RESEARCH & SCHOLARSHIP AT WILLIAM & MARY WINTER, 2008-09

A close look at the new Integrated Science Center

A BRIGHTER SHADE OF PLAID • BE AFRAID, BE VERY AFRAID • STUDYING MUSIC IN TIME OF WAR

ideation RESEARCH & SCHOLARSHIP AT WILLIAM & MARY

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A look inside the Integrated Science Center

More than updated facilities, the ISC is a building that acknowledges how science actually gets done.

Biological research in the ISC

What can the DNA of yeast tell us about the mechanics of cancer and other diseases? Plenty.

Chemical research in the ISC

Alzheimer's. Lou Gehrig's. Parkinson's. Anti-oxidants. All have a chemical root...and we're looking into it.

Undergrad research at the ISC

Why let the faculty have all the fun? A group of freshmen are discovering new things about phages.

PLAID shines even brighter

Support from the Gates and Hewlett foundations allow this *Consumer Reports* of international aid to grow.

Music in time of war and peace

The Middle Eastern Musical Ensemble offers a window into a culture that is becoming more and more a part of our own.

Fear itself

The Perception Lab is showing how fear actually does change things. Really.

A head start on research

The new Dintersmith Fellows program puts our rising seniors to work with our soaring faculty.



Not Fidel's show

Ninety miles south of Miami, they speak a whole different cinematic language.



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Lab, Field and Library

Awards, plaudits, achievements, grim news about striped bass.

On the cover

Jill Hamilton, a member of William & Mary's class of 2010, works in one of the new labs in the Integrated Science Center. "Every student at William & Mary will use the ISC," says Carl Strikwerda, dean of Arts & Sciences.

<u>research in the big leagues</u>

The College of William & Mary

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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ISC 1 is completed... ISC 2 is in progress...

Integrating sciences: ...just wait until we build ISC 3

by Joseph McClain

he Integrated Science Center at William and Mary is a matter of the College's past, present and future. ISC Phase 1 is past—that is to say, it's completed and up and running. ISC 2 is, at this writing, about midway towards completion. ISC 3 is still on the drawing boards, but will be very much a part of the future of research at the College, as it will contain activity devoted to "things that we don't even have names for yet," in the words of Dennis Manos, vice provost for research.

ISC 1 got up and running in the summer

of 2008, housing all of the Departm Chemistry and elements of the Departm of Biology. Chemistry moved over fr adjacent Rogers Hall, which is being transformed into ISC 2. ISC 1 and 2 nected, once the renovation process complete. ISC 1 holds research labs ing labs, along with meeting areas a offices—but no classrooms. The phi to foster collaborative creativity amo tists and researchers—including stu

"I tend to see the ISC as a progres trend of how we do business in the s William and Mary," Manos said. "Th away from the isolated, individual ir working on one or two problems in defined discipline, towards engagen ing larger-scale problems through te

Both chemistry and biology had b do with outdated and worn-out facilopportunity to put the two in the sar was fortuitous.

"The boundaries between chemistry and biology long ago began to dissolve," Manos said. "The techniques, the instrumentation, and the various methods the individual practitioners use are often the same. For instance, the difference between fluorescent resonant excitation transfer in chemistry and various forms of fluorescent microscopic imaging in biology may someday disappear altogether."

The sciences, Manos says, have been integrating themselves for years, and the ISC concept will further the process here at William and Mary. Chemistry shares part of ISC 1 with biology, while psychology will move into the first floor of ISC 2, with more biologists on the second floor. The anticipated result will be a type of cross-fertilization, or at least a dissolving of traditional departmental boundaries.

"By melding the interests and capabilities of various types of scientists, and having them collide in hallways, share study spaces, and interact over common equipment, new things



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that week by the smells in the hall. That is not an issue in this building."

The business end of any air exchange system is in the laboratory hoods: vented, enclosed workspaces behind sash doors. The work capacity of any lab that uses chemicals is more accurately described in terms of number of hoods, rather than, say, square footage of space. The two chemistry floors of ISC 1 have plenty of hoods, placed strategically among teaching and research labs—double the number the department had in Rogers Hall.

"We had three teaching labs in Rogers Hall. Each lab had four hoods along one wall," Rice said. "Now, we have four teaching labs with 12 hoods in each of them."

The department's research labs have hoods appropriate to the research that goes on inside. The air handling capacity of the building is also designed to accommodate additional hood requirements as faculty needs change.

hley Janiga and Omar Hamdy '09.

tions=ISC1+2

t, both phases = **\$65** million million = Commonwealth of ginia's contribution

number of laboratories

of departments housed = 3

number of fume hoods

ojected savings from efficiency HVAC = 15%

s of backup emergency power

10% = energy savings from heat recovery from exhaust

"Some faculty do research that requires a lot of ventilation for the type of work they do; others do not," Rice said. "So, some research labs only have two hoods. Some have four. Some have six. The six-hood labs are for those that tend to work with a lot of organic chemicals that require constant ventilation."

Over the years the chemists adapted Rogers for their own purposes, creating a warren of labs, offices, classrooms and other necessary spaces. The ISC provided a blank slate for lab design.

"As research became a bigger mission of the College, we did every conceivable renovation possible in Rogers to create research space for our faculty. Lab space varied from a few hundred square feet up to 500-600 square feet, tops," Rice explained. "Now everybody has essentially

Integrating sciences

continued from page

a 900-plus square-foot research space. In the old labs, you had narrow passageways. Students could bump into each other easily. The labs today are far more spacious, with open aisles."

Uncool in Millington

While ISC 1 holds all of chemistry, eight researchers from the Department of Biology moved over from neighboring Millington Hall. (More biologists will move into ISC 2 when it is completed.) Paul Heideman, chair of the biology department, says temperature stability is important to many of the researchers in his department, but temperature stability is not one of Millington's virtues.

"Millington really wasn't designed to house the much more expensive, much more highend equipment that we use now," Heideman said. "Some of it is noisy and hot, and the cooling system in Millington often didn't keep things cool."

He explained that many biologists samples in special cooling units, usi called "minus-80" freezers, as they l contents at 80 degrees below zero C In the event of a power outage, Milli backup power for the minus-80 free not much else. When room tempera above 83 degrees Fahrenheit, the con on minus-80s start to overload, ther Heideman says, "You could lose year and \$100,000 in a night."

Freezers weren't the only pieces o vulnerable to temperature; many ins and specimens were endangered du power outage, Heideman said. Powe events that would close down the Co send the biologists into overtime.

"Every hurricane, every ice storm, that knocked out power, people wou here worried about the heat," he said Hurricane Isabel, I practically lived i ton for several nights."

The comprehensive, computerized air-exchange system built into ISC 1 will eliminate the chemists' concern about ventilation. Both chemistry and biology will benefit from the peace

of mind provided by the back-up system anchored by a pair of 600-kilowatt generators. The system is designed to keep HVAC systems running for at least four days.

All of chemistry moved into ISC 1, which made their problem of space allocation relatively simple compared to the one faced by the bio department, which was faced with the decision of who gets to move into the third floor of ISC 1 and who will move into the second floor of ISC 2. Above all, who gets to stay in Mil-



into the second floor of ISC 2-the gutted and refurbished Rogers Hall. (Five biologists, including Heideman, will remain in Millington for now.) The first floor of ISC 2 will hold most of the Department of Psychology. Occupation



Virginia Gov. Tim Kaine toured ISC 1 in August, visiting labs and chatting with researchers and students. Kaine even donned lab goggles to help chemists make (and eat) a batch of ice cream made with liquid nitrogen.



at right) work at an organic chemistry mistry teaching lab in the ISC 1. The ith a hood for each pair of students. ig is scheduled for spring/summer

ychology space

ry and biology, psychology will benefit from a set of greatly improved facilities. Department Chair Constance Pilkington is one of 19 faculty-and all of their students-who do research on human psychology out of one shared and two individual facilities in the psychology wing of Millington.

continued on page 3



Chemist Debbie Bebout & Ashley Butland '10 work in X-Ray Diffraction Lab (left); teaching and research labs (center two photos) were put into immediate use; newly constru

Drawing the hypotenuse: The need to build ISC 3

Dennis Manos says all three segments are necessary for the Integrated Science Center concept to be fully realized and College research programs to continue to work at or near the frontiers of scientific inquiry.

If the third phase of the Integrated Science Center will hold "things we don't have names for yet," then what kind of activity is likely to go on inside? For one thing, Manos says, a near-certain avenue of inquiry at ISC 3 will involve mathematical modeling of natural phenomena.

"The final frontier will be the ability to bring physics, mathematics and very high-level computer science together to make predictive models in every area of scientific and technological study," Dennis Manos said. Good, accurate, predictive computational models being made today are necessarily crude, he said, but resemble reality more and more closely each day.

"Now, researchers are building computational models of everything from hurricanes to riots to pathological parasites," he said. "Some of them—like the model for flooding and coastal inundation being developed by our faculty—already do a good job of reproducing the actual flooding and coastal storm."

Models of the future, he said, v for challenges such as predicting of a diseased liver at a level that

More labs, b

continued from page 2

"The shared space is booked consignation said. "We got some relief whe lished some individual laboratories i Bell Hospital. But basically, that's all The rest of the data are collected in c

A department conference room in is dominated by an enlargement of t plan of ISC 2's first floor. Pilkington the Post-it® notes indicating space a

"All faculty will have their own ded research space when we move. Now, us they are fairly small rooms that are larly flexible in what you can do with

said. "But everybody having dedicated research space will be a vast improvement. At minimum, there will be good space for research team meetings and certain kinds of data collection."

She said that psychology outgrew the space in Millington long ago. The department moved



cted ISC 1 towers over Rogers Hall, soon to be ISC 2 (right)

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personal in one room," she explained. "And then I might separate them to get their takes on what happened. Then I'd compare their perceptions with what actually happened, as recorded—with their permission—by the cameras."

Large lab spaces fitted with multiple computer stations also will be part of the package. "A lot of us show people certain kinds of stimuli on the computer and we need to show it to them for a specified period of time," she said. "So we can bring groups of participants in at the same time and have them do that all at once, rather than running individual sessions for as many as 100 people. It will make us much more efficient collecting that kind of data."

The sciences integrate

Phase 1 of the Integrated Science Center was designed to maximize contact among students and faculty. Each floor has at least one lobby, and the long corridors are punctuated

intervention-well in advance of those consequences.

The third phase of William and Mary's Integrated Science Center will make a hypotenuse opposite the right angle where ISC 1 meets ISC 2. The three phases of the center will, therefore, make a triangle along Landrum Drive near Crim Dell. Drawing the hypotenuse—making the ISC 3 a reality—will take considerable effort and expense, but will pay off, for the students of William and Mary as well as the faculty.

"To reach these frontiers of science, scientists are going to be grappling with problems of immense difficulty," Manos said, "but those are the sort of problems our students need to be exposed to as they evolve. If we do not build the final phase of our Integrated Science Center we will not reach these frontiers and thereby our students will be comparatively disadvantaged."

Manos says the third phase of the Integrated Science Center will not only take money—he estimates ISC 3 will cost about \$85 million—but also institutional will.

"It will take recognition on the part of all of our faculty and alumni that no less a contribution is expected of this remarkable,

take its place as a major is to the problems that orld," he said. "That is a fancy ill along: sandlot baseball is much better."

m" areas. The history of science a stories of a researcher puzzling horical lock, while his colleague l has discovered an equally key and is wondering what it s believes that the open areas will ourage interaction, an extension ated science concept to the scale of

w science is done," Manos said. er coffee and in gab sessions." f food and drink—even a bottle of ouraged in labs. The lobbies and reas are handy places to hydrate, take a break.

"You'll see students out at the tables and in the lobbies, which we didn't have in Rogers. They're working on problem sets or preparing for exams," Rice said. "I can see faculty sitting out there with them, talking about research and things of that nature."

The colloquium areas are equipped with white boards so that ideas that arise over coffee can be worked out and recorded. Many of the areas are wired with data ports as well. Even though the ISC, like the rest of the William and Mary campus, has wireless internet access, sometimes it isn't enough.

"We want people to be able to hook up to a land line when they have to do really high-volume things if they want to get into the NIH or National Cancer Institute databases to analyze complex things," Heideman said. "That's hard to do with wireless because it's often such big files and there's so much data." in the biology labs of the Integrated Science Center

Biological Research: Attacking human disease by studying yeast



Oliver Kerscher has discovered identifying their counterparts chromosome segregation, the

hen future generation story of how medical found a cure for cance other diseases resultin DNA damage, the firs may center on an unassuming and character—yeast.

"We work with the same stuff your bake bread," Oliver Kerscher says. "It's cheap and it gives you good results. I can take you in my lab and teach you everything you need to know to work with it in three weeks."

Kerscher and his students study the interaction of genes in the chromosome cycle, a complex, elegant process through which cells make copies of themselves. Errors in the process can lead to DNA damage, resulting in health problems that range from cancer to Down's syndrome to spontaneous abortions. By studying imperfections in the yeast cellreplication cycle, they hope to better understand the roots of DNA damage in humans. Abundant and easily cultivated, yeast has another, more important, quality for basicscience studies, Kerscher said.

