This is an incredible time in USF’s history and our development as a premier national research university. We are at a momentous intersection of celebration, reflection, and progress as we approach the university’s 50th anniversary.

In less than half a century, USF has grown from a small commuter school into a diverse, top-tier national research university. Today, we are poised to become one of the top 50 public research universities in America.

USF is becoming a local and national leader in high-tech and bioscience economic development. We continue to break records in total research funding. None of this would be possible without the consistent success and leadership of our research office, community partners and USF’s own faculty, staff, students, alumni and friends.

Through our combined efforts, we are strengthening the economy, improving health care and quality of life. Together we are making the Tampa Bay area and the world a better place to live.

The University of South Florida (USF) reached a new milestone in 2004 with total research funding of $290 million. This is a 14 percent increase over last year and a 40 percent jump in the last two years.

What does $290 million in research funding say about USF? It says that we are growing—and growing fast—in the research arena. We are one of the fastest growing universities in research awards in the nation.

USF has a variety of research strengths in cancer, neuroscience, mental health, aging, education, engineering, biodefense technology, drug discovery, and advanced gene and stem cell therapies. Our colleges, institutes, centers, and regional campuses are all developing stronger research programs.

Making USF a top research university is not only measured in dollars. It must reflect high quality students, faculty awards, and the essence of scholarship. In this report, we celebrate some of USF’s successes and endeavors in research.
Welcome

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On the cover: USF Marine Scientist Eric Steimle and his Guided Surface Vehicle, see story, page 5.
A Bridge to the Doctorate

By Kevin Hale

Dr. Ashanti Pyrtle, professor of chemical oceanography in the Colleges of Marine Science and Engineering at the University of South Florida, announced a new interdisciplinary graduate program called “Bridge to the Doctorate.”

The program, in partnership with the Florida-Georgia Louis Stokes Alliance for Minority Participation and the National Science Foundation, aims to recruit and provide funding for underrepresented minority students. The project will help USF continue to serve and promote the participation of a diverse student body, including participation in science and technology research.

Pyrtle, who serves as the program’s director, says the project will help “provide research and professional development experiences for under-represented U.S. minority students — African-Americans, Native-Americans, Native-Alaskans, Pacific Islanders and Hispanic-Americans — committed to careers in science.”

The program will sponsor 20 minority students in its first year, and they will work toward their graduate degrees in engineering and marine science. At the same time, they will explore “cutting-edge design and applications of marine, environmental, biological, and biomedical sensor technologies.”

In its first year, the program has accepted minority graduate students who will be funded at $30,000 per year for up to two years. Doctoral students may receive an additional two years of support at a minimum of $15,000 annually. The program pays a stipend, full tuition and fees, supports research experiences, conference and travel opportunities and workshops.

Dr. Shekhar Bhansali, a professor of electrical engineering, is the co-director of the Bridge to the Doctorate program. He says that USF “has been able to provide very competitive packages to the students, making it a viable option to go to graduate school.”

Pyrtle also works with the Earth System Science Initiative to provide minority undergraduate and graduate students with opportunities for increased exposure to, interaction with and participation in the Earth System Science community. The 2004 Professional Development Program was carefully crafted utilizing community input and insight gained from the 2003 Ocean Sciences Program.

The Bridge to the Doctorate program aims not only to provide students with graduate opportunities. According to Pyrtle, it is also “designed to foster cross-disciplinary exchanges among students and faculty in the Colleges of Marine Science and Engineering.” Bhansali agrees, stating that the program could help to enable additional bridges and collaborations between faculty researchers.
It’s a tight fit in Dr. David Morgan’s office. The room is literally stacked to the ceiling with journals and papers. Morgan serves as director of the Alzheimer’s Research Laboratory (ARL) and is an easy person to get comfortable with very quickly.

Dr. Jun Tan, MD, PhD, director of the Neuroimmunology Laboratory in the USF Department of Psychiatry, is a wiry and energetic fellow who requires a lot of focus to keep up with the pace of his lively explanations.

These two neuroscientists have been awarded a $1.1 million four-year grant from the National Institute for Neurological Disorders and Stroke to improve the safety and effectiveness of an Alzheimer’s vaccine developed earlier by Dr. Morgan.

“Initially an active immunization approach was attempted using an amyloid vaccine. The vaccine reduced the amyloid deposits and the ARL found this amyloid vaccine could reverse the memory deficits developed by the transgenic mice as they aged,” explained Morgan. “This approach attempts to reduce amyloid by using the immune system to coat the amyloid deposits with antibodies against the Aβ peptide, and clear these deposits from the brain as if they were pathogens or dead cells.”

There are several advantages of this passive immunization approach over active immunization with a vaccine. First vaccines are essentially irreversible; you cannot unvaccinate someone. If there are adverse reactions, they will not go away spontaneously, but need to be treated aggressively with immunosuppressive drugs. The problem here is increased risk of other diseases. With passive immunization, if someone develops an adverse reaction you simply stop injecting the antibody. Over days the antibody levels drop and the individual recovers.

Under certain circumstances, immune cells in the brain, known as microglia, promote the inflammatory and destructive process that can lead to Alzheimer’s disease. The microglia are most beneficial in clearing amyloid. Many agents are being developed to modulate the activation state of microglia. The ARL have already launched a large series of studies to characterize the states of microglia in mice genetically engineered to develop symptoms similar to Alzheimer’s disease to evaluate the microglial modulating agents for their potential to tune the microglial response for the maximum benefit of Alzheimer patients.

“Although not all aspects of Alzheimer’s disease are manifest in the transgenic mice the scientists use, they are very good models of amyloid deposition, a material that creates extracellular plaques made of a fibrils peptide called Aβ,” said Morgan. “These amyloid plaques are found in abundance in Alzheimer cases. Many researchers believe that reducing the amyloid deposition will slow or reverse the disease. Thus, agents that we find effective in this transgenic mouse model are very strong candidates for clinical testing in humans.”

The researchers hypothesize that the combination treatment may even have “super-additive effects” in removing Alzheimer’s-associated plaques from the brain, while protecting the brain from the side effect of microglia-induced inflammation.

Dr. Tan concluded, “This approach shifts the focus from treating symptoms of Alzheimer’s disease to treatments that slow down the disease or prevent it altogether.”
Guided by signals from a remote joystick controller and gliding over the water behind USF St. Petersburg’s campus, the five-foot-long raft on green pontoons topped by an assortment of plastic boxes might at first seem more like a big toy for big kids rather than a vehicle for marine research. It certainly looks as though it’s fun to operate, especially when you put on the high-tech goggles with the heads-up display.

But even though it’s simple enough for an eight-year-old to maneuver, and there’s a certain element of fun in its operation (along with a few video game components in its makeup), Eric Steimle’s Guided Surface Vehicle (GSV), which its inventor calls “a pickup truck for instruments,” is entirely serious in its purpose and very effective in handling the diverse tasks it’s been called on to perform.

Lightweight, inexpensive, easy to use, and versatile, the GSV has made a big hit with Steimle’s colleagues at USF, particularly those associated with the College of Marine Science (CMS). To date, in fact, at least eight publications by USF researchers have included results from its use. In all, the GSV has had more than 50 actual working launches including a test conducted for NASA at the Kennedy Space Center. It’s been used to carry hydrophones for listening to fish and a mass spectrometer for detection and analysis of chemical substances.

