DISCOVERY:
FLORIDA TECH
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Splash Heard 'Round the World

In Thailand, Dr. Lee Harris inspects one of the Reef Ball artificial reef units covered with propagated corals.

In fall 2005, **Dr. Lee Harris** was a pinball of activity. In less than five weeks, he ricocheted from Melbourne to Grand Cayman to Thailand to New Zealand and back to Melbourne. But it wasn't pinballs on his mind. It was Reef Balls©.

In his September-October travels, the ocean engineering associate professor propagated coral, reconstructed tsunami-damaged natural reefs, combated beach erosion from hurricanes and put in motion a plan to thrill surfers. Reef Balls and artificial reefs were central to these projects.

A Reef Ball is a designed, artificial reef made of marine-friendly concrete, deployed to mimic natural reef systems. The hive-shaped masses restore ailing coral reefs, create new fish habitats and scuba diving sites, and establish badly needed breakwaters where beaches have eroded into the sea.

Pocked with big, Swiss cheese-like holes and in a range of sizes, Reef Balls become homes to corals and reef-dwelling fishes.

Jetting first to Grand Cayman, Harris and Florida Tech graduate students, **Doug Bowlus** and **Ashley Naimaster**, joined a team of about 20 skilled volunteers at Grand Cayman's famous Seven Mile Beach. Harris spent an action-packed nine days there augmenting work he began in 2002, when he first investigated the island's beach erosion problems. Since 1995, he has published more than 10 papers on artificial reefs as submerged breakwaters for erosion control.

Helping Grand Cayman recover from a direct hit by 2004's Category 5 Hurricane Ivan, Harris on this trip, demonstrated and taught coral propagation to the staff of the Cayman Islands Department of the Environment. They rescued and re-attached a variety of target species of imperiled

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Discovery: Florida Tech
Focusing on the discoveries and innovations faculty and students are making at Florida Institute of Technology.

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Dr. Harris and Todd Barber, chairman Reef Ball Foundation, Inc., discuss the artificial reef deployment plan.

corals that had broken off the shallow reefs.

The scuba diving volunteers fastened the live coral "plugs" to the 250-unit artificial reef breakwater in the shallow waters offshore. They dived further out, nurturing coral on Cemetery Reef, creating two new artificial reef sites.

"These efforts should help stabilize the beach and shoreline. This should improve the health of the underwater environment and attract tourists," said Harris.

"Time is critical. Damaged coral eventually dies completely if it doesn't have a stable substrate," he said. With healthy, "snorkelable" reefs, "we're not just rebuilding the reefs, we're helping to rebuild tourism."

Harris and the graduate students also taught Reef Ball assembly and casting, supervising the entire restoration effort for film crews. The filmmakers were on the Western Caribbean island shooting for BBC TV's "Jewel of the Caribbean" special.

Another TV crew, for a Travel Channel show, awaited Harris in Thailand, where he joined a post-tsunami artificial reef project. The team there worked to restore coral reefs on Racha Island, just south of Phuket.

"The December 2004 tsunami made a real mess of the corals in the bay. We were invited by several organizations and the country's prime minister to expand coral rescue, reef cleanup and rehabilitation," said Harris.

Something Completely Different

Countering beach erosion and protecting a fragile environment are undisputedly worthwhile. Making a good surfing beach better has its passionate advocates, too. This is another function of an artificial reef.

The mission of New Zealand's Mount Maunganui ("Mount Reef") Reef Trust is to create an artificial surfing reef for consistent, kow-abunga!-quality waves. The location is already known as the country's "Surf City."

A surfer himself, Harris enthusiastically tackled this project on the last leg of his autumn travels. He advised the project's director, Dr. Kerry Black, a professor at nearby University of Waikato, on how to build the reef by deploying sand-filled geotextile containers.

The bags of sand create a submerged, artificial reef to kick Surf City up a notch, improving the wave breaking for surfing. Causing waves to break offshore, the reef should also protect beaches and provide a hard substrate for marine organism colonies.