A 60-percent solution

"Yeast can tell a lot about this process, because about 60 percent of the genes that exist in yeast cells are homologous to genes in humans—

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the College of William and Mary, points out that a properly functioning chromosome cycle is important, as the process is no less than the means by which the body's cells replenish themselves. Imagine a biological Xerox in which the copy, ideally, should be indistinguishable from the original. The content that's being replicated from what biologists call the mother cell to the daughter cell is DNA.

Kerscher described a multi-step process through which the mother cell duplicates its chromosomes, aligns the two sets and then divides off the daughter cell. The process is characterized by checkpoints at which the cell examines itself.

"It stops the cell cycle and says, OK, let's see if we have everybody. Our DNA has been healthy? No DNA damage at this point?," he explained. "Only when the cell has checked that there is no DNA damage, then it will go on with the next step." by Joseph McClain

If the cell does detect something amiss, it will send out an enzyme repair squad to repair the damage. Kerscher said that the checkpoints and repair systems make for very robust quality control—but nothing is perfect. Even with a mistake occurring only at a rate of one in every hundred thousand cell divisions, a body containing somewhere around 50 trillion cells is vulnerable.

cer can begin

arise if you make one serious misrong gene. You can imagine that ay, you go out and accumulate a lot e in your skin's DNA. If you have NA repair proteins missing, you repair the DNA. The unrepaired a problem in the chromosome t division cycle. The damage can nulate," Kerscher said. "Cancer is lti-step process."

of the chromosome cycle are reguw of molecules, proteins, enzymes lich each have a function in the ss. Kerscher's lab focuses on the lual genes in the chromosome

t least one or two cases in the lab we first have identified in yeast appear to play a very important ns," he said. "The role of these t identified because we studied

humans or human cell life—but the role of the genes was identified because we understood the function in yeast first."

For instance, his lab has been focusing on the function of a yeast gene known as HEX3, usually found bound to its "buddy protein" SLX8. Kerscher explained that the HEX3/SLX8 complex may act as a biochemical terminator of the enzymes that perform repair of damaged DNA.

"You not only need to make sure that DNA damage-repair comes on, but you also have to make sure that it gets turned off again," he said, "because these DNA repair enzymes meddle with DNA. You don't want them unsupervised and hanging out with DNA, because they can take DNA and recombine it, meaning they can re-shuffle the genetic information. So you need to keep them in a locked box and you let them out only if you really, really need them."

HEX3/SLX8 identifies the repair enzymes after their work is done and, as Kerscher suggests, may send them to the "molecular I don't believe a cancer cure will come from an approach where you take cancer cell lines and sprinkle some drug on top. Rather, I think basic research is going to teach us how to nip it in the bud.



Caitlin Cook '09 is one of several working with Kerscher: "I know r done when I can't keep them ou

wastebasket"—the proteasome—by a a "death tag" of ubiquitin to the mole the context of the whole chromosom ubiquitin acts as a kind of traffic cop explained that many of the steps in t halted by a molecular stop sign. "Ubiquitin," he explained, "says 'get rid of that stop sign."

The lab has discovered that another protein known as SUMO serves as a signal to attract HEX3/SLX8 to its target proteins in a manner that Kerscher says might be "almost like a search and destroy mission" within the cell.

"The search comes in because HEX3/SLX8 looks for SUMOylated target proteins that meddle with DNA damage," he said. "The proteins already have a little flag on them, a SUMO flag" which may mark them for destruction via HEX3/SLX8 mediated ubiquitination.

Search and reorganize

Kerscher explained that the HEX3/SLX8 complex's search-and-destroy mission may actually be a search-and-reorganize mission, in which the DNA target proteins are biochemically reorganized into another part of the cell by the

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humans. They're similar, but not identical, because some of the functions performed in our never-ending cell cycle are performed by different molecules than those in yeast. For instance, the function performed by HEX3/SLX8 complex in yeast is handled





Yeast varieties (above) often reveal chromosome damage by change in color. At left, Kerscher's lab has one of the nation's few colony-picking robots, a device that can identify and pick up 4,000 mutant yeast colonies in an afternoon. In 'botless labs, a student with a toothpick can manage to do 400 in a week.

by a single, unaccompanied gene known as RNF4.

The relationship between our own RNF4 and HEX3/SLX8 in yeast is surprisingly close. Laura Boutwell '09, an undergraduate researcher in Kerscher's lab, was able to knock out the HEX3/SLX8 from some yeast samples and replace it with the human RNF4 gene. Kerscher said the cell cycle continued just as

y with the human gene in the

take a human gene, put it into the it shows a function. Now if you way to show the function of the I don't know what it could be," . "So we can do genetics, we can , we can do biochemistry and we olecular biology with yeast. It's verful and you don't have to do umans and we don't have to kill and it's easy to learn." in the chemistry labs of the Integrated Science Center

Chemistry Research: Investigating the theft of electrons

by Joseph McClain

nce a year, biochemist Lisa Landino makes a scientific pilgrimage to Virginia's great pork-packing center of Smithfield, coming home with eight or ten fresh pig brains. "I know; it sounds lovely," Landino says. "They're a buck each, with a minimum of fifty. I only need ten, but I have to pay fifty bucks." She runs the brains through a blender ("I really do."), then the "pig-brain milkshake" goes into a centrifuge. The resulting liquid, portioned out and frozen, represents enough raw material to last Landino and her students through a year of intensive investigation of oxidative d proteins in the brain.

Many diseases such as Alzheimer's son's and amyotrophic lateral sclerosi known as Lou Gehrig's Disease, have in the chemistry of our own bodies. L associate professor of chemistry at W Mary, studies the chemical roots of th rodegenerative conditions. Her lab fo oxidative damage to a protein known

Thousands of protein

Tubulin is only one of the thousands ent proteins in our bodies. Most, if n in some stage of a 24/7 destruction-a cycle involving molecular toxins that bodies make.



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Shannon Kim '09 uses antibodies to detect the presence of a protein. The antibody solution, after incubation, binds the proteins to a membrane.

chemical structures that are intermediate between O₂ and water. "Reactive," in chemical terms, means that these ions or small molecules have an unpaired electron in their outer-or valence-shells. If nature abhors a vacuum, it hates an unpaired electron with a purple passion. Their unfilled outer electron shell makes them chemically prone to react with something nearby, Landino says, so they "steal an electron" to make their outer shell complete and stable.

Often, the victim of electron theft is one of the body's own proteins. The electron loss among molecular components of ate reader. The instrument 96 reactions at once. Researchers on of microtubules.

unchecked, damages the proteins e, the cells themselves. lar perpetrators of electron theft n as free radicals. When you l or dietary supplements high in these free radicals are what you Landino explained that antioxinolecular sacrificial lambs: "If you y, it gives these reactive species

something else to steal an electron from, rather than targeting the proteins in your cells."

Concentrating on repair

Landino's work concentrates less on antioxidants and more on the cell's abilities to repair oxidative damage to its own proteins—especially tubulin. Fifteen to 20 percent of the protein in a neuron is tubulin, she explains, which functions as scaffolding, giving each cell its three-dimensional structure.

"Tubulin also acts as a kind of intracellular railroad track," she explained, "because some proteins use the tubulin as a walkway to get around inside the cell."

Landino explained that tubulin exists in two states: a dimer and a polymer. A dimer is a two-part molecule, like two balls of clay stuck together. For tubulin to fulfill its functions as scaffolding and railroad track, the dimers arrange



As you age, it's been shown that you produce more of these intermediates that can be toxic—and that you have fewer defenses against them.

themselves in polymer microtubules, creating hollow filaments made of protein.

The tubulin molecule, she said, has amino-

acid "arms" that are vulnerable to ele by free radicals. These arms consist of and a hydrogen atom, known to cher thiol, or, in chemical notation, as an A reactive oxygen ion or molecule, ea an electron, sees these thiol arms as cal equivalent of an unlocked car wit running.

"If this guy loses an electron, what monly happen in a protein is that it i an S with a little dot," Landino said." these S-dot guys are close to each oth will form a new bond called a disulfic they are now linked together." Anoth of electron theft could be that two dif proteins—each missing an electronan unwanted covalent bond with eac Enough of this damage, Landino exp cause the tubulin filaments to dissolpolymer microtubules crumbling int loose tubulin dimers.

"There are proteins that like to ass with these polymer microtubules, and if those proteins don't have anything to grab onto, it changes the organization of the cell," Landino said. "And so if you get rid of a main structural component, there's a blip in time where the proteins don't know who they're supposed to interact with. It can be enough to turn on a process called programmed cell death, where cells actually pause and say something's just not right here. And the cell will begin the process of just...dying. In a disease like Alzheimer's, if you have a sufficient number of those cells that just die, you start having big holes in your brain."

In addition, Landino says dissolved tubulin may be implicated in neurofibrillary tangles, the signature protein clumps found in and between neurons of Alzheimer's patients. The tangles are made up of concretions of a protein known as tau, which normally binds to tubulin.

"My theory is that if something fundamentally bad happens to tubulin, well, then tau's got nothing to do but bind to itself," she explained. The good news, Landino says, is that oxidative damage to proteins is reversible—and

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She has the only research lab she knows of that is studying oxidative damage of tubulin, and already has made a great deal of progress

> ing the process. Using off-thels—and even temperature—she d reverse oxidative damage in the le protein microtubules to dise dimers and then to re-assemt, Landino's lab is searching for otein or group of proteins in the rovides the chemical signal for 1.

n I'm interested in this type of t it is reversible. You can make ne other way fairly easily. That's ly does when it repairs damage



Carolyn Edson '09 checks on the progress of protein electrophoresis. The target proteins are large molecules, while the tags are much, much smaller. The technique is essentially a sieveing process, used to separate the large proteins from their tiny fluorescent tags.

in the teaching labs of the Integrated Science Center

Undergraduate Research: On the trail of the bacteriophage

by Joseph McClain

oom 3033 in the Integrated Science Center 1 is a nice, new lab. It's spacious, too—or so it seems until you fill it with 15 freshmen, a handful of TAs, three professors and what everyone hopes will turn out to be a few billion

phages. Phages, more formally known as bacteriophages, are viruses that infect bacteria. In

recent years they have become a hot topic in ecological studies, while the viral of also show promise in the clinical appossible alternative to antibiotics. *A* and Mary, phages are the focus of *a* mester freshman research course, by the Science Education Alliance of ard Hughes Medical Institute (HH

William and Mary is one of only schools nationwide that HHMI cho participate in its Phage Genomics I Initiative. Biologists Margaret Saha Forsyth are conducting the course. are joined by virologist Kurt Willian new faculty member in biology and specialist.

The HHMI initiative is designed freshmen in-the-lab familiarity wit niques and concepts used in micro molecular biology, genomics and b matics. The students are not just le advanced biological concepts, but a working to create new knowledge a phages and their genetic structure.

"It's real research," Saha said, surveying the lab filled with freshmen plying test tubes and pipettes. "It's not just instructional. It's not research-like. These people are doing real research."

The experiment

The course is devoted to the identification and the genetics of phages in soil and fresh water. The process began with collection of samples



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periment in progress.'," Sam Harvey '12 said, marking the spot near Crim Dell where he had just collected a soil sample. "We don't want someone running over it, in case we want to come back to take more samples." A GPS reading gives the exact location of the site, which is logged on paper.

The class members take their soil samples to the ISC, where the lab work begins. The first step is to separate the phages, not only from the soil or water, but also from their bacterial hosts. Askew and Carolina Ruiz process eaching assistant; the others are sen to take part in the initiative.

of laboratory procedure for firstshmen, but it's only the first step that will include identification of rieties and preparing the phage ncing of its DNA.

re doing today," Oscar Alcoreza '12 explains, as he shakes a test tube, "is isolating the bacteriophages from the soil so that we can analyze them."

Valerie Villanueva, a senior teaching assistant, outlined the isolation process, which begins with mixing the soil in a tube with a phage buffer, basically a saline/calcium chloride solution.

"When you shake it up, it separates the phage from the bacteria in the soil," she said. "You let the soil fall down to the bottom by let-



Students are not only learning advanced biological concepts; they're also working to create new knowledge about phages and their genetic structure.

ting it incubate for 20 minutes. The solution at the top is going to be full of phage because they don't sink to the bottom."

The isolation process continues through a filtering and culturing process. Williamson said the students will extract liquid from the top of the tube and add to it samples of *My-cobacterium smegmatis*, a species of bacteria. Finally, they mix in some top agar. ("It's like jello," he says.) The mixture is poured into Petri dishes and watched for evidence of phage.

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presence.

"Without any in a continuous phage infection, plaques," Willia the students are With any luck, c come up with a one has ever see After isolation

and identificatic another. Finally, genetic sequenc ing" the DNA of

"We want to t and see if we ca infects the bacte sis," Saha said." lead to possible a phage-based T alternative to the

Phage the

The medical use infect a harmful fact, the plot of *Arrowsmith* cent for a phage to k plague. (Forsyth preparation for there has been a therapy, which <u>J</u> William and Ma forefront of clin

"We're going to choose one phage that actually gets sequenced. All of them are going to be tested," Saha said. "There is a clinical application that is really important and that motivates a lot of these pre-med students. It's pretty exciting."