Steimle expects that soon it will be used for research on sargassum mats, and also it’s likely to play a role in studies on scallops and in the mapping of sea grasses and corals. There are also demonstrations scheduled for private companies who have expressed an interest in its use. And that’s just the beginning of what Steimle expects will be a very bright future for the GSV.

The reason for the instant popularity of the GSV is as simple as the sturdy little watercraft itself—it’s the right tool in the right place at the right time, and it’s filling an important niche that no one else had been paying attention to. That is, no one until Steimle, an assistant professor of chemistry with an engineering background and a knack for, as he puts it, “building stuff,” started looking for a project that might attract funding.

“Unmanned vehicles that operate on land and water and in the air are attracting a lot of attention now, especially from the military,” says Steimle. “The navy has a heavy-duty version of the GSV, and I thought we needed something like it for research. The idea was for something you could just throw stuff on and go.”

Once on the water, the GSV can handle a light chop and a fair amount of wind and waves; it also will ride, says Steimle, right up and over a boat wake. And although the prototypes have not been waterproofed for instrument packages, completely sealed housings using Pelican cases commonly available in dive and marine supply stores are now under development. A black clamshell cover in an aerodynamic shape for the entire top has been made; when it’s in place, the GSV looks like something Jules Verne’s Captain Nemo would have felt quite at home with.
The GSV can be operated either remotely from a line-of-sight distance of up to two miles using a small onboard computer; for that, a post-doctoral student from USF’s College of Engineering is currently writing control software.

From Steimle’s initial idea of developing a simple, easy-to-use platform for conducting various tests, the GSV has evolved into a fully research-ready vehicle that can be customized to its users’ needs. Further design and development are continuing through USF’s environmental science program, and once the GSV has been redesigned for specific tasks, says Steimle, the university will apply for a patent.

Other improvements include the installation of flexible, lightweight solar panels to run the wireless control system and to keep the batteries for the motor charged. Recently new pontoons have been developed that will allow the GSV to be used in various types of water environments, such as rivers with current. These will enable the GSV to stay in one spot and even to travel upstream against a current as strong as 5 knots.

With grant money awarded to the Department of Environmental Science and Policy through the efforts of U.S. Representative Bill Young, in addition to funding from the Greenwell Foundation, Steimle plans to upgrade and fine-tune the equipment so that the GSV can be used for research on seagrass and corals. It also can carry a device known as SIPPER3—a Shadow Image Particle Profile Evaluation Recorder that uses lasers to capture images of microorganisms as water flows through a sampling tube.

In the past, SIPPER has been mounted in an AUV or towed behind a ship. “Those are great techniques for sampling lower depths,” says Steimle, “but because the GSV can travel slowly on the surface without disturbing the water, it will allow sampling of the top meter.”

That ability to operate without disturbing the surface waters has led to the GSV’s planned use in upcoming research on sargassum mats. Next summer, a Florida Institute of Oceanography (FIO) ship will take Steimle and Norm Blake on a cruise to Key West and the Dry Tortugas, where they will launch multiple GSVs to do some close-up investigations of sargassum mats, which, says Steimle, “are ecosystems in themselves.”

The free-floating mats of seaweed provide a habitat for an astonishing variety of plant and animal life. Large ships can’t get very close to these, but it’s no problem for the GSV, which will be equipped with video cameras as well as equipment for collecting samples.

Steimle also sees important uses outside the area of marine research. One of those is port security. The GSV, says Steimle, could carry various instruments including cameras and TNT detectors to conduct searches for explosives and other devices both above and below the surface, looking at docks, seaways, and ships’ hulls.

Another potential use he sees is in forensics. For example, when law enforcement investigators want to search a lake or other body of water, instead of several divers going in and churning up the bottom, the instrument-equipped GSV could be deployed first, operated either remotely or by the onboard computer. If it detects anything of interest, the technician onshore can flip a switch to drop a weight with a flag that marks the location. Then a diver can go in to take a look.

Although Steimle developed the GSV for use as a research tool, its user-friendliness also has made it valuable for teaching. “It’s a great tool for public outreach and to get students of all ages excited about science,” says Steimle.

WHO’S USING THE GSV?

Norm Blake of the College of Marine Science will be using several GSVs in the waters around the Florida Keys and Dry Tortugas to study sargassum mats, which, he says, are like displaced coral reefs. Floating in time and space, their chemistry and biology change as they move and age. “This has never been done before,” says Blake. “Up to now, discrete samples were taken at intervals, and it was difficult to stay even with the same mat.”

Dave Fries of the Center for Ocean Technology works with fieldable microsystems, a general term for microinstruments and microsystems applied in the field—in this case, the ocean—for security, regulatory, and research uses. While they can gather data from a fixed position, using a moving vehicle, he says, makes it possible to survey a wide area and to change what you want to survey.

The GSV also will play a major role in work with SIPPER3 (see main story), a collaborative effort of several CMS and COT researchers under the direction of principal investigator Tom Hopkins. Towed through the water, SIPPER3 uses an industrial linescan camera firing lasers at the rate of 36,000 per second to capture and record images of organisms as small as 25 microns as they flow through a sampling tube. The data will enable researchers to identify and count the organisms as well as show their distribution.

Dave Mann, whose specialty is marine bioacoustics, has been exploring the use of the GSV as a tool for conducting his research, and he’s enthusiastic. His lab uses the sounds produced by fish to map where and when spawning is taking place, and Mann says that the GSV’s portability, and, more importantly, its quiet operation, make it “ideal” for this task. He explains, “If you do this from a regular boat, the engine noise can overwhelm the sounds we’re trying to measure, as well as influence the calling of the fish we’re trying to record. The GSV is one way we can overcome the limitations of listening from a boat.”

Tim Short, a sensor engineer with the COT, has found the GSV to be an ideal partner for his underwater mass spectrometer, a powerful tool for detecting and analyzing chemical substances in minute quantities and low concentrations. Short has taken the GSV to Bayboro Harbor and to St. Petersburg’s Lake Maggiore, where he’s looked for volatile organic compounds, which are often found in motorboat exhaust, and correlations of variations in dissolved gas concentrations.
Making the Pieces Fit
Research that Solves the Problems of Children's Mental Health

By Kevin Hale

The Research and Training Center for Children’s Mental Health recently was awarded $4.125 million to support continued research on service systems for children and youth with serious emotional disturbances and their families.

The five-year award is funded jointly by the US Department of Education’s National Institute on Disability and Rehabilitation Research (NIDRR), and the National Institute of Health’s Substance Abuse and Mental Health Services Administration, Center for Mental Health Services.

The Center, housed in the Department of Child and Family Studies (CFS) at the University of South Florida’s (USF) Louis de la Parte Florida Mental Health Institute (FMHI), is staffed by a multidisciplinary team of researchers, family members, and individuals with experience as policymakers.

Since 1984, Dr. Robert Friedman has served as director of USF’s Research and Training Center for Children’s Mental Health, one of two such centers in the U.S.

Friedman is a researcher, author, policy analyst, and consultant on issues such as the development and evaluation of community-based systems of care, prevalence of emotional disorders in children, new developments in service delivery, and the relationship between the mental health system and other systems.

He is also a clinical psychologist who received his B.A. from Brooklyn College, and his M.S. and Ph.D. degrees from Florida State University.

