DISCOVERY:
FLORIDA TECH

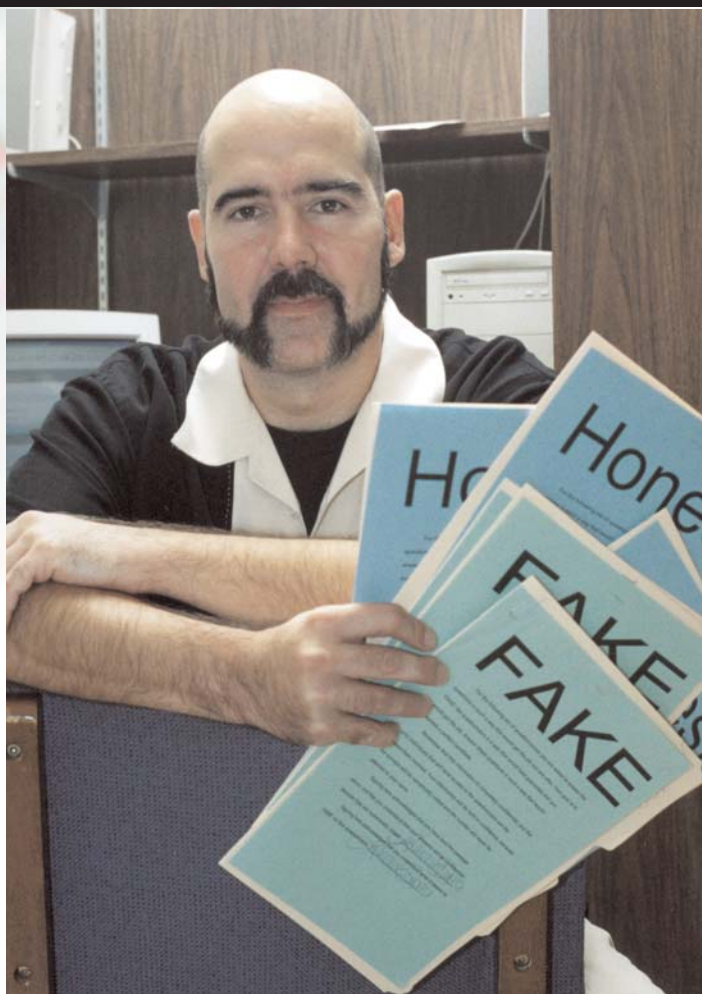
Volume 5, Issue 1

I/O Psychology

Faking Out the Fakers

"My approach to pre-employment personality tests has been zero tolerance vis-à-vis the obvious "crimes"—drug use and theft—but to leave a little wriggle room elsewhere, just so it doesn't look like I'm faking out the test. My approach was wrong. When presenting yourself as a potential employee, you can never be too much of a suck-up."

Nickel & Dimed,
by Barbara Ehrenreich, page 124.



By using their own methodology, Dr. Richard Griffith and his team can find out if job applicants taking personality tests are faking their answers.

Learning if job applicants are faking and finding out if it matters is a passion for **Dr. Richard Griffith** and his Applicant Response Behavior team. Griffith, director of the School of Psychology's Industrial Organizational Psychology program, has researched personality tests since he was a doctoral student at the University of Akron. Continuing this work since coming to Florida Tech seven years ago, the effort is beginning to bear fruit.

Finding that former attempts to model applicant faking have failed, he and his team of graduate students created a new methodology and analytical technique to model applicant response distortion. "Previous tools often capture the results of faking and not faking itself," said Griffith.

One of the team's published papers, "Modeling Applicant Faking: New Methods to Examine an Old Problem," discusses the efforts and limitations of past researchers to model faking behavior, and explores the new methodology.

In the new model, which closely mirrors an applicant setting, individuals at a local community college were assessed under two types of conditions. First they completed a test while believing they were applying for an attractive, genuine job.

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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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Kathie Grant, Dr. T. Dwayne McCay, Karen Rhine, Liz Tottenham
Contributing Writers

Verna Layman, Karen Rhine, Liz Tottenham, Jay Wilson
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Judi Tintera
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Kathie Grant
Copy Editor

Personality tests have become a major screening tool for today's employers.

"I/O Psychology" continued from page 1

Then, after being debriefed and told that no job existed, they were asked to honestly fill out a personality measure so that their responses could be used in Griffith's research study.

The "applicants" were told that no one would see the results of the second test except the research psychologist.

"Our study marks the first time that data has been collected that can identify the applicants who faked, how much each one faked and if their scores are valid predictors of job performance," said Griffith.

The team has moved on, with more published results, to the question of whether or not test faking matters in employee selection.

"We found that applicant faking had a substantial impact on the rank ordering of scores and thus on top-down selection," said Griffith. By once again applying a new model, the researchers found that, yes, individuals do fake in an applicant setting, and that this falsifying affects the rank ordering of applicants.

The next question, said Griffith, is "What are the consequences? Do the fakers turn out to be poor performers?" Does testing, in fact, ensure better employees?

Considering the booming personality-testing industry and the millions spent by employers hoping to reduce turnover and decrease search costs, the answers should be significant.

Griffith is also hoping to provide significant answers in another area of industrial/organizational psychology. He is working with **Dr. John Deaton**, chair of the School of Aeronautics Human Factors program, to apply psychology in the arena of "synthers." These are synthetic agents, driven by high-end computers, used in training Navy pilots. Replacing human trainers, they are also used in antiterrorist training for airport personnel or cultural awareness training for military and other government personnel.

Griffith has written a white paper on the dynamics of synthers and teams, and the development of trust between "man and machine." He is developing his concept into a proposal for the Navy.

Research opportunities abound in Griffith's 2003–2004 I/O psychology program, which has 25 M.S. students and 10 Ph.D. students enrolled. The research-intensive doctoral program is the third largest in the country. The largest is his alma mater's, the University of Akron; number two is at the University of Florida.

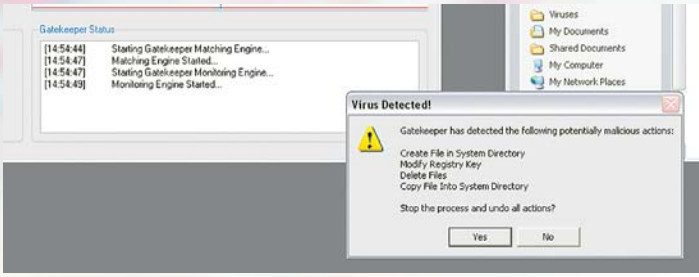
"With organizations evolving and businesses going more global, there is a growing demand for professionals in this field," said Griffith. "Making good use of testing, addressing