic commitment to unparalleled teaching.

Accordingly, I am anxious to move forward quickly to help secure more powerful and sustained footing for our essential research programs. Early this fall, I announced to the faculty a set of initiatives that will help to correct our course.

First, through concentrations of private funding and the development of other university and ancillary resources, we will move to fully fund the College's Summer Research Grant program and its new Scheduled Semester Research Leave program— which together draw almost a million dollars per year from other funds—eating, in effect, much of our research seed corn, the money that has fed our remarkable acceleration in the advancement of knowledge.

Secondly, we will create, through a combination of annual gifts and foundation and endowed support, a William & Mary Faculty-Student Research Fund of at least $25 million. This fund will support, to name a few, start-up packages, travel funds, conference support, more generous graduate-student stipends, technology expenditures, exhibitions in the arts, stipends for undergraduate student projects and many other scholarly activities.

This two-pronged initiative to support our research and scholarship will develop over the next five years. I hope we can count on the support of the entire College community to make these necessary forward steps. We are confident that cutting-edge research can be carried forward in a scholarly community that places the teaching of highly motivated students at the center of its professional life.

Go Tribe. Hark upon the gale.

Gene Nichol
President
The College of William & Mary

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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COVER PHOTO
Seize the Bay: blue crab at Gloucester Point.
Photo by Steven Salpukas

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Seize the Bay

A sampling of Chesapeake-related work at the College of William and Mary

A portion of this issue of *Ideation* is devoted to the relationship of the College of William and Mary with the Chesapeake Bay. The Bay predates us all. What the Sage of Baltimore, H. L. Mencken, called an "immense protein factory" has also been a playground, thoroughfare, barrier, battlefield and, sadly, a sewer.

The Chesapeake region also includes the surrounding land and tributary waterways, not just the great rivers—James, Potomac, Susquehanna—but also the hundreds of smaller rivers, creeks and tidal estuaries. It likely was Mencken's protein factory that attracted the first inhabitants, native groups that predated Wahunsenacawh (Chief Powhatan) by many hundreds of years. Even though the Jamestown Colony had a famously rocky beginning, the Chesapeake Bay region has proven to be a fine place to live.

The College of William and Mary is not on the Chesapeake, but it always has been of the Chesapeake. It only makes sense that many of the College's contributions to the advancement of knowledge center on the Chesapeake Bay region—its inhabitants, its history, its environment and all the conflicts and controversy of the past and present.

Researchers at William and Mary have been studying the region's complex ecosystem as well as its rich history and anthropology. The scope of our studies range from the immense to the detailed. At one end of the spectrum are scientists at the Virginia Institute of Marine Science (VIMS), using their Gloucester Point facilities as a base for conducting cutting-edge research on the state of the Bay and its flora and fauna. On the other end, our researchers examine every detail of the human ecology of the region. A good example is the work of Sarah Glosson, a graduate student in American studies who is studying the sheet music collection at Shirley Plantation near Richmond. The Chesapeake is also our laboratory and our classroom and our home.

The issues of the Chesapeake Bay, one way or another, revolve around people, past and present. Many of the features that enticed early inhabitants to live here are still enticing people to settle in the area, and that creates problems. For example, Bryan Watts, director of William and Mary's Center for Conservation Biology, fears that the success story of the comeback of the Chesapeake's bald eagle population might be endangered by pressures of development around the birds' nest sites. A separate set of problems centers around beach erosion, the scientific specialty of John Wells, dean of VIMS.

"Some of the most fragile land is also the most expensive," Wells said. "Property values on the Eastern Shore are skyrocketing. Everybody wants to live near water and when more people live near the water, the environment starts to get stressed."

Other forms of stress come from non-native species. You may have read about snakeheads in the Potomac, but perhaps the spread of phragmites in the Chesapeake is beneath the radar of most people. Phragmites is a species of grass that grows up to 20 feet tall and can take over a wetland. It likes freshwater and thrives in tidal environments with up to 50 percent seawater. Randy Chambers of the Keck Environmental Field Lab at William and Mary and Kirk Havens, assistant director of the VIMS Center for Coastal Resources Management, have been among those studying the spread of phragmites, which (other than the Eastern Shore) isn't the problem in Virginia that it has been to the north. Yet.

Some of the most important and pressing issues of the Chesapeake Bay are the most complex to solve—even to grasp. The former great abundance of finfish and shellfish isn't what it used to be and finding a solution won't be easy.

"Blue crab populations in the Bay have been low for a while. They're hovering around just over a line that if they drop below it, we should really close the fishery." Wells said. "Striped bass—rockfish—are doing fine, except for this mycobacteriosis infection that's going through them.

"Menhaden populations are pretty low, too, and they're supposed to be the prime forage of the striped bass. But we've been doing gut checks on the striped bass and you know what we've been finding lately? Little blue crabs about this long," he said, holding thumb and finger an inch or so apart. "Now are the rockfish eating the crabs just because the menhaden stocks are low? That's a good question and we don't know the answer to that yet. The point is, we've been approaching fisheries management on a species-by-species basis and the issues have become so complicated that that kind of approach isn't going to work any more. The situation has become complex and we're going to have to bring together science to match it."

This set of articles is by no means meant to be exhaustive or comprehensive.

How's the water?

by Joe McClain

Instrument-laden buoys offer a comprehensive high-tech answer to the age-old question

photo by Cindy Baker

Construction site of VIMS' new Marine Research Complex looms over the instrument-laden buoy in the York River.

For the past few years, the water off Gloucester Point has been some of the most analyzed H2O anywhere. For the past few years, a buoy, or rather pair of buoys deployed in tag-team fashion, has been sitting quietly off the coast of VIMS sending in a stream of data by modem.

Most buoys that you see along the Chesapeake are simple single- or double-purpose instruments for navigation purposes. By comparison, the VIMS buoy is a veritable Swiss army knife, a container for a variety of sensitive instruments. Carl Friedrichs stood near the end of a VIMS pier on a hot day last summer, explaining the functions and potential of the buoy. Friedrichs, a professor of marine science at VIMS, is the director of the VIMS Coastal Hydrodynamics & Sediment Dynamics program.

"There's a sensor on the bed—an acoustic Doppler current profiler—it's measuring the waves and currents," he said, gesturing toward the apparatus bobbing in the wake of a crab boat about a quarter mile out in the York River. "It also has a pressure sensor on it that can measure the height of the tide. Then at the surface we have what is called a CTD—a conductivity, temperature and depth recorder. The depth part is not so important here because it is sitting at the surface, but the unit measures temperature and conductivity which also gives you the salinity. The data are sent by radio modem back to shore. Then at the top of the buoy there is a weather station, an anemometer, for wind speed and direction, and it has some other sensors—incoming radiation for example."

> **In the world of sediment dynamics, there is no such thing as plain old mud.**

WHERE THE BUOYS ARE

The source of the "incoming radiation" Friedrichs mentioned is the sun. "That can be really important for marine science because the growth of phytoplankton in particular depends on how much light is coming in," he said. Taken together, data transmitted by the buoy gives a continually updated picture of the quality of the water that goes up and down with the tide past Gloucester—water temperature, salinity, dissolved oxygen, turbidity, fluorescence, plus water velocity and wave height. The unit off VIMS is one of an expanding network of buoys being placed all over the Chesapeake, including the VIMS Nomad, a larger unit off Goodwin Island near the mouth of the York River. The buoys are part of a consortium known as the Chesapeake Bay Observing System (CBOS). VIMS is a member of CBOS, of course, along with the University of Maryland, the National Oceanic and Atmospheric Administration (NOAA) and several other universities and state and federal agencies in the region.

REAL TIME, OR CLOSE TO IT

There is a lot of interest from varied sources about using buoys to monitor water conditions, Friedrichs says. The instruments on the buoys maintain a steady stream of answers in real time or at least very close to real time. All that's needed are questions, and the questions are as varied as the water conditions.

"One of the major early sources of funding was the Coast Guard," Friedrichs said. "They were interested in applications for real-time measurements for search and rescue because if you have the real-time currents and you know when someone has gone overboard, it's much easier to determine where you think they may have ended up."

Since many of the same measurements that give the Coast Guard an edge in a search can also be used for predicting the course of a maritime oil spill or the effluent resulting from an industrial incident, the buoys have attracted funding from a number of sources, including the Commonwealth of Virginia, NOAA and the Office of Naval Research. What interests Friedrichs most, though, is sediment and the effects of sediment. The study of sediment, ultimately, is the study of the health of the bay.

"There are three main criteria that the EPA uses to evaluate the health of the Bay: water clarity, oxygen levels and chlorophyll levels," he explained. "Clarity is determined mainly by suspended sediments, because if the water is cloudy the light does not get to the submerged aquatic vegetation—seagrass—which is so important to habitat for economically valuable

continued on the next page

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components of the ecosystem like blue crab and fish larvae."

COMPLEX AS MUD

The York River estuary is a great observation point because, well, there is so much sediment. Water clarity readings are the simplest measure of turbidity, but alone they don't even begin to tell the whole story. An acoustic instrument on the buoys—similar to a fisherman's fish finder—provides water clarity data using sound waves to create a picture of sediment concentration throughout the water column.

The cloudiness in the water, Friedrichs says, could be algae, zooplankton or just plain old mud. But in the world of sediment dynamics, there is no such thing as plain old mud. There's a big difference, he explained, between mere suspended dirt or clay and the same thing mixed with the gooey, adhesive polysaccharides secreted by bacteria and/or plankton.

"Mud is very important to water quality," he said, "but our ability as scientists to model and predict the transport of mud by currents is pretty poor. A big factor is trying to understand the nature of how mud transport changes when biology interacts with mud. Most of the mathematical models that try to predict simple transport of mud don't distitnguish yet between biologically- and physically-dominated suspensions."

The importance of mud extends to tracking pollution. Often, Friedrichs said, pollution adheres to the mud. "So where the mud goes is where the pollution goes. That has been the case in the Hudson, where a lot of deposited sediment is contaminated with PCBs ." As for the York, its tides act as a "conveyor belt" for sediment, resulting in a strange situation.

"Presently, the largest source of new sediment entering the York might not be the rivers at the top of the system, but rather the mouth of the system," he explained. "Because of the way the circulation works, the heavier salt water moves upstream along the bottom. The surface water coming downstream is fresher and doesn't interact with the sediment as much, so the water near the bottom is muddier."

VIMS is preparing a new buoy for deployment in the York near Clay Bank, a little less than halfway between Gloucester and West Point. "The water is a lot muddier up there, the currents are stronger, and there is less biology on the bed," he said.

www.vims.edu/realtime

It's not just for scientists: Click on "Real-Time Data" to get a continually updated report from the buoy off Gloucester Point. Recreational boaters, fishermen, sailors, watermen and weather buffs all can make use the current conditions and 24-hour records (inset, below).

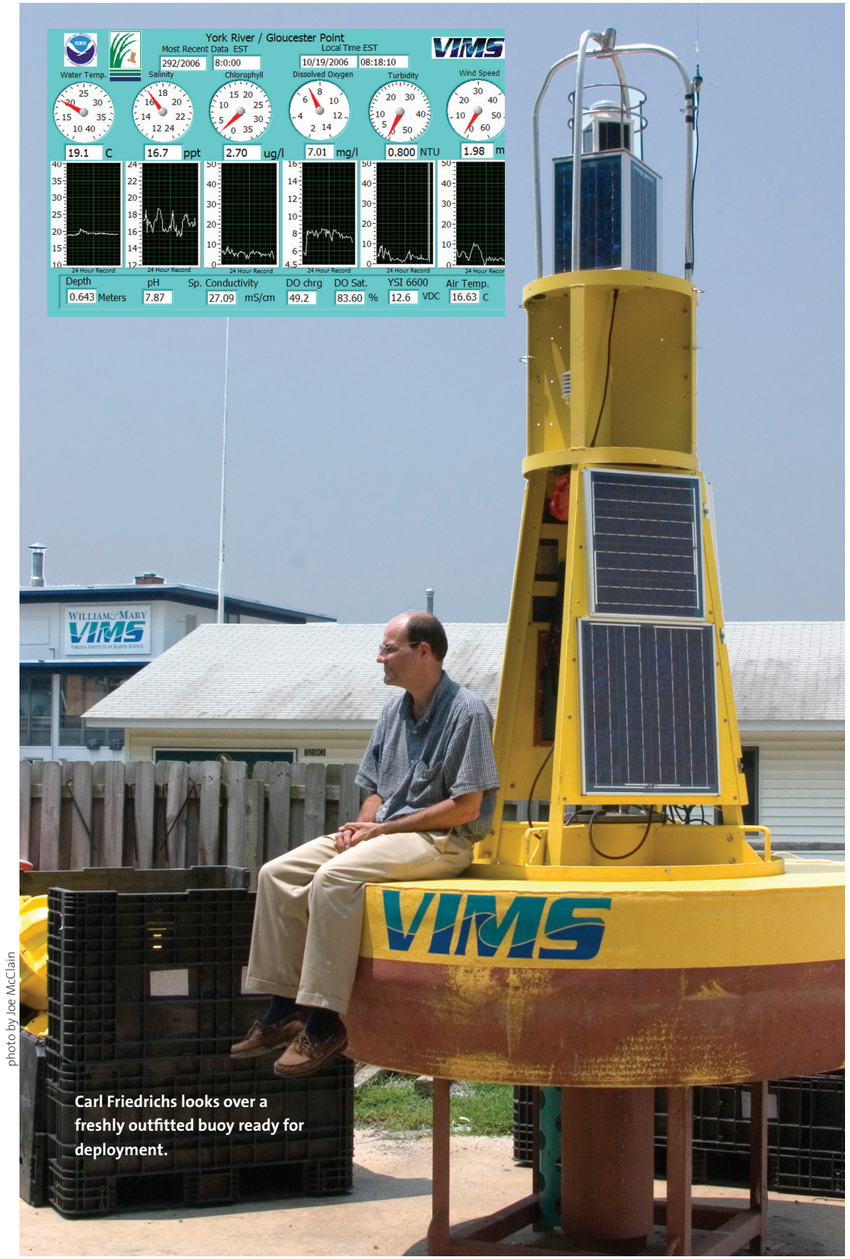

photo by Joe McClain

Carl Friedrichs looks over a freshly outfitted buoy ready for deployment.

Menhaden by the thousands

If they swim in such large schools, why are they so difficult to count?

by Joe McClain

They swim in schools of thousands—maybe hundreds of thousands—but there's some concern that the Chesapeake Bay's population of menhaden may not be all they should be.

Menhaden are important to the Chesapeake Bay in more than one way, according to Rob Latour, assistant professor of fisheries science at VIMS.

"They're somewhat unique in that they serve three functions," Latour said. "The first being that they support a large-scale industrial fishery that has high value and high economic value to the state of Virginia. They perform an ecological service in that they're a filter-feeding species in the Bay, so they can impact and improve water quality. They also serve as a forage base for the fishes that are also commercially, but more importantly, recreationally important—striped bass, weakfish, bluefish."

In general, the populations of menhaden along the Atlantic coast don't seem to be in trouble, Latour said. Routine stock assessments conducted in 2003 and again last summer by the Atlantic States Marine Fisheries Commission (ASMFC) have shown no indication of overfishing, but, Latour says, "The key assumption there is this analysis is conducted on a coastwise basis and doesn't address regional population."