In addition to his national work, Dr. Friedman has served on many local, state, and university committees. He currently serves as co-chair of the steering committee for the USF Collaborative for Children, Families, and Communities.

Over the past 25 years, Friedman has received over 70 grants and awards to support the initiatives of the Center. The list of sponsors includes agencies like the Florida Department of Health, Department of Education, Annie E. Casey Foundation, Naval Training Systems Center and Children’s Board of Hillsborough County, to name just a few.

In the next five years, the Center will play an important role in supporting the recommendations of the President’s New Freedom Commission on Mental Health, which recently has called for a transformation in the nation’s mental health services system for children and adolescents. Despite advances in past decades, care for children and adolescents with behavioral, psychological and emotional problems remains fragmented and hard for families to access.

“The number of children and adolescents with serious emotional disturbances, and the degree to which their lives and the lives of their families are affected by their disturbances is enormous,” said Friedman. “There is a strong need for effective systems of care. I am confident that our activities will bring about positive change in practice and policy.”

Work soon will begin on six integrated research projects that are designed, in the short run, to enhance knowledge about implementation of effective systems of care and, in the long run, to make it possible for children with serious emotional disturbances to live, learn, work, and thrive in their own communities.

“The number of children and adolescents with serious emotional disturbances, and the degree to which their lives and the lives of their families are affected by their disturbances is enormous.”
The dawn of a new era is starting under one roof as buildings dedicated to bioengineering, life sciences research and entrepreneurship begin to take shape on the grounds of the Research Park at USF’s Tampa Campus. The new buildings will provide offices for start-up businesses, research and wet-lab space connected by a common atrium.

“We are building the nerve center that will allow a high-tech entrepreneurial culture to thrive,” said President Judy Genshaft. “We are making bioscience economic development an integral part of this region’s agenda.”

- Location and Concept

The Research Park is conveniently located on Fowler Avenue, near the main entrance of the University of South Florida Tampa Campus. It is situated strategically at an infrastructure crossroads. It lies between Interstate 75 and Interstate 275 and is about 10 minutes away from Interstate 4; 25 minutes from Tampa International Airport.

The nexus for Tampa’s growing technology sector is the brain-child of USF President Judy Genshaft, who envisioned development like this before arriving at USF in 2001. At the University of Albany, where Genshaft served as provost, she aided in the formation of a similar technology/economic development program. One of Genshaft’s first recruits to USF was Executive Vice President Carl Carlucci, who led much of the development for the University of Albany.

The idea is simple: bring together researchers and entrepreneurs. The new Research Park not only brings them together conceptually, it also does so physically with the help of a spectacular and spacious glass atrium that offers a casual meeting setting for researchers and entrepreneurs to have a cup of coffee and share their ideas. Conference rooms, open meeting spaces, and a kitchen for catering can be used by residents of both buildings as needed for special events.
After the groundbreaking ceremony the area is prepped with dirt paths for the construction vehicles to move freely.

The ground is cleared and the dirt is piled and packed in preparation for the vibro-replacement system.

Pilings are driven into the ground and support posts appear.

The sixth building to be added to the Research Park is the Interdisciplinary Research building (IDRB). It will offer over 130,000 square feet of space to be used for core and shared laboratories. Highly sophisticated and expensive scientific equipment like NMRs, SEMs and TEMs will be housed centrally for researchers to use in their projects.

The top floor of the IDRB will serve as the new site for the Center for Biological Defense, thanks to the generous support of Congressman Bill Young. The ground floor will be open and spacious to provide sufficient work area for engineering designers like those in Professor Robin Murphy’s Center for Robot-Assisted Search and Rescue to have sufficient room to work on their robots.

“Approximately two-thirds of the building will be reserved for lab space and research,” said Rod Casto, associate vice president for research, “I hear from the private community that there is a lack of lab space in Tampa. The USF Research Park growth is just one example of our commitment to the community.”

The Business Partnerships building boasts over 100,000 square feet of office space to be used for start-up companies, anchor tenants and shared lab space. Sponsors of the building project also will have offices located near the atrium area to provide services and support to entrepreneurs. The building will serve as a bridge between USF and the community. It also will be the future home of the Tampa Bay Technology Incubator.

The Tampa Bay Technology Incubator is part of a new outlook on technology partnerships. This program is part of an umbrella concept called USFConnect. Support for new technology start-up companies will come from the Tampa Bay Technology Incubator. Tenants will have access to state-of-the-art facilities in the Business Partnerships Building and the support of world-renowned USF faculty, graduate students, business experts and entrepreneurs.

Entrepreneurial education, research and training will bring together the resources of the Center for Entrepreneurship, Small Business Development Center and Tampa Bay area service providers to enhance these community-based start-up companies, providing the information, skills, and support needed to succeed.

Building on a sandy site like this one requires taking special measures to ensure a firm foundation and to eliminate or at least minimize the possibility of future damage caused by settling and by another of Florida’s trademark natural features—sinkholes.

On the site of USF’s Research Park, a specialized state-of-the-art technology called vibro-replacement has been used to make sure that the park’s buildings are sitting on a solid and stable foundation. Todd Collier, general superintendent for Skanska USA, the general contractor, explains that vibro-replacement, a technology developed and used by subcontractor Hayward Baker, is a fast, efficient, and economical alternative to the traditional deep foundation that would be created by sinking pilings into the sand or drilling shafts and filling them with concrete.

The basic idea is actually simple: A vibrating steel probe 30 inches in diameter and 65 feet long with an attached water jet is suspended from a crane and carefully lowered onto a targeted point on the ground. Helped along by its own weight of about 6,000 pounds and the force of

An architectural rending of the IDRB opening in 2005.
gravity, the probe shakes itself down into the soil, creating a hole that is kept open by the water jet. When it meets a density that is determined to be sufficient, it’s pulled out as crushed stone is fed into the hole to form a compacted column. It takes about 15 minutes to create each column, says Collier.

In the case of the USF site, says Collier, the expectation was that the probe would need to go to a depth of 25 feet, but at 20 feet it met sufficiently dense sand. That lucky break cut a week and a half off the anticipated time for this now-completed phase of the project.

Another advantage of the vibro-replacement technology, notes Collier, is the fact that it can be used in close proximity to people and to buildings without drawing complaints or causing damage, as a pile driver would.

- The Occupants

New companies are being added to the growing list of names that reads like a 'who’s who' of research technology: BioMedTech Laboratories, DNAPrint Genomics, Imigene, Nanopharm Technologies, Nanobac Pharmaceuticals, Sanerion CCEL Therapeutics, Transgenex Therapeutics, Medegy, Modelithics, Delphi Analytical AL Services, Intezyne Technologies, and Morpho-Genesis.

- The Impact

Dr. M. Ian Phillips, USF vice president for research, states, “Strengthening and diversifying economic development in the Tampa Bay area and the State of Florida continues to be an integral part of the University’s mission. At USF, new cooperative ventures with government and industry partners are undertaken with enthusiasm and innovation. The mission of the building will be to bring different research experts together to make new discoveries that can be translated into economic development for the state and academic success for USF.”

A LOOK AT THE CONSTRUCTION

JUNE 2004: The first floor of the IDRB.

AUGUST 2004: Work begins on the third floor.

OCTOBER 2004: With its fourth floor near completion, the IRDB takes shape.