Forsyth explained that the first semester's work should culminate with the sequencing of the phage genome. The second semester, he said, will be devoted to the bioinformatic analysis of the genome, the study and annotation of the genes present in the bacteriophage that were collected by students in September.

"This next stage is even more 21st Century than what we're doing currently," he said.

"The students' involvement, contribution and comprehension will each be amplified 10- or 100-fold when we get to the second semester of this seminar."



Arrykka Jackson '12 (top left) displays a soil sample. Grad student Eric Blue and Kobie Gordon '12 (top right) check Petri dishes for the clear spots that indicate phage presence, while Mark Forsyth and Margaret Saha (above) assist Kasi Hartman '12 with a preparation.

a more vivid **DILATION**

Support from Gates and Hewlett foundations accelerates version 2.0 of aid-tracking initiative by Joseph McClain

PLAID is moving to the next level.

PLAID—the acronym for Project-Level Aid has received nearly \$2 million in financial support from the Bill and Melinda Gates Foundation and the William and Flora Hewlett Foundation. The funding will allow researchers to increase the size and depth of the project. Faculty involved in the project characterize the advancement as "moving from version 1.0 to 2.0."

An interdisciplinary program dedicated to offering detailed, accessible information on the flow of international aid, PLAID was formed at William and Mary in 2003 as a project to compile and maintain a web-accessible database on international development finance. It tracks foreign aid between sovereign nations, known as bilateral aid, as well as multilateral aid, which refers to financial assistance provided through multinational organizations such as the World Bank and the United Nations.

The PLAID team is led by three members of the College of William and Mary faculty, Robert Hicks, J. Timmons Roberts and Michael Tierney. The team is interdisciplinary, as Hicks is from the economics department; Roberts is from sociology; and Tierney is from government. A parallel group of lead investigators are faculty at Brigham Young University, and includes Daniel Nielson, Darren Hawkins and Sven Wilson. The final member of the team is Brad Parks, a research fellow at William and



William and Mary's men from PLAID include (from left) Michael Tierney, associate professor of government and international relations; Rob Hicks, associate professor of economics; and Timmons Roberts, professor of sociology. Greening Aid? is their book on the environmental friendliness of aid.

Mary's Institute for the Theory and Practice of International Relations and an associate director at the Millennium Challenge Corporation.

Looking at gaps in the data

Parks, a 2003 graduate of William and Mary, wrote a senior honors thesis on foreign aid and the environment that sparked the formation of PLAID. His examination of the changing allocation of aid by Western governments revealed gaps in the data being used by development researchers all over the world. PLAID began filling in the missing information and addressing inconsistencies on records of thousands of individual projects.

"PLAID is a unique project for me because it combines the missions of academic research and public service," Hicks said. "This project will hopefully impact, in a positive way, the lives of the poor all over the world and at the same time help shed light on some of the fundamental questions in development research."

To construct PLAID 1.0, researchers compiled and recategorized more than 430,000 individual aid projects from 1970 to 2000. Tierney, associate professor of government and co-director of the Institute for the Theory and Practice of International Relations, explained that PLAID 2.0 will contain updates, additional data and a deeper level of detail.

"PLAID 2.0 is going to merge a variety of different data efforts," Tierney said. "First, we're going to update through 2006 by gathering data on development projects from 2000-2006 for all of the donors we have in PLAID 1.0. Further, we are filling data fields in PLAID 1.0 that are currently not populated."

Tierney said that among the most important of the version 1.0 fields to be thoroughly completed throughout 2.0 is one holding a "long description" of the project. Existing databases, he explained, often lack a detailed narrative account of what the project is supposed to accomplish.

"So, it's quite difficult for a researcher to know really what was going on in the project," he said. "There may be a title and a short description, but a four- or five-sentence description is missing in a lot of these records, so we are finding and then adding long descriptions for PLAID 2.0."

New categories of information

In addition to filling in the blanks of 1.0, PLAID 2.0 will include new categories of data to reflect changes in the way aid is administered. Traditional foreign-aid packages, Tierney said, were often delivered for a single purpose—to build a road or to recruit teachers for a rural school, etc. PLAID 1.0 was able to accommodate single-purpose grants with a single set of categories, but the international aid world has outgrown that approach.

An institute without an acronym

In terms of number of students and faculty working on it, as well as funding, PLAID is the largest of the research projects operating from William and Mary's new Institute for the Theory and Practice of International Relations.



"There's no good acronym for it," said Mike Tierney, "and I may be the only one who can remember its name. But I do think it captures the spirit of what we're doing. We're all about social-science research that could inform real-world policy issues."

In summer of 2008, the institute and its staff moved into new quarters in the Corner House along Jamestown Road from a collection of offices in Morton Hall. The institute arose from a 2002 conversation between Tierney and Sue Peterson, dean of undergraduate studies and the Reves Professor of Government. Tierney and Peterson discussed the need to tap into internationally oriented teaching and research to produce "public goods," which Tierney describes as "more speakers coming to campus, more workshops, more conferences with international scholars, maybe people who come here from other universities either as visiting scholars or as post-docs who would do research with W&M faculty."

At the same time, there were a number of William and Mary faculty who were working on research that, while not related topically, shared common qualities of an international focus and a relevance to some sort of policy debate.

After much discussion and search for support, the Institute for the Theory and Practice of International Relations came into being, with Tierney and Peterson as co-directors. The institute was founded through the sponsorship of Carl Strikwerda, dean of Arts & Sciences, and Laurie Koloski, director of the Wendy and Emery Reves Center for International Studies. The institute has received additional support, including a \$75,000 gift from Tierney's old William and Mary roommate.

The institute's purpose, Tierney says, is to be "an umbrella entity that can provide some administrative support, can help to write grants, and can administer some of these research projects that can really be a bear if you have to do it all by yourself."

He said a research project taken on by the institute must meet three criteria: it must have an international focus; it must use social-science methods in order to make knowledge claims; and it must be policy-relevant.

In addition to PLAID, the institute houses a handful of other projects addressing topics such as environmental governance and policymaking, AIDS and national security, nuclear nonproliferation, civil strife and the links between teaching, research and policy in international relations.

http://irtheoryandpractice.wm.edu/

"In real life, and increasingly, donors give what are called multi-sector projects. USAID will give a project to Tanzania, but it won't just be to improve their heating and power generating. It will be to improve their heating and power generating and build a school and rope off the rain forest," Tierney explained. "How do you categorize that? If you're insisting on providing just one category for the project, you're in trouble, because you don't know how to weight it. The new PLAID 2.0 has multiple sector categories. So you have a primary sector category based on the budget and you can categorize each chunk separately. This gives you a much more marbled, much more nuanced view of aid flows than 1.0."

More donors

In addition, the new and improved PLAID will also include more donors, especially emerging bilateral donors from Eastern Europe and the Middle East. "In the last five or ten years, many

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more sovereign donors have gotten into this game of providing development assistance," Tierney explained, citing Poland, Lithuania, the Czech Republic, Kuwait and Saudi Arabia as examples. "Now, even Venezuela, with their oil money, and China and India are emerging donors."

Tierney pointed out that PLAID 2.0 will also include emerging multinational donors. PLAID 1.0 had 15 or 20 multilateral donors—the biggies, such as the United Nations and the World Bank. The upgrade to 2.0 will include about 25 more obscure, but active, multinationals, such as Scandinavia's Nordic Development Bank and the North American Development Bank.

"Who knew that the North American Development Bank even existed?," Tierney asked. "Well it turns out that it has been in existence since NAFTA was formed. It's a multilateral bank and it's designed to provide funding for development projects along the border between the United States and Mexico. Most of their projects are funded in Mexico."

Most importantly, PLAID 2.0 will be a step toward the open, accessible and searchable database originally envisioned back in 2003 as a valuable tool for donors and recipients and others interested in the flow of bilateral and multilateral aid. Tierney expects a beta version of PLAID 2.0 to be released in March 2009 to a group of target users: academic researchers, make both more powerful and user-friendly.

"We want to build PLAID 2.0 so that it is useful to a wide variety of users. PLAID 1.0, which was funded by the National Science Foundation, was basically built for the academic community. But Gates and Hewlett were very insistent that PLAID be useful to lots of different people," Tierney said. "So, donors might use it for aid coordination, to find out what other donors are doing in a particular country. Recipient governments might use it to do planning: 'Aha! Look! I can see now that Germany is giving out more aid for infrastructure. We've got this infrastructure project. We need to approach Germany.'"

Merge and purge

The construction of PLAID 2.0 is a matter of merging and purging, with a lot of checking in the middle. Rob Hicks is the member of the team who has taken charge of what Tierney calls "the grand merge." The merge includes the PLAID 1.0 database and incorporates a database from the collaborators at Brigham Young, where the multiple-sector concept was developed. It also includes an updated version of the database from the Organization for Economic Cooperation and Development, a Paris-based organization that has been the traditional collector of and repository for foreign-aid data. PLAID 2.0 also will contain information about aid projects from a number of smaller databases. communities for changes coming their way." Roberts said. "'Climate' is on the lips of the donors: The World Bank just set up two new 'climate investment funds' with donations from ten donor nations worth \$6.1 billion."

Still, there has been no systematically maintained set of information of just how much development funding was flowing to climate work. The William and Mary team, led by undergraduates Tommy Jones and Kara Starr, found that funding for energy efficiency and hydroelectric projects dwarfed funding for "adaptation" to climate change. "These findings support the claims many are making—that there is barely any funding going to helping poor nations of the world prepare for and recover from the natural disasters which scientific models predict are taking an upswing," said Roberts.

"We are in the process of merging it all together," Tierney said. "You can merge a lot of it automatically, because there are unique features in the project line items, but for hundreds of thousands of projects, the computer cannot match them. Those hundreds of thousands of projects get flagged for human matching. So if you walk into the next room right now, you will find student research assistants in there, doing line-by-line matching."

He explained that the computer merge will generate two projects that look very similar. A student will examine them and apply a set



New quarters in the Corner House provide convivial and versatile working space for PLAID. From left: Institute Co-Director Michael Tierney confers with Alena Stern '12 in the big room. Hannah Thornton '10 (left) and Molly Neel '09 take advantage of a warm fall day to carry a laptop onto the porch to do some work al fresco. Rob Hicks, associate professor of economics, discusses categorization with Christian Peratsakis '09.

personnel representing both donor and recipient governments, journalists and people from non-governmental organizations (NGOs).

"We want these five groups to bang on the database, to beat it up, to use it in a way that they would do their own work," Tierney said. Recipients of the beta version will get together with the PLAID staff in September 2009 at a conference at the University of Oxford to share their experiences with using the 2.0 database and the PLAID interface and to discuss how to

The melding of databases has generated additional research opportunities. Roberts led a group of PLAID students this summer categorizing 115,000 projects from the updated OECD database on aid. The students looked for projects that were designed to help countries cope with climate change or to reduce their emissions.

"There is a major swing in development finance internationally to try to 'climate-proof' development projects, by preparing recipient of rules to see if they are different projects or computerized versions of the same project, one of which should be purged from the database.

"Basically, the students are doing quality control on the merge," Tierney said. "We have very, very tight quality control, because people are concerned that we're going to get duplicates or that we're just going to miss stuff when we do the merge."

ley to a culture

Middle Eastern Music Ensemble opens the door to greater understanding

by Lillian Stevens

Zema Mirza '09 dances to 'ud accompaniment of Anne Rasmussen, director of the Middle Eastern Music Ensemble.

Survey as a lens through which the West can view Middle Eastern culture.

"It is an excellent way to investigate important aspects of culture—from history to colonialism and from contemporary politics to social constructs, like gender," says Anne Rasmussen.

Music can also provide a means of passing down important information about cultural traditions, events and contemporary news information eventually recorded by historians.

To serve both ends, Rasmussen, professor of music and ethnomusicology at William and Mary, not only teaches classes such as Worlds of Music, but also directs the College's Middle Eastern Music Ensemble, a scholarly labor of love that she began in 1994.

The ensemble is as much a cultural laboratory as it is a performing collaborative. Membership has waxed and waned over the group's 28-semester life and usually mixes students from the Middle East (or who have parents or grandparents from the Middle East) with other students from a variety of different backgrounds, who are interested in the idiom for any number of reasons.

What does it mean to teach something that is outside the Western musical canon? Especially

something that comes from a culture and place we know so little about?

"When we hear music from other cultures. we have not been drilled with the history of that area. We have not heard that music in advertising jingles and film scores; we have no method by which to place it, no context for understanding it," Rasmussen said. By contrast, we are immersed in the context of Western culture and its musics. "For example, you might have a flute student studying works of a Western European classical composer. That student can walk out of a lesson and go to a concert and hear music by that same composer. Or they will see a film where they hear flutes in the soundtrack. Then our same student goes to a history class and learns about nationalism or the Romantic or Classical periods, which enables them to put their flute piece into a historical context."