BAIT & PHARMACEUTICALS

There are two fisheries for menhaden. The smaller one, which Latour says accounts for less than 20 percent of landings, is for bait and chum for crabbers, lobstermen and recreational fishermen. "The dominant fishery is the purse-seine fishery," he said. "The fish are effectively reduced and boiled down to their oils and fatty acids that go into a number of products like women's makeup, but the most recent use is in pharmaceuticals—Omega 3 fatty acids."

Over the past half-century, menhaden processing plants have shut down from Maine to North Carolina. The only one left, Latour says, is a plant in Reedville, Virginia. In addition, he said, Atlantic coast states have passed laws banning purse seining in coastal waters.

"In fact, the only states that allow purse seining now are Virginia and North Carolina," Latour said. "All the commercial menhaden fishing is taking place in the Bay or just outside the Bay, leading to some concern that the stocks may be regionally depleted."

To regulate the catch intelligently, it is important to have a good grasp of the number of menhaden in the Chesapeake. The industrial harvest of menhaden in Virginia's portion of the Chesapeake is subject to a five-year restriction. But, because of their schooling habits, determining the abundance of menhaden is tricky, Latour says.

"When we use traditional fishing sampling methods, we'd go out and catch no menhaden a few times, then all of a sudden come up with a bazillion of them. You have to think out of the box a little about how you're going to do this," he added.

Latour and a group of researchers from the Maryland Department of Natural Resources and the National Oceanic and Atmospheric Administration (NOAA) are working on an "out of the box" way to achieve a reliable count of the menhaden in the Chesapeake. Last summer, they began a pilot program, funded by ASMFC, to investigate a high-tech method of calculating the abundance of the fish.

ENTER LIDAR

The method uses LIDAR (light detection and ranging), essentially a laser beam aimed from the belly of a small airplane. "The laser will reflect off the school. Given some calibration of the reflective properties of menhaden, you can obtain a density figure of what that school would be." Latour said. A group of NOAA physicists from Colorado came to VIMS to try out LIDAR apparatus on some menhaden swimming in a tank. In September, the researchers conducted some test flights over the Chesapeake, with the cooperation of purse seiners from Omega Protein.

"Omega Protein was very cooperative," Latour said. "Our pilots talked to their pilots. We had people on the vessel and they were going to turn over the catch abundance figures to us."

The value of LIDAR as a fish-counting tool will be determined by testing over the next couple of years. "We're just working out the bugs," Latour said. "But LIDAR does have some potential."

LIDAR has been used with some success in fresh water environments, he said. But the VIMS pilot work is the first time the technology has been used in a marine or estuarine environment, which pose challenges due to the plankton and other particles and the increased density of the salty water.

photos from left by Joe McClain and Olga Trofimova

photo by Joe McClain

William and Mary students (from left) Dina Abdel-Fatah and senior Christopher Hendricks look over a piece of bloomery iron with journeyman blacksmith Shelton Browder.

Hot enough to smelt

Advanced technologies help re-create an ancient method of making iron

by Joseph M. McClain

On a day warm enough to discourage backyard grilling of hot dogs, students and technicians from the Applied Research Center were standing around a yard in Colonial Williamsburg helping to heat a clay oven up to 600 degrees. Celsius.

"The idea at Colonial Williamsburg was to try to rediscover the process of converting local ores to a workable material—wrought iron," said Steven Mankowski, a journeyman blacksmith in the CW smithy. "One of the processes that we are experimenting with is the direct method of making iron with what is called a bloomery. We have been curious about this technology for years, and with the 400th anniversary of Jamestown coming up, it seemed like a good time to start."

A bloomery is essentially a clay oven and is an ancient method for smelting iron, long predating the Jamestown colony. Shelton Browder, a journeyman blacksmith in the CW smithy, explained that wrought iron is distinct from cast iron, which requires a blast furnace. The manufacture of bloomery iron basically consists of heating up a mixture of charcoal and iron ore. It's certainly "low tech," but it's also "lost tech." The knowledge, lore, skills and knack that are necessary for getting a consistently good iron bloom have gone the way of flint knapper and the linotype repairman. The blacksmiths set up a bloomery in the side yard of the smithy to produce their own iron from ore, starting with a mix of locally mined ore and commercially purchased ore.

As a shortcut for recovering lost knowledge, the smiths got in touch with Amy Wilkerson, manager of the Surface Characterization Lab at the Applied Research Center in Newport News, usually known as the ARC. Wilkerson presides over an impressive array of instrumentation and for years has incorporated a steady stream of William and Mary students—along with the occasional high-performing high schooler—into the mix as paid interns. Wilkerson and her colleagues agreed to put the smiths' attempts at making 17th Century iron to a series of 21st Century tests.

"There are other people in the country doing this," Brower said. "But we have the best lab in the country helping us out."

With a left hand full of charcoal and a right hand filled with iron ore (above, left), Stephen Mankowski, journeyman blacksmith at Colonial Williamsburg, displays the raw materials for do-it-yourself wrought iron. At right, Dina Abdel-Fatah, a freshman at William and Mary, runs an analysis on the DIY iron on the HIROX microscope at the ARC.

GO ON, TRY THE BELLOWS!

The collaboration is highlighted by an exchange of visits between the smithy and the ARC, shops representing the extremes of ferrous metallurgical technique. The apparatus for making bloomery iron is pretty simple: a large bellows connected to a clay oven by an airpipe known technically as a tuyere. Charcoal and iron ore go into the oven, to be baked at a high temperature made possible by a constant draft of air. The bellows, of course, is worked by hand. It looks like fun when you first see it done, but the students found that the bloom needs oxygen long past the time at which working the bellows is entertaining.

It's been an ongoing win-win relationship, characterized by learning on both sides. Christopher Hendricks, a William and Mary senior from Baltimore, was put in charge of researching the literature.

"I looked up other examples of old wrought iron—tools, and that kind of stuff — trying to see if our pictures that we were getting on our microscope were similar to examples that other people have used for their work," he said. "I noticed that they did look really similar. One of the articles gave hardness measurements, so we figured that would just be another area to test the local wrought iron that they produced and compare it against some known samples cited in these articles."

> "I really like to see the excitement that they show when they discover something in the lab. It's real. You can see it in their faces..."

At one visit to the smithy, lab tech Olga Trofimova discussed the group's findings after putting the first batch of iron through a battery of tests. The ARC lab team compared the newly smelted iron with samples of old iron provided by the smithy, using techniques such as energy-dispersive X-ray spectroscopy. Trofimova reported early results that showed the bloom had higher carbon content than expected, plus a mystery—presence of copper, despite a complete absence of copper in her analysis of ore samples used in the bloom.

"We know where that's coming from," Browder said, exchanging knowing looks with Mankowski. He explained that the tuyere supplying the oxygen to the bloomery is a heavy copper pipe—the only possible source of the trace metal in the samples. Theoretically at least, the copper should hold up to the intense heat of smelting as long as the supply of air is uninterrupted.

CARBON CONTENT IS CRUCIAL

The smiths were especially interested in the carbon content of their iron. Browder explained that low-carbon iron is more plastic, therefore easier to work on the anvil, but that some uses might call for a higher carbon content. Dina Abdel-Fatah of Yorktown, now a first-year student at William and Mary, assisted Trofimova in analysis of carbon content while still a student at Tabb High School.

"I basically do a lot of the calculations, like I average the stuff out and see how much carbon, and other elements are present in the samples after we do the EDS scans," she said. "We found higher content than expected of carbon in this batch, and with time we will figure out where it is coming from."

The analysis of new bloomery iron is in the very early stages. There are a number of analytical tools in the Surface Characterization Lab that have yet to come into play. As the smiths learn to refine their understanding of the ancient technology, Christopher and Dina and the other students in the ARC's Surface Characterization Lab have the opportunity to participate in real-world research.

"Instead of getting a sample off the shelf and learning to do analysis, the students can see exactly how their work will be of benefit," Wilkerson explained. "And they don't spend their time wondering why they're doing what they're doing. I really like to see the excitement that they show when they discover something in the lab. It's real. You can see it in their faces—'Hey! I did this!' They gain self-confidence, and it's the kind of self confidence that they wouldn't get from working in a restaurant or some other job."

COVENANT OF THE ARC

Untangling the technology of bloomery iron is only one of the projects going on in the Applied Research Center. The Surface Characterization Lab is one of 27 labs in the ARC, a facility in Newport News operated by a consortium of four universities, including William and Mary, and the Thomas Jefferson National Laboratory. A research powerhouse in the Chesapeake Bay region, the ARC occupies a seven-story, 122,000-square foot office and lab facility anchoring a 200-acre research park.

www.jlab.org/ARC/

by Joe McClain

IS THERE A DOCTRINE IN THE HOUSE?

James Monroe's Northern Neck birthplace could reveal more than the early years of the fifth president

That's James Monroe clutching an American flag, standing just abaft the commander-in-chief, in the iconic painting, *Washington Crossing the Delaware.*

The painting has a reputation more for its patriotic and emotional symbolism than as a historic illustration, but nevertheless, James Monroe was indeed a member of the force that crossed the Delaware and beat the Hessians at Trenton. Until just months before he crossed the Delaware in December of 1776, Monroe was in more congenial and no doubt warmer surroundings, as a student at the College of William and Mary. He was listed on the bursar's books as "Mr. James Monro," from June 20, 1774 to March 25, 1776.

It's the same James Monroe who became the fifth president of the United States, fathered the Monroe Doctrine and became the proprietor of Highland Plantation near Charlottesville. Now called Ash Lawn-Highland, Monroe's former home is now owned by the College of William and Mary, which has opened it to the public for tours, demonstrations, and workshops centered around period crafts such as lantern-making and candle dipping.

SUMMER SHOVELING

In contrast to Ash Lawn-Highland, the birthplace of James Monroe, on the Northern Neck, is an overgrown piece of property in rural Westmoreland County. The James Monroe Memorial Foundation hopes to change all that as it moves forward with plans to build a replica of the Monroe farm on the site. As a preliminary step to establishing a historical attraction, the foundation brought in the Center for Archaeological Research from the College of William and Mary to uncover the history that has lain buried on the site and within archival documentary records. Joe Jones and David Lewes of the center are directing the project, which began in the summer of 2006 with systematic shovel testing of the site.

"We're taking a standard archaeological survey approach, beginning with shovel testing, which is essentially digging dinner-plate sized holes into the topsoil at regular intervals," explained Jones, who is director of the Center for Archaeological Research. "You set up a grid so that you have mapping control over where these holes are located across the landscape. The holes are 15 meters, or 50 feet, apart— a standard interval for a survey like this."

Jones said that they will respond to any hole in which period artifacts are found by digging a supplemental set of shovel tests at half the standard interval around the initial positive shovel tests to gain a more refined understanding of the content and extent of any subsurface artifact scatters.

"Then we'll select four or five of the hottest spots—the ones that hold the best potential for being Monroe-era activity areas, and we'll come back and do a more intensive controlled excavation within those areas," he said. A typical excavation at the "hot spots" will be a one- by two-meter rectangular test unit, excavated with careful attention to soil stratigraphy, so that the workers can keep track of where the artifacts are found both horizontally and vertically. The results should provide an informed sense of activities represented and various processes affecting the formation of the site deposits.

"That gives you an objective source of information about what the archaeological integrity is and its research potential. Once we get down to the underlying subsoil, essentially the clay below the topsoil that has not been affected by plowing after the site was abandoned, we hope to find features like post holes or root cellar pits, for example, that extend into that subsoil clay," Jones explained. He added that such holes and pits would contain deposits that offer undisturbed information about the resources they represent.

"Ultimately, we hope that information from features across the site will help us understand the farmstead layout and activities during the Monroe occupation," Jones said.

The site was partially excavated in 1976, but Jones explained that the previous work concentrated on the foundation remnants of the house itself, only one of several buildings that made up what might be called the Monroe farmstead. Much of the activity within such an agricultural entity would have involved a number of outbuildings on the property.

BEYOND THE HOUSE

"These types of farmsteads would have comprised a cluster of buildings, with the house being the core of that cluster. You'd expect to find other components of the domestic complex in that time period—the kitchen would have been a separate building, for instance. There could have been slave quarters, barns, little outbuildings like smokehouses, and such," he explained. There is archival evidence of the presence of such work buildings, including a 1780 classified ad from the *Virginia Gazette* listing the property for sale. "One of our aims is to take a careful look at this property immediately adjacent to the house, to see if we can find the remains of some of these other activity areas and outbuildings."

The Center for Archaeological Research has been planning the testing phase of the field work as an opportunity for what they call a "public dig." Effort will be devoted ahead of time to advertise the field work and invite interested public to participate in the excavations. David Lewes, project manager at the center, said the testing phase of field work at the presidential birthplace was scheduled to take place in October. It will be among a series of public archaeology events scheduled to coincide with what is celebrated annually as Virginia Archaeology Month.

As information on the Monroe property comes to light and the James Monroe Memorial Foundation comes closer to their goal of building a reproduction, the archaeologists caution the public not to expect a Tara, a Monticello or even a Carter's Grove. Considerable evidence compiled by researchers indicates that the Monroes were "what we might call upper middle-class today," Jones said.

> "Considerable evidence compiled by researchers indicates that the Monroes were "what we might call upper middle-class today."

VIRTUES OF PLAINNESS

"You might have expectations of kind of a grand house, a brick structure, that's very commanding," he said. "By all accounts, however, this was a more common type of farmstead for a fairly well-to-do family in Tidewater Virginia in the mid-eighteenth century. The dwelling was a wood-frame structure that would probably appear to be surprisingly modest on the inside and out by today's standards, especially for a family who owned as much land as the Monroes."

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Field archaeologists from the William and Mary Center for Archaeological Research establish a metric control grid across the Monroe birthplace site prior to systematic shovel testing.

Eleventh-grade students in John Lewis's AP history class at Washington & Lee High School in Montross, Virginia help screen the soil for artifacts during the Virginia Archaeology Month public dig at the site of Monroe's birthplace.

THE MOST-ASKED QUESTION ON THE DIG

Work at the James Monroe birthplace site began in the summer of 2006 under the supervision of Project Archaeologist Elizabeth Monroe, one of the senior staff at William and Mary's Center for Archaeological Research.

No, she's not related to the late president.

"She probably will be talking to folks about the project, so she's a little bit braced for that question," said David Lewes, project manager at the center. Monroe is supervising a crew of five field technicians on work that began in the heat of August on the Northern Neck site.

"In the summer, the field crew will often shift their daily work schedule during periods of extreme heat, which has been the case at Monroe's birthplace during this initial study. Specifically, they're working from 6 in the morning until 2:30 in the afternoon. Postponing the initial survey work until a cooler season is not an option in a case like this because we've got subsequent stages of work that depend on milestones of completion before that so we really have to be prepared to work under all kinds of conditions," said Joe Jones, director of the center. "There's always going to be something that you have to contend with on a field survey like this, whether it's cold weather, bugs, poison ivy or questions—so this kind of goes with the territory."

return of the NATIVES

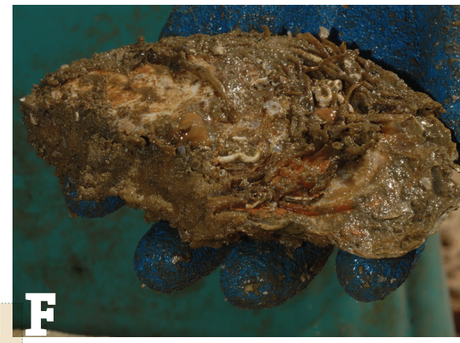

A


B


C


D


E


F

On a pleasant October afternoon, the York River beach at Gloucester Point made an ideal venue for culling and counting several test bags of oysters by staff of VIMS' Aquaculture Genetics and Breeding Technology Center (ABC).