USF Connect is your link to a wide range of small business development services available at the University of South Florida. It was created to provide a single point of contact for resources like technology, financing, marketing, management, partners and support services that can accelerate and support the growth of your business.

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USF Connect is more than a referral. It’s a relationship.
Gene Therapy
It’s Certainly Not “Sluggish”

By Kevin Hale

A team of USF biology researchers has developed molecular evidence showing that groups of sea slugs have evolved ways of incorporating plant genes into their bodies to convert the sun’s energy into sugars and other nutrients.

Dr. Sidney K. Pierce, professor and chair of the biology department, post doctoral fellow Steven Massey, and graduate student Nicholas E. Curtis, have investigated the molecular biology of an intracellular symbiosis between the digestive cells of a sea slug and the algal chloroplasts it feeds on. They have discovered that the genomic DNA of these “solar powered” slugs appear to share at least one gene that the algae uses to code for a chloroplast protein.

Once incorporated into the molluscan cell, the plastids are able to provide the slug sufficient energy through photosynthesis to survive even after several months of separation from any additional food.

The discovery is significant because current research is starting to reveal that about 75 to 80 percent of all human diseases appear to be genetic. One way scientists are hoping to cure these diseases is through gene replacement therapy—the insertion of healthy genes into cells. Unfortunately, this is both biochemically and physiologically difficult.

This slug steals pastids from algae and may also have genes for plastid proteins in the molluscan DNA.

Biologists like Pierce, Massey and Curtis have been looking for gene transfers that occur in nature for the answer. While horizontal gene transfer is relatively common in retroviruses like HIV and in bacteria, these biologists hit on one of the few examples of eukaryote to eukaryote gene transfers from different kingdoms.
“Transfer of genes between multicellular organisms has never been demonstrated before, so this specie of sea slug may be very useful in modeling a system to understand how such an important phenomenon could occur,” explained Pierce.

Pierce’s team has recently focused on one particular sea slug living in the Florida Keys, Elysia crispata. These slugs are specialized feeders on algae. They look like pieces of lettuce and vary in color from brown to green to yellow. They are found clinging to the algae in a semi-secret location off Grassy Key, Florida, near the Keys Marine Lab, a government-funded marine laboratory.

Unfortunately, the biologist’s were slowed down due to some inaccurate information in the literature that showed the slugs feeding on the wrong algae.

“For us the issue became whose (what species of algae) gene is it? The literature is confusing with respect to the algae that E. crispata consumes. For many months we were doing a variety of molecular and biochemical experiments with the wrong one based on information that E. crispata was a Caulerpa eater,” said Pierce in a forum on sea slugs. “In fact, it does not eat Caulerpa at all. To make a long story short, we have spent the last year showing, with both molecular markers and electron microscopy, that the sequenced chloroplasts in E. crispata actually originated in three species of algae.”

To discover their proper food source, Massey and Curtis starved the slugs by keeping ones with photosynthesizing abilities in a freezer at 8 degrees celsius. Feeding them only on automated lights that shine on the slugs for 12 hours each day, the slugs eventually turned brownish-yellow after their symbiotic plastids failed. When they tried to feed these starved slugs Caulerpa, they died, but when they put them on Penicillus capitatus they rapidly recovered both their green color and their intracellular chloroplasts.

“These experiments have made me cautious about what’s in the literature about algal food of eyslids as this is the second time we’ve been led down a wrong path,” said Pierce.

The discovery, however, won graduate student, Nicholas Curtis, several awards in March at the Joint Symposium of Florida Society of Microscopy. The symposium, which took place at the University of Central Florida in Orlando, honored Curtis with the NanoSpective Award for Excellence in Microscopy. His poster, titled “The Algal Source of Symbiotic Chloroplasts in Elysia Crispata is not Caulerpa”, also won 2nd Place in the 2004 Student Poster Competition for his characterization work in the lab.

Curtis’ work in microscopy was all made possible thanks to a National Science Foundation (NSF) grant that allowed the Biology Electron Microscope Lab to purchase a brand new, state-of-the-art transmission electron microscope (TEM). “What’s nice about that microscope is that it’s equipped with a high resolution AMT digital camera. We don’t have to wait through the time consuming process of developing photographs in a darkroom,” said Curtis.

Now that this trio has straightened out the actual feeding habits of the slug, the next step in the process will be to see exactly which genes are being transferred between these organisms. Since the algae that the slugs feed on have already been genetically mapped, the team intends to acquire additional funding to map the slug’s DNA.

More on Horizontal Gene Transfers

A horizontal gene transfer is any process in which an organism transfers genetic material (DNA) to another cell that is not its offspring.

By contrast, vertical transfer occurs when an organism receives genetic material from its ancestor—a parent or a species from which it evolved. Most thinking in genetics has focussed on the more prevalent vertical transfer, but there is a recent awareness that horizontal gene transfer is a significant phenomenon.

Horizontal gene transfer is common among bacteria, even very distantly related ones. For example, this process is thought to be a significant cause of increased drug resistance. When one bacterial cell acquires resistance, it can quickly transfer the resistance genes to many species.

Also enteric bacteria appear to exchange genetic material with each other within the gut in which they live.

Typically, we see horizontal gene transfers occurring artificially in various advanced organisms through genetic engineering.

This process bypasses reproduction altogether by exploiting horizontal gene transfer, so genes can be transferred between distant species that would never interbreed in nature. For example, human genes are transferred into pig, sheep, fish and bacteria. Toad genes are transferred into potatoes. Completely new, exotic genes, can therefore be introduced into food crops.
Flying Beneath the Radar

USF Researchers at Moffitt Discover How Tumors Escape Capture

By Kevin Hale

You can run, but you can’t hide. To enter and survive in enemy territory it is vital to remain undetected. Tumors evade capture and destruction by the host immune system, which is designed to suppress tumor growth.

In one of the biggest advances to come from the H. Lee Moffitt Cancer Center & Research Institute in its 17-year history, USF researchers have unlocked at least part of the mystery of how tumors flourish undetected by keeping their presence a secret from the sentries of the body’s immune system.

“Flying beneath the radar” is how Nature Reviews Cancer labels the mechanism of tumors evading capture, a process described by Hua Yu, Ph.D., and her colleagues at Moffitt. Their findings are published in the current issue of the journal Nature Medicine.

“Cancer is allowed to wreak havoc on the body’s immune system because it knows how to fool the body’s defensive arsenal,” explains Jack Pledger, Ph.D., Associate Center Director for Basic Science. “The discoveries of Dr. Yu give us vital information about how tumors stay ‘invisible.’ They open the way for new treatments to help flush the cancer cells into the open, so the body’s armies against disease can destroy them.”

Yu is an associate professor in the Immunology Program at Moffitt. Her coauthors on the study include Drew Pardoll, M.D., Ph.D., from the Johns Hopkins University School of Medicine, Richard Jove, PhD, at USF and Moffitt’s CEO, William Dalton, PhD, MD.

The researchers documented that the tumor’s activation of Stat3 (from the STAT family of proteins that regulates genes) secretes factors that inhibit the body’s immune responses by keeping Dendritic Cells (DC) from maturing. The activation also blocks expression of inflammatory mediators required to trigger the immune system. Other ongoing research at Moffitt related to Stat3 includes using microarray technology to lay the groundwork for developing new drugs based on inhibiting Stat3 for more effective treatment of breast cancer, prostate cancer, sarcoma, melanoma and other tumors.