Harris's fall engineering trips built on more than 25 years of multifaceted oceanography and ocean engineering project experience. Much of it he conducted on beaches nearer to home.

In 1999, 2001 and 2002, he tested water-filled portable breakwaters for the U.S. Army Corps of Engineers at Port Canaveral and Fort Pierce, Fla. He has advised award-winning student human-powered submarine teams, who combine scuba and engineering in a fun project.

Harris has helped create artificial reefs in Florida with projects off seven counties. All are now thriving marine life habitats.

"Lee's interests in water sports, such as surfing and diving, are legendary," said **Dr. George Maul**, Harris' department head. "He is a great teacher and accomplished researcher, and is truly dedicated to the success of his students."

Returning to teach at the end of October, Harris brought hands-on experiences back to his classrooms. He had fresh, real-life engineering stories for his classes in coastal structures, coastal processes, and port and harbor engineering. And, what he didn't tell them about, they could see themselves, just by turning on their TVs.

Karen Rhine

Ocean engineering graduate students Doug Bowlus and Ashley Naimaster learn mold construction techniques for fabricating Reef Ball units from Larry Beggs, president of Reef Innovations, Inc.

For more on Dr. Harris and his work with artificial reefs, visit www.fit.edu/AcadRes/dmes/faculty/harris.html

Understanding Autism:

Florida Tech Researchers Seek to Enhance Quality of Life for Children Living with a Complex Condition

"What people still don't understand is that autism is a diagnostic label, not a disease to be cured."

In one sweeping statement, Florida Institute of Technology Assistant Professor of Psychology **Matthew Normand** paints the challenge that autism researchers and clinicians face every day.

"An autism diagnosis is a difficult one for both doctors and families," said Normand. "Causal evidence isn't easy to find—there's no identifiable biological marker and therefore no medical cure. But, because it's a medical diagnosis, parents expect treatment to follow the medical model. And it simply doesn't."

For Normand and fellow autism researcher, Associate Professor of Psychology **David Wilder**, autism research and clinical work go hand-in-hand.

"We approach the clinical practice the same way we do research," said Normand. "We define a goal, do baseline measurements and update our data throughout the treatment process. For the outside observer, it's difficult to distinguish when we're doing research and when we're providing clinical help. All of our work dovetails into helping the child."

> "We define a goal, do baseline measurements and update our data throughout the treatment process."
>
> *Dr. Matthew Normand*

The two Florida Tech faculty members have been doing autism research at the university since the summer of 2003, and the majority of the children they work with are 5 to 8 years old. While they collaborate together, their research focus is on decidedly different tracks. Wilder works with children to correct abnormal behavior, and Normand tries to help them acquire better mechanical and language skills.

"I assess and treat problem behaviors," said Wilder. "I try to correct instances of self-injury, property destruction, pica (eating inedible food, like wood or cardboard) and food refusal."

Normand's focus is on teaching new skills, including toileting, dressing, and language and communication. In particular, he scientifically evaluates popular treatment techniques.

For Wilder, the difficult question at the root of his research is, "Why?" Why do autistic children repeat behaviors like banging their heads against walls? The key to learning the answer lies in creating a controlled environment.

"We conduct research by setting up conditions that allow us to eliminate reasons for problem behaviors one-by-one," said Wilder. "We use typical control methods in the scientific process so that if a behavior occurs for one reason we'll be likely to see it."

In addition to understanding behavior causes in a specific child, Wilder seeks to reinforce a long-established set of behavior commonalities. Because a number of factors can trigger improper behaviors, from simple eye contact to a particular tone of voice to facial expressions, parents can encourage problem behavior without realizing it.

David Wilder, left, and Matthew Normand continue research into the difficult world of autism.

"As a parent, you really can be trapped by a self-injuring autistic child in this way," said Wilder. "If your daughter is banging her head against the wall, your first—and correct—inclination is to go to the child and stop her from repeating the behavior. Unfortunately, in doing this you're reinforcing her actions. It's a no-win for the parent."