Six bags of specially selected families of native oysters, *Crassostrea virginica*, were removed from homes on aquaculture racks in the York River after 28 months of testing.

The test oysters made their way from bags into baskets (A,B, C), then onto a sorting table set up on the sand. Lionel Dégremont D), breeding research manager for ABC, took charge of culling dead oysters and counting the live ones. Spat—young wild oysters—were removed from the shells of adults using a culling knife (E).

The work is part of several ongoing studies to improve the genetics of the native oysters, especially to breed in resistance to the diseases MSX and Dermo, which have seriously depleted stocks of the wild shellfish. Early indications showed the test group very resistant to MSX, Dégremont said, while resistance to Dermo varied.

"We are going to keep the 10 best families in order to produce the next generation," he said. "We are going to select for survival."

These oysters are part of a cohort of 50 families deployed in the York and in a site off the Northern Neck. "We have two more cohorts, which were produced in 2005 and 2006," Dégremont added.

Along with disease resistance, ABC is developing other characters through the domestication process. Among the desired traits are faster growth and triploidy – a genetic manipulation that creates non-reproductive oysters, which are marketable year-round and have an even higher degree of disease resistance. ABC's overall goal is to enable an industry of oyster cultivation that will produce a bay full of plump, healthy *Crassostrea virginica* (F). The understanding of oyster genetics being developed at VIMS also benefits breeding programs for other shellfish species.

photos by Steve Salpukas

text by Joe McClain

photo by Ariel White

Birds of the Shenandoah have high methylated mercury levels, but how bad is the problem?

A different kind of meth lab

by Joe McClain

For the past two summers, a particular townhouse in Waynesboro attracted a certain amount of attention from the neighbors. A mix of characters, mostly young, came and went at odd hours. A glance into the garage, whenever the door was open, revealed mysterious puttering among some strange-looking equipment.

"I'm sure some people thought we had a meth lab in the garage, because we had 10 people living in this rented townhouse, which was kind of weird, and we had all these syringes and test tubes and incubators," Dan Cristol said.

It was a different kind of meth lab, one devoted to the study of the effects of methylated mercury on birds—not the manufacture of dangerous drugs. Cristol, an associate professor in William and Mary's biology department, has been leading a two-year study of mercury levels in birds living in a stretch of the Shenandoah Valley. The South River was polluted with mercury in Waynesboro prior to 1950, and since the 1970s, mercury has been detected in fish and sediment in the South River and the South Fork of the Shenandoah River. Mercury levels in these birds were unknown before Cristol and his team compared stretches of river that have elevated mercury content with similar, but uncontaminated sections.

Mercury is a widespread pollutant. It gets into the environment from a number of sources, including runoff from small-scale gold mines, old batteries leaching out of landfills and the smokestacks of coal-fired power plants. The environmental culprit isn't the silvery elemental mercury, Cristol said, but a highly toxic form of methylated mercury that seems to get stuck in the food chain after entering it at the bacterial level.

"Once bacteria work on mercury and methylate it —eating it basically—it can go right through any cell membrane, straight into your blood stream and it will adhere to protein and it may stay with you forever," he said.

Methylated mercury not only gets stuck in the food chain, but it also accumulates in higher amounts in the animals higher on the chain through a process called biomagnification. Insect larvae and small crustaceans in a contaminated area usually have low mercury levels, around a part per billion. When a small fish spends its life eating larvae, the mercury piles up in the cells of the fish, which in turn may be eaten by a duck, kingfisher or a larger fish. Fish and birds are large enough and high enough on the food chain to accumulate dangerous levels of mercury in their bodies of a part per million or more.

The phenomenon of biomagnification isn't unique to methyl mercury, nor is mercury contamination endemic to the Waynesboro area, near where the South River joins with the North and Middle Rivers to form the Shenandoah proper. The Shenandoah, of course, is a tributary of the Potomac, which flows into the upper Chesapeake. The river downstream of Waynesboro was contaminated by a polyester fiber manufacturing plant there, but Cristol said there are mercury advisories on waterways throughout the nation, including a number in Virginia. In September, he said, a new mercury advisory was released for the Chickahominy River, west of Williamsburg. There have been a number of studies of methylated mercury in the Shenandoah's fish—fishermen had been warned against eating the smallmouth bass they catch—but Cristol's group was the first to study mercury levels in birds. The Waynesboro region was a nearly ideal place for the study. There were long-known contaminated stretches of river, along with nearby "clean" areas to use as a reference, and plenty of birds. The valley also offers upland habitat immediately adjacent to the river, for monitoring species such as bluebirds that aren't generally part of an aquatic food chain. An examination of the upland birds would give insight on the degree to which methyl mercury is invading the food chain of the Shenandoah flood plain.

"When you get a mix of wetting and drying like in a riverbed, you get both anoxic and aerobic conditions, and you'll get a lot of methylation," Cristol explained. "Methyl mercury will eventually move up the food chain, get into the little fish, the big fish, and the people who eat them, and that's where we get most of our mercury—from eating fish. Birds can get it the same way, of course, from eating fish, but not that many kinds of birds eat fish, so we are examining whether it's getting into other kinds of birds besides the few that eat the fish."

MINING FOR KINGFISHERS

Work began in winter of 2004-05, with the construction of nest boxes in the basement of Millington. If they had been built by Boy Scouts, Cristol quipped as he helped grad students stack some of the 600 nest boxes,

continued on next page

Rachel Fovargue '09, a native of the Shenandoah Valley, talks to belted kingfisher nestlings approximately 4 weeks old and ready to ltunnel into embankments to nest.

photo by Anne Condon

Summer intern Maryse Leandre from Thomas Nelson Community College participated through the BioMath program at William & Mary.

photo by Rebeca Brasso

photo by Dan Cristol

photo by Dan Cristol

Finding kingfisher nestlings takes some digging; kingfishers tunnel under embankments to build. Master's student Ariel White, her head in a hole, approaches the nest one way while Sean Koebley '08 hangs over the embankment blocking the nest's entrance. The nest isn't harmed in the process.

Master's student Anne Condon removes a radio transmitter from a juvenile bluebird that has been out of the nest for about two months. She has followed the bird weekly and the transmitter battery needs to be replaced.

Condon prepares to take a blood sample from a bluebird that left the nest two weeks before.

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there would have been enough for a whole troop's worth of Eagle projects. The boxes were built to attract breeding pairs of tree-cavity nesters that were among the target species: tree swallows, screech owls, wrens and bluebirds. The team wouldn't have to build boxes for kingfishers; they don't nest in trees and have no interest in nest boxes. That's the good news. The bad news is that kingfishers nest six feet deep in riverbank tunnels. You have to dig for nesting kingfishers.

Cristol and his team mapped sites for putting up their boxes, selecting areas near both contaminated and "clean" sections of the river. Over two field seasons, nearly 50 species of birds would be sampled. The sampling methodology was bird-friendly: a drop of blood and a feather is all that were needed, except in special cases.

"You fill a couple of small capillary tubes with blood and then you pull some feathers," he said. "That's it. The blood reflects what they've eaten in the last two to three weeks, because mercury doesn't last long in the blood. Feathers are a separate analysis that provides a longer-term record of mercury exposure."

Comparison of the presence of mercury among target species would be telling. It would make sense, Cristol said, to find mercury in fish-eating kingfishers as well as tree swallows, for instance, which feed heavily on aquatic insects. But how about mercury in bluebirds and wrens, diners on upland insects and which have no direct connection to the aquatic food chain? Wrens, he said, were a puzzle, showing oddly high levels of mercury—higher than even kingfishers.

"Wrens don't eat insects that fly, so they are not eating the bugs coming out of the river," Cristol said. "We suspected that they were eating a lot of spiders that in turn eat stuff that comes out of the river, but we didn't know how they were getting their mercury. They are as high as any songbird ever studied."

To examine what the wrens were eating, Scott Friedman, a master's degree candidate used a method which Cristol says "sounds rather revolting," but didn't harm a single baby bird. It involved putting plastic cable ties around the necks of nestlings in the boxes.

"The parents come in and deliver the food," Friedman explains. "The baby can breathe just fine, but it can't swallow the food, so then you quickly come back and just pull the food out and remove the cable tie. Then you have the food item so you know exactly what they are getting fed and you can find out how much mercury is in it."

As suspected, results showed that a quarter of the wren's diet is spiders, which in turn may eat mercury-laden aquatic insects, a plausible explanation of how aquatic mercury is working its way up to these terrestrial birds.

A mysterious hot spot

So, how much mercury does it take to harm a bird? A good question, and a hard one to answer definitively. Government regulators get concerned about levels near one part per million. For instance, you can buy a legal can of tuna containing less than 0.3 ppm, or eat a duck that you shoot with less than 0.5 ppm. When you're talking about wild birds, one ppm is often cited as a level of concern, but Dan Cristol says this is based on very little evidence.

"It's based on feeding mercury to birds or injecting their eggs; you can demonstrate that level will cause a problem in a laboratory. But it would be extremely hard to find any effect in the wild," he said. Other studies of swallows throughout the Northeast, including three polluted Superfund sites, show mercury levels in the wild birds below one part per million. In summer of 2006, Cristol's group set up three sites in a previously unsampled 10-mile stretch of river. For some reason, the swallows in the area were heavily contaminated—but, strangely, showed only a mild depression in nesting success.

"We found some swallows that were above 10 parts per million in their blood," Cristol said. "You'd think that should be enough to kill a bird, but these birds look completely healthy, so it's hard to know what's going on. "We may have identified this incredible hot spot. No one really knows why it's such a hot spot though, it's 20 miles from the original pollution source."

Data from the swallows were being processed into the fall of 2006. Rebecka Brasso, who has led "team swallow" in the Shenandoah, based her master's thesis on the swallow study. "I'd love to stay and study them for a third season to find out if they come back again" Brasso says "But it's time for me to migrate."

CLEAN BIRDS, DIRTY BIRDS AND NO-SHOWS

Screech owls, one of the target species, were uncooperative, at least as far as nest boxes were concerned. The team built 160 nest boxes and hung them high in trees, just as the owls like. For their troubles, they attracted exactly one owl per year. As the owls didn't come to the boxes, the researchers had to go to the owls. A team led by master's student Ariel White used mist nets at night to capture and sample the nocturnal raptors.

"Everybody loves working with screech owls. They are really cool." Cristol said. "I snapped pictures of all five of my undergraduate researchers holding owls, and every one is grinning ear to ear. We were able to work with lots of them but couldn't get any data on their reproductive success because—despite the fact that everywhere around the country, they use nest boxes—they won't for me."

There was better luck with bluebirds, which readily accepted the team's nest boxes. In the first year of the study, the researchers found that the adult bluebirds had elevated levels of mercury in their blood, while the young had none, even though they were being fed insects that researchers suspected were high in mercury content. The young birds were getting rid of their mercury through feather growth, Cristol believes.

"They are growing more than 10,000 feathers during the two weeks that they are in that nest box," he said. "Those feathers can store over 50 percent of the body burden of the mercury in the birds and so their blood is going to be cleansed, because the blood is flowing through the feather while it grows. Each feather has

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photo Cindy Baker

success story

Bald eagles

Numbers of our national bird are soaring, but its outlook in the Bay isn't all blue skies

To find where eagles nest, you have to fly like an eagle.

Each spring, Bryan Watts and Mitchell Byrd of William and Mary's Center for Conservation Biology climb into a Cessna 172 flown by a former fighter pilot known as Captain Fuzzzo. ("Spelled with three z's. The middle z," he says, "is silent.") They begin a series of treetop flights up and down Virginia's portion of Chesapeake Bay and its tributary rivers, looking for the nests of bald eagles.

Byrd has been doing the annual eagle surveys since 1977; Watts began in 1992. In spring of 2006, they logged a total of 485 breeding pairs producing a record total of 705 eaglets. They're a lot busier now than they were in the bad old days, when trees along the James River had no eagle nests.

"From '77 to '81, when we found that first nest, you had to search the whole James River and that got to be really frustrating," Byrd said. "Now, it has become almost an impossibility for one person to do it. There are just so many more nests and so much to cover."

Bald eagles like to nest in tall trees near water and Watts says some of the nests can be the size of a Volkswagen and weigh a couple of tons. Eagles need such large nests, he said, because they raise such large chicks. Large nests, of course, require a large tree for support and eagles have their own preferences in choosing a nest tree.

"Down here in the lower part of the Bay, a large portion of nest trees are loblolly pines and are over 100 years old," Watts said. "As you go further up the tributaries, you begin to see the transition to hardwood and the pines begin to peter out. Another characteristic of these trees is that they tend to stick out above the surrounding forest and that gives the birds what we refer to as crown access. These are big birds and they don't like to fly in enclosed spaces and so it's important that the nest site be elevated above the surroundings so that they can fly into the nest without having to go through these other trees."

Despite the prominence of eagle nests in the forest, the census takers fly over millions of trees, thousands of which have potential to host a bald eagle family. Nest-spotting from a speeding plane is an acquired skill. A CBS news videographer along on a flight couldn't see one even after repeated passes with Watts pointing it out each time. In addition to optimal weather and light conditions, there seems to be a "Goldilocks" altitude for the plane to fly.

"When you are at a thousand feet you are looking over a much larger field of view and things are smaller," Watts said. "If you're down at a hundred feet you can only see out a little bit, so things are blowing by at such an incredible rate. But at about three hundred feet you're just right—you're covering a field that's about the right resolution."

Flying a census for nesting eagles is for neither the faint of heart nor tender of stomach. When flying at Goldilocks altitude, Captain Fuzzzo's Cessna often experiences turbulence issues utterly unknown to eagles. Watts and Byrd like to tell anecdotes of world-class airsickness among certain of their passengers, including a severely stricken graduate student who was whisked back to the airfield and dragged into the shade of a hangar, only to be found in that exact same spot when the census flight was over, still slumped over incapacitated.

From their eagle-eye view in Captain Fuzzzo's plane, Byrd and Watts have been concerned to see suitable nesting habitat shrink even while the numbers of bald eagles have rebounded up and down Virginia's portion of the Chesapeake.

"Eagles feed on fish and aquatic prey, so they are constrained to the main shoreline. About 95 percent of the nests are within 250 meters of the channel," Watts said. Eagles, it turns out, like to build homes on the same sort of shoreline real estate as do people. "And that's what presents a conflict because waterfront property is the most valuable property for development that we have."

—Joseph McClain

To know what the natural Chesapeake ecosystem should look like, we have to consult the fossil record

OLD BAY

by J. Malcolm McClain

Don't ask her about dinosaurs because Rowan Lockwood isn't that kind of paleontologist. Dinosaurs have the glamour, but Lockwood prefers to study fossils of clams and other mollusks. Not, she says, "out of any innate love for clams," but partially because study of the ebb and flow of the population of clams thousands of years ago is going to help us better understand what is happening in the Chesapeake Bay and other at-risk aquatic environments.

"Most people, when they hear about paleontology and paleontologists, they assume, oh, it's all about dinosaurs," she said. "In reality a lot of us do it because we're hoping that the past will be the key to the present."

The metal ax heads that came ashore at Jamestown began an age of tree-felling that changed the Chesapeake Bay forever. Lockwood, an assistant professor of geology at William and Mary, said the Bay is one of the most studied habitats on the North American coastline, but she noted that such intense study only goes back a quarter of a century.

"Three hundred years ago, deforestation started along the Bay, and that deforestation caused a whole cascade of problems that the Bay is facing today. Too much sediment has been deposited, and that sediment is smothering animals living on the bottom.