So, exactly how does Stat3 activation in tumor cells affect the immune response? There are two components of the immune response — innate and adaptive. Cytokines and chemokines amplify pro-inflammatory signals that are involved in the innate immune response. Blocking tumor-cell expression of Stat3 in vitro strongly induced Rantes and nitric-oxide production by macrophages, and Tnf-production by neutrophils. Similar effects were seen in vivo, as disruption of Stat3 signaling by gene transfer of Stat3 into B16 tumors resulted in immune-cell infiltration. Innate immunity is crucial for the development of adaptive immunity, as it enhances maturation of DCs.

Stat3 activation in tumor cells therefore blocks expression of inflammatory mediators, which are required to activate both arms of the immune system.

It is also possible that transformed cells directly block DC maturation, by secreting inhibitory factors that are induced by Stat3 activity. Maturation of bone-marrow-progenitor (BMP) cells into DCs was inhibited by supernatants from fibroblasts with activated Stat3. So, what are the tumor-derived factors, induced by Stat3, that inhibit this process?

Investigations indicate that these factors are diverse and depend on the tumor type. More importantly, the diverse inhibitory factors seem to converge at a common point. So, tumor inhibition of DC maturation involves a cascade of Stat3 activation — first in tumors and then in surrounding DCs.

This work demonstrates that constitutive Stat3 activation in tumors, which occurs at very high frequency, inhibits chemokine and cytokine production and induces factors that inhibit the adaptive immune response. Using targeted therapies against Stat3 could relieve this inhibition, allowing the immune system to detect and eliminate tumors.
Shekhar Bhansali, Ph.D., Associate Professor, Electrical Engineering, College of Engineering

Received a National Science Foundation Career Award and a five-year NSF Integrated Graduate Education & Research Traineeship (IGERT) Award.

Gaëtan Brulotte, Ph.D., Professor, World Languages Education, College of Arts & Sciences

Received critical acclaim for his play Le Client at the International Drama Festival in Avignon, France.

William E. Haley, Ph.D., Professor, Aging Studies, College of Arts & Sciences

Published an article and editorial in the New England Journal of Medicine; briefed the US House of Representatives on lifespan respite care; he was selected as an associate editor of APA’s Psychology & Aging.

Mohamed Eddaoudi, Ph.D., Assistant Professor, Chemistry, College of Arts & Sciences

Published in Nature on the development of new crystalline solid-state materials and in Science on hydrogen storage in microporous metal-organic frameworks.

Susan D. Greenbaum, Ph.D., Professor, Anthropology, College of Arts & Sciences:

Her book, More than Black: Afro-Cubans in Tampa, received the Theodore Saloutos award for outstanding book of the year; the Harry T. and Harriet V. Moore award for best ethnographic history of Florida; and was selected as an Outstanding Academic Book by the American Library Association.

Lawrence O. Hall, Ph.D., Professor, Computer Science & Engineering, College of Engineering

Elected a Fellow of the Institute of Electrical and Electronics Engineers; appointed as Editor-in-Chief of the IEEE Transactions on SMC, Part B and vice president of IEEE Systems, Man & Cybernetics (SMC) Society.

Ashok Kumar, Ph.D., Associate Professor, Mechanical Engineering, College of Engineering

Received from NSF, a Major Research Instrument (MRI) grant and a Grant Opportunities for Academic Liaison with Industry (GOALI); a Faculty Early Career Award, and a Nanoscale Interdisciplinary Research Teams (NIRT) grant.

Pat Rogers, Ph.D., Eminent Scholar, English, College of Arts & Sciences

Published in the Times Literary Supplement an article titled, “Hurricanes Happen: Hampshire Defoe and the Great Storm of 1703.”

Hua Yu, Ph.D., Associate Professor, Interdisciplinary Oncology, College of Medicine

Published in Nature Medicine an article titled, “Regulation of the innate and adaptive immune responses by Stat-3 signaling in tumor cells.”

2004 Outstanding Faculty Research Achievement Award Winners

Presented by the Research Office to celebrate those who have been recognized for extraordinary scholarly achievements
Research Matters at USF

A Look at Innovation Across Our Campuses

The University of South Florida has evolved into a major urban research institution through the efforts of outstanding, highly productive faculty in various colleges and schools on multiple campuses. They have made major discoveries that improve the quality of life and enhance the economic development of our communities. The following is a sampling of the research excellence that occurs throughout the University.

• College of Arts & Sciences

Microbiologists at USF have developed tests that can rapidly identify anthrax and smallpox. Used in the field in the event of a suspected bioterror attack, positive rapid testing could prevent disease spread while negative results could prevent panic over fears that an anthrax or smallpox attack has occurred. Studies reporting the USF findings were published recently in the Journal of Microbiological Methods and in Biosensors & Bioelectronics.

"After the bioterrorism anthrax mailings of 2001 and the recognition that terrorists could weaponize smallpox, it became increasingly important to develop rapid testing to confirm attacks and initiate public health efforts, or allay public fears if no attacks had occurred," said Dr. Daniel Lim, a USF microbiologist associated with the USF Center for Biological Defense.

"Using throat swab samples seeded with Vaccinia virus, a surrogate of smallpox, and a fiber-optic biosensor, we found we could detect the virus in 20 minutes. We also found we could detect moderate concentrations of anthrax in less than an hour directly from powder samples with no false positives with the same biosensor."

Rapid detection of potential acts of bioterror is part of the brave new world in the war on terror ushered in by the development of tests tuned to detect small amounts of dangerous material quickly using a portable biosensor called the RAPTOR.

According to USF microbiologist Kim Donaldson, co-author of the smallpox detection paper, throat swabs of potential victims of smallpox infection could be carried out by public health personnel on a large number of people and vaccination could be offered to those testing positive within four days of exposure.

"This could provide some protection from the disease and offer significant protection from a fatal outcome," said Donaldson. "A similar procedure with the RAPTOR could quickly identify an anthrax attack," explained Bryan Tims, co-author of the anthrax paper and a member of Lim’s research team.

"After the anthrax spore mailing in 2001, public health officials were overwhelmed by samples of unidentified white powder," recalled Tims. "In this study we demonstrated the ability of a fiber-optic biosensor to detect anthrax in less than an hour and quickly separate the real threat from the hoax."

USF researcher and co-author of the smallpox study, Marianne Kramer, explained that smallpox is likely to be spread through an aerosol people inhale and then spread to others.

"Smallpox was essentially eliminated in the late 1970s," said Kramer. "But the virus still exists. With today’s lack of smallpox vaccinations, even a relatively small outbreak created by terrorists could spread easily throughout the world. Rapid testing within the 20 minute capability of the biosensors and the RAPTOR may be our best front line weapon."

Since the World Trade Center attacks and the anthrax attacks shortly thereafter, scientists at the USF Center for Biological Defense have made major strides in the war against bioterror through the development of rapid biosays and the development of computer software that can quickly assess symptom reporting on a large scale to determine if a biological attack has occurred.