So musical traditions become cultural markers, evidence that someone or something belongs to a social or ethnic group. Each culture has musical systems intertwined in its own unique history, as a composition for flute is not just a musical piece, but also a contextual piece of the history and culture of, say, Vienna in 1750. If 18th-Century Vienna seems ancient, Rasmussen points out that the culture of the Middle East contains traditions of literate music theory dating back to the 8th and 9th centuries, within which people were already writing and taking examples from the Greeks about the role of music.

"Early scholars believed that music, arithmetic, geometry and astronomy—the Quadrivium—represented paths of knowledge which were fundamentally interconnected," says Rasmussen.

"They wrote about the role of various instruments, how harmonics work, the morphology of instruments and the way strings vibrate, but they also studied the way that music affects the human body and the cosmos."

Into the music

Drawing on such a rich cultural background, the participants in William & Mary's Middle Eastern Music Ensemble learn the intricacies of rhythm and the arcana of instrumentation—but the heart of the enterprise is making the music. Rasmussen says the ensemble provides a forum for students to do the "real stuff" beyond reading articles, writing papers and watching films.

"Some of these kids often come to the group with excellent musicianship, but no prior experience with the Arab, Turkish, Persian,



Anne Rasmussen plucks the qanun, or zither.

Guitarists often become 'ud players.

Rasmussen and takht play in the Great Hall.

The ensemble entertains on Parents' Weekend.

Middle Eastern Music

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Armenian and Greek traditions that comprise the music of the Middle East," Rasmussen said. "They might be alternative musicians who play the mandolin, or singer-songwriters or just really creative musicians. Or they might be 'heritage learners'—students of global studies and international studies whose parents or grandparents are from Bangladesh or Saudi, for instance. We are a very diverse group."

Each incarnation of the ensemble presents Rasmussen with a different version of the pragmatic challenge of figuring out who should play what. Most ensemble members are already experienced musicians, which gives her a starting point. For instance, she generally encourages players of wind instruments to try the *nay*, or flute, while she steers mandolin players and guitarists toward the '*ud* , the round-backed lute. "They already have the fingering and picking motions down," she says.

Violin players stay on violin, but use Middle Eastern tunings. Members with little or no musical background start off in percussion; Rasmussen says she likes to have at least one "real" percussionist to anchor the section.

"The only way to do an ensemble like this with limited resources of teaching and time is to attract capable musicians who already play music. If they don't play any instruments and don't sing, it is difficult to just wave a wand and work miracles," she said. "If they are interested and have a decent ear and a great attitude they can learn. Sometimes a weaker musician will have a fantastic energy and that is worth all the fancy playing in the world."

To teach the material, Rasmussen prepares a CD of the tunes, holds regular rehearsals and sometimes meets with the performers in sectionals. Musicians start off with simple ditties such as "Ah Ya Zayn," the "Twinkle, Twinkle" of Arab music, but soon move on to more sophisticated material.

Inviting guest artists

Often, Rasmussen will invite guest artists scholars or composers or both—to lecture or perform or assist in a class. In spring 2007, the ensemble's work focused on the traditional music of Iraq. Rasmussen arranged for the group to work with Amir ElSaffar, an Iraqi-American who has devoted his career to salvaging Iraqi music during a time of extreme unrest. ElSaffar visited William and Mary twice and performed as a guest artist in a concert of Iraqi music.

Whether there's a guest artist or not, ensemble performances are often packed.

"The quest for global knowledge in general is huge on this campus," says Rasmussen. "For one thing, global awareness is a new prerequisite for employment, whether it's in the government, military or public sector. Another motivating factor may be that in this particular moment of world history, students want to be able to generally be conversant in a variety of cultural contexts. Consider that many of our students were 11 years old when 9/11 happened. These kids have come of age in an era when you can't take a tube of toothpaste on a plane because of the nation's overarching concern for national security! I think they want to move beyond that mindset."

A year ago, the ensemble presented a major concert in Washington, D.C., sponsored by the Embassy of Spain, with the theme "Andalusia: Cultural Crossroads." The concert featured repertoire shared by Christians, Jews and Muslims, along with several traditional Sephardic pieces sung by guest vocalist, cantor Ramon Tasat.

"One thing we do in this kind of music is work through oral tradition," says Rasmussen. "That is, through listening to an idiom and deciding where do you put the trills, where do you slide between notes, how can you take this melody and play with it and make it your own?"

Middle Eastern music is structured around a system of melodic modes called *maqam*, many of which feature quarter tones, and around rhythmic patterns called *iqa'*. More complex than Western scales, the *maqam* have notes that fall *between* the notes on a piano. Rasmussen explained that the rhythmic patterns may be performed in very basic ways or may exhibit extreme complexity as well—a number of them would be considered "uneven" in Western terms.

"Stretching all the way across North Africa because of various migrations, it's a huge kind of template for organizing melody and rhythm," says Rasmussen. "Within each separate area, there are different names for the melodic and rhythmic modes as well as for musical instruments."

Rasmussen's primary area of teaching, Middle Eastern music and culture, stems from her dissertation work and some 10 years of field work among Arab American communities and Middle Eastern American communities. In addition to her work on music in the Arab world and Middle East, she is currently at work on a book. To be titled *Women's Voices, the Recited Qur'ân, and Islamic Musical Arts in Indonesia,* it is based on several years of ethnographic research she conducted in Indonesia, the world's most populous Muslim country.

Real-life, real world

A scholar of not only Islamic musical arts in Indonesia, but also of female reciters of the Qur'ân, Rasmussen asks culturally important questions: "What do the women do? What do they look like? What does their music sound like?" What is their motivation for becoming religious specialists and professional reciters of the Qur'ân?" Her experiences and studies allow

All ready for the *takht*

The Middle Eastern Music Ensemble, a forum for exploration and performance, is an extension of the ethnomusicology curriculum in the Department of Music. Established 14 years ago by Anne K. Rasmussen, the ensemble, when performing at full strength, consists of 15-25 musicians, primarily undergraduate students.

"The ideal aesthetic," Rasmussen said, "is one person per part, so you can hear complementary timbres, or colors, of the instruments. But at William and Mary you want to offer the experience to as many people as possible. Plus, you might not know who the best players will be; it is difficult to audition people, because they are learning—so you might sacrifice quality to accommodate quantity."

Musicians in the ensemble play music

from a variety of regions and repertoires. Their instruments include the 'ud, an 11-stringed, pear-shaped lute (1); qanun, a 72-string zither (2); nay, a reed flute (3); kamanjah, or violin (4); 'cello; and bass (5). The ensemble also uses various percussion, including the tablah or darbukah, a vase-shaped, ceramic drum (6); the riqq, a tambourine with fish-skin head and heavy brass cymbals (7); and daff, the frame drum (8).

A *takht*, or small ensemble, consists of just the core instruments: '*ud*, *qanun*, *kamanjah*, *nay*, percussion and a singer.

her to add flavor and diversity to her work with students and ensemble members—to debunk myths and give students examples that are not only "real-life," but also "real-world" which, Rasmussen says, "might not always be what we get from the popular press."

"You can visit the most populous Muslim country," says Rasmussen, "and you will find

that these women are beautiful, articulate, very educated and quite public. You will see them on television performing a wide variety of different kinds of music or reciting the Qur'ân, an artistic and religious phenomenon central to national and cultural identity in Indonesia, as it is in the Middle East and Muslim world.

"Because it is meant to be recited aloud rather

than read silently, the Qur'ân is enjoyed as a kind of musical oratory. While the meaning of the Qur'ân is central to Islam, the divine origin and power of the sound of the Qur'ân is something experienced on a purely aesthetic level, particularly in a society where few understand the Arabic language."

Power of music

Rasmussen explains that some Islamic cultures have developed a reputation for being "antimusic." She said skepticism regarding musical performance and performers stems from the belief that music is extremely powerful and has a direct affect on human emotions and behavior.

"In Sufism, a mystical tradition of Islam, music is used as a catalyst for spiritual experience because it is so powerful and can lead you into altered states of consciousness," says Rasmussen. "If music is used with the wrong 'vision of the heart,' then it can lead to crazy behaviors like drinking, dancing and sexual promiscuity."

The varieties of music of Islamic cultures and the Middle East are as varied as the people who make it, although they share traditions of melody and rhythm from western China all the way across central Asia and Iran and northern India. Rasmussen adds that the instruments of Western music owe a large debt to the instruments of the Middle East and the Muslim world, due to cultural exchange during the crusades and the melting pot that was created in the Iberian peninsula prior to the Spanish Inquisition.

"When you look at musical instruments themselves," says Rasmussen, "much depends on the cultural geography. In the Middle East, instruments are small and transportable because it is a desert culture. In Southeast Asia you have huge gong-type instruments, which you can't just throw on your camel. They stay in a special place in a court or palace and musicians come to those instruments."

Science of performance

When she came to William and Mary over a decade ago, Rasmussen was the first professor of ethnomusicology at the College. Today she teaches a variety of courses in music and ethnomusicology, the anthropological study of a culture through its music.

"In the field of ethnomusicology, in addition to learning languages and library research, we usually engage ethnomusicological field work as a kind of participant observation method. For instance, if you want to learn about somebody's music you could brandish a microphone and say 'tell me about your music!' Well they might not even have a vocabulary," she said. "But when you sit down and play, then there is all of this other kind of exchange that happens. So for us, musical performance and participation is really part of our methodology."

By Erin Zagursky

he only thing we have to fear, we're told, is fear itself. But what does fear itself really influence? According to researchers, fear and other negative emotions change just about everything when it comes to how we perceive the world.

"There's this great German proverb that I found and it's 'fear makes the wolf bigger than he is,'" said Jeanine Stefanucci, an assistant professor of psychology. "I think we would just say that we've shown that's true. It not only makes him bigger than he is, but it makes him closer to you, makes him move faster, makes him louder. When you're afraid, the world is

In the Perception Lab, Jeanine Stefanucci watches the monitors showing what Dillon Niederhut is experiencing in a more vivid form through the virtual reality headset. The Perception Lab will be moving to new quarters in the Integrated Science Center Phase 2, along with other elements of William and Mary's Department of Psychology. The virtual reality mask allows experimenters to simulate conditions of varying heights for subjects.

Negative emotions skew how you perceive the world

A sensor tipped with a blue light on the far side of Gillian Freeman's head will indicate how far she believes she must duck her head to get under the bar. Experimenter Mike Geuss adjusts the height of the bar and monitors the proceedings.

Gina Veits has no qualms about reaching for a nice clean hammer. Another version of this test uses a set of identical items "doctored" to make them look disgusting. The experiment measures the effect of repulsion on the subject's perception of distance.

different to you than when you're not."

Stefanucci started the Perception Lab at the College of William and Mary when she first came to the school about two years ago. The lab focuses on spatial perception—how far away, how big or how high things appear—and what factors influence those perceptions.

"Traditionally, people have thought, well, the eye just kind of collects the light rays coming into it and computes the geometry of the world, and that's how we decided how far things are from us, how high things are, which is true," Stefanucci said. "It definitely does that, but it does that also with, we believe, input from other parts of the brain and body."

For instance, Stefanucci said, distances look further to tired people and hills looks steeper to older people. Along those lines, Stefanucci's lab has been looking at how emotions—in particular, negative emotions such as fear—can affect how people see the world.

Roots of the Perception Lab

The experiments began with two students going to the Sadler Center and asking people about the height of the balcony. The participants who stood on the ground and looked up at the balcony estimated its height somewhat accurately. However, the people who stood at the top of the balcony—and, thus, were more likely to be experiencing fear—overestimated the distance to the ground.

Building on those findings, the members of the Perception Lab teamed up last year with Kim Whitley, a professor from the kinesiology department. Whitley planned to have students rappel off the College's parking deck for his Adventure Games course.

"Before they would come up on the platform and jump, we would ask them, 'How high does that look to you?'" said Stefanucci. "An experimenter standing right next to them just starts moving along the parking deck—on a horizontal plane—and they make the experimenter stop at the same distance from them that they believe they are from the target on the ground."

Using data collected from about 45 people, the researchers found—like in the Sadler Center experiment—that the students who had to jump from the parking deck platform overestimated the distance to the ground. The non-jumpers were more accurate in their assessment.

"We showed that people who are afraid estimate heights to be higher than people who aren't," said Stefanucci. "That can be a trait-level thing, so you can have just a general fear of heights in any situation—or we can manipulate it so that in a particular situation you are afraid, which is a state-level evaluation of emotional

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reaction to the height." Additionally, during the kinesiology class study, the researchers found that the participants were accurate in predicting their level of happiness during various activities, but "massively over-predicted" their level of fear, said Erika Siegel, a second-year graduate student.

For instance, participants who said that on a scale of one to seven they expected to be a six on happiness came back a week later and reported that they had been about a 5.6 on the happiness scale. But participants who guessed they would be a six on the fear scale came back and reported that they actually only experienced a 3.2 level of fear.

"So, people are bad at forecasting negative emotions like fear and pretty good at forecasting positive emotions like excitement," said Stefanucci.

Though the lab has mostly done its research by taking participants to real-world locations, they are now taking their studies to virtual worlds.

"We put people in a head-mounted display that displays a virtual world that we've created and we can show them maybe 50 heights at once, whereas in the real world, that's really hard to do," said Stefanucci. "You have to walk people from building to building and you can fatigue them on the way, which can compound the effect."