Too many nutrients are entering the watershed; those nutrients are causing algal blooms. Those algal blooms are robbing the water of oxygen, she said. "There are all kinds of invasive species, including introduced predators and diseases, that have gained a foothold through shipping and the pet trade. Most of this happened prior to 20 years ago, so the fact that we have detailed ecological data from the last 20 years doesn't help us figure out what the Bay was like before the disturbance."

To get a picture of what the Chesapeake Bay was like before deforestation, industrial pollution and other human-caused factors, there's nothing like a fossil record stretching back thousands of years. Lockwood explained that about 20 years ago, paleontologist Grace Brush began sketching out a rough outline of the picture by studying the fossil record of algae cored from the bottom of the Chesapeake.

AGRICULTURE CHANGES EVERYTHING

"She started taking sediment cores and looking at the last 10,000 years of algae in the Bay and found that the Bay was tootling along quite nicely in its development until agriculture got going," Lockwood said. "Then you see this massive change in the algae – their abundance and what kinds are living in the Bay. The Chesapeake Bay, after human disturbance, is very, very different from the Bay before human disturbance."

In other words, none of us knows what the truly "natural" ecosystem of the Chesapeake is like. Actually, Lockwood says, the Bay formed at least three times in geologic time, the most recent incarnation beginning 8,000 to 9,000 years ago. Humans began putting serious stress on the Bay about 200 years ago, when colonists got agriculture going on a large scale. 21st Century ecologists, she says, can best reconstruct the individual components of an ideal Chesapeake ecosystem through examination of the fossil record.

"People are starting to realize that the fossil record is this wonderful sample of what life was like before humans got involved," she said. "There's a whole field that's now springing up within paleontology. Some people are calling it 'conservation paleo-biology,' others are calling it 'applied paleontology.' It certainly has a more applied feel to it."

Lockwood is a specialist in veneroids, or Venus clams, although these days, she says, "I basically look at every species I can get my hands on." Venus clams are an excellent subject for the long-term study of biodiversity because there are so many species. Lockwood estimates that she has examined in the neighborhood of 100,000 individual fossil shells representing more than 2000 species and 200 genera. She has begun doing work with fossil shellfish similar to what Grace Brush did with fossils of algae and others have done with fossilized pollen and plants.

photos by Joe McClain

Professor Rowan Lockwood (standing, left) watches Natasha Hunter '06 sort shell fossils small enough (top, right) to require a microscope. Sarah Kolbe (below, right) works on larger specimens.

The work was prompted by an article by a scientist named Jeremy Jackson which proposed that oyster depletion was the root cause of many of the Bay's environmental problems.

NOT ENOUGH OYSTERS

"He argued that if humans hadn't over-harvested oysters, the oysters would still be filtering the water in the Bay, filtering out the algae, and we wouldn't have the kinds of problems that we have now," she said. "And it occurred it to me, well, one of the things that we really ought to be looking at is what the oyster and other shellfish populations looked like over time in the Bay. We can't just rely on the 20 years that we're getting from ecological surveys."

Lockwood has enlisted a number of William and Mary undergraduates to assist in the project—or projects—since her examination of the fossil record of shellfish in the Chesapeake has been twofold. The first aspect is to examine the quality of the record: Are there enough fossil shells out there to work with?

"Any time you do a fossil study you have to ask the question, how good is the fossil record? Is it good enough to ask the question that I want to ask? Am I getting a strong enough signal?," she explains. "So, over the last couple of years I've had a total of six students that have worked with me on this question—for two of them, we've already published papers. What we found—actually, much to my surprise—is that the fossil record for the Bay, or the record of the last 9,000 years in the Bay, is much better than what I expected it to be."

Lockwood and her students are now working to compare the natural changes in the Chesapeake ecosystem recorded in the fossil record with the human-induced changes experienced over the past few centuries. She says that she's particularly interested in comparing ecological changes of historic time with those brought about by a big climactic change of about 6,000 years ago. The work is promising, she says, largely because between 75 to 90 percent of the species living in the Chesapeake Bay today are represented in the fossil record.

> "People are starting to realize that the fossil record is this wonderful sample of what life was like before humans got involved."

"This is good news for us. This means that the fossil record is faithful enough to the original community that I can now begin to ask some of these questions about comparing the 6,000-year-old climate change to human disturbance," she said. Lockwood and her students are beginning to bring the picture into focus, by determining which kinds of shellfish tend to thrive after an ecological disruption.

"You do see a distinctive change in the shellfish. You go from shellfish that are more saline-tolerant to shellfish that are less saline-tolerant and are associated with a warmer and wetter climate," she said. "We also have what I think of as weed species that tend to pop up after climate change. They're also the same species that pop up as soon as deforestation and sedimentation start in the Bay."

LOATHING A CLAM

What Lockwood calls "the classic weed species, the one my students absolutely loathe" is the dwarf surf clam, *Mulinia lateralis*. Growing to a maximum shell size of just over half an inch, Mulinia lateralis is not suitable for eating on the half shell or steaming, frying or chowders—but it tends to displace shellfish that are.

"They are absolutely amazing. They are much more tolerant of salinity and oxygen changes than some other shellfish are, and so they seem to indicate any kind of interval of disturbance," Lockwood explained. "And they can out-compete other shellfish, but only if there's been some kind of disturbance."

She said that some of the core samples, provided through the cooperation of the U.S. Geologic Survey, contain mostly fossils of *Mulinia lateralis*. "Sarah Kolbe did her project during her sophomore year, and there were some layers where she took an inch by 4 inch chunk and found over 6,000 *Mulinia* in there," she said.

Ghost pots can be scary things.

Fish, like these croaker, and other organisms can find a crab pot to be a haven from which there is no escape. Scientists have a name for the phenomenon: "self-baiting."

by Suzanne Seurattan

It's scary, that is, to consider how many fish and shellfish must die each year after finding their way into crab pots that are baited, set and then—for one reason or another— left to lie on the bottom of the Chesapeake Bay and its tributaries.

The Virginia Institute of Marine Science (VIMS) at the College of William and Mary was selected in August by the National Oceanic and Atmospheric Administration (NOAA) to administer a project to remove deadly derelict or "ghost" crab pots in the Chesapeake Bay.

"We can't separate the human from the natural. This program will move that objective forward," said William and Mary Provost P. Geoffrey Feiss.

NOAA has funded the project to identify, assess, track and recover the crab pots and other marine debris in the Chesapeake Bay through its Marine Debris Program. VIMS will work on the project jointly with NOAA's Chesapeake Bay Office.

"NOAA is proud to be involved in projects like this one that work to develop solutions to reduce the impact that marine debris has on our resources and environment," said Brigadier General Jack Kelly (Ret.), NOAA deputy undersecretary for oceans and atmosphere.

Data gathered by VIMS and NOAA's Chesapeake Bay Office since November, 2005 in a pilot study suggest that ghost pots identified in the surveyed area of the York River trap 100,000 crabs per year.

"It's clear from recent studies at VIMS that lost crab pots can affect the commercial and recreational fishery in the Chesapeake Bay," said John Wells, dean and director of VIMS. "By sharing resources and data, VIMS and its state and federal partners will be able to implement practical solutions to this and other environmental problems."

Ghost crab pots are a persistent problem in the Bay. Lost during storms or accidentally cut loose from their buoys, the pots continue to catch crabs and other important living bay resources without ever being retrieved.

There are a lot of ghost pots out there, as many as 30 per kilometer for the York River in Virginia and 120 pots per kilometer for the South River in Maryland, according to pilot studies. Researchers used side scan sonar technology to location ghost pots on the riverbed floor.

The new study will expand current data by sampling additional areas, investigating how the pots "self-bait," looking at the long-term efficiency of the pots and developing a Bay-wide removal plan.

"We hope through this collaborative effort that William and Mary and VIMS can help NOAA and the state rescue this critical resource," added Feiss.

Through the project, VIMS and NOAA scientists also hope to assist in the creation of an improved management plan and policy for blue crab stock in the Chesapeake Bay while reducing economic hardship for working watermen and fishers and engaging them in Bay restoration.

NOAA, created in 1807 as the U.S. Coast and Geodetic Survey by William and Mary alum Thomas Jefferson, will soon celebrate 200 years of science and service to the nation.

continueds

FOR THE BIRDS

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its own artery and the mercury is going to stay in the feather and the blood is going to come back to the body without much mercury in it. So that means that when the feathers stop growing, and the blood supply is withdrawn, which is right after we studied them last year, their mercury level should rise."

One of the projects for the second year of the study was the tracking of the grown-up babies through radio telemetry to determine if the fledged birds are retaining mercury. For a hundred days after the bluebirds left the nest box , Anne Condon, another graduate student, followed and recaptured them and took new blood samples to see if the blood mercury level suddenly rose, potentially with great harm to the bird during this sensitive period.

"The mercury level rises very steadily after they leave the nest and the feathers stop growing," Condon said. "The data are so nice it looks more like a physics experiment than an ecology study."

NOT SO HARD TO SWALLOW

The most-studied species was the tree swallow, which yielded, Cristol said, "enormous sample size, unheard of in these kinds of studies," especially since the swallows didn't nest in the area until the researchers put up nest boxes. The large sample size allowed the team to compare precisely the return rate of birds from clean and contaminated areas of the river.

"About 50 percent of the 2005 birds came back in 2006, which is probably all that's alive," he said. "There were exactly equal numbers coming back to both kinds of sites. So it looks as though the really high mercury levels in the swallows didn't kill them off during their southward migration last winter. We know it didn't kill them off while they were here last year, because we studied them and they had babies and they fed them and the babies fledged normally."

The team is still processing data from the second year of field work and Cristol is pondering the next likely step. Two seasons of sampling thousands of birds in the Shenandoah have generated as many questions as answers. One of the puzzles concerns birds that are apparently thriving—and apparently reproducing almost as well as uncontaminated birds—despite blood mercury of many times the level known to be lethal in other bird species. Another set of mysteries surrounds how the methylated mercury is penetrating the food chain of the surrounding flood plain. In addition to the wrens, Cristol said, the team found unexpectedly high levels of mercury in woodpeckers and other species with no known links to the aquatic food chain.

photo by Ariel White

Prof. Dan Cristol, the leader of the flock, holds an Eastern screech-owl.

"Woodpeckers eating on hundred year old trees shouldn't be getting a lot of mercury, but they are," he said. "These are red bellied woodpeckers, so they don't eat much on the ground. They do eat baby birds that they find in tree cavities though."

DuPont, the previous owner of the plant blamed for the pollution, has funded two seasons of the study, but Cristol is seeking additional support to expand the work.

"We have been able to answer applied questions for DuPont about mercury in the birds," he said, but there's still a lot of basic science about mercury in the environment to be done up there."

A National Science Foundation undergraduate biomath grant, a Marjorie S. Curtis Distinguished Professorship, and internal funding from the Office of the Vice Provost for Research at the College have also supported this research.

IS THERE A DOCTRINE IN THE HOUSE?

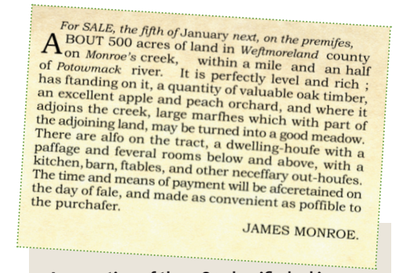
Continued from page 9

The comparative "plainness" of the Monroe farmstead may lend itself, in a way, to a unique interpretive opportunity, when compared to the grand, high-style homesites more typically associated with the various founding fathers, the archaeologists said. At the same time, however, an informed interpretation of the Monroe site could fill an existing gap in the current range of colonial house museums by offering an important and yet overlooked example of a type of farmstead that was common throughout Virginia during the late Colonial era, establishments that straddled the definition between farm and plantation.

"It is a plantation in that they were growing cash crops," Lewes said. "And there's an aspect of it where they are striving for self sufficiency; it's not just a dwelling but it's kind of a little miniature community. Often, these places were not only involved with cash crops, but also food crops and domesticated animals. In Virginia Tidewater, especially, there was that ideal of striving to make the place self sufficient. For example, many of the crafts were produced on site by the slaves or the landowners."

"Another plus to this study," Jones said, "is that unlike many Virginia counties from which most of the older county records were destroyed during the Civil War, the records of Westmoreland County survived largely intact. Such records are helpful in providing context to the archaeology. There is, for instance, an inventory of the estate made in 1774 after Monroe's father died, and a nearly complete chain of title tracing the Monroe family's ownership of this particular property, and the division of the land among the various Monroe heirs.

"Some of the information you get from a site is kind of site specific and it's specific to the individuals that lived on the site, but the archaeological information from a site like this can also contribute, by comparison and contrast to other sites across the region, to the identification of broad anthropological patterns that may be significant but otherwise overlooked by folks who lived during that time as well as scholars of today."



For SALE, the fifth of January next, on the premises, ABOUT 500 acres of land in *Westmoreland* county on *Monroe's* creek, within a mile and an half of *Potowmack* river. It is perfectly level and rich; has standing on it, a quantity of valuable oak timber, an excellent apple and peach orchard, and where it adjoins the creek, large marshes which with part of the adjoining land, may be turned into a good meadow. There are alfo on the tract, a dwelling-houfe with a paffage and feveral rooms below and above, with a kitchen, barn, ftables, and other neceffary out-houfes. The time and means of payment will be afcertained on the day of fale, and made as convenient as poffible to the purchafer.

JAMES MONROE.

A recreation of the 1780 classified ad in the Virginia Gazette offering the Monroe birthplace for sale.

color it PLAID

by Suzanne Seurattan

It started as an honors thesis and is becoming one of the world's most valuable tools for evaluating foreign aid

Inspired by students and driven by their involvement, Project PLAID is a shining example of the power and benefits of undergraduate research.

"We can make "cookbook" research projects for lab classes, but it's not the same as being on an original research project where you keep doing it until you are satisfied and there is no known answer until you get there," said Timmons Roberts, professor of sociology.

PLAID is an acronym for Project Level Aid, an ambitious ever-expanding database of donors and recipients involved in thousands of international-aid projects. The goal is to develop the initiative into a globally recognized, authoritative guide for the international-aid community. A British non-governmental agency, for instance, which is considering lending money to a proposed Nepalese erosion mitigation project, could check the PLAID database for information on the past success and failure of such projects. And, of course, such groups also will be able to check the track records of their projects on PLAID, which is on its way to becoming accepted as a sort of "seal of approval" for aid projects.

Roberts is one of three William and Mary faculty members guiding PLAID, along with Brigham Young University political scientist, Daniel Neilson. The project grew out of an honors thesis presented by undergraduate Brad Parks to Roberts and faculty members Rob Hicks of the economics department and Mike Tierney, of government. Parks, who graduated in 2003, based his thesis on an examination of environmental assistance to developing countries.

"He wrote the best honors thesis I have ever seen in my life," noted Roberts. "It was 200 pages, 400 footnotes, 400 references or something like that – it was better than a master's thesis, close to a doctoral dissertation."

So impressed were the professors with the paper they encouraged Parks to turn the thesis into a book—*Greening Aid: Understanding Environmental Assistance to Developing Countries*. Parks asked the professors to participate as co-authors.

Parks' book, due out in fall of 2006, required more additional research than the foursome anticipated. Tracking development assistance can be a challenge. There is a lot of money to follow, countless donor countries and organizations involved and very few tracking entities available.