• College of Education

The Institute for Instructional Research and Practice has been active in procuring external research and development grants with a focus on the development and administration of exams (particularly teacher certification) since 1984. This highly successful effort of the Institute truly has been a team effort which has brought in nearly $70 million dollars since 1984. This funding has benefited the State in a critical area by certifying tens of thousands of teachers in the State of Florida and training thousands of educators in the area of test development. The Institute has established itself as a leader in test development and administration and enhanced the reputation of the College of Education. The Institute has recently expanded its focus to provide technical assistance to developing nations. For more information about the Institute for Instructional Research and Practice contact the Director of the Institute, Dr. Neal Berger.

Although the work of the Department of Educational Measurement and Research is not new, the newly established Center for Research, Evaluation, Assessment, and Measurement (CREAM) is a good example of the College of Education working with multiple units representing the University of South Florida, public schools, health care providers, and private enterprises. CREAM has provided research and measurement consulting and services for the College of Engineering, Office of the Provost, and the College of Public Health. In the area schools,
CREAM has provided research and measurement expertise to Hillsborough County and Pinellas County, and in the area of private agencies. CREAM has assisted the American Cancer Society, PhyTrust, and Spectrum Systems.

**• College of Engineering**

Dr. Ashok Kumar, a professor in the Nanomaterials and Nanomanufacturing Research Center (NNRC), received a four-year grant for $1.3 million from the National Science Foundation (NSF) under the Nanoscale Interdisciplinary Research Teams (NIRT) Program.

“Research and education areas in nanoscale science and engineering are inherently interdisciplinary and the USF NIRT team’s expertise brings together several unique skills necessary to make significant contributions,” said Dr. Kumar, an Associate Professor in Mechanical Engineering.

The objective of the research is to synthesize nanocrystalline diamond thin films with very small grain size (5-10 nm), lower surface roughness (20-30 nm), lessen internal stress and utilize the thin films’ extraordinary properties in various applications such as microelectromechanical systems (MEMS) and biomedical devices.

The co-investigators on the grant are Dr. Shekhar Bhansali and Dr. Tom Weller from the Department of Electrical Engineering and Dr. Ivan Oleynik from the Department of Physics. Dr. Kumar will synthesize nanostructure diamond thin films by using novel plasma chemistry and further apply advanced characterization techniques to understand the mechanical and tribological properties of this material at the nanoscale. Dr. Weller and Dr. Bhansali will demonstrate potential applications in critical technologies including high fidelity MEMS and biomedical devices. Dr. Oleynik will model the growth and resulting properties of nanodiamond thin films.

“The rationale for this NIRT project is based on the fact that material properties change drastically as the grain size of the materials reduces to the nanoscale,” said Kumar. By controlling the grain size and grain boundary structure at the nanoscale, extraordinary materials properties will be achieved including high hardness, high fracture strength, high Young’s modulus, extremely low friction coefficient and high wear resistance, negligible stiction, low residual stress in as-deposited nanocrystalline diamond films.

The NIRT grant will provide a unique environment for the research, education and training of graduate and undergraduate students from different disciplines in an interdisciplinary setting with active participation of national laboratories (Argonne National Lab, Wright-Patterson Air Force lab, Sandia National Lab, US Army Research Lab), industries (Raytheon, EMC Technology) and international collaborators (Nagaoka University of Technology, Japan; and Institute of Microelectronics, Singapore). Students will be involved in the development and use of cutting-edge research tools and will receive excellent training at the frontiers of nanotechnology.

“A vigorous education and outreach program also will be pursued aggressively to bring nanotechnology to pre-college students, teachers and general public from NSF Supplemental REU and RET grants,” said Dr. Kumar.

The latest movement in science, engineering and technology is based on our ability to organize, characterize, and manipulate matter systematically on the nanoscale. Far-reaching outcomes for the twenty-first century are envisioned in both scientific knowledge and a wide range of technologies in most industries, health care, conservation of materials and energy, biology, environment and education. Since arriving at USF in 2001, Dr. Louis Martin-Vega, Dean of the College of Engineering, has made significant commitments to enhance the research, educational and outreach activities related to nanotechnology. The University anticipates that a new dedicated research facility called “Nano-tech I” will help focus the integration of research and education in nanotechnology.

Undergraduate Engineering Research

Faculty members and graduate students are not the only contributors to USF research. The Research Experience for Undergraduates (REU) celebrated contributions made by USF undergraduate students at its second annual symposium.

The symposium featured poster presentations by 50 University of South Florida undergraduate students in the departments of chemical, civil, computer, electrical, industrial, and mechanical engineering. Presentations included topics ranging from nanotechnology to watershed aquifer monitoring.

First prize was awarded to Anthony Cascio for his work on the construction of an electrospray system for nanoscale patterning of macromolecules. Second prize went to Monica Gonzalez for her research on the use of ultrasound to accelerate drug release. Sadiya Hasan earned third prize for her work on the evaluation of slurries used in chemical mechanical polishing. Honorables mention awards went to Leonardo Gomez for his research on enabling SiC oxidation and characterization, Daniel Rojas for his work modeling and evaluating the parking selection process, and Rochelle Minnis for her evaluation

Vehicles of CRASAR

Photo By Kevin Hale

The wheels behind the Center for Robot Assisted Search and Rescue (CRASAR), a research center at USF for developing new search and rescue technologies.
of copper released into the water distribution system from copper pipes.

Dr. Rudy Schlaf, director of Undergraduate Research in the College of Engineering and professor of Electrical Engineering, was pleased with the presentations, saying that the “symposium was an impressive show of the quality of work done by the participating students. The quality of the posters and their presentation was outstanding and on a very professional level.”

Dr. Schlaf also thanked the Research Office and College of Engineering Dean Louis Martin-Vega for their support of the program.

The REU program allows undergraduate students to gain valuable hands-on research experience while they work with graduate students and professors in the College of Engineering. Over 100 students have participated in the program in its first two years.

- Health Sciences Center (HSC)

In 2001, to facilitate interdisciplinary research and education, the Colleges of Medicine (COM), Nursing and Public Health launched a Health Sciences Center Strategic Plan to build on the combined strengths of the three colleges.

Since then, the HSC has been engaged in facilitating a collaborative approach to education and research by working closely with affiliated institutes, research centers and the Colleges of Engineering and Arts & Sciences. FY2003-2004 saw the HSC research grants and contracts funding rise to an all-time high of $145,421,766.

This success has been achieved through both individual research and collaborative projects organized around the following Strategic Interdisciplinary Research Initiatives:

Aging Research: During the past year, USF awards for research on aging in the HSC totaled almost $16 million. These projects typically involved investigators working together across college boundaries. In addition to collaborations between the HSC Colleges of Medicine, Nursing and Public Health, we see increased involvement of researchers from the College of Arts & Sciences in such departments as Psychology, Biology and Gerontology. About $3 million in federal dollars were allocated to the HSC for construction supporting aging research.

Biomedical Engineering: A new degree in Biomedical Engineering currently is undergoing final review, and meetings on interdisciplinary research initiatives resulted in a proposal invited by the Department of Defense for a 2005 joint project between cardiology and biomedical engineering faculty.

Cardiovascular Research: The cardiovascular research initiative workgroup gathered data on funded research across HSC Colleges in the past fiscal year. The grant awards for 75 cardiovascular research projects involving investigators within a department and across several departments and colleges totaled over $21 million.

A Cardiovascular Research Symposium was held at USF-Tampa in January 2004 that drew presentations from investigators in five USF Colleges, four other universities in Saudi Arabia and from ten USF-affiliated and non-affiliated hospitals and units from as far away as the Cleveland Clinic to share research and plan future projects. Another Symposium is planned for 2005, and an on-going monthly “research-in-progress” seminar is being held to continue the dialogue and sharing.