Smell and sound

In addition to branching out into the virtual world, the Perception Lab's members have also been expanding their research to include other areas of perception.

Siegel has taken the findings from the current research and is looking into whether fear can also affect a person's perception of smells and sounds.

Last year, she had participants in her auditory study write about a very frightening experience. In the middle of writing about that experience, the participants were stopped and asked to listen to a series of tones, rating them for loudness and length. A control group rated the sounds without writing about frightening experiences.

"We found a pretty reliable difference," she said. "The fearful participants were hearing tones louder and longer."

This year, Siegel is trying to do something similar with smell. Though she has not started yet, she plans on again having participants evoke frightening memories, and while they are in the midst of remembering them, she will waft an odor into their noses and have them rate the intensity and pleasantness of the smell.

"It certainly seems like that would extend to smell as well," she said. "So, something might smell very powerfully negative if you're already very afraid, especially if it's a novel odor or if it's something that can harm you."

How we see others

While Siegel investigates smell and sound, two other members of the Perception Lab are looking into how emotions and body state can affect how we might see others. Noah Schwartz, a research fellow with the School of Education, is focusing on how emotion can influence people's ability to encode and recall faces.

"When you look at facial recognition literature, it's what parts of the face are you using to identify the face. But I'm looking at what parts you are more likely to forget," he said. "When we put this into an emotional context, specifically a negative emotional context—something like a crime scene—we can then start to speak to issues in eyewitness testimony." For instance, he said, "if I witness a crime and I see that you are the perpetrator, using this method I have developed, I can tell you what parts of the face you're going to forget. Then when I look at the people in a line-up and see four people who look like you, am I going to pick the person who has everything the same except different eyes, everything the same except a different nose, everything the same except a different mouth? That's kind of the direction that it's moving in."

Schwartz plans on possibly using crime scene photos or another method to evoke negative emotions in his participants. Then, using an eye tracker, he will study how participants look at faces while experiencing negative emotions.

In an experiment based on perception of body size, Andrea Robinson carries a large pink handicap through an aperture. Experimenter Mike Geuss says people usually perceive their body size as being larger than it really is, likely an evolved safety mechanism.

How we see ourselves

Mike Geuss, a recent graduate and current graduate student, is taking what he's learned in the lab and applying it to how people perceive their own body size. The research, he said, began as an interest in body size as it relates to driving. For instance, people in SUVs tend to see parking spaces as smaller than those who are driving compact cars.

"It's an evolved mechanism that you see things as smaller because you want things as larger as a safety precaution," said Geuss. For instance, he said, you wouldn't want to just squeeze through a doorway if you are being chased by a dog and therefore underestimate the door's width in order to have some room to spare.

"You also perceive it as smaller because you perceive yourself as larger than you are," he said.

Based on that idea, Geuss ran experiments where participants wore a book bag on their front with a curtain rod attached to it. Geuss then asked the participants to estimate how wide they thought an aperture was by adjusting a tape measure that he slowly pulled open for them. Though other researchers have studied body size in reference to apertures, they have always asked participants to either walk through them or if they thought they could walk through. Geuss's research is unique, he said, because he used a visual matching task and also changed the dimensions of the body.

Geuss will expand his research to look at how people with anorexia, bulimia and other body dysmorphic disorders react in the experiment.

"Those populations, we hypothesize, will probably see themselves as larger than normal populations would," said Geuss.

Erika Siegel holds a pair of kitchen knives—one with a high yuk factor—used in tests to measure the effect of negative emotion on distance perception. The rubber gloves add to the effect, even though the nasty-looking one is only smeared with hand lotion.

A world of applications

Geuss and his fellow perception students said they love the exchange of ideas that occurs in the little back room of Millington Hall where the lab is located.

"One of the really cool things about working in the lab here is that there are a lot of really creative, really ingenuitive people and so we are constantly bouncing ideas off of each other, constantly looking for new ways of asking questions that could be interesting from a research standpoint," said Schwartz.

Stefanucci encourages the discussions and welcomes all of her students—from undergraduates to graduate students—to get involved.

"She has this vested interest in her undergrads and our intellectual development," said Dillon Niederhut. "When I'm here, I don't feel I'm being used by someone from the upper echelon as a rat to run their experiments."

As a result of that free environment, the lab has flourished and now includes about 20 undergraduates and two graduate students. Additionally, various members of the psychology department and neuroscience program have contributed to the work being done in the lab, sharing equipment and helping to look into some of the other questions brought up by the findings.

Because of the broad-reaching effects of their research, the members of the Perception Lab said that they can see a variety of applications for their research.

"It's so important for every aspect of psychology because it's how the information gets in," said Stefanucci. "If the information gets in in a different way, that affects everything down the line. Or if you are interpreting that information from the beginning, that affects everything down the line. So it has applications for social reactions to a situation, clinical populations, teaching people how to not be afraid. If you have a fear, it creates this vicious cycle where you see things differently which enforces your fear, which is awful for people with anxiety disorders, with phobias."

The lab is currently working on two papers for publication from the kinesiology course experiments, two on Geuss's research and one on Siegel's. Others will surely follow. Though they have more experiments to run and ideas to track down, the members of the lab say their findings so far have already shaped how they look at the world when, for instance, they choose a pair of Rollerblades over running shoes.

"I think the big take-away message is that nobody sees the world as it is," said Niederhut. "People see the world the way they need to see it."

"Everybody sees the world differently," Schwartz agreed. "Whether that is a function of your experience or of your innate biology, it's something we can't deny, and it's something we'd like to learn more about."

Dintersmith Fellows

New program gives five seniors an intensive faculty-mentored research experience

Jennifer Fitzgerald uses notes of the late Norman Barka, including this record of a ritual dog burial.

Five seniors at William and Mary got a head start on their honors projects after spending the summer doing funded, faculty-mentored research as participants in the College's first class of Dintersmith Fellows.

The program, made possible by Ted Dintersmith '74, is designed to support undergraduate honors research, especially pre-honors research conducted in the summer before the students' senior year. Joel Schwartz, director of William and Mary's Roy R. Charles Center, explains that the primary goals of the Dintersmith Fellowship Program are to provide undergraduates with the support necessary to do high quality research, and to increase the number of students who participate in the senior honors program.

Currently about 10 percent of each class of William and Mary seniors, about 130 students, do an honors program—an in-depth investiga"Currently we are funding five students; our goal down the road is to increase this to 20 students."

Dintersmith fellows commit to a 10-week summer research experience. They and their faculty mentors then continue the work begun during the summer throughout the senior year, ending with a senior honors thesis. The Dintersmith Fellows Program provides a modest research stipend for the faculty mentors, as well as providing substantial funding for the students.

"Our senior honors program is built on close student-faculty collaboration and a dedication to integrating the teaching and research missions of the College," Schwartz said. "By providing

Martin Gallivan and Jennifer Fitzgerald examine the skull of a dog excavated from a Virginia burial site. Dog graves are not uncommon, but Fitzgerald is one of the few scholars studying ritual dog burial among the Algonquin communities of the region.

You can't buy the kind of dithienylethene Brooklynd Saar (right) need research, so she and Elizabeth Harbron worked through the summer to enough of the photochemical substance for them to use for experime

tion on an approved topic, culminating in a written thesis and an oral defense that is administered by a faculty panel. Most senior honors projects are comparable to graduate school work in terms of scope and rigor.

"Our goal is to attract as many of our strongest students as possible to do honors," he said. research funding for both students and their faculty mentors, the Dintersmith Fellows program provides incentives for participation in activity that embodies the essence of our values as an institution."

Native Dog Burials and Associated Ritual in Coastal Virginia

Jennifer Fitzgerald with Martin Gallivan, associate professor of anthropology

Almost no scholarship has been done on the ritual burial of dogs by ancient Algonquin communities of the Virginia coastal plain, so Jennifer Fitzgerald has the field almost to herself. She is working with archaeologist Martin Gallivan to investigate ritual dog graves at four Late Woodland sites along the Chickahominy River.

"Dogs were the only domesticated animals on the East Coast and the Jamestown settlers recorded that they were used as hunting companions but not kept as pets," Fitzgerald explained. "But the rituals of dog sacrifice in neighboring groups and the fact that dogs were the only animals to be buried suggests that they had a significant role in Algonquin communities."

Archaeological examination of the sites has revealed complete skeletons of dogs buried carefully, often in unusual contexts—under an item of grave goods, such as a pot. There are at least two instances at Weyanoke Old Town in which a dog was found buried with a human arm.

"It seems as if dogs are associated with human deaths, because they seem to appear close to human burials in large part," she said. "So I am thinking that they are considered separate get the canine remains carbon dated.

"Jen's really developed the research topic, the research interest, the research project, the schedule, the methods and begun to move toward a bit of interpretation, with some guidance—but largely on her own," Gallivan said. "This is really Jen's research and she has taken the ball and run with it."

—Joe McClain

Romanticism in China: The Intersection of East and West

Shannon Reed with Xiaobin Jian, associate professor of modern languages and literatures

Shannon Reed and her professor traveled half-way across the world this summer where they have access to periodicals, books and articles that are nearly impossible to obtain in the United States.

When Reed isn't reading the works of Chinese Romantics (in original Chinese) she is translating books on comparative literature and meeting with experts on Chinese and Western literature. Specifically, she is researching the literary genre known as 'Chinese Romanticism' and comparing that with the English Romantic movement of the early 19th Century.

"Most of my time goes to translation work," Reed said. "I'm currently translating Professor Sun's book on comparative literature, which besides being a great introduction to comparative

ded for her o synthesize nts.

Jeanine Stefanucci of the psychology department works with Dillon Niederhut to examine how emotions and body state effects perceptions. Niederhut uses "point-light" simulations of human motion displayed on the computer monitor.

from other types of animals and the natives are treating dogs differently because they see them more as this connection with the next life."

The artifacts Fitzgerald is working with were excavated in the 1960s and 1970s by Norman Barka, a William and Mary anthropology professor who died recently. She will use some of the money she received as a Dintersmith fellow to literary theory and practice, is also improving my Chinese reading skills."

Her mentor, Xiaobin Jian, says, "By working closely with a leading Chinese scholar in the field and by getting involved in some of his ongoing research projects, Shannon is learning the Chinese perspectives first hand and approaching the 'Chinese mind' closer than many researchers have been able to." Jian continues, "The significance of Shannon's project lies in the fact that she is attempting to look at the issues from inside out. While most English written studies on China are done from non-Chinese perspectives, Shannon asks questions such as what do the Chinese people think of the issues and why do they see things in such ways?"

Reed adds, "It would be hard to undertake a project on comparative literature without guidance from experts in both Chinese and Western literature, so I consider this summer's research to be indispensable to my thesis research."

"This is particularly impressive for someone who less than three years ago did not even know a single Chinese word!" says Jian. —Lillian Stevens

The Effect of Emotion on Human Motion Perception

Dillon Niederhut with Jeanine Stefanucci, assistant professor of psychology

A few dots of light on a dark computer screen may look, at first, like nothing more than a constellation. But when those lights are put into motion, the seemingly random conglomeration becomes suddenly recognizable as a human walking, running or even imitating a Michael Jackson dance move. Dillon Niederhut is using how people react to these "point-light displays" to research not only what people perceive but how their emotions and body state might affect that perception.

"We call this the 'embodied' theory of perception, which is part of the embodied theory of the brain," he said. "The embodied theory of the brain basically states that what the mind does depends on how the body feels. This produces interesting consequences in perception."

Niederhut has been exploring those consequences with the help of Jeanine Stefanucci. Perception of distances can vary, based on factors including a person's age or physiological capabilities and the emotional state he or she is in. Niederhut is now looking into how emotional state can similarly affect biological motion.

"What Dillon wants to know is, like everything else in our lab, does the emotion of the observer change their perception of the biological motion in the scene," said Stefanucci.

Niederhut will induce emotion in his participants, then ask them to observe point-light displays. He will then ask them to make some sort of judgment about the motion that is being performed, examining how quickly participants respond and what they might say about the display.

"While distance and motion perception is very basic—even frogs see motion—biological motion processing is a higher order function. So, we have the potential for some interesting findings here," said Niederhut. "If emotion produces any continued on page 22

Dintersmith Fellows

continued from page 21

effect at all, we can show empirically that it can change higher order processing."

–Erin Zagursky

Synthesis and Analysis of Photochromic Dithienylethenes

Brooklynd Saar with Elizabeth Harbron, associate professor of chemistry

Brooklynd Saar is trying to find a use for one of the photochromic molecules known as dithienylethenes-but before she can study the molecule she has to make some of it in the lab.

"Other people have made this compound, but you can't buy it," explains Saar's mentor, Elizabeth Harbron. "Everyone has to make their own. It's not commercially available, but once she has made it, maybr we can transform it into things that no one's made before."

There is a wide array of photochromic molecules, light-sensitive chemicals that change color and/or fluorescence upon exposure to light. Dithienylethenes are a class that show particularly promising photochromic properties, in that an adroit chemist can use light to toggle the molecule between colors or degree of fluorescence. Such molecules are used in biologic studies and have potential applications for cell phones, laptop screens and other electronic displays.