FOLLOWING THE MONEY

Annually, more than $100 billion flows to countries across the globe in the form of development assistance from bilateral donors, including the U.S., Sweden and Germany, and from traditional multilateral donors such as the United Nations and the World Bank. The primary tracking agency for this money is the Organization for Economic Cooperation and Development (OECD). The OECD gets its data from its member nations, maintaining a database on their annual reports of aid funding.

While the OECD data is useful, it doesn't tell the whole aid story. As Parks and the professors began to write the book manuscript, they realized that the OECD didn't have all the data the book needed and that they'd have to gather the information themselves—Project PLAID was born.

Missing in the OECD database was a clear guideline of how the projects were classified. Tierney, an assistant professor in the government department, noted that a project funding the clear-cutting of a rain forest might be put in the same OECD forestry sector as a project that funds tree planting.

"For scholars interested in the environmental impact of foreign aid, such measurement errors create serious problems. The obvious, but difficult, solution, is to gather data directly and classify each project individually using a consistent coding scheme," Tierney said. "The bottom line is that sector codes are simply too tough to capture project-level variation and that different countries don't use the same criteria over time. PLAID does."

The aim of the PLAID database is to bridge this gap in understanding. To do this, the researchers have included information from more donors, more information on each project and have compiled statistics from more years.

"This is one of the most exciting research projects we have going on at the College," said Carl Strikwerda, dean of the faculty of Arts and Sciences. "It is wonderfully fitting that it grew out of a student project and that students have been so fundamental to making it succeed."

Development assistance data may be tracked on one of three levels—aggregate, sectoral or project. Aggregate is the broadest reporting level, while PLAID data is based on project-level reporting. It provides the greatest detail about the individual programs, explained Tierney, assistant professor of government.

The database has been an enormous undertaking. Thus far, more than 60 William and Mary students have participated in the project guided by the team of three professors.

In the course of the project, the student researchers have gone line by line through international development aid grant records for the last 30 years—twice. Each aid project received entries or codes on 71 independent variables—26 more than the projects in the OECD's database.

GREEN AND BROWN

The PLAID team created the codes based on criteria and scales they established, asking not only how much money was involved and who donated it but also where the money went. In addition, they coded each project on a five-point environmental impact scale, rating the project as either "green" – globally, environmentally friendly or "brown" – providing only local environmental benefit. The researchers also

continued on next page

Professor Rob Hicks examines the work done by Brendan Williams '06. Williams, an economics and government major, studied abroad in Spain, where he interviewed government officials for PLAID.

photos by Cindy Baker

WORKING WITH PLAID HAS PAID OFF FOR THE STUDENTS

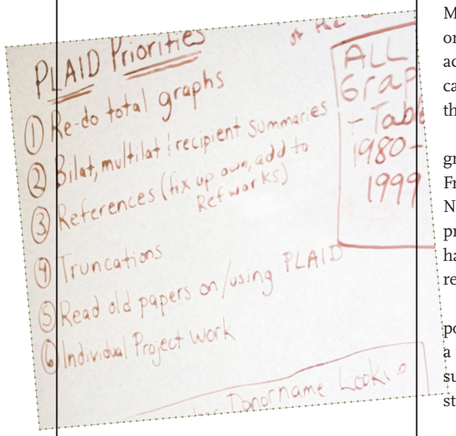
continued from page 21

GOOD HOUSEKEEPING SEAL OF APPROVAL

Three years into the project, the PLAID team is close to making the database public. They have almost completed coding aid projects reported to OECD from the late 1970s through 2000, nearly 500,000 cases in all. The NSF grant requires the team make the core data available to the public by 2008.

To accomplish this, the College hopes to partner with GuideStar, a nationally recognized clearing house for domestic philanthropy located in Williamsburg.

"My dream would be that PLAID /GuideStar become sort of the 'Good Housekeeping Seal of Approval' for people who are seeking an international development aid project approval," said Carl Strikwerda, dean of the faculty of Arts and Sciences.



recorded all project funding in terms of constant dollars (adjusted to year 2000 value) and recorded co-financers for projects where applicable.

"The PLAID database contains an immense amount from the OECD but it has been added to in a way that really makes it quite unique without really destroying the integrity of the DAC (the OECD data)," Strikwerda said.

Having the aid data evaluated based on a standard set of criteria readies the information for comparative studies by putting all the information on the same playing field. OECD's data is reported by member countries and does not include data submitted on a standardized scale. The OECD database is "historically a more passive collection system," Tierney added.

The OECD asks for annual reports on aid assistance from its member countries. If the data wasn't filed by the deadline, that information is missing from their database. PLAID filled those gaps by going back to those countries and requesting the missing information and in some cases sending researchers to individual countries to get it.

Configuring data in this way allows researchers to ask more questions of the database including where aid is needed, which projects are working and who cares about the outcome of the aid project?

"This set of data is truly one of a kind," added Miranda Hutten, an undergraduate researcher on the project. "It is also very versatile: academia as well as international organizations can benefit from incorporating this data into their research and project selection strategy."

Initial funding for the project came from grants to the College from the Mellon and Freeman foundations. Then in 2004, the National Science Foundation awarded the project $250,000 over three years. The project has also received significant funding for student researchers through the Charles Center.

A comprehensive retrieval of data was made possible, in part, by the generous support of a private donor. These funds have provided support for field research, foreign travel and staff support.

"We simply could not have done all this without these private gifts," said Tierney.

"The PLAID Project data set puts a lot of information in one place," noted Roberts. "It is particularly useful in understanding the impact of a particular sector of aid." The database not only includes information from more donors, but also more information on each aid program and from more years. The students have already detected a downward trend in aid funding projects destructive to the environment, Roberts added.

"This project has given a large number of students experience with real research that is potentially going to have an impact and I think it seems to be along the lines of the model that the College is trying to move in as a center for excellence in undergraduate research," Roberts said. The experience of working with PLAID has paid off.

> "I've learned that foreign aid is not at all as simple as it appears. . . there is far more to the successful aid equation than just money."

RESEARCH EXPERIENCE FOR STUDENTS

"I've learned that foreign aid is not at all as simple as it appears," said Brad Potter, '08. "It's easy for one to simply say 'Throw money at a problem and it will be OK,' but after looking at development aid statistics for the last twenty years, it is clear that there is far more to the successful aid equation than just money."

Potter noted that planning, leadership and intent also play a big role in an aid project's success or failure.

Some of the lessons learned have been hard ones: "The most shocking aspect of the project was what many donor countries categorized as 'clean' environmental projects,: said Hutten, a member of the class of 2007. "For many donor countries, forestry projects were considered clean projects despite the fact they aided in deforestation. Now I am more interested in the interplay between local development projects and the mitigation of large environmental trans-national issues."

The researchers and the college want to take the data to the next level. As the project moves forward, the team hopes other sectors can be added. They are already talking with other collaborators to add agriculture and health sector funding variables. Adding sectors and the capability to search the database on-line could make the data even more useful.

"We hope to have these kinds of sectors done in a couple of years," Roberts added.

Ultimately, the professors and researchers hope the project will lead to a center for international policy research on campus "so there will be an enduring structure for collaboration across disciplines and including people from outside the university producing useful research," Roberts said.

"PLAID could be a ready tool that would be net searchable and it would help with what is called donor coordination or at least strategic planning of aid," Roberts continued.

Determining the flow of aid is crucial: "On the world stage that would be the biggest contribution PLAID could make," said Hicks, an associate professor of economics.

Donor countries often duplicate efforts, the professors noted. Increasing the coordination of donors is likely to increase the effectiveness of the aid.

"Strategic planning is important because there is quite ridiculous overlap in different agencies...and they don't even know that the other people are there," Roberts added. "They are repeating their efforts or they are stepping on each others toes and it becomes territorial and counterproductive and extremely wasteful. And for the recipients, for the poor countries, it's a nightmare."

The professors, their researchers and the College see endless possibilities for the project.

"I think it is the most comprehensive database on international development aid that is out there," Strikwerda said. It fills a real need, he added, by providing the additional data on aid that makes the information searchable.

"We have been able to produce a tremendous resource with modest funding with the continued support of the administration and with additional agency and/or foundation support, this project has the potential to be an ongoing and sustainable resource," said Roberts.

Still, whether PLAID becomes an internationally recognized resource on aid funding or not, the project has been immensely successful.

"It marks the future and the direction I think that we want to go as an institution—to continue to encourage these kinds of research projects and to continue to bring students into these kinds of research projects so that they get the most of what I think our faculty are doing," Strikwerda said.

"My favorite thing about PLAID is engaging our students in the process of discovery," added Tierney. "It's just a great feeling when a student figures something out and comes bouncing into my office to tell me all about it."

Above left. Kaity Smoot '08 keys in donor data. A double major in international relations and economics, she hopes to work as a development economist in Sub-Saharan Africa after graduation.

Above right. Rob Hicks and Mike Tierney (standing) discuss adding sectors to the data base with Charlotte Jackson '07, Brad Potter '08 and Scott Parks '09. Parks is the brother of Brad Parks whose honors thesis became the impetus for PLAID.

This is your brain, *virtually*

by Jos. McClain

Computing power at William and Mary is facilitating neurosurgery at Harvard

A tessellated image of a brain appears on a large monitor in McGlothlin-Street Hall (left). The 3-D images appears to full effect when you wear the special glasses as depicted by Nikos Chrisochoides (pointing) and Andriy Fedorov, who are working with neurosurgeons at Harvard to provide intraoperative images quickly.

Everything changes after the surgeons open your skull. Your brain, and the tumor inside it, no longer fully float in the protective bath of cerebrospinal fluid. Gravity comes into play, as does the atmospheric pressure of the operating theater. The brain responds to these foreign forces, the cerebral tissue sagging, rebounding and changing shape. The tumor that the neurosurgeons want to remove also has changed position. The preoperative MRI image is no longer accurate enough for brain surgery.

Thus, the brain the surgeon operates on is a different shape from the one depicted in the preoperative MRI. Of course, once the surgeon begins work, the shape of the brain changes even more.

The brain's changing shape is a problem not only of space, but of time. The goal, of course, is to remove as much as possible of the tumor and none of the healthy neural tissue. Today's operating procedure is to keep track of the brain's movement through a series of intraoperative MRI scans. And that takes time. MRI—magnetic resonance imaging—is a labor-intensive and painstaking process. The MRI instrument is a big magnet, so all metal instruments have to be removed from the area. Processing of each intraoperative MRI can put the procedure on hold for as long as 90 minutes.

"They tell me that they don't even talk while the MRI is happening," said Nikos Chrisochoides, Alumni Memorial Associate Professor in the Computer Science Department. Chrisochoides is leader of a William and Mary group that is working with a team at Harvard Medical School to solve the neurosurgeon's problem of space and time through adroit application of mathematics and computer power. At Harvard, a research group directed by Simon Warfield and Neculai Archip at Children's Hospital and Brigham and Women's Hospital coordinates the effort.

Everything changes after the surgeons open your skull.

In essence, the William and Mary team provides the surgical team with a dynamic computer model of the patient's brain, updated within a few minutes to show the surgeons, as Chrisochoides describes, " exactly what is where during the operation, even though the shape of the brain is constantly changing." The process is under evaluation in clinical trials, and Chrisochoides says his team can render a new model in six or seven minutes, but hopes to be able to do so in under two minutes.

"We want to help the neurosurgeon make an informed decision of what to cut, where the critical paths are, what areas to avoid," he said. "I'm neither a neurosurgeon nor a doctor, so the contribution of my research is to make this distillation of objects really, really, really fast."

A POOR MAN'S CAVE

"When I was at Notre Dame, I was called the caveman," Chrisochoides remarked, as he ranged about his lab in McGlothlin-Street Hall, "This is a poor man's cave." The focal point of his "poor man's cave" is a projection computer monitor whose screen would not look out of place in a small multiplex theater. Chrisochoides handed out 3-D glasses to a small audience that included a colleague from NASA and Andriy Fedorov, a Ph.D. student recently returned from 15 months as the team's representative at Harvard.

Chrisochoides took his place at the keyboard and mouse and in the dim light of lab, the monitor displayed a parietal slice of a computer mesh brain. A nasty-looking blob clearly indicated the presence of the tumor. The glasses give the audience a striking 3-D effect, showing off the curves of the vector arrows indicating how displacement—represented by color as well as length of the shaft—were acting on the brain. The curved surface of a real "cave," Chrisochoides said, would create the illusion that "you could reach right into the brain, there." But the three-dimension tessellated brain and its force vectors are plenty impressive enough. Chrisochoides takes the mouse, nods at the monitor, and tells how it all works.

MANY PROCESSORS MAKE LIGHT WORK

The process begins with the acquisition of a variety of images before the surgery, which are otherwise unavailable in the middle of the procedure. Low-resolution intraoperative data allows the tracking of the shift of brain matter and calculate how to deform the preoperative images accordingly.

The brain, of course, is an elastic object. "If you push it," Chrisochoides said, "it takes energy and then after a while it settles down. We can calculate the place where it settles by solving the partial differential equation. Mathematicians can tell us that there is a solution, but they cannot tell us what the solution is. There's no such thing for this equation. There's no analytic solution. So we have to approximate."

Chrisochoides approximates the geometry of the patient's brain by tessellation—dividing it into triangles in three dimensions, or in other words, generating a mesh representing the brain.

The task of generating a mesh representation of the brain and all the forces that will work on it poses a number of related problems. It takes a lot of people: Chrisochoides has a number of Ph.D. students investigating practical applications and issues related to software development. Another group of students are working on algorithms, to make the process even faster.

In addition to taking a lot of people, mesh generation at this level requires a great deal of computing power. Chrisochoides' group uses William and Mary's SciClone, a cluster of 300 processors linked in a parallel network.

"Rather than using one computer, we can use all 300 computers that we have on SciClone and find a way to do it 300 times faster," he said. "We are one of the few to do this fast enough for the doctors to see the result during the surgery. This becomes possible using many, many processors."

Distance, the hundreds of miles between the operating theater at Brigham and Women's Hospital and the banks of SciClone processors, was not an issue, thanks to high-speed Internet. "The bandwidth connecting here with Chicago or Pittsburgh is much higher than the bandwidth from my office to your computer," Chrisochoides said.

The team is primarily made up of advanced grad students, but it contains at least one undergraduate. Robert Staubs from Manassas, Virginia, joined the team shortly after his freshman year at William and Mary. He had taken a course, Discrete Structures of Computer Science, from Chrisochoides and began work over the summer, making modifications on a program that a grad student had written to that it would run on the multiple-processor SciClone format. Staubs also was charged with installing setting up the remote visualization laboratory—the "poor man's cave." This fall Staubs co-published an article related to the work on an online journal.

"The most challenging part was getting a handle on an unfamiliar programming," said Staubs, a member of the class of 2009. "And the algorithm I was using was a bit difficult for me to understand at first. It was a bit high-level. But because image processing uses Euclidian geometry, I was able to get that much easier."

Mesh generation has more applications than biomedical modeling. Chrisochoides' lab has some funding from NASA, which is interested in very large meshes for simulations of conditions to optimize the shape of aircraft wings. Another program, with VIMS, will apply mesh technology to the study of water dynamics in the Chesapeake Bay and the Gulf of Mexico. Chrisochoides said mesh simulation will be especially helpful to VIMS researchers modeling erosion of land.

OF JOY AND BY JACQUES: FACULTY WIN NEH FELLOWSHIPS

Two William and Mary professors, Adam Potkay and Sally Price, have secured prestigious year-long fellowships from the National Endowment for the Humanities.

by Lillian Kelly

NEH fellowships support individuals pursuing advanced research that contributes to scholarly knowledge or to the general public's understanding of the humanities. Recipients usually produce scholarly articles, monographs on specialized subjects, books on broad topics, archaeological site reports, translations, editions or other scholarly tools. Full-term (9- to 12-month) NEH fellowships carry a stipend of $40,000 and allow recipients to take time off from teaching and other faculty duties in order to work full time on their research projects.