Cell Therapy Research: An interest group of researchers from several different fields of expertise meets monthly to share research results and review the latest advances in this rapidly growing field. In FY2003-2004, HSC basic research on cell mechanisms related to the potential for therapy and utilizing cell and gene approaches to therapy totaled over $3.2 million.

Children’s Health: The emphasis on children’s health, including maternal and child health, spans the three colleges of the HSC. It includes the Chiles Center for Healthy Mothers and Babies. Basic pediatric research, clinical research with adolescents, and community programs are some of the multidisciplinary projects contributing to improving the health of children. Over $10 million was awarded during the fiscal year to support these efforts, and ground was broken on the Tampa campus near the Medical Clinics for the...
New Faces in USF Research

By Kevin Hale

A number of new faces joins the growing USF research family. USF President Judy Genshaft named Stephen Klasko vice president for Health Sciences and dean for the College of Medicine at the University of South Florida. Dr. Klasko comes to USF from Drexel University where he served as dean of the College of Medicine, professor of obstetrics and gynecology and dean of graduate medical education.

Dr. Klasko takes over at a time of dynamic growth for the Health Sciences Center. The construction of a new College of Nursing building is well under way, and the Florida Legislature this year appropriated $25 million for USF to build a state-of-the-art outpatient facility for health care and education.

The new dean will also oversee the Health Science Center’s $119-million research program, which continues to gain in national stature as its emphasis on interdisciplinary and federal funding increases. He will manage relationships with clinical affiliates across the Tampa Bay Area, including major teaching hospitals, community clinics and public and private health agencies.

“I am excited about the potential that exists at an already great Health Sciences Center,” said Dr. Klasko.

USF also appointed Donna J. Petersen, MHS, ScD, as the new dean of the College of Public Health.

Dr. Petersen joins USF from the University of Alabama at Birmingham, where she is a full professor and former senior associate dean and known as an innovator in the area of public health education and a leader in the fields of health policy and maternal and child health.

“Donna Petersen understands the need for leadership in building the next generation of public health and health care professionals in America, and that’s exactly USF’s vision for our College of Public Health,” said Genshaft. “We have found a great leader for a great college.”

Christopher F. D’Elia, PhD, joined USF St. Petersburg as associate regional vice chancellor for Research and Community Partnerships, the first research leader in the campus’s 59-year history.

Dr. D’Elia will be responsible for identifying new research priorities for the St. Pete campus, will develop and promote internal competitive awards, and oversee quality assurance for research activities.

Dr. Boris Galperin, professor of Marine Science, presented the results of a study at a conference at Columbia University that links the movement and appearance of ocean currents on Earth and the bands that characterize the surface of Jupiter and other large planets in our solar system.

The 25th Conference of the International Union of Geodesy and Geophysics’ Committee on Mathematical Geophysics heard Dr. Galperin and his colleagues (Hideyuki Nakano, Meteorological Research Institute, Ibaraki, Japan; Hui-Ping Huang, Lamont-Doherty Earth Observatory of Columbia University, Palisades, New York; and Semion Sukoriansky, Center for Aeronautical Engineering Studies, Ben Gurion University of the Negev, Beer-Sheva, Israel) report on findings that have “long been a subject of fascination and intensive research.”

Dr. Galperin, a physical oceanographer who analyzes turbulence theory and applies theory and numerical modeling to analyze planetary processes, talked about how “the visible bands on Jupiter are formed by clouds moving along a stable set of alternating flows.”

Dr. Galperin and his colleagues have discovered that the oceans on Earth also harbor stable alternating bands of current that, when modeled, reveal a striking similarity to the bands on Jupiter due to the same kinds of "jets."

“We think this resemblance is more than just visual," explains Dr. Galperin. "The energy spectrum..."
of the oceanic jets obeys a power law that fits the spectra of zonal flows on the outer planets. The observation begs the question of whether similar phenomena are rooted in similar physical forces. “To answer this question,” says Dr. Galperin, “one needs to determine what physical processes govern the large-scale dynamics in both systems.”

According to Dr. Galperin, there is a similarity in the forcing agents for planetary and oceanic circulations. The study maintains that both sets of zonal jets -- the ocean's bands of currents and the bands of Jupiter's clouds -- are the result of an underlying turbulent flow regime common in nature.

Comparing the energy spectra on giant planets and in the Earth's oceans can yield valuable information about the transport properties of the oceans, says Galperin, especially about the strongest currents in the mid-depth ocean.

“The implications of these findings for climate research on Earth and the designs of future outer space observational studies are important,” said Dr. Galperin. The findings were published earlier in Geophysical Research Letters (Vol. 31, No.18). The funding for this study came from both the Army Research Office and the Israel Science Foundation.

**St. Petersburg**

Researchers at the University of South Florida's Center for Ocean Technology (COT) in St. Petersburg hid a round Christmas tree stand underwater not far off a campus seawall to test its cutting-edge sonar system's ability to find it.

The tree stand is about the same size and shape as a limpet mine, a common type of underwater bomb that is magnetically attached to its target. USF's sonar system creates high-resolution, three-dimensional color pictures and will allow our Coast Guard to scan below the waterline for any suspicious objects.

“We're not restricted by dark waters,” said Scott T. Tripp, an engineer with the Coast Guard's Research & Development Center for Ocean Technology in Groton, Connecticut.

In the short term, the goal of USF’s Center for Ocean Technology is to find military and homeland security applications -- and to tap their currently lucrative funding -- for its emerging security projects. In the long run, the Center hopes to commercialize a variety of security-related systems.

“Ultimately, the Coast Guard is not interested in a single sensor, but rather a complete and mature scanning system,” said John Kloske, director of operations at USF’s Center for Ocean Technology. “That's the real challenge -- delivering a tool that 19- or 20-year-old sailors can use.”

USF’s Center of Ocean Technology is talking with ports in California and elsewhere about using its sonar system. The Center sees a rapidly growing cruise ship industry as another market likely to embrace a product to improve the safety of its passengers.

The USF Center, along with St. Petersburg College, recently formed a consortium to convince our federal government to establish a “national center for maritime and port security” in St. Petersburg. That effort is in its early stages, said Carol Steele, the center's business development manager.

The current 3-D sonar system emerged from an earlier USF project designed during the Persian Gulf War. That system helped the U.S. Navy scan ocean bottoms for mines before landing soldiers on shore. Later development of a $100,000 sonar system was driven by federal interest in scanning ships’ hulls for places to hide guns or drugs.

With the federal government's heightened interest in national security, USF's Center upgraded its system to scan a wider range of underwater surfaces. Development of USF’s 3-D sonar system was funded by the Office of Naval Research at nearly $1 million annually. Tripp said his organization recently added new funding to accelerate the 3-D sonar system into “an operational tool.”

Overall, USF ranks among the highest federally funded universities in the nation for antiterrorism. Between USF's Center for Ocean Technology in St. Petersburg and its four-year-old Center for Biological Defense in Tampa, USF has received more than $8 million from the U.S. Department of Defense and other branches of the military this past academic year for antiterrorism projects.

**Lakeland**

The Bartow Community Healthcare Foundation has donated a 4,000 square foot building to the University of South Florida-Lakeland for use in developing its senior resource programs.