The key, then, is to stop the behavior before it occurs. So Wilder looks for these triggers and helps parents eliminate them from the home environment.

Normand's work is somewhat different. He is trying to learn what specific teaching approaches actually work. He's limiting his research to methods that he believes are truly plausible.

"There's a lot going on when a child is being treated for autism," said Normand. "We pull out specific treatment components and test them in isolation as much as possible. In this way, we can better measure the effectiveness of an individual treatment."

Normand is currently researching whether a specific type of stimulus-stimulus pairing procedure can be an effective way to encourage language development in children with autism.

"We're trying to determine if self-vocalization can work as conditioned reinforcers in teaching children to talk. The theory is that if you teach them certain sounds, they can use those and self-reinforce communication behaviors," said Normand. "Right now, though, we're finding very little evidence that this method is effective."

Both researchers know that they are part of a long process. For Normand, there is no shortage of unvalidated tools to evaluate. Wilder believes that his continuing research will be beneficial to both children and parents. Both know, however, that there is no silver bullet for autism, and that both parent and child face a difficult journey.

"On the autism spectrum, higher functioning children have better lifetime outcomes," said Wilder. "But no matter the level of functioning, early intervention is critical. Without a change in the learning environment, there will be no change in behavior, and that child will likely become an institutionalized adult."

Jay Wilson

Hurricanes Help Tarpon Population

Who likes hurricanes? Tarpon do. "Tarpon larvae love hurricanes," said **Dr. Jonathan Shenker**, associate professor of biological sciences. Hurricanes give them a fast, free ride to their nurseries.

Tarpon larvae drift around in the Atlantic Ocean until they can ride a current to where they grow to be juveniles. After a hurricane, or an especially strong tropical storm, a large number of tarpon larvae show up in inlets and along the coast.

Shenker said 1995's Hurricane Erin brought the most tarpon larvae he has ever seen into Sebastian Inlet. He and his students collected more tarpon larvae samples in one week than they would normally collect in two years.

The translucent one-inch tarpon larvae grow into juveniles in marsh and mangrove areas, taking about seven years to reach maturity before they migrate to coastal waters and inlets. They can live for more than 50 years and grow to eight feet and 280 pounds, although most are 25 to 80 pounds. The world record of 283 pounds was caught in Africa.

Shenker studied tarpon for 10 years—all life stages from larvae to adult. He and his fellow researchers at Florida Tech make up the only group that focuses on juvenile tarpon. His current team consists of four graduate students, two undergraduates and volunteers who collect field samples.

These tarpon experts are ideally located for research because the Indian River Lagoon has the best known nursery habitat in the United States, according to Shenker. He and his students routinely wade in neck-deep water to net juvenile tarpon at marshes near Sebastian Inlet. Mosquito impoundments associated with marshes at Long Point Park and the Pelican Island National Wildlife Refuge are among the best local tarpon nurseries.

Adult tarpon appear to start migrating from the Keys north up the East Coast in the spring, arriving in coastal waters of Central Florida in early summer. Many fish stay along the local beaches, while others migrate as far as North Carolina before heading south in the winter. Other tarpon migrate along the west coast of Florida and from Central America through Texas and Louisiana.

Shenker said, "We're trying to answer some of the biggest questions about the biology and management of tarpon—where do they come from and how do we best protect them?" Although tarpon spawn offshore, primarily in May and June, scientists aren't sure where this occurs. Shenker asked, "Do lagoon nurseries provide the adults we find in our areas, or do our adults migrate from other nursery areas in the Caribbean, Mexico or elsewhere?"

This 20-day-old larval tarpon was caught in the Sebastian Inlet while it was moving from the offshore spawning habitat into the Indian River Lagoon mangrove nursery habitat. The 1mm ruler marks indicate it is nearly one inch long.

These baby tarpon were caught in a local mangrove marsh. They are probably 2–3 months old.