Synthesis of Saar's target molecule is a challenge in itself, and she hoped to have enough of her dithienvlethene made by the end of the summer to begin analysis. She ran across some bumps in the road, mainly in the form of contamination in the synthesis process. Harbron explained that Saar is following an established, multi-step procedure to make her molecule.

"What she's trying to do in each of these steps is to add one atom," Harbron said. And not just add one atom, but add it in a very specific place." Saar is getting her target molecule as a main product, but the sample also contains unwanted byproducts.

Saar has started over again, using a different, less-reactive process and feels confident about the outcome.

"I think we've ironed out the problems," she said. "We're pretty confident that we're going to be done with the synthesis probably by the end of the summer. And then we can start working on the fun analysis part."

—Joe McClain

"Truly Though Not Ostentatiously": Wordsworth and the Odic Tradition Lindsay Gibson with Professor Adam Potkay

Lindsay Gibson will be completing her honors thesis focusing on the Romantic poet William Wordsworth's odes (written 1798-1834) in a poetic tradition that stretches back to Pindar in Greek and Horace in Latin.

"My project emerged largely from a wish to combine some of my Classics background with a

By providing research funding for both students and their faculty mentors, the Dintersmith Fellows program provides incentives for participation in activity that embodies the essence of our values as an institution.

thesis in English literature," Gibson explained. "I had studied Horace extensively in high school. At William and Mary, Professor Potkay was responsible for exposing me to Wordsworth's major odes in my freshman English survey course."

Potkay says Gibson has embarked upon an important scholarly project, embracing not only Wordsworth, but also the original works that inspired him.

"Lindsay has a firm command of the difficult Greek and Latin originals—and their English imitations and extension-against which Wordsworth would have us understand and judge his achievement," Potkay said. "There is a substantial body of secondary literature on the history of the ode form from antiquity onwards-Lindsay

as Greek, Roman and Hebrew poetry. She said some consider Wordsworth's works "dry" or a bit "stodgy" in comparison to his contemporaries and to later Romantic poets. So Gibson has decided to use odes as a lens for her analysis, to reassess Wordsworth's "revolutionary" impact on English poetry over the span of a long and prolific career.

Gibson hopes to trace the development of the ode in Classical and English literature, and to examine the ways in which Wordsworth draws on these earlier traditions. "Also, I would like to assess what he contributes to the form in later Romantic poets, particularly Keats and Shelley," she says.

"I hope to be able to read at least some of the

Lindsay Gibson and Adam Potkay mull a passage from one of her papers dealing with the odes written by English poet William Wordsworth. Gibson's examination of Wordsworth's "revolutionary" impact includes Classic works in Latin and Greek.

has already taken the first steps towards mastering this-but little of it treats Wordsworth's place in this history with any detail."

Gibson's project deals with much of the history of English and Greek literature as well Classical sources in their original languages, and I believe that my background in Classics will greatly enrich my analysis of this subject."

-Lillian Stevens

Subtleties of subtitles

Now, even the greenest of gringos can understand Cuban films

by Erin Zagursky

any Americans know Cuba only in terms of missiles, cigars or a bearded man in a fatigue jacket and hat.

Given the political tension between the U.S. and Cuba over the past 50 years, the lack of other knowledge about the nation in recent times is to be expected. But one William & Mary professor and her students are working to bring a more nuanced understanding of Cuba to the U.S. and the rest of the world. Their mission is to make the Cubans' own stories—captured on film—more accessible and comprehensible by adding subtitles in English.

"I think what we're doing is creating a more complex vision of what it means to be Cuban," said Ann Marie Stock. "We are providing students and scholars and film festival directors and attendees the opportunity to experience Cuba through the lens of Cubans."

Going to the source

Stock, a professor of Hispanic studies and film studies, has been researching Cuban films since she first visited the country to attend a 1989 film festival while working on her doctoral dissertation about Latin American cinema.

"At the time, given the U.S.-Cuba political impasse, there wasn't a whole lot of information moving back and forth and so it wasn't possible to just go to Amazon.com and buy Cuban films," she recalled. "I had to go to the source."

The film festival shifted Stock's focus to Cuba, and she began friendships with several young filmmakers.

"We stayed in touch and that gave me a unique opportunity to track their development and even see some of their work in progress, like rough cuts of films. I found myself in this wonderful position, as a scholar, of having access to information that no one else had," she said.

Stock joined the William & Mary faculty in 1993, and immediately incorporated her research into her classes. She also directed about a dozen week-long academic and immersion programs in Cuba.

At the same time, Stock was attending conferences across the world and served as a consultant to groups who wanted more con-

Jessica Boten '10 and Ann Marie Stock work on subtitling a set of credits on a Cuban film.

nections with Cuba. As she engaged with more and more people interested in Cuban culture, she wondered why information on Cuban filmmaking—and the films themselves—were not available.

"I kept thinking that somebody should take the initiative to subtitle these films, put them on DVD and distribute them in the U.S.," she said. "Eventually, I figured that was something I needed to do."

And so she created Cuban Cinema Classics, a non-profit initiative to select documentaries from the Cuban film archive and subtitle and distribute them to universities and cultural centers throughout the United States.

"What really excites me about this is that it's a research project I've worked with students on," said Stock. "They've learned a lot and loved it."

Cuban Cinema Classics

The project has grown into a two-part QEP/ Mellon Course that Stock is teaching along with Troy Davis, director of the College's Media Center.

"The idea is to bring together Hispanic studies students with a lot of knowledge of Latin American culture and skills in translation and put them beside their film studies counterparts who have some knowledge of film production and film analysis. In this way students learn from one another," said Stock.

Project headquarters are in the Media Lab, in the lower level of Swem Library, but Davis said that he and Stock have set up the subtitling process so that students can do it from just about anywhere. All they need is a laptop. "When we thought about the process, we didn't want the students chained to the computer while they were doing their subtitling," he said. "So we designed a process where we essentially create a text file."

The students watch the film as a low-res QuickTime movie while they edit a text file to enter the subtitles. Then, they go to the Media Lab and import their subtitle file into a computer that contains a high-resolution version of the movie. Davis explained that the low- and high-res versions of the films use the same time codes, which makes for easy synchronization. Working in a program called DVD Studio Pro, they can tweak the subtitles in the high-res versions.

"If all things go well, when they bring in that text file, it lines up properly," said Davis. "They may need to change the font color or the size or where it fits on the screen, that sort of thing."

But the subtitling process is not as simple as just translating, said Stock. Stock introduced students to the history of Cuba's revolutionary cinema, documentary techniques and translation theory. She also shared some strategies to meet the challenges they would face. A film soundtrack contains several aural elements often appearing simultaneously. Dialogue is spoken at the same time that a song is being sung. There may be a sign or billboard bearing important information. Just what do you translate and subtitle—and what do you leave out?

"In some cases, it's just the dialogue. In other cases, if the lyrics to the music are really important, the students translate those, too," *continued on page 24*

Cuban Film

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Stock said. "But sometimes the music is just background, and often people are talking over it and so they have to make a choice whether they choose one or the other. It's impossible to have people reading both at the same time. That's part of the decision-making process: Is what's being said more important than what's being sung?"

Jessica Boten '10 said that space constraints also make subtitling challenging. She said that each screen has a practical 14- or 15-word limit for subtitles.

"We always have that problem when subtitling," Boten said. "You have to be able to cut a 20-word sentence down without losing the meaning, which is something that we've really tried hard to work on. But it's not easy to do. You always have to work hard to find the right words to get the point across without losing the meaning."

Boten also said that it's a challenge to maintain cultural context in translation.

"Sometimes there are sayings or things that just don't translate into the English language, or something that viewers won't understand because they don't understand the Cuban culture," she said.

While some students work on subtitling documentaries, others are creating a documentary of their own—about the New Media Research Workshop. Sara Grant '10 is a member of the crew working on the documentary, which is being produced so that it is accessible to both English- and Spanish-speaking audiences. They are taping some interviews in Spanish, to be subtitled in English—and vice versa.

"We go around to the different groups and film them translating and subtitling," she said. "Then we're going to edit the whole thing together to create a final product that, hopefully, Professor Stock will be able to use to introduce Cuban Cinema Classics and give an overview of what we've been working on all semester."

"We're trying to make it accessible to everyone; Professor Stock plans to bring it over to Cuba and wants to show it to a Spanish-speaking audience," said Grant.

The students participating in the second part of the course in spring 2009 will create another documentary, this one about Cuban filmmaking.

"We'll use footage that I filmed doing interviews with two dozen Cuban filmmakers and clips from some of their films as well as others we're subtitling," said Stock. "I'm thrilled that they will be working with these interviews, ones I drew upon for the book project I just finished. This illustrates, for me, one of the concrete ways faculty research and scholarship contribute to enhancing students' learning here at the College."

On location in Cuba

Through all of her experiences with teaching and researching contemporary Cuban cinema, Stock noted the absence of a book on the subject. At the time, the most current book on Cuban cinema had stopped at about 1989, "when Cuba began to undergo some significant changes following the dissolution of the Soviet Union," said Stock.

"Cuba lost its major trading partner, lost its symbolic model and found itself in the midst of a staggering economic crisis and floundering. Given that turbulent socio-political, economic moment, you can imagine the implications for the cultural sphere.

Cuba was struggling financially, and there wasn't money to support culture like there once had been, said Stock. At the same time, internationally, new technologies were springing up. Making films had to happen very differently," she said.

"35mm film gave way to analog video which

gave way to digital video. This meant that in a few short years, a huge studio apparatus was no longer necessary to make a film," Stock said. "You didn't need 200 people and truckloads of equipment. Suddenly one person with a handheld camera and a PC with some editing software could make a film."

Those two "engines of transformation"—Cuba's repositioning after the break-up of the Soviet Union and the introduction of new technology collided "to create this really rich moment that I wanted to study," said Stock.

"By examining cinema,

I wanted to analyze how a nation like Cuba collides with the global sphere and manages to preserve a sense of home and community," she said.

With that question in mind, she began working on a book. She conducted interviews with Cubans, people she termed as "street filmmakers"—entrepreneurial Cubans who team up with state agencies and non-governmental organizations to find their own ways to finance films. She wanted to ensure she included their voices and visions in the book. Stock's book, On Location in Cuba: Street Filmmaking During Times of Transition, is due out next spring through the University of North Carolina Press.

"My intent with this book is to provide readers with an overview of Cuban filmmaking in recent years, and also a sense of the complexity, the diversity, and the nuanced perspectives of Cubans," she said. "I want to introduce some Cubans as people, as creators, and as human beings.

Impact

Stock said that she hopes her students will leave William and Mary with "some very concrete products disseminating their new knowledge." She said that she thinks Cuban Cinema Classics is impacting her students and the U.S. at the same time.

"Students are engaged in original research and making discoveries. They're not just writing papers that go in a file drawer, but are actually engaging with Cuban culture and packaging it in a way that it can be useful to others," she said. "In this country, our contact with Cubans has been limited by lots of factors, and it becomes very exciting to engage with real Cubans. I think we forget that it's a very vibrant nation comprised of exceedingly diverse individuals. So it is very empowering and energizing for our students to connect with some of those individuals, to see that diversity, through their films."

Additionally, said Stock, their work is having an impact on Cubans, particularly young filmmakers like Karel Ducases, who made the award-winning documentary *Zone of Silence* and asked Stock to subtitle it.

"Thanks to William and Mary students thanks to our collaborative efforts—this young filmmaker will have an opportunity to place his creative output at international festivals," she said. "This might be the step that moves him into the international sphere. It's really exciting to make a difference in the lives of individual people, particularly in a case where we've had such tension between our countries and there's been such a distance."

Troy Davis, director of the College's Media Center, knows video. Ann Marie Stock knows Cuban film, so the two team-taught a course.

Grants to produce more math, science teachers

The College of William and Mary recently received nearly \$2 million in grants to help prepare students to become science and math teachers in high-needs schools.

A National Science Foundation grant for \$750,000 will establish the Noyce Scholars Program at the College of William and Mary, and a \$1,172,507 grant from the Department of Education will establish the Teachers for a Competitive Tomorrow (TCT) Teaching Fellows Program at the College of William and Mary. The grants are being administered in a partnership between William and Mary's School of Education and Arts & Sciences.

"These grants from the National Science Foundation and the

Faculty members from both the School of Education and Arts & Sciences make up the team that is administering the grants. The team members include (seated, from left) Paul Heideman and Juanita Jo Matkins, and (standing, from left) Margie Mason and Virginia McLaughlin.

U.S. Department of Education make clear, once again, the College's preeminence in training K-12 teachers," said William and Mary President Taylor Reveley. "It's especially good that the grants hinge on collaboration among our education, math and science faculties."

The TCT grant will support summer research and science teaching internships for 50 undergraduate students over five years. The grant will also go toward developing three new courses in an attempt to recruit more science, technology, engineering and mathematics (STEM) majors into teaching. Those courses are: a freshman seminar on the importance of K-12 education to a free world, "How Students Learn," and "Theory and Reality: Practicum in Science and Math Teaching in High-Needs Schools." Support for TCT fellows is available beginning in the summer between their freshman and sophomore years at William and Mary. Upon graduation, the fellows will teach in high-needs schools.