Rosemarie Lamm, PhD, ARNP, associate professor of interdisciplinary social sciences at USF-Lakeland, along with staff, administrators, and participants in “The Coalition on Aging Think Tank,” or CATT, will use the space to further their efforts to benefit Polk County's elderly.

“The new center will house organizations that serve the elderly in Polk County,” explains Lamm. “Each organization will donate staff for helping seniors with needs to connect to the proper service or agency. The building will also be a home for classes in our Senior Scholars Program and serve as a research center.”

According to Lamm, CATT is a “grassroots” organization that has been meeting for the last five years with the twin goals of promoting senior education and identifying needs of the elderly in Polk County.

**H. Lee Moffitt Cancer & Research Institute**

Scientists may be a step closer to finding an accurate blood test for early ovarian cancer, according to a new study released by the H. Lee Moffitt Cancer Center & Research Institute.
USF’s Graphicstudio
Develops New Sculpture Using
Rapid Prototyping

As partners, the College of Engineering, School of Architecture, College of Visual and Performing Arts, and Graphicstudio purchased a Rapid Prototyping printer. Rapid Prototype printers create 3D computer generated model files into "real" objects in space.

Working with an artist collective from Cuba, Los Carpinteros, Graphicstudio has developed a new sculpture edition using the Rapid Prototyping printer. This project, titled Sandalo, is a larger than life size pair of 'flip flop' sandals. Topographical maps of neighborhoods in Havana, both the east and west, are depicted on the inner soles of the sandals. With this project, Los Carpinteros explore the sensation of being part of a place through walking, mapping and feeling the city streets beneath your feet.

The idea was first realized as a drawing, then developed in a 3D computer rendering and created using the Rapid Prototyping printer. Molds were made from the prototypes and then sandals (multiple) were cast in a dense rubber. Rapid Prototyping process allows artists to achieve detail and scale with an efficiency not possible with traditional sculpture techniques.

The study showed that an indicator in the blood of ovarian cancer patients can be used to detect the disease with 93 percent accuracy. That biomarker, called lysophosphatidic acid, or LPA, is produced at high levels by ovarian cancer cells and isn't detectable in the blood of healthy women.

Developing a reliable screening test for ovarian cancer is crucial because most patients can be cured when the disease is caught early, said USF principal investigator, Dr. Gary Litman, Hines Professor of Pediatrics, who works at the Children’s Research Institute at ACH. “They may be related to receptors in humans involved in natural killer cell function.”

Natural killer cells sense and kill malignant cells including a control group of healthy women.

“We know that it does cause ovarian cancer cells to proliferate ... but the full function and role of LPA in ovarian cancer still isn’t known,” Sutphen said.

• Children’s Research Institute at ACH

For the first time, researchers at USF have sequenced all 36 genes of novel receptors that appear to play a critical role in innate immune protection of zebrafish—an achievement that could lead to a better understanding of infectious diseases and certain cancers.


“This is the most genetically complex system of innate immune receptors thus far described,” said principal investigator, Dr. Gary Litman, Hines Professor of Pediatrics, who works at the Children’s Research Institute at the University of South Florida College of Medicine and All Children’s Hospital (ACH). “They may be related to receptors in humans involved in natural killer cell function.”

USF researchers at Moffitt partnered with doctors at four hospitals in Hillsborough and Pinellas counties to seek blood samples from patients. Called the Tampa Bay Ovarian Cancer Coalition, the partnership followed hundreds of women, including a control group of healthy women.

Like humans, it has two types of immune systems—innate and adaptive. Innate immune systems provide a first line of defense against foreign microorganisms. Humans and other jawed vertebrates have also evolved more customized or adaptive immune systems, that use an arsenal of antibodies and T-cell receptors to fend off diverse pathogens and prevent repeat attacks.

They searched the genome of the zebrafish and identified a class of genes, called novel immune-type receptor (NITR) genes, which are predicted to be capable of recognizing a wide range of surface molecules.

A portion of the NITR genes is very similar to variable region genes of antibodies and T-cell receptors, but the NITR genes do not undergo the complex genetic rearrangements of these adaptive receptors.

“The comprehensive definition of the NITR gene cluster in zebrafish reported in this paper represents a significant step toward understanding the mechanisms underlying the transition from non-specific innate immunity to specific adaptive immunity,” Dr. Litman said.

The zebrafish genome study was supported by grants from the National Institutes of Health, Pediatric Cancer Foundation, National Science Foundation and American Cancer Society.
Research Facts

FALL 2004

RESEARCH AWARDS

Federal Awards
Total Research Awards

$0 million $50 million $100 million $150 million $200 million $250 million $300 million


Federal  $53.7  $84.1  $101.9  $122.7  $126.8
Totals  $171.3  $186.2  $207.9  $254.8  $290.1

FACTS ABOUT RESEARCH AT USF

• 42,357 students
• 7,333 graduate students
• 12,446 employees
• 1,611 full-time faculty
• 200,000+ graduates
• 85,000+ graduates live in the Tampa Bay area
• 200+ degree programs, including MD
• $1.2 billion operating budget
• $24 million new building construction

National Research Ranking
43rd in top public research universities (Source: TheCenter)

Sponsored Research Activities, 2003-2004
• $290+ million annually in sponsored research funding
• 844 funded faculty
• 1,610 active sponsored projects

A FOCUS ON RESEARCH

Health & Health Care Research
• Cancer
• Bioinformatics
• Heart/Cardiovascular Disease
• Public Health
• Neuroscience/Alzheimer’s Disease
• Cell & Gene Therapy

Marine Science
• Weather and Coastal Change
• Port Security
• Ocean Modeling, Remote Sensors, and Real-Time Data

Technology
• Nanotechnology & Microsystems
• Bioengineering
• Sensors
• WAMI
• Optics

Homeland Security & Bio Defense
• Search & Rescue Robotics
• Port Security
• Infectious Disease Detection and Containment
• Readiness and Emergency Training

Education Research
• At-Risk Children
• Child Development
• Physical Wellness
• School Reform

Transportation Research
• Alternative Fuels
• Public Transportation
• Geographic Information System

RESEARCH PARK HIGHLIGHTS

USF Nanotechnology Building
• Home of Nanomaterials and Nanomanufacturing Research Center
• Multidisciplinary research related to sensors, actuators, electronics, optics, and integrated nanoscale systems
• Fabrication, characterization, and metrology capabilities

Five Facilities in Operation
• UTC I and II Office, Research, and Training Space
• University Diagnostic Institute (nuclear imaging)
• Florida Department of Health Lab
• Embassy Suites Hotel and Conference Center

All data compiled from information taken from the Research Office Report of Research Activities 2003-2004 and http://reports.research.usf.edu
RESEARCH AWARDS BY FUNDING TYPE: 2003-2004

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AWARDS BY COLLEGE OR AREA: 2003-2004

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SOURCES OF FEDERAL FUNDING: 2003-2004

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PATENTS AND LICENSING BENCHMARKS: 1999-2004

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<td>22</td>
</tr>
<tr>
<td>2003/04</td>
<td>178</td>
<td>23</td>
</tr>
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</table>

*Patents can take on average 2-5 years to be issued.

**Health Awards Breakdown**

- National Institutes of Health: 70%
- Other DHHS agencies: 30%

RESEARCH FACTS