Florida Tech students use a seine net to corral baby tarpon.

To answer these questions, Shenker applies a variety of tools, including DNA fingerprinting. This DNA evidence should help Shenker understand whether populations are mixing throughout their range, or if there are local isolated populations. He also takes samples periodically throughout the year, especially after hurricanes, in mosquito impoundments in the Pelican Island National Wildlife Refuge and other Indian River habitats. The

number of juveniles found in the refuge increased dramatically after the 2004 hurricanes, with several hundred three- to four-inch juveniles found in just a single pool of the marsh. "We've seen a good number in 2005 too, but not near the numbers we saw in 2004," Shenker said. "Hurricanes Francis and Jeanne probably pushed huge numbers of

larvae from their offshore spawning ground toward the coast, where they made their way through Sebastian Inlet and into the surrounding marshes."

They've been swimming in our oceans since prehistoric times. In addition to Florida, they are found in the Caribbean, Central America and northern Brazil. A different species of tarpon lives in western Africa.

Despite the tarpon's vibrancy and appeal, very little is known about this species. Because they aren't endangered, research funding is not readily available. It's difficult to convince some funding agencies that they should care about what happens to the tarpon population. Shenker says there are at least two reasons to care. Obviously, anglers and others involved in sport fishing care because the tarpon is a premier game fish that is prized for its strength, stamina and fighting ability. Fishing guides, fishing tournaments and all facets of the recreational fishing industry know that tarpon are one of the biggest money-makers for local economies.

Another reason to care is that development is diminishing the tarpon habitat. What happens to the juvenile tarpon population will impact adults 10 years later. By the time a drop is noticed in the adult fishery, it may be too late to easily help it recover. Identifying critical juvenile tarpon habitats will help researchers focus their conservation efforts on the most valuable regions.

"We're trying to answer some of the biggest questions about the biology and management of tarpon—where do they come from and how do we best protect them?"

Dr. Jon Shenker

In addition to population counts, Shenker is also gathering information on how the population changes over time and in different locales—right down to the DNA level. A small sample from the tarpon's dorsal fin is all he needs. About 40 anglers across the state are involved in his "Fishing for Science" project. When they catch a tarpon, they clip a half-inch section from the end of the long filament that extends from the rear of the tarpon's dorsal fin. "This clipping does not injure the tarpon," Shenker explained.

A Florida Tech student caught this 1-year-old juvenile tarpon in a local marsh. This is the size that is ready to move out of the upper marshes into larger bodies of water.

Anglers also record the length, estimated weight, date and location of the catch before releasing it back into the water. The sample is preserved for DNA analysis in ice or drinking alcohol. "High-proof vodka works just fine," Shenker said. The samples help Shenker build a genetic database on the tarpon. Specifically, it will help him determine whether the Indian River Lagoon juveniles are closely related to migratory adults who travel along Florida's coastlines. This will help unravel the mystery of their origin.

In addition to DNA from present-day catches, Shenker recently acquired samples from the early 1950s. A friend at a Florida museum rescued tarpon scale samples from consignment to the trash bin. This catch represents a potential gold mine for his DNA research. "We'll be able to tell what the tarpon population was like 50 years ago, and this gives us an unparalleled opportunity to see how this wonderful fish has changed genetically," he explained.

Finally, Shenker and his students are looking at little bones called otoliths in the inner ears of tarpon. These bones are diaries that pick up a signature of the chemical composition of the water of their juvenile nursery. "These otoliths give us a powerful tool to identify nursery habitats used by adult tarpon, and further help us focus our conservation efforts," Shenker said.

Shenker's research will help preserve this valuable sport fish so future generations can enjoy the challenge of hooking and fighting a silver king.

Melinda Millsap

If you want to help Shenker with his DNA research, join the "Fishing for Science" team by contacting him at (321) 674-8145 or Shenker@fit.edu.

Climate Change:
50 Years and Counting

"We are OK for the next 50 years, but after that, all bets are off," said **Dr. Mark Bush**, professor of biological sciences.