Potkay: about joy

Adam Potkay, professor of British literature, is in the final throes of his book, *The Story of Joy, from the Bible to Late Romanticism*, due for publication by Cambridge University Press in 2007. He anticipates that this book will be of interest not only to lovers of literature, but also to those in philosophy, history, musicology and theology. "It's chiefly a literary and intellectual history, though to some degree a more broadly cultural one," Potkay said, "touching on music, opera and film, politics and advertising, memoirs and revelations."

Potkay, who is celebrating his seventeenth year on the faculty here, notes that this was his third attempt at a NEH Fellowship— his first received— and one he considers a "once in a lifetime" award. "In this book, I offer a history of joy or, more specifically, the ways in which joy has been addressed in Western literature and art philosophy and religion, psychology and statecraft," he explained.

Potkay is taking a one-year leave of his teaching assignments—which include 18th-Century and Romantic-era literature and the Bible as literature—to finish his manuscript right here in Williamsburg. "I have to get a plug in for the library!," he said. "Everything I need is here. Our holdings are quite remarkable. "

A large portion of his book concerns 18th- and 19 th-Century literature and Potkay can access the early modern and Eighteenth Century holding of the British Library through ECCO (Eighteenth Century Collection) and EEBO (Early English Books Online).

"Five years ago I would have had to have gone to London or Charlottesville to finish this book," Potkay said. "I received the NEH starting July 1 to finish *Joy*, but I applied for the fellowship two years ago. At that point, I was deep in the midst of the book—which I would have written anyway—but the fellowship makes it possible to work on it full time and finish it sooner than later."

Price: house of jacques

Sally Price is the Duane A. and Virginia S. Dittman Professor of Anthropology and American Studies. She is on research leave abroad until January and won support from both NEH and the Wenner-Gren Foundation for Anthropological Research. Her project involves the cultural politics of non-Western art in France.

Price came to William and Mary in 1994. Her field is American studies and anthropology, with emphasis on the cultural politics of art, museum studies, the African diaspora and the Caribbean. She has been continuing research on gender constructs and other aspects of the cultural life of Maroons in Suriname and French Guiana.

This represents the third NEH grant of her career (during 1992-1993 she also had a Guggenheim Fellowship). She is particularly proud that her daughter, a professor of English at Harvard University, received her own NEH fellowship at the same time. "I gave up my William and Mary salary for a year in order to conduct research and was fortunate enough to find support from both NEH and the Wenner-Gren Foundation for Anthropological Research," she said.

Price's work on the cultural politics of non-Western art in France centers around two sites. The first site is France's outpost in South America, the former colony of French Guiana, once notorious for the Devil's Island penal colony. She is interested in the changes of artistry of the Maroon population as their works entered the international art market. The Maroons are descendants of slaves who escaped in the 17th and 18th centuries and formed independent societies in the northern extension of the Amazonian rain forest.

The second site is Paris, where President Jacques Chirac saw the fulfillment of a long-standing dream in June with the inauguration of the Quai Branly museum, next to the Eiffel Tower, which features indigenous art, cultures and civilizations from Africa, Asia, Oceania and the Americas. The new museum is the subject of her book, *The House that Jacques Built: Art and Difference in France*, as well as the focus of heated controversy ever since it was conceived in the mid 1990s. (Price predicts her book, slated for 2007 publication by the University of Chicago Press, "will raise some heated controversy as well.")

Return of the DUKE

Will an exhibition in Paris mean vindication for the missing Titian?

by Joseph Malcolm McClain

Science can only take you so far.

There is a seemingly endless battery of scientific tests used in the process of authenticating works of art. But what's needed isn't better science, but better art history, better connoisseurship, says Aaron De Groft, director of the Muscarelle Museum in Lambertson Hall. De Groft has spent the last eight years tracking down the story of a portrait that has been bounced in and out of the acknowledged oeuvre of the High Renaissance master Titian. In late August, as students were arriving on William and Mary's campus, De Groft, a member of William and Mary's class of 1988, was preparing to leave. He and the duke were expected in Paris shortly.

The unsigned portrait of Federico II Gonzaga, the first duke of Mantua, is on loan to the Muscarelle. It was long accepted as a work of Titian, until 1938—when remarks by respected art historian August Mayer cast doubt on the portrait's place among Titian's work, suggesting Titian would not have had enough time to paint the portrait.

"It was one of those funny little articles in the *Gazette des Beaux Arts*," De Groft said. "It was entitled 'Some Notes on Titian,' which indicates that there's not going to be a lot of depth. So, within the space of a few lines Mayer said this painting couldn't be the one because it's dated June 17, 1540, and we know Federico died June 28."

As a result of the "funny little article," the portrait of Federico was shuffled off to the margins of the art world, despite having been a part of several major collections, bringing a high price at 20th Century art auctions and being depicted on the cover of a 1931 issue of *Art News*. Such was the weight of the word of August Mayer, De Groft notes. He added that Mayer never asserted that the duke's portrait was not by Titian, just that it could not be the painting referred to in the letters. A providential exhibition this fall may prove to be the venue to lift Duke Federico from obscurity once and for all.

"It's a big Titian show in Paris. This is a once-in-a-lifetime exhibition. It's about Titian and the courts of Europe and the show is basically all portraits. The opening will be September 11, in the Musée du Luxembourg, where the French senate sits. The president of Italy will be there, as will the prime minister of France and the mayor of Paris. They won't have a show like this for another fifty or sixty years," De Groft said. "The picture was requested to be in this exhibit and I was asked to write the catalog entry."

IS IT XXXX OR XXXIX?

The duke's troubles all started with a bad reading of some Roman numerals. De Groft explained that Mayer had apparently based his "Notes on Titian" on an archivist's notes about a letter from the duke. The letter still exists, and De Groft can demonstrate how the archivist made his mistake.

"X, X, X, X—four exes is forty. But if you look closely..." De Groft said, zooming in on a scan of the original letter document on his desktop monitor to reveal a short, but unmistakable vertical stroke in front of the final X. "In the 19th Century, they just read the date as 1540. But when you start looking closer and closer, you can read it: 10, 20, 30—and one before 10 makes it 39. It's 1539—a year and two weeks before Federico died."

He added that another source confirms the date. A copy of the out-going letter from the Bavarian duke who requested the Gonzaga portrait is dated 1539 and now is part of the collection in the imperial archives in Munich.

De Groft has spent nearly nine years working to return the portrait of Federico to the A-list of Renaissance art. After Mayer's "Notes on Titian" cracked the painting's reputation, the Federico portrait slumped off the art world's radar and at some point found its way into the United States.

continued on next page

"It just fell into this American obscurity." De Groft said, though no art historian had ever said the work was not by Titian. "We heard talk of it being in Reading, Pennsylvania, someplace in Virginia, then Tennessee; it's just been off the radar. And then in 1970, the people who own it now took it in trade for some legal work."

De Groft met the current owners when he was working at the John and Mable Ringling Museum of Art, the State Art Museum for Florida. The painting followed De Groft to Williamsburg when he took the position at William and Mary, his alma mater. His relationship with the painting was based on professional objectivity, rather than advocacy.

"I didn't set out to prove it was a Titian," De Groft said. "I just said 'OK, what is it?'."

SCIENCE MEETS THE DUKE

The resurrection of the reputation of the portrait of Federico II Gonzaga had four elements. First came a scientific analysis of the work in the 1980s by Walter McCrone & Associates, to authenticate the date of the picture.

"They looked at the chemical composition of the paint, the size of the particles and the binder, based on well-known samples from various European museums," he said. "And what that science tells you is that it's dead on – the late decade of the 1530s. One thing that's interesting—Titian is using about half the number of raw pigments as he did in his earlier work because he's painting faster. There were no traces of things like lead white, which was developed after 1576. But does all this mean Titian painted it? No, the guy next to Titian could have painted it. It's simply putting it in the right time and right place."

The second aspect centered around archival documentation. De Groft points out that as a component of major European collections for centuries, the portrait left a hefty archival trail—including a correction of the Roman numeral debacle that set off August Mayer.

photos by Bill Walker

Aaron De Groft: "After working on the picture this long and being so intensely focused on it, I don't have any problems with it. If I were selling this picture, I'd want a bunch of affirmations, but that really doesn't enter into the equation, because it's not mine."

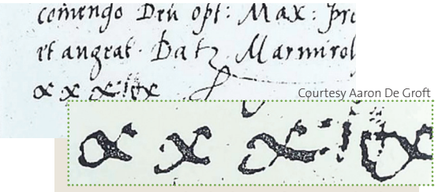
The third component centered around a known Titian miniature painting, now in Vienna, which is a copy of this Titian portrait of Federico and it is inscribed with his name and titles. "It was the publication of that inscribed miniature in 1896 that revealed the identity of the first portrait by Titian of Federico (that portrait dates to around 1523), currently in the Prado Museum. The Prado actually had incorrect names on it because they were not sure who it portrayed."

And the fourth part? "It's all about style, and about connoisseurship," De Groft said. Titian lived into his nineties and had a prolific output, including a large number of portraits of the rich and famous of the day. The Paris show will place the duke's portrait in the context of his other portraits from the period, including many of the duke's contemporaries.

CONNOISSEURSHIP'S BOTTOM LINE

"The whole point of taking it to Paris is to have it seen with other Titians," De Groft said. "It was last seen in a major European museum in 1911."

And De Groft's evaluation, after pursuing the better part of a decade with the duke: "I believe that Titian painted the head and the hands and the workshop painted the body and the background—though after a very recent conservation assessment for the Paris exhibition, there is the growing possibility that Titian painted it all," he said. "Nobody cares if it's by Joe Schmoe paint-grinder in Titian's studio. These are the high stakes. On the one side, just to have the picture accepted and catalogued for this show, that's a certain step, a certain plateau. How it's debated after the show, that might be another plateau."



Courtesy Aaron De Groft

Roman numerals, the bane of many a third grader, were disastrous for Duke Federico as well. A 19th Century archivist missed the "I" before the "X," causing an error that ultimately sent the duke's portrait into the art world's third world.

CRATES ON A PLANE

There's nothing glamorous about being a courier of fine art, says Aaron De Groft.

"It's just me, some crates and a couple of pilots on a cargo plane," he said. De Groft, custodian of the portrait of Federico II Gonzaga on loan to William and Mary's Muscarelle Museum, escorted his charge to the Musée du Luxembourg in Paris.

The portrait has seen nearly half a millennium of ups and downs, including misidentification, being on the cover of a collector's magazine and being bartered for legal work. At one point, it was sold for $1,700. For the trip to Paris, the portrait of Federico II Gonzaga was insured for $50 million.

books: briefly

THE ORIGINAL MAN OF STEEL

Steel-Drivin' Man: John Henry, The Untold Story of an American Legend

SCOTT NELSON

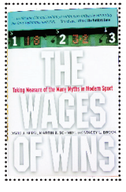
Oxford University Press

In a book the publisher describes as "part detective story" and "part cultural history," historian Scott Nelson unearths the real John Henry. *Steel-Drivin' Man* takes readers through the events that created the legend. The book draws from new-found facts about Henry's life uncovered in census data, penitentiary reports and railroad company records. Nelson enlarges on some of the influence the legend and life of John Henry had on American culture, including serving as a possible model for Superman.

Steel-Drivin' Man will also be a selection for Quality Paperback Book Club and is an alternate selection for the History Book of the Month Club. The paperback edition will contain a promotional blurb written by Bruce Springsteen.

Scott Nelson is an associate professor of history who specializes in 19th century American history.

—Suzanne Seurattan



NUMBERS DON'T LIE

The Wages of Wins: Taking Measure of the Many Myths in Modern Sport

MARTIN SCHMIDT, CO-AUTHOR

Stanford University Press

If you get into a debate about sports with Martin Schmidt, you'd better come to the water cooler armed with more than today's sports section and what you believe is conventional knowledge. Schmidt, in addition to being a sometimes sports columnist for *The New York Times*, also is the co-author of this book, often described as "freakonomics meets ESPN." Wages of Wins wages war on the conventional wisdom, setting up a top-ten list (example: Number 2: "Labor disputes threaten the future of professional sports") and then examining each item through the application of regression analysis and other tools of the economist. Schmidt and his co-authors, David Berri and Stacey Brook, maintain a web site, www.wagesofwins.com, which serves as a continual update of their rationalistic approach to the appreciation of athletics.

Martin Schmidt is an associate professor of economics whose research focuses upon empirical measurement of U.S. monetary policy and its role in recent economic fluctuations.

—Joe McClain

CONSIDERING AGE

Age Matters: Realigning Feminist Thinking

KATHLEEN SLEVIN, CO-EDITOR

Routledge Press

It's the age-old question – but not the way you might think, says Kathleen Slevin. Considering age and being considerate of age are missing elements of dialogue among feminists, Slevin says, and it's time for that to change. She and Toni Calasanti, professor of sociology at Virginia Tech, are editors of *Age Matters: Realigning Feminist Thinking*. The book is a collection of essays from a wide range of experts at the forefront of critical thinking in aging studies and gerontology in North America and Great Britain. The authors address ageism, how gender shapes aging, the value of age relations, how age factors in to the study of inequality and why it's all important. "The focus on age relations enables us to learn more about how all of our positions and experiences rest on power relations," the editors write.

Kathleen F. Slevin is the Chancellor Professor of Sociology. She studies age as a core factor of social inequality.

—Suzanne Seurattan

WHAT'S A WIGHT'S WEIGHT?

Shakespeare and the Mismeasure of Renaissance Man

PAULA BLANK

Cornell University Press

Placing Sir Toby Belch and Sir John Falstaff on opposite ends of a balance may be a fun idea, but it isn't exactly what this book is about. Rather, *Mismeasure* explores Shakespeare's references to "measure, number and weight" and how the rhetoric of the era used the terms of the quantifiable to make qualitative judgments on men and women and to describe complex feelings and situations. Chapters explore topics ranging from the intelligence of Hamlet, race relations in Venice, the math of King Lear and poetic numbers.

Paula Blank is an associate professor of English. She studies Shakespeare and Renaissance English literature.

—Joe McClain

BUT HOW ABOUT THE KIDS?

The Relationship Rights of Children

JAMES G. DWYER

Cambridge University Press

The state is often the decision-maker in numerous aspects of family law, such as paternity, adoption, custody and visitation (for grandparents as well as parents) and termination of parental rights. Dwyer examines the rights adults have in legal relationships and makes a case that children should have equivalent—but not identical—legal rights. The book also proposes a reformation of the rules for establishing legal parent-child relationships at birth and an examination of the rules for deciding whether to end a parent-child relationship.

James G. Dwyer is Cabell Research Professor of Law. Among his specialties are family law, youth law and trusts and estates.

—Joe McClain

LORD OF THE FLIES

by J. M. McClain

Drosophila seems to be able to evolve as the climate changes, but how about the rest of us?

photo by Joe McClain

George Gilchrist with several dozen of his thousands and thousands of members of the genus Drosophila.

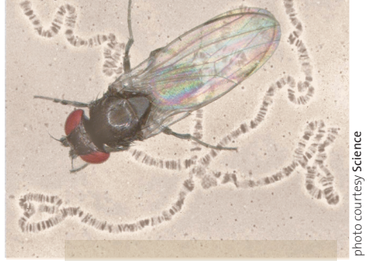


photo courtesy Science

Drosophila subobscura with chromosomes in background

George Gilchrist opens an incubator in his lab in Millington and gazes with satisfaction on his stash of Spanish flies.