The Noyce grant will support 33 students—about half undergraduates and half master's degree students—over five years beginning in spring 2009. The fellows will receive \$10,000 per academic year for up to two years (undergraduates) or for a year for the master's degree work. Recipients will teach in high-needs public school systems for two years for each year of funding received.

"William and Mary is pleased that our science and education faculty members can be supported in their collaborative work addressing one of our nation's most pressing educational issues: improving the quality of science education for the next generation of students," said Carl Strikwerda, dean of Arts & Sciences.

Faculty members from both the School of Education and Arts & Sciences make up the team that is administering the grants. The team members include Paul Heideman, professor and chair of the biology department; Heather Macdonald, chancellor professor of geology; Margie Mason, professor of education; Juanita Jo Matkins, associate professor of education; and Virginia McLaughlin, dean of the School of Education and a co-principal investigator on both grants. For the Noyce grant, Heideman is the principal investigator and the others are co-principal investigators. For the TCT grant, Matkins is the principal investigator and the others are co-principal investigators.

—Erin Zagursky

Global study shows rise in marine 'dead zones'

A global study led by Professor Robert Diaz of the Virginia Institute of Marine Science at William and Mary shows that the number of "dead zones"—areas of seafloor with too little oxygen for most marine life—has increased by a third between 1995 and 2007.

Diaz and collaborator Rutger Rosenberg of the University of Gothenburg in Sweden say that dead zones are now "the key stressor on marine ecosystems" and "rank with over-fishing, habitat loss and harmful algal blooms as global environmental problems."

The study, which appeared in *Science*, tallies 405 dead zones in coastal waters worldwide, affecting an area of 95,000 square miles, about the size of New Zealand. The largest dead zone in the U.S., at the mouth of the Mississippi, covers more than 8,500 square miles, roughly the size of New Jersey. A dead zone also underlies much of the main-stem of the Chesapeake Bay each summer, occupying about 40% of its area and up to 5% of its volume. An interactive global map of dead zones is available at www.vims.edu/deadzone.

Diaz began studying dead zones in the mid-1980s after seeing their effect on bottom life in the Patapsco River near Baltimore. His first review of dead zones in 1995 counted 305 worldwide. That was up from his count of 162 in the 1980s, 87 in the 1970s and 49 in the 1960s. He first found scientific reports of dead zones in the 1910s, when there were 4. Worldwide, the number of dead zones has approximately doubled each decade since the 1960s.

Diaz and Rosenberg write, "There is no other variable of such ecological importance to coastal marine ecosystems that has changed so drastically over such a short time as dissolved oxygen."

Dead zones occur when excess nutrients, primarily nitrogen and phosphorus, enter coastal waters and help fertilize blooms of algae. When these microscopic plants die and sink to the bottom, they provide a rich food source for bacteria, which in the act of decomposition consume dissolved oxygen from surrounding waters. Major nutrient sources include fertilizers and the burning of fossil fuels.

Geologic evidence shows that dead zones were not "a naturally recurring event" in the Chesapeake Bay or most other estuarine ecosystems, says Diaz. "Dead zones were once rare. Now they're commonplace. There are more of them in more places." The first dead zone in the Chesapeake Bay was reported in the 1930s.

Scientists refer to water with too little oxygen for fish and other active organisms as "hypoxic." Diaz says that many ecosystems experience a progression in which periodic hypoxic events become seasonal and then, if nutrient inputs continue to increase, persistent. Earth's largest dead zone, in the Baltic Sea, experiences hypoxia year-round. The Chesapeake Bay experiences seasonal, summertime hypoxia through much of its main channel.

Diaz and Rosenberg note that hypoxia tends to be overlooked until it starts to affect organisms that people eat. A possible indicator of hypoxia's adverse effects on an economically important finfish species in the Chesapeake Bay is the purported link between oxygen-poor bottom waters and a chronic outbreak of a bacterial disease among striped bass.

Diaz and Rosenberg also point out a more fundamental effect of continued on page 26

Marine scavengers abound in "dead zones."

hypoxia: the loss of energy from the Bay's food chain. By precluding or stunting the growth of bottom-dwellers such as clams and worms, hypoxia robs their predators of an important source of nutrition.

Diaz and VIMS colleague Linda Schaffner estimate that the Chesapeake Bay now loses about 10,000 metric tons of carbon to hypoxia each year, 5% of the Bay's total production of food energy. The Baltic Sea has lost 30% of its food energy—a condition that has contributed to a significant decline in its fisheries yields.

Diaz and Rosenberg say the key to reducing dead zones is "to keep fertilizers on the land and out of the sea." Diaz says that goal is shared by farmers concerned with the high cost of buying and applying nitrogen to their crops. "They certainly don't want to see their dollars flowing off their fields into the Bay," says Diaz. "Scientists and farmers need to continue working together to develop farming methods that minimize the transfer of nutrients from land to sea."

-Dave Malmquist

College libraries ranked among nation's best

he College of William and Mary's libraries are among the best in the country, according to rankings from The Princeton Review.

The rankings list William and Mary eighth in its category of "Best College Library." The list is part of The Princeton Review's annual college guidebook, the Best 368 Colleges, which was published in summer 2008.

The recognition is satisfying news for those connected to William and Mary's main campus library, the Earl Gregg Swem Library. The library recently completed an extensive renovation and expansion. The six-year, \$36.2-million construction project, completed in 2004, transformed the building (originally built in 1965) into a state-of-theart university library facility. The Wolf Law Library at the William and Mary Law School also recently completed a major renovation and expansion. The Princeton Review list did not specify a library facility. The rankings are based on surveys of nearly 120,000 undergraduates from across the country.

"We are very proud of our renovated, expanded and improved library facilities and understand their importance in the overall educational experience here," said William and Mary Provost P. Geoffrey Feiss. "Both projects at Swem and the Wolf Law Library were critically needed. It's nice to now be recognized and included among what people consider the country's best."

The expansion project at Swem Library more than doubled the building's size—from 100,000 square feet to more than 268,000 square feet. This included an additional 34,000 linear feet in collection capacity, 792 spaces in seating capacity, and information commons and the new Warren E. Burger Special Collections Wing. The late chief justice of the U.S. Supreme Court also served as William and Mary's 20th chancellor. The now wired and wireless library offers patrons computer access from any vantage point in the building. Traditional stacks are accompanied by laptops, DVDs and multi-media rooms. Other popular amenities include a 24-hour study lounge and café, new special exhibit space and individual and group study rooms.

The Wolf Law Library recently completed a \$16.8 million project in 2007. The law library is a combination of newly constructed space and a complete floor-to-ceiling renovation of the original 1980 facility. The new facility totals 57,100 net square feet, a 56% increase in size from the old library.

-Brian Whitson

Travels with Tooy wins Victor Turner Prize

ravels with Tooy: History, Memory, and the African American

Imagination (University of Chicago Press, 2008) has been selected as the winner of the 2008 Victor Turner Prize in Ethnographic Writing.

The author of Travels with Tooy is Richard S. Price, Duane A. and Virginia S. Dittman Professor of American Studies, Anthropology and History at William and Mary. Price has conducted 35 years of research among the descendants of rebel slaves living in the South American rain forest. He encountered Tooy, a priest, philosopher and healer living in a shantytown on the outskirts of Cayenne, French Guiana.

The Victor Turner Prize is a juried competition sponsored by the Society for Humanistic Anthropology. The award will be presented at the annual meeting of the American Anthropological Association in San Francisco in November.

—Joseph McClain

William and Mary isn't using quill pens

 ${f R}$ andy Coleman, an associate professor of chemistry at the College of William and Mary, has been named a 2008 Campus Technology Innovator by Campus Technology Magazine.

Coleman, who is featured in the August issue of the magazine, was one of 14 innovators chosen out of about 340 applicants from across the country. He was recognized for his use of a tablet-style computer to improve teaching and learning in his fall 2007 courses. By using a Lenova Tablet PC with a webcam and the programs OneNote and Skype, Coleman saw remarkable results in both his large-lecture and smaller classes, including the highest class average ever for his organic chemistry course and the highest-level rating he's ever received as an instructor.

"I want to let the nation know that the second-oldest university is not using quill pens," he said. "We are using tablet PCs, and it's my favorite sidekick."

Coleman's use of the tablet PC was a result of his involvement

with the Department of Information Technology's Technology Integration Program (TIP). The program seeks faculty members who are willing to take their teaching "to the next level through meaningful collaboration and experimentation," said Tammy Thrift, senior academic technologist.

Coleman previously had written on brown chalkboards during his lectures. That meant that he spent much

Randy Coleman demonstrates notebook technique

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of his time with his back to the class, and the thick, dusty chalk made it hard for students to see clearly, he said. With the use of the tablet PC—which can be turned flat and written on with an electronic pen— Coleman was able to spend much more time facing his students.

"I noticed a difference right away," said Coleman. Students were maintaining eye contact with him and he could see when students were confused and needed further explanation.

"It was almost like having a conversation," he said. "There was that kind of connection."

Coleman also uses the technology to organize his automatically saved lecture notes and post them online. Students also can annotate slides in class and write, using different colors, to show how chemical reactions occur. The process also reduces the College's carbon footprint, as students turn in papers electronically.

"The kids love it," he said. "It's changed my way of thinking about lectures."

—Erin Zagursky

X-ray marks the spot. The upper arrow shows the band worn by bluebird number 8; the lower arrow indicates the transmitter.

The sad fate of bluebird number eight

Her patience stretched, Allyson Jackson followed the beeping of her receiver, searching for elusive bluebird number eight. She saw no birds perched in the area and heard no familiar calls; however, her receiver insisted that bluebird number eight was near. Surveying the scene once more, she realized that the instrument had, in fact, led her to the culprit: a black rat snake coiled in front of her. She placed the directional antenna by the snake. A series of beeps confirmed her suspicions: Bluebird number eight had been eaten.

"That was a pretty interesting day for me," Jackson said. "I had been doing this all summer, so I started wondering if the transmitter could be in something other than a bird."

Jackson is a graduate student in biology at the College of William and Mary. She began her field study in May to investigate how bluebirds are affected by the pesticides used on golf courses, part of ongoing work by a group headed by Dan Cristol, professor of biology.

"The question of the whether golf courses are bad for birds is really interesting," Jackson said. "Bird clubs put up boxes to attract bluebirds, but no one ever thinks about the fact that golf courses lay down a lot of pesticides that could be hurting them."

Jackson employs telemetry to determine if the mortality rate of bluebirds is increased on golf courses, as compared to other reference sites. She randomly chooses bluebirds from bird boxes located on golf courses and attaches transmitters to the birds. The antenna of Jackson's receiver picks up the frequency emitted by the transmitters, enabling her to home in on the birds' locations.

"I put transmitters on the babies in the nest to see where they go and in what numbers they die," Jackson said.

Once it was clear that bluebird number eight was never going to fly off, Jackson called on her reptophile field assistant, Josh Froneberger, a student at Thomas Nelson Community College, who had joined the bluebird crew as an intern through the College's summer BioMath Research Experience for Undergraduates program sponsored by the National Science Foundation. Froneberger caught the serpent and the team kept the snake for a few days to wait until it digested bluebird number eight and passed the transmitter.

"These things are expensive," Cristol said, "we can send the transmitter off, get the batteries changed and use it again and not have to buy another."

-Rachel Apostoles

Marine Technology Society honors VIMS professor

he Marine Technology Society has bestowed its Lockheed Martin Award for Ocean Science and Engineering on Mark Patterson, associate professor at the Virginia Institute of Marine Science.

Patterson is a marine biologist and world expert on underwater robotics with patents in autonomous underwater vehicle (AUV) technology and neural-network recognition of targets from side-scan sonar. He has developed and deployed underwater instrumentation from the Hydrolab and Aquarius underwater habitats, and his work on how flow modulates the metabolism of corals is cited in many textbooks in marine science.

Patterson co-founded Sias Patterson Incorporated, the first company devoted to the design and manufacture of small AUVs. The company's flagship product, Fetch, racked up a long list of firsts, including qualifying as the first swimming supercomputer.

Fetch became commercially available in 1996, well before other technologies developed in Navy-sponsored labs went commercial. Patterson was intimately involved in all aspects of Fetch's development, including the LabVIEW code that controls it, which evolved into a cross-platform "AUV toolkit" used on Northrop Grumman's NNEMO1 AUV. He has been honored with the Antarctic Service Medal and the Phi Beta Kappa Award for Scholarship.

The Marine Technology Society is an international organization of marine scientists, technicians, educators and policy makers. Patterson has been a member since 1998.

-Dave Malmquist

\$2.5 million commitment will assist libraries

College of William and Mary alumna H. Elizabeth "Bee" McLeod '83, M.B.A. '91, and her husband, J. Goodenow "Goody" Tyler III, of Norfolk have committed \$2.5 million to provide students, faculty and the greater community access to information through state-of-the-art library systems.