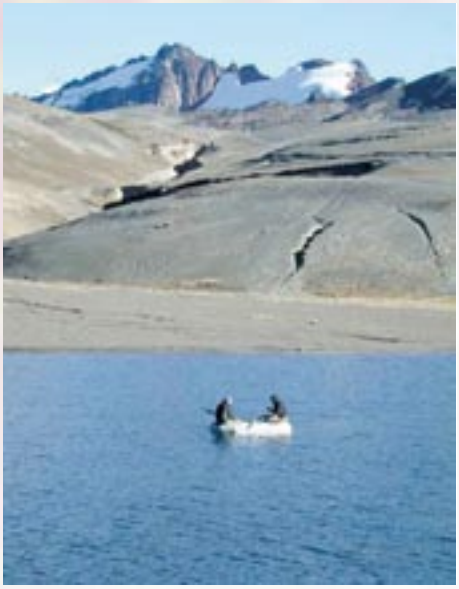
Bush said this is not a doomsday prediction, but given the uncertainties over how climate will respond to loading the atmosphere with greenhouse gases, humanity has embarked on a global experiment. Humans will survive, but other species may not be so lucky after 2050.

Bush's statement is based on recent climate change research, including his own research conducted in the Andes-Amazon region of South America with doctoral candidate **Jennifer Hanselman**, **Dr. Gina Paduano** and post-doc **Dr. Will Gosling**.

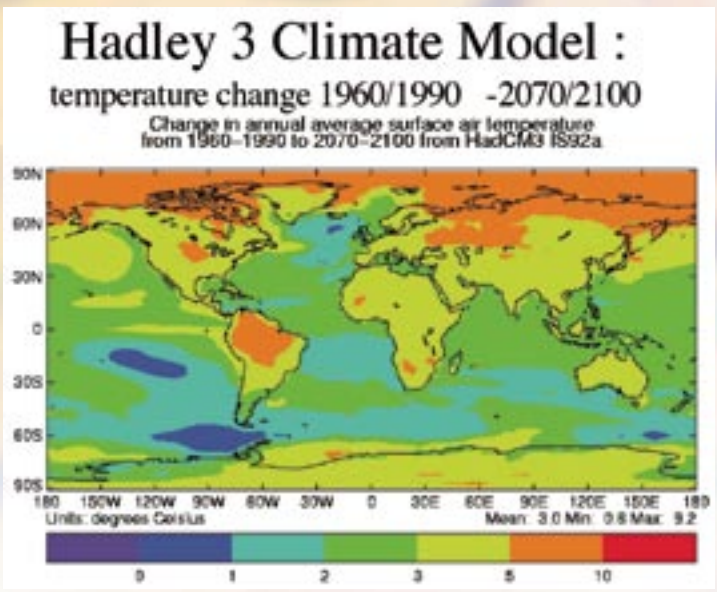
Core samples from deep drilling in the Antarctic and Andes indicate a rise in carbon dioxide (CO_2) that correlates with a subsequent rise in temperature. "CO_2 appears to be the trigger that leads to rising temperatures," Bush said. For thousands of years, the maximum level of CO_2 in the environment was about 280 parts per million (ppm). In just the last 250 years, the CO_2 level has risen to 380 ppm. The CO_2 content of pre-industrial age air was discovered by measuring gas bubbles within polar ice caps, and the recent rise of CO_2 concentration, about 5 ppm per year can be measured anywhere on Earth.

"The climate has been oscillating stably for at least the last half million years," Bush said. But this is going to change, according to Bush. Climate change models project Earth to be somewhat warmer in the future. "Once Earth starts to warm, it can't just be turned off," he explained.

Climate change models project a continued rise in CO_2—up to 700 ppm by 2100, with about a 5 degrees Celsius warming and little change in precipitation for Amazonia. "As temperatures continue to rise, they will be warmer than anything experienced in the last two million years. You would have to go back at least eight million years to get to CO_2 concentrations of 700 ppm, which is what we will have by mid-late this century," Bush said.