"These are from Barcelona," he smiles, pulling out one of a dozen or so wide-mouth plastic jars. "They might like paella."

In another life, Gilchrist's jars might have held two liters of medium salsa, but here, stored on their sides, they constitute the living quarters for large numbers of the fruit fly *Drosophila subobscura*. The species is quite a globetrotter, native to regions of the Old World ranging from North Africa to Scandinavia and introduced to many locales in North and South America.

Gilchrist, an associate professor of biology at William & Mary, believes his flies— from Barcelona and 25 other spots on three continents—to be canaries in the global coal mine. He is a member of an international group of researchers that have found that global warming is driving genetic change in wild populations of *Drosophila subobscura*. The group attracted international media coverage after publishing a paper in Science in September on the subject.

INVERTED CHROMOSOMES

It's been long known that some specimens of *D. subobscura* mutate in a certain way: chromosomes become inverted. Gilchrist likens the phenomenon to flipping around a section of a UPC bar code. Most significantly, particular chromosomal inversions are correlated with the latitude of the insects' habitat.

"Certain inversions occur in a very high frequency in, say, Århus, Denmark, and a very low frequency in Barcelona, Spain. We have the same pattern that occurs between Port Hardy, British Columbia and Atascadero, California," Gilchrist said. "These are called clinal patterns in biology—where a trait varies in a systematic way with latitude or with altitude." He added that flies introduced to the New World soon evolved latitudinal patterns of inversions that paralleled those in Europe.

To track the clinal inversions, Gilchrist and his colleagues have collected the flies from three continents. Not too long ago, they would bring back flies in containers in their pockets or in carry-on luggage.

"That always makes for interesting times when you go into customs," he said. "They'll ask 'Do you have any plants, animals or vegetable matter on you?' and you say 'Yes, I've got 5,000 flies.' So then it's 'Step over here, please.' Nowadays, though, we have to have permits and send them by overnight mail."

The researchers bring the wild flies back to the lab to rear through one generation, which is then crossed with marker-stock flies, a practice that facilitates identification of the chromosome inversions.

"It makes it easier for the human bar code reader," he said. "That's what we call him, because the chromosomes look something like bar codes. And what you're looking for is places where the bar code has been cut out and turned around backwards the other way." Inverted sections can be huge—chromosomally speaking—spanning 500 or 600 genes. Gilchrist pointed out that chromosome inversions are an important part of the study of human genetics, and are one of the major challenges for genome sequencers.

"In *Drosophila*, these inversions are usually considered as having something to do with climatic adaptation in an evolutionary sense," Gilchrist explained. "Certain genotypes do better in colder, high-latitude climates than hotter, low-latitude climates."

25-YEAR SAMPLE

Sampling of 26 populations over 25 years revealed that the chromosomal inversions were reflecting not only latitude of the resident population, but also local changes in average temperature. As average temperatures grew warmer, flies in the cooler, high-latitude populations began showing chromosomal inversions common among their more equatorial cousins, he said. Once again, the changes in the inversions were consistent in populations in the Old World as well as in North and South America.

"Our findings were stronger than I had imagined them to be," Gilchrist said. "I had thought that we probably would see some sort of shift. I couldn't imagine that it would be as similar on all three continents. That surprised me. When you see the same pattern on three continents, you have reason to think it's not coincidence."

This research has implications for studies of evolutionary biology as well as for those concerned about global warming. Short-lived, rapidly breeding fruit flies are capable of producing five or six generations a year in the wild, making them ideal subjects for genetic study.

"I'd like for people to think of these flies as just another canary in the coal mine," he said. "Right now, the story looks pretty good. The climate's changing, the species are adapting—their genotypes are evolving and they seem to be able to keep up right now. How long will that keep up...and how about organisms that have longer generational times?"

The *Science* paper reporting the results is titled "Global Genetic Change Tracks Global Climate Warming in *Drosophila subobscura*." Other authors are Joan Balanyá, Luis Serra and Josep Oller from the University of Barcelona, Spain, and Raymond Huey, of the University of Washington. The work was supported by grants from the National Science Foundation, as well as Spain's Ministry of Science.

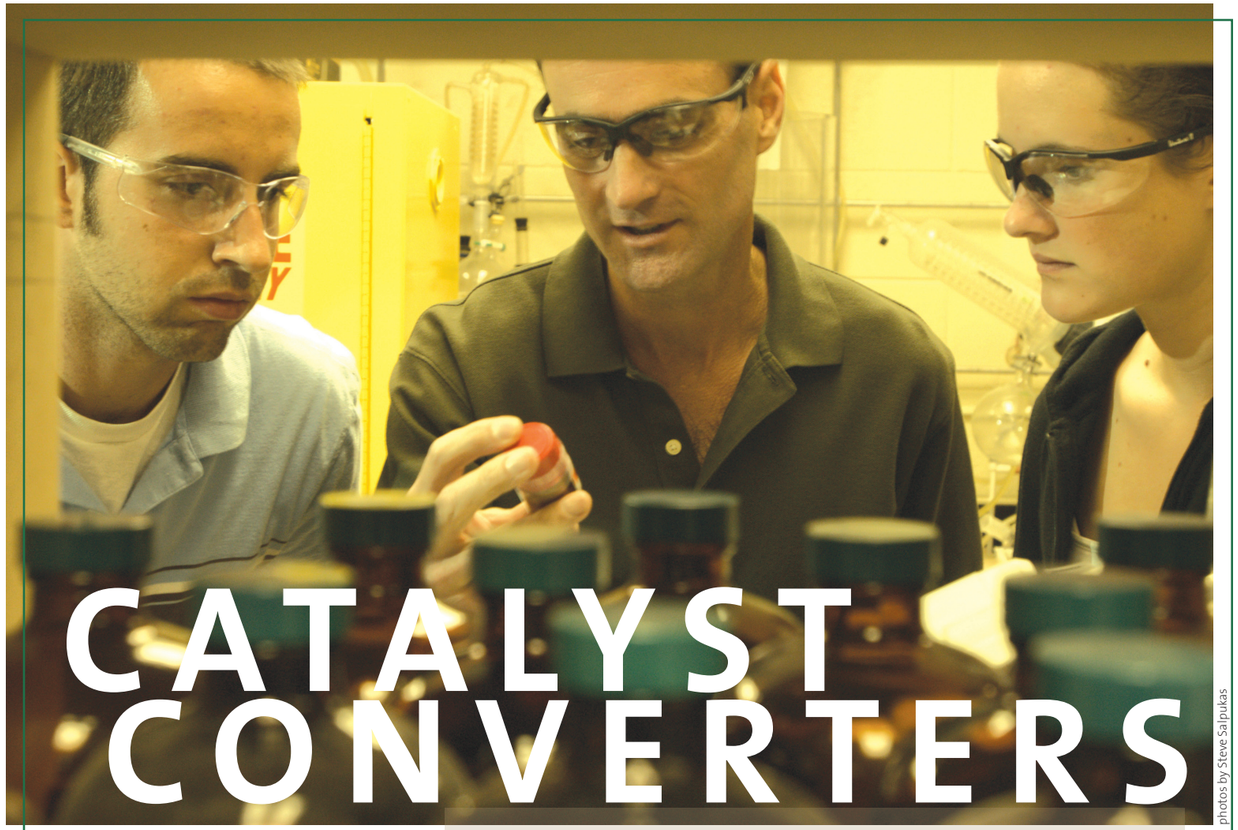
TIME FLIES LIKE AN ARROW; FRUIT FLIES LIKE A BANANA

It just follows that geneticists and evolutionary biologists love fruit flies. George Gilchrist's office and lab space are peppered with versions of the "banana" aphorism, made famous by Groucho Marx, honoring the genus Drosophila.

Fruit flies have a lot going for them as a genetic study tool. They're small, of course, and they are cheap and easy to house and feed. And they not only like a banana, they love a banana; a bucket of rotten bananas and a net is the standard way to trap flies in the wild.

Plus, Drosophila breed quickly. For most species new generation of makes its way into the world every two to three weeks, allowing a researcher to easily follow 50 or 100 generations in a lab experiment.

For being so tiny they have enormous chromosomes in their salivary glands—big enough to see easy with a an ordinary microscope. The chromosomal inversions so important to genetic research show up easily as knotted loops.



photos by Steve Salpukas

CATALYST CONVERTERS

Rob Hinkle (center) explains some of the benefits of bismuth to undergraduate students Tim Brown and Heather Stevenson.

by Joe McClain

Bismuth is an element with many uses and many virtues—and a few quirks.

For example, bismuth's neighbors in the Periodic Table tend toward toxicity. Among useful but potentially dangerous companions such as lead, antimony, arsenic and mercury, the characteristic pinkish hue of bismuth shines benignly. Although the density of metallic bismuth makes it a suitable non-toxic replacement for lead fishing sinkers and shotgun pellets, you're more likely to use bismuth in the form of one of its many alloys or compounds.

"It has just a wide variety of industrial uses," said Rob Hinkle, associate professor of chemistry at the College of William and Mary. "Bismuth oxychlorides imparts the pearlescent quality to lipstick and pearl paints that luster, for instance. A bismuth salt is an ingredient in Pepto-Bismol."

Bismuth has a lot going for it in consideration for industrial uses. In addition to being non-toxic, it's also cheap. Hinkle points out that we get bismuth as a byproduct of mining some other mineral such as tin or copper. It's also a very versatile metal to a chemist, offering an array of potential applications.

During a 2002 sabbatical, Hinkle began investigating the potential of bismuth-based compounds for use as alternative catalysts in a number of industries, including pharmaceuticals. Two William and Mary undergraduates received funding from two separate pharmaceutical companies to expand Hinkle's investigation of bismuth catalysts during the summer of 2006.

Heather Stevenson of East Lyme, Conn., and Tim Brown of Portsmouth, Va., received financial support from Pfizer and GlaxoSmithKline, respectively. Both are members of the class of 2007. Both won support through a competitive grants process, backed by a letter from Hinkle.

"It was the first proposal I've ever written, so it was a little bit challenging for me," Heather said. The students didn't exactly start from square one; Tim had worked on a related project in Hinkle's lab the previous semester, while Heather had already served an internship with Pfizer.

NEW HETEROCYCLES

In a nutshell, their projects revolve around using bismuth catalysts in the creation of heterocycles, compounds widely used in pharmaceutical manufacturing. Heterocycles are molecular structures consisting of a carbon ring containing one non-carbon element. Heather's work centers on nitrogen heterocycles, while Tim is working on a tandem cyclization-addition reaction, sort of an oxygen analogue of what Heather's doing.

Catalysts, of course, are not primary ingredients in a chemical reaction, but serve essential roles by accelerating or otherwise enhancing the reaction. A catalyst usually

emerges from the reaction unchanged. Hinkle explains that many of the old-school catalysts used in the manufacture of pharmaceuticals are Lewis acids or other kinds of acids, ripe for replacement by a new cheap, non-toxic alternative.

"Most of those acids are difficult to handle, especially when you get to production scales of hundreds or thousands of gallons," Hinkle said. He stressed that, as catalysts, the acids are not left behind in the finished pharmaceutical products. "The FDA has very exacting standards about that," he said. Even though today's catalysts aren't contaminating our medicine, there are concerns about their environmental effects.

NOT SO TOXIC

"We like knowing that we use something that's not as toxic," Hinkle said. "If you run a lot of reactions, a less-toxic ingredient will mean that you'd have to do a lot less testing for toxicity."

Tim Brown and Heather Stevenson received funding from two pharmaceutical companies to work with Professor Rob Hinkle (right) on the development of bismuth-based compounds for potential use in a number of industrial applications, including pharmaceuticals.

Bismuth compounds could enhance the pharmaceutical manufacturing process

The students began their summer work by examining catalysts currently in use in the pharmaceutical industry. "We wanted to see what the product should be like, so we could know what to look for before we switch to bismuth," Heather said.

In early June, Tim was wrestling with some knotty cis/trans issues with his nucleophile—a reaction partner which participates in a chemical reaction by contributing a pair of electrons. Tim wanted the substituent groups on his molecule to be trans, or to form on opposite sides of the heterocyclic ring system. The opposite of trans is cis, which describes a molecular arrangement of the groups on the same side.

"The nucleophile I'm using gives predominantly the trans, but we get enough of the cis that pharmaceutical companies wouldn't even want to bother with it," he said.

By the Fourth of July, Heather and Tim each had developed a working reaction and started to evaluate the scope and limitations. The summer fellowships officially ended in early August, but the students, and Hinkle, continue working on their bismuth catalysts after classes started.

"We certainly hope to find a nucleophile that gives us better product ratios. The results seem to hinge upon the strength of the nucleophile, so we're going to try several different nucleophiles of different strengths," Hinkle said. "Part of chemistry is luck. No matter how good things look on paper, they don't always work out that way in the lab, so you have to try them."

RESEARCH GENERATES HIGH YIELDS

Summer research pays off in many respects. William and Mary's chemistry department is one of the nation's top producers of young chemists. American Chemical Society figures for 2004-05 placed the department in the top 25 of the 634 ACS approved chemistry departments in the country, with 57 bachelor's degrees.

Even more impressive is the department's fifth-place rankings for graduates holding ACS-certified bachelor's degrees. The 49 certified degrees in 2004-2005 puts William and Mary ahead of such institutions as the University of Virginia (42), Georgia Tech (32) and MIT (29).

An ACS certified degree requires students to meet the minimum curricular standards of the American Chemical Society. More importantly, they must participate in a minimum of three credits of independent senior research, which amounts to a minimum commitment of 180 hours over the course of the academic year. Many seniors opt to take the maximum of six credits, and an average of 45-50 majors stay every summer as well.

"Our department probably runs one of the largest summer undergraduate chemistry research programs in the country with respect to serving our chemistry majors' research needs," said Gary Rice, chemistry department chair.

In addition to his teaching, Bob Pike is a productive researcher, including serving as director of the X-ray Crystallography Center at William & Mary.

Chem course cited for 'best practices'

An undergraduate course at William and Mary was singled out in a national study of chemistry courses conducted by the Center for Educational Policy Research (CEPR) on behalf of the College Board.

The CEPR identified General Chemistry I/ Descriptive Inorganic Chemistry, taught by Professor Robert Pike, as one of the top examples of best practices in chem courses nationwide. It's listed as CHEM 103, an introductory course for science and pre-med majors.

"I guess I'm on my sixth go-round of teaching this course," Pike said. He added that the course was evaluated based on materials including a syllabus, exams and problem set that he submitted in spring, 2005. "Any recognition the course received had relatively little to do with the way I teach it. It's kind of ironic, because my favorite part of the class are the demonstrations. Students enjoy them too. You know—the bangs and fire and things."

Odile Stout, research team leader at the CEPR, said Pike's course was one of 23 cited for best practices out of 166 chemistry courses examined nationwide. The CEPR was commissioned to examine a number of college courses by the College Board, the organization behind the SAT. The College Board also administers Advanced Placement (AP) exams for high school students and the suggested curricula for AP courses in high school.

"The study sought to identify best practices college courses that could inform the redesign of AP courses in chemistry," CEPR Director David T. Conley wrote in making the announcement. "The goal of the redesign process is to ensure that AP courses reflect the best of college teaching."

Conley's announcement explained that CEPR assembled a panel of national experts to review the nominated courses and identify the critical components of best practices present in each course.