McLeod and Tyler's gift provides \$1.5 million to the Earl Gregg Swem Library—the largest gift in the library's history—and \$1 million to the Mason School of Business. The business school's future facility, Alan B. Miller Hall, will include library space named in honor of McLeod.

"I grew up in a house packed with books," explained McLeod, who retired in 2007 as director of Network Operations at Cox Communications. "William and Mary is doing tremendous things in the digital area, but traditional books and materials are irreplaceable."

"Because a library is the heart of any academic community, Bee and Goody's support for libraries at William & Mary is especially meaningful," said William and Mary President Taylor Reveley. "We are very grateful for this gift and the good it will do now and far into the future."

The gift of \$1.5 million to Swem Library will support the library's first named position, the Marian and Alan McLeod Director of the Special Collections Research Center. In making the gift, the couple is honoring McLeod's parents for their dedication to academic research and passion for great libraries. With an extensive collection of manuscripts, rare books, and other original sources, the Special Collections Research Center is a learning lab for students in the

humanities, much like physical laboratories are for students in the sciences.

"This gift will directly impact the faculty, students and researchers who rely on Swem to provide unique research materials in the Special Collections Research Center," said Connie Kearns McCarthy, dean of university libraries. "This gift also recognizes the outstanding work of Swem's librarians such as Dr. Beatriz Betancourt Hardy, who will hold this named position."

Through McLeod and Tyler's support of the Mason School of Business, McLeod celebrates her special connection with the School, where she received two degrees, and her lifelong love of libraries. Upon completion of the business school's new facility, the Elizabeth "Bee" McLeod Business Library will be located off the main public space on the building's second floor, a prime location that will elevate the services that the school provides its students. The library will provide patrons with access to electronic and print business research resources, as well as research assistance by a professional business librarian. The McLeod Business Library will also have such librarystyle services as course reserve materials, electronic catalog with access to all campus libraries, study areas and copy services.

"The Mason School of Business has long been dedicated to ensuring that its community has fast access to the most accurate and up-tothe-minute business information," said Larry Pulley '74, dean of the business school. "Bee and Goody's generosity will create a state-ofthe-art library and information center in our new building."

-Brian Whitson

Katherine Preston

Preston is Fulbright Distinguished Chair

K atherine K. Preston will spend the spring 2009 semester at the University of Leiden in the Netherlands, after being named the Walt Whitman Distinguished Chair of American Culture by the Fulbright Center of the Netherlands.

She will teach a course for undergraduates on American popular music and a course for graduate students on music in American film.

"I love to travel and I love to be in different places," said Preston, the David N. and Margaret C. Bottoms Professor of Music. "What I learn from this kind of travel is a different perspective on my own research and different perspective on education."

Preston, who will be teaching in Leiden's American studies department, has previously taught both classes she will teach while in the Netherlands. As an Americanist, she said she hopes to "share what we have with the world."

"Students in the Netherlands have no clue about the wealth of

musical activity in this country during the 18th and 19th centuries, not to mention the 20th Century," she said. "I hope to introduce to them this aspect of American social and cultural history." And while her students are learning about American music, Preston hopes to learn more about the music of the Netherlands.

"I'm going to a country with a great concert tradition—especially in the performance of early music," she said. Preston said she also will try to make some time to travel to England and conduct research.

—Erin Zagursky

Mitchell Byrd (left), exchanges congratulations with Bryan Watts.

Eagle researchers honor two of their own

A group of conservationists and eagle researchers took a break in a day of review and discussion of the current status of bald eagles to honor Bryan Watts and Mitchell Byrd of William and Mary's Center for Conservation Biology.

Watts and Byrd—and the CCB itself—were recipients of U.S. Fish and Wildlife Service's National Recovery Champion awards for 2007. The luncheon presentation was a break in a day-long set of activities at the Virginia Department of Game and Inland Fisheries office at the Rice Center of Virginia Commonwealth University on June 12. That morning, Byrd and Watts had a group, including federal wildlife officials from offices in Washington, D.C., and Hadley, Mass., out on the James River to look at habitat used by bald eagles. After lunch, Watts gave a presentation on the strategic importance of the upper James and other areas of the Chesapeake Bay region. Such areas, he said, are important to migrating bald eagles from populations that nest along the entire Atlantic coast, from Florida up into the Maritime Provinces of Canada.

The day's activity was typical of the work that earned Watts and Byrd recognition for their contribution to the comeback of bald eagles. Virginia-based U.S. Fish and Wildlife Service officers Joe McCauley and Karen Mayne prepared the documents nominating Watts and Byrd for the Recovery Champion award, in recognition of decades of work to bring back bald eagles on the east coast.

Watts' presentation sparked a three-hour discussion among state and federal wildlife officials with Center for Conservation Biology staff and other conservationists, including representatives of VCU and the Richmond Audubon Society. The discussion centered on the need for amended federal policies to protect sensitive areas of eagle habitat within the Chesapeake Bay region in the wake of the June, 2007 removal of the nation's bird from the U.S. Endangered Species List. —Joseph McClain

Study shows mycobacteriosis spread in stripers

A study led by researchers at the Virginia Institute of Marine Science at William and Mary is the first to demonstrate that striped bass in the Chesapeake Bay are succumbing to mycobacteriosis. This chronic bacterial disease, first detected in Bay stripers in 1997, now infects more than half of all striped bass in Bay waters.

The study, which appears in the October 2008 issue of *Ecological Applications*, was authored by VIMS researchers David Gauthier, Rob Latour, Chris Bonzek, Jim Gartland, and Wolfgang Vogelbein, as well as Erin Burge of Coastal Carolina University and Dennis Heisey of the U.S. Geological Survey's National Wildlife Center.

Observation of mortality among wild fish is typically limited to acute fish-kill events of schooling species such as menhaden, when large numbers of dead fish float to the surface or wash up on shore.

Detection of mortality from chronic infections is much more difficult, as fish are likely to die by ones or twos through time across a wide area. "Due to the chronic nature of mycobacteriosis in striped bass, the mortality is cryptic," says lead researcher Gauthier. "That makes it difficult to measure."

Knowing whether mycobacteriosis ultimately kills Bay stripers is of concern to fisheries managers and anglers all along the Eastern seaboard. Striped bass are one of the region's most economically and ecologically important finfish, and the Chesapeake Bay is the main breeding and nursery ground for this species on the Atlantic coast.

Evidence that mycobacteriosis might be killing Bay stripers comes from recent fishery stock assessments, which show an increase in natural, non-fishing mortality among striped bass in Maryland waters since 1999. However, these studies do not differentiate between death due to disease and death due to factors such as predation or old age.

To test if mycobacteriosis has contributed to the observed increase in natural mortality, the researchers fed data from a three-year field survey of mycobacteriosis in Chesapeake Bay striped bass into a stateof-the-art demographic model developed by co-author Heisey.

The team conducted the survey work between 2003-2005 in collaboration with the Chesapeake Bay Multispecies Monitoring and Assessment Program (ChesMMAP), an ongoing VIMS study of fish demographics and food-web interactions in the Bay.

"That's what sets our study apart," says Vogelbein, a fish pathologist at VIMS. "We were able to provide our model with field data showing the prevalence of infection in different age classes through time."

For each of the 1,420 striped bass sampled, the researchers determined the fish's age, sex, and whether it was diseased with mycobacteriosis. They then fed these data into their model. Their findings show that:

- A fish infected with mycobacteriosis is only about 70% as likely to survive another year as a non-infected fish.
- Older females are more likely than males to succumb to mycobacteriosis, perhaps due to the demands of spawning and migration.
- Disease-related mortality increases through the summer, possibly

A striped bass specimen infected with mycobacteriosis

due to stress from warm temperatures and low oxygen levels in the Chesapeake Bay.

The authors caution that the results of their model rest on several assumptions. One is that an infected fish will remain diseased throughout its life. A second is that the risk of death from mycobacteriosis is independent of age. They write that these assumptions "are reasonable given the current understanding of mycobacterial pathobiology in fishes, but require testing, especially in the context of wild populations."

"We think our work will inspire tests of these assumptions," says Gauthier, "and thus help develop more sophisticated models of disease dynamics based on directed field studies and experiments." —Dave Malmquist

William Starnes in his lab in ISC 1

Chemist joins inaugural Walk of Fame class

C hemist William Starnes is a member of the inaugural class of the Southwest Virginia Walk of Fame, a group that includes other accomplished natives of the region, such as the Stanley Brothers, Daniel Boone and actor George C. Scott.

Starnes, a native of Lee County, is the Floyd Dewey Gottwald, Sr., Professor of Chemistry, Emeritus, at William and Mary. Though he holds emeritus rank, Starnes still conducts research in his lab in the Integrated Science Center. He is one of the world's leading experts in the chemistry of vinyl plastics, particularly PVC—poly(vinyl chloride), the world's second most widely used plastic material.

At William and Mary, Starnes perfected, patented and licensed an alternative PVC stabilization technology based on organic compounds known as ester thiols. His discovery provides a more environmentally friendly alternative to the toxic heavy-metal additives traditionally used in the manufacturing of PVC articles. Tests are ongoing to determine which of the tens of thousands of PVC products will be most appropriate for the new stabilizer/plasticizer technology.

"We are happy to have Dr. Starnes as the sole scientist in our inaugural class," said Sharon Ewing, director of the Southwest Virginia Museum in Big Stone Gap. The walk of fame was inspired by the Virginia Legends Walk in Virginia Beach, she said.

Starnes joined the William and Mary faculty in 1989, working in the departments of chemistry and applied science. Before joining the College, he worked at Polytechnic University, Brooklyn and at Bell Labs. With nearly 500 publications, patents and oral presentations to his credit, Starnes was listed by the Plastics Pioneers Association in 2001 as one of fewer than a thousand individuals worldwide who have had the greatest impact on the history of plastics.

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OUR FACULTY-STUDENT RESEARCH INITIATIVE MOVES FORWARD

illiam and Mary's Faculty-Student Research Initiative has made a great deal of progress towards one of its primary goals—bringing research inside the undergraduate curriculum.

"We're moving on a number of fronts," said Carl Strikwerda, dean of Arts & Sciences. "We're pushing a lot of innovative projects using the Mellon money and the Quality Enhancement Plan—QEP—money that came out of the SACS accreditation. We have all these ways that we're giving small amounts of money to faculty members to come up with projects to test new ideas about how to bring students into research."

The QEP, which emerged from the College's accreditation self-study, was drawn up to promote independent inquiry at the upper-division level, in part by emphasizing faculty-student research. The Faculty-Student Research Initiative itself was begun in 2006 and later received financial backing from the Andrew W. Mellon Foundation.

Joel Schwartz is director of the College's Roy R. Charles Center, which promotes undergraduate research and scholarship, and so became the natural headquarters for the Faculty-Student Research Initiative, administered through a faculty panel known as the QEP/Mellon Committee. Schwartz noted that at William and Mary science departments have long been natural incubators for involving undergraduates, as researchers often bring students into their labs.

The QEP/Mellon Committee wanted to create similar research opportunities in other

disciplines, and to more fully integrate research into the curriculum. To that end, the committee conducted information sessions and workshops for faculty in the humanities, social sciences and arts. A particularly effective component of these workshops were presentations by nonscience faculty who have successfully integrated research experiences into their coursework.

"Sometimes we use the term 'teaching with research,'" Schwartz said, "communicating concepts, theories and knowledge via hands-on research experiences rather than through traditional lectures." Their efforts were successful. The committee's first annual report describes 26 funded faculty-student projects that were initiated in the past year: 10 are in humanities disciplines; 9 are in the social sciences; 4 are in the sciences; and 3 are in mathematics.

One of the projects involved the digital electronics course taught by Seth Aubin, assistant professor of physics. Backed by funding from the committee, Aubin was able to buy electronic equipment that allowed him to incorporate a class research project on integrated field programmable gate array chips into the last month of the class.

"On the other end of the academic spectrum, ambitious research opportunities will be integrated this year into the Latin program in the Department of Classical Studies," Schwartz said. "Students in several spring, 2009 Latin courses will identify topics, form hypotheses and conduct literature reviews; then, with this preliminary work complete, they will travel to Roman sites with their faculty mentor in the summer to actually do the research."

He said the initiative is being organized by Barbette Spaeth, chair of the department. Schwartz said the experience might serve as a model for incorporating research more fully into William & Mary's study-abroad programs.

"One of the problems we've had trying to integrate research into study-abroad is that time is limited when students are on these programs," he explained. "Here, they're really doing all the literature review and preparation in advance, so the ducks are really lined up and they can get there and start using archaeological sites or original sources very quickly and productively."

The Faculty-Student Research Initiative is attracting additional financial support. Schwartz pointed to the establishment of the Weingartner Global Initiative, a recent initiative brought about by the generosity of Mary Ann and Werner Weingartner. The program creates a two-year Weingartner Professorship in International Studies, who will mentor two to six student researchers. Schwartz said he expected the name of the first Weingartner Professor to be announced soon.

Schwartz said that the faculty-student research initiative continues to encourage the development of "co-curricular" research, the traditional types of arrangement in which faculty mentor students in their labs and on projects outside of class. He mentioned the success of the Dintersmith Fellowships (see page 20).

—Joseph McClain

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