Post-doc Will Gosling, left, and doctoral candidate Jennifer Hanselman take core samples from Lake Estrellani in Bolivia at an elevation of 4,655 meters.

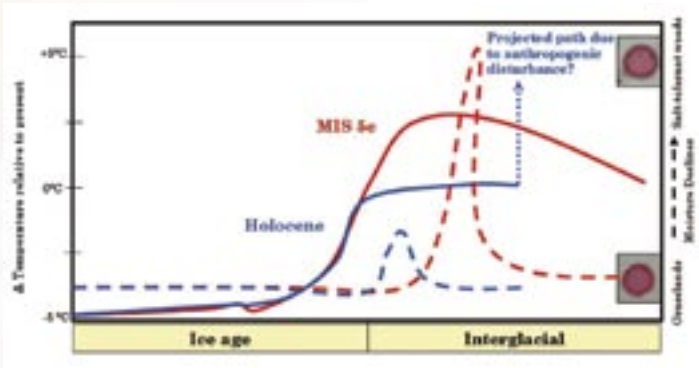


Bush suggests we might get an idea of what Earth could be like in 2050 and beyond by comparing modern settings with those of previous interglacials, specifically Marine Isotope Stage 5e (MIS 5e), data derived from core samples. "This could offer an accurate analog for our present interglacial," Bush said.

A core from deep drilling in Lake Titicaca, which borders Peru and Bolivia in the Andes, makes this correlation possible. The 140-meter-long core from beneath 220 meters of water provides a 370,000-year record of

"The uncertainty in this prediction is not that climate will change, for it will, but whether plants and animals are allowed to respond naturally to that change."

Dr. Mark Bush

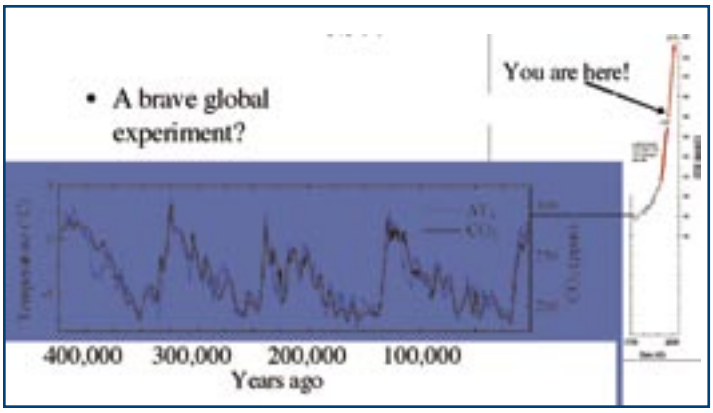


The present interglacial (Holocene, blue line) and the previous interglacial (MIS 5e, red line) have similar patterns of temperature (solid line) and moisture (dashed line) during the ice ages prior to warming and during the initial warming phase. The peak of MIS 5e is warm and very dry, characterized by the representation of Chenopodiaceae/Amaranthaceae, which are salt-tolerant weedy plants. This extreme has not been documented in our current interglacial, which has been primarily grasslands. Human (anthropogenic) impacts predict unprecedented temperature increases, as visualized by the blue dotted line.

climate change in the Andes and represents four interglacial periods. Of these four interglacials, MIS 5e is clearly more extreme than the present interglacial (The Holocene), probably about 2 degrees Celsius warmer than the one we are in now. The present interglacial started 11,000 years ago.