A commission in chemistry convened by the College Board will meet over the current academic year to develop new course descriptions and exam specifications for AP courses.

Stout said that additional details of the CEPR study, including specific aspects of Pike's course found to be noteworthy, will be released later by the College Board. The CEPR is based at the University of Oregon.

Pike is teaching another section of Descriptive Inorganic this semester to a full house of 155 students. "Even at the most basic level, I enjoy teaching this course," he said. "We fit a whole lot of science into one semester."

—Joe McClain

pikisms

Professor Pike's students collect and trade gems from his lectures. Here's a sampling:

- I don't think improper fractions should be taught to children.
- I love Italian. All the words end in vowels. It must be so easy to be a poet in that language! Everything rhymes! Dante-schmante!
- It's not just infinity, it's infinity squared. That's a lot.
- If you ever get an equation or theory named after you, go to court first and change your name to something pronounceable and spellable. We don't like to fool with these names.
- Clapeyron. It sounds like the clap-on, clap-off thing, doesn't it? The Clapeyron!
- Three squared—it's going to be nine, I hope.
- It always took me the longest time to spell "protein." Another of those stupid "i" before "e" things.
- It's plummeting like a rock...a rocket. Eh, make up your own simile.

Separation of church and state

Chancellor O'Connor discusses 'serpentine wall'

Religious freedom and judicial independence dominated two talks given by William and Mary Chancellor and retired Associate Supreme Court Justice Sandra Day O'Connor during a visit to campus this fall.

Without a clear boundary or definite line, Supreme Court rulings on religious freedom can be compared to Thomas Jefferson's "serpentine wall," O'Connor told an audience of about 400 people on Oct. 8 during a seminar at the Kimball Theatre.

Referring to the serpentine wall built by Thomas Jefferson at the University of Virginia, O'Connor acknowledged that Supreme Court rulings on the separation of church and state have not followed a straight line. However, the retired Supreme Court Justice said the system of separating church and state has worked well for this country.

Although each case does not provide a clear cut line or boundary for the separation of church and state, the system has worked as it was intended—to protect the free exercise of religion and barring government from the establishment of a single religion, O'Connor said. Both clauses are critical to religious freedom, she added.

During the seminar, O'Connor gave opening remarks and then participated in a panel discussion that included *USA Today* journalist Joan Biskupic, who wrote a biography of O'Connor; Marci Hamilton, law professor at Yeshiva University's Cardozo School of Law and former law clerk to Justice O'Connor; and David Holmes, a noted religious studies author and Mason Professor of Religion at William and Mary.

The chancellor's remarks were part of a three-day visit to campus where O'Connor, who was invested as the College's 23rd chancellor last April, participated in two academic seminars in addition to meeting with students and taking part in a conversation with the campus community, including taking questions from a student panel.

—Brian Whitson

Professor Harris and Mr. Jefferson

Harris's NEH seminar examines principles of separation

James F. Harris, Jr., Haserot Professor of Philosophy, directed an NEH Summer Seminar last summer titled "The Principles of Separation of Church and State." Fifteen teachers, mostly high school government or history teachers, hailing from California to Maine, lived on campus for four weeks in July and attended classes in the Wren Building.

"The principle of separation of church and state and its role in a constitutional democracy is undoubtedly one of the most important themes in the history and culture of the United States, but it is also one of the most controversial and least understood," Harris said. "Issues involving questions about the proper relationship between church and state are currently in the news. Almost daily, court rulings and challenges to those rulings, clashes between individuals and various public officials—even Congressional hearings and debates over Supreme Court nominees—have all served to focus attention of the informed populace on church-state relations."

Harris' career at William and Mary has spanned over three decades, from serving as associate professor of philosophy to department chair. He has published three books, dozens of articles and other works on the analytic philosophy of religion. Indeed, he has taught and written on the philosophy of religion his entire career.

In the past five or six years, however, his career has been concentrated more exclusively on public/civic life versus private/religious life and the questions surrounding those two spheres of one's life. So Harris was particularly delighted to win this opportunity to direct a NEH Summer Seminar – a first in his distinguished career.

Harris' four-week seminar focused on differing perspectives on four major aspects of the principle of separation of church and state. The focus of the first week was on the historical and political environment surrounding the ratification of the Constitution of the United States and the Bill of Rights and the early years of the republic. Special attention was given to the Commonwealth of Virginia and the roles of Thomas Jefferson and James Madison. During week two, the discussion centered on "The Philosophical Basis for the Principle," and explored the Enlightenment and the philosophical origins of the American Revolution.

"The Principle and Current Events," during week three, included cases decided by the U.S. Supreme Court involving religion and the state, including a celebrated 1879 case concerning polygamy and the Mormon Church. Harris said from this case until the present day, Jefferson's "wall of separation" has been at the heart of many important court cases determining exactly how and to what extent the equal protection clause of the Fourteenth Amendment applies to religious freedom on the state level. The final week was devoted to "The Extrapolation of the Principle to Developing Democracies and World Religions."

Summer seminars and institutes are offered by the National Endowment for the Humanities (NEH) to provide senior faculty members an opportunity to enrich their understanding of significant humanities topics. In addition, these seminars enable the participants to return to their classrooms with a deeper knowledge of current scholarship in key fields of the humanities.

—Lillian Kelly

CCAS: 'Helping deans be deans'

The Council of Colleges of Arts and Sciences (CCAS), a 600-member national association of university deans of arts and sciences, will open its new headquarters at the College of William and Mary, on July 1. Formerly housed at Arizona State University in Tempe, the Board of Directors selected the William and Mary location from a national competition.

Carl Strikwerda

Provost P. Geoffrey Feiss and dean of faculty Carl Strikwerda spearheaded the effort to host the association.

"William and Mary has had a long-standing commitment to this organization. Its purpose is for 'deans to help deans be deans,'" explained Strikwerda, who assumes the duties of secretary-treasurer and ex-officio member of the board.

The board selected Anne-Marie McCartan of Richmond as executive director. McCartan previously was provost at Richard Bland College of the College of William and Mary, and most recently served as president of Northwest Campus of Pima Community College in Tucson, Arizona.

"The move to Williamsburg is a wonderful opportunity for CCAS to increase its collaboration with national higher-education associations, through use of the William and Mary offices in Washington, D.C.," she said. "William and Mary was selected as the host university as it is considered a premier institution for arts and sciences, and several previous deans have taken active leadership roles in CCAS."

Margaret Saha works in her Millington Hall lab with Daniel Teasley of Richmond, a member of the class of 2008 working on a summer research grant from HHMI.

$1.8 million HHMI grant bolsters undergraduate science education

The College of William and Mary has received a $1.8 million grant from the Howard Hughes Medical Institute (HHMI) to support undergraduate science education at the College.

The funding period of the Undergraduate Science Education grant will extend over four years. William and Mary has received previous funding from HHMI, including a $1 million grant in 1989 and two previous Undergraduate Science Education grants of $1.6 million each in 1998 and 2002. Professor Margaret S. Saha of the William and Mary Department of Biology has been the program director of the HHMI-funded activities on campus since 1998.

The latest grant will allow the continuation of a number of science related initiatives at William and Mary, such as expanded undergraduate research opportunities and a number of new and enhanced course offerings. Through the HHMI grants, for example, as many as 60 William and Mary undergraduates can receive funding for individual research projects, which often result in presentation or publication of their results in peer-reviewed journals.

The HHMI grants also have made possible the establishment of a biological mathematics program at William and Mary as well as a science outreach program to benefit pre-college teachers and students.

"We believe it is vital to bring fresh perspectives to the teaching of established scientific disciplines and to develop novel courses in emerging areas, such as computational biology, genomics, and bio-imaging," said Thomas R. Cech, HHMI president. "Our grantee universities are providing hands-on research experiences to help prepare undergraduates, including women and minorities underrepresented in the sciences, for graduate studies and for careers in biomedical research, medicine, and science education. We also hope these grants will help the universities increase the science literacy of their students, including non-science majors."

William and Mary is one of 50 schools to receive Undergraduate Science Education grants in 2006. Since 1988, HHMI has provided 247 institutions of higher learning with nearly $700 million for programs that include undergraduate research opportunities; new faculty, courses, and labs; teaching and mentoring training; and work with pre-college students and teachers.

—Joe McClain

National Cancer Institute funds proteomics study

The College of William and Mary has received a RO1 grant totalling $1.437 million from the National Cancer Institute to work in a multidisciplinary collaborative to advance proteomics/bioinformatics technology that ultimately could result in improved sensitivity of cancer detection.

The three-year funding supports a collaborative effort involving around 25 physicists, biologists, statisticians, computational scientists and health-care professionals from William and Mary, Eastern Virginia Medical School (EVMS), the Applied Research Center and INCOGEN, a Williamsburg bioinformatics firm. Dariya Malyarenko and Tina Bunai, research scientists at William and Mary, are principal investigators on the project, along with Maciek Sasinowski of INCOGEN and John Semmes of EVMS.

Proteomics is the study of the myriad of proteins that make up the body's cells. Some of the body's proteins can be used as "biomarkers," indicators of the presence of a certain disease, such as cancer.

Malyarenko explains that the William and Mary collaboration uses a technique known as MALDI-TOF (matrix-assisted laser desorption/ ionization time-of-flight), a variety of mass spectrometry to analyze samples provided by specialists in early cancer detection at EVMS. The MALDI-TOF process involves using a laser to ionize protein molecules from tissue or body fluid samples, which are then separated by mass-to-charge ratio and registered for abundance in a mass spectrometer. The data from MALDI-TOF is processed through bioinformatics tools, optimized using a software package developed by INCOGEN.

The goal is to use the process to develop an accurate, non-invasive early cancer-detection process, said Sasinowski, CEO of INCOGEN. Once the technique is fully developed, a patient's blood or urine sample will be analyzed for the presence of specific proteins that indicate the presence of cancer. The group faces two sets of related challenges: the first deals with how to identify target proteins from among the hundreds present. The second set of challenges is related to perfecting the detection process itself. Mass spectrometry inherently generates a certain amount of unwanted data known as "noise," which clutters the results, making it even more difficult to find the targeted biomarkers.

"The analysis is just extraordinarily complex, because there are just so many proteins in the blood. Even separating the real data from the noise is very difficult. That's where people like Dr. Malyarenko come in," Sasinowski said.

"There are two sources of noise. One is electronic noise, which refers to signal-to-noise ratio. But there is also the issue of chemical noise, or ionization noise, which is connected to the technique itself. Both of them are big problems," Malyarenko said. "This grant will allow us to further develop computational tools that can be useful for the cancer research community analyzing large volume of proteomics MS data."

End users of the process can either use open-source packages developed by W&M or INCOGEN's software, known as VIBE. Originally written to facilitate analysis of DNA sequences, the revised proteomics-oriented VIBE-MS (mass spectrometry toolkit) will make cancer biomarker data analysis user-friendly for medical professionals.

—Joe McClain

Virtual moot court makes real history

Four William and Mary Law School moot court members made history when they competed with law school teams on the other side of the world in the first international virtual moot competition this fall.

William and Mary joined four Australian law schools—University of Melbourne, Murdoch University, Queensland University of Technology and the University of Canberra—for the competition that took place through videoconferencing. The case in the competition involved a dispute over an internet domain name.

The moot court members representing William and Mary's law school were Brandon Jordan and Svetlana Khvalina, who served as co-counsels for the complainant, and Elizabeth McElroy and Amy Markopoulos who were co-counsels for the respondent.

—Kaila M. Gregory

National certification not linked to success

A study of more than 300 fifth-grade teachers in North Carolina found that the distinction of being a nationally certified teacher doesn't necessarily translate into greater student success in the classroom.

Funded by a $330,000 grant from the National Board for Professional Teaching Standards, William and Mary education professors Thomas Ward and James Stronge examined the extent to which National Board certified teachers differ from other teachers in terms of student achievement results and teaching practices.

"We found no significant relationship between National Board certification status and student achievement gains in the classroom," said Ward, professor and associate dean for academic programs at the William and Mary School of Education. "Students of board certified teachers performed slightly better than those on non-board certified teachers but the differences were minor."

Joined by researchers from the University of North Carolina at Greensboro's SERVE Center for Continuous Improvement and the University of Virginia, the study team examined student achievement during the 2004-05 school year in three school districts in North Carolina and also conducted in-class evaluations for both National Board teachers as well as other teachers.

The study was conducted in two phases, Ward said. In the first phase, extant math and reading student achievement results of fifth-grade National Board teachers were compared to results of non-certified teachers. Using a value added methodology, the researchers found no significant relationship between National Board certification and higher student achievement gains.

In the second phase of the study, the researchers evaluated the teaching practices of 21 National Board certified teachers and compared them to those of two other groups of teachers identified solely on the basis of either high or low student achievement gains. While previous studies have examined the student achievement gains of National Board teachers, this was the first time researchers supplemented those results with actual classroom instruction evaluations.

—Brian Whitson

THIS JUST IN...

Omohundro books win awards

Six books published by the Omohundro Institute of Early American History at the College of William and Mary received major book awards in 2006. Most recently, Steven W. Hackel's *Children of Coyote, Missionaries of St. Francis: Indian-Spanish Relations in Colonial California, 1769-1850* received the Erminie Wheeler-Voegelin Best Book Award from the American Society for Ethnohistory. The prize was presented at the society's Annual Conference co-hosted by the college in early November.

"The quality of the editing that the institute offers through its capable and experienced editorial staff under the leadership of our enormously talented editor of publications, Fredrika J. Teute, is truly unique in the world of commercial or academic publishing," said Ronald Hoffman, director of the Omohundro Institute of Early American History. "This is why our books have won more prizes than those of any other publisher, even though we produce only four to six titles a year, far fewer than the number released annually by bigger commercial and university presses."

Other prizes awarded to the institute's books in 2006 were:

- **J. Franklin Jameson Award of the American Historical Association.** Presented to Ronald Hoffman, Sally D. Mason, Eleanor S. Darcy, eds., *Dear Papa Dear Charley*
- **Frederick Douglass Book Prize, Gilder Lehrman Center.** Presented to Laurent Dubois, *A Colony of Citizens: Revolution and Slave Emancipation in the French Caribbean, 1787-1804*
- **Abbott Lowell Cummings Award, Vernacular Architecture Forum.** Presented to Bernard L. Herman, *Town House: Architecture and material Life in the Early American City, 1780-1830*
- **James Broussard Best First Book Prize of the Society for Historians of the Early American Republic.** Presented to Steven W. Hackel, *Children of Coyote, Missionaries of St. Francis: Indian-Spanish Relations in Colonial California, 1769-1850*
- **James Willard Hurst Prize of the Law and Society Association.** Presented to Holly Brewer, *By Birth or Consent: Children, Law, and the Anglo-American Revolution in Authority*

The Omohundro Institute, established in 1943, has published more than 200 volumes in its lifetime that have received more than 100 book prizes. Founded as the Institute of Early American History and Culture by the College of William and Mary and The Colonial Williamsburg Foundation, the institute, which is still jointly sponsored by those institutions, was renamed in 1996, in recognition of a generous bequest pledged by Mr. and Mrs. Malvern H. Omohundro, Jr.

Look for more books and prizes from the institute; in 2006 it published an unprecedented ten books.

—Suzanne Seurattan

photo by Lillian Selby

Faculty art show opens

Works featuring the studio art faculty at the College of William and Mary will be on display in the Muscarelle Museum of Art, on campus in Lamberson Hall—off Jamestown Road near Phi Beta Kappa Memorial Hall. The Faculty Show opened with a gala event in late October and will be on display through Jan. 7, 2007.

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