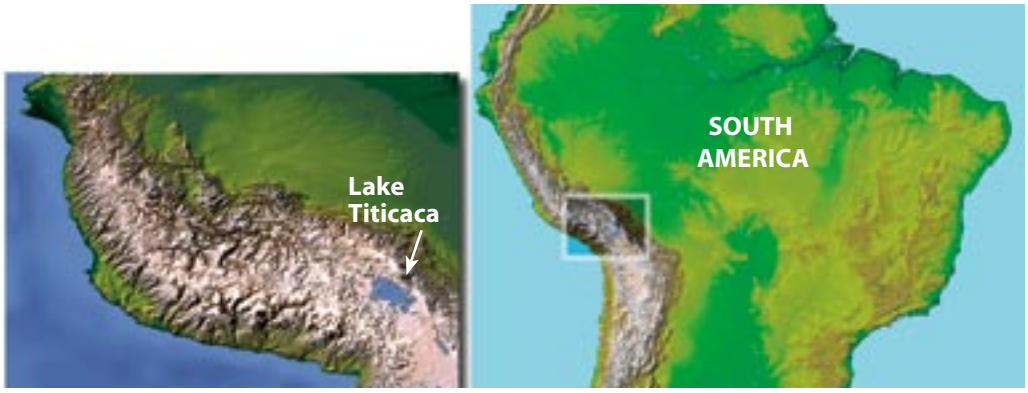
Fossil pollen in sediments from MIS 5e shows a strongly seasonal environment, more so than the present. "Given the projections of future change, MIS 5e is probably roughly equivalent to the climate that we will experience in the middle of this century in the Andes," Bush said.

Dr. Mark Bush tows coring gear in Lake Sauce, Peru.



Almost all Amazonian and Andean species are several million years old, and finding more extreme climates just 117,000 years ago tells us that species have already survived at least this much climate change. However, in the second half of the century the projected climate is yet more extreme and species' survival is far less certain. Even in the next 50 years, there may still be an extinction event due to the combined effects of human actions and climate change. "If human activity allows species to migrate, the climate change that they experience in the first half of this century should not induce a wave of extinctions, but this is a big if," Bush said. "The uncertainty in this prediction is not that climate will change, for it will, but whether plants and animals are allowed to respond naturally to that change." In the past, animals could migrate freely—there was no development blocking their path to more favorable climates. Some species will adapt, but some may not. "This potential extinction event is a great concern if you're trying to conserve economies, coastal environments and particular species," Bush said.

Melinda Millsap



"Grant and Contract Growth" continued from page 8

COLLEGE OF ENGINEERING

Dr. Lee Harris—$100,000 from the Sebastian Inlet Tax District to continue operating a wave and weather data collection system at the inlet.

Dr. Brian Lail—a $73,000 subcontract from the University of Central Florida (UCF) for work on antenna-coupled sensors. The agreement is with the Infrared Systems Laboratory and Dr. Glenn Boreman at UCF's Center for Research and Education in Optics and Lasers. In this collaboration, Lail will research millimeter and sub-millimeter wave detection.

Dr. Ronald Menezes—$70,000 from the Brazilian government to develop research in the areas of swarm intelligence and genetic algorithms, and their relation to software engineering, especially to software testing.

Dr. Geoffrey Swain—$100,000 from PPG Industries for a collaboration with PPG and Florida Gulf Coast University to develop, test and evaluate new boat antifouling coatings.

Marine Biologist is Prestigious Fulbright Faculty Scholar

Dr. Ralph Turingan, associate professor of biological sciences, has

earned a 2005-2006 Fulbright Scholar grant to lead a marine fish biology course in the Philippines. He will teach the course, "Inquiry-Based Teaching of Advances in Marine Fish Biology: Towards Sustainable Fisheries in the Philippines," May-December 2006, at the University of the Philippines in Visayas, Iloilo City.

"Fisheries are a major source of livelihood for the citizens of the Philippines," said Turingan, who was born there. "Filipino citizens engaged in fisheries and agriculture are among the poorest in the nation because production is remarkably low. I believe that education and training in science and technology will accelerate social progress and human-resource development. I want to contribute to the acceleration by teaching this course and helping to advance marine fisheries education. For example, fisheries policy makers and fisher folks need to understand the consequences of fishing on aquatic habitats such as coral reefs and they need to know about the physiological ecology of fishes."

Message from the Vice Provost for Research

Dr. Terry D. Oswalt

As Florida Tech's new vice provost for research, I am pleased to be given the chance to brag a bit about how spectacularly well our faculty members are doing in research. We owe much of today's success story to the seeds planted by my predecessor, **Dr. Robert Sullivan**. His shoes will be awfully hard to fill!

In the current fiscal year (FY'06), externally funded research projects are expected to reach an all-time high of $34 million, an increase of almost 15 percent from the same time last year. Federally appropriated research funding may account for as much as $5 million of this total, an area where Florida Tech first began to compete only three years ago.

Five new research institutes have been established to foster interdisciplinary research between our departments and colleges. These new institutes draw together Florida Tech's current strengths in biological/biomedical sciences, computer/information systems, energy research, marine and environmental systems, and materials and nanotechnology. In addition, federal appropriations supported the establishment of the National Center for Small Business Information and the National Center for Hydrogen Research at Florida Tech.

In the past year, several state-of-the-art instruments have been purchased—some with funding from the National Science Foundation, others with the proceeds from intellectual property developed by Florida Tech faculty. Recently delivered, or now on order, are an atomic force microscope, DART mass spectrograph, nuclear magnetic resonance spectrometer, scanning tunneling microscope and the largest telescope in the state of Florida.

Here's just a glimpse of some of the many individual faculty achievements this year.

- **Dr. Joe Dwyer**'s ground-breaking research on lightning was featured on the PBS TV series "Nova."
- **Dr. Joshua Rokach** received major funding from the National Institutes of Health for his research on the biological markers of afflictions such as Alzheimer's disease.
- The NSF funded **Dr. Richard Tankersley** to lead one of the largest training programs in the Southeast for future science teachers.
- **Dr. James Whittaker**'s research on information security resulted in the founding of a new company.
- **Dr. Jonathan Whitlow** received NASA funding to develop ways of mining oxygen from lunar soil.

During the past five years, faculty research has more than tripled at Florida Tech. We are competing head to head with the biggest research universities in the United States—and winning. With world-class faculty exploring everywhere from the ocean's depths to the farthest reaches of space, I think it's safe to say "you ain't seen nothin' yet!"

Terry D. Oswalt, Ph.D.

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Grant and Contract Growth

The university continues to increase research funding to support a variety of continuing and new projects.

COLLEGE OF PSYCHOLOGY AND LIBERAL ARTS

Dr. Juanita Baker—$102,000 from the Florida Department of Health to fund the Family Learning Program for the 15th year in a row.

Dr. Frank Webbe—$200,000 from the Alzheimer's Association to study the use of PocketPC technology (palm pilot) to promote quality of life for Alzheimer's patients and caregivers. **Dr. Annie Becker** is co-investigator.

COLLEGE OF SCIENCE

Dr. Elizabeth Irlandi—$312,000 over three years. The Florida Fish and Wildlife Conservation Commission (FWC) is providing $233,998, with matching funds of $77,999 from co-investigator Florida Fish and Wildlife Research Institute. Researchers will study how beach nourishment affects common animals, such as crabs and clams.

Dr. Joshua Rokach—$1.3 million for four years from the National Institutes of Health. The grant, from the National Heart, Lung, and Blood Institute, will allow Dr. Rokach to continue his studies on chronic inflammatory diseases.

Dr. Ralph Turingan—$200,000 from FILDUTCH Ventures and $120,000 from Florida Sea Grant (NOAA). The combined funding supports his research on the biology of coral reef fish larvae over the next two years. This includes salaries for four graduate student research assistants: **Matthew Wittenrich, Alexandra Didoha, Vutheary Hean** and **Justin Anto.**

Turingan, in a contract with Kinectrics Inc., is designing and testing fish protection systems at the university's Institute for Marine Research in Vero Beach. Kinetrics has provided an initial grant of $37,000 to fund two graduate students, invested $150,000 to construct experimental fish tanks and provided another $50,000 for recording equipment for the research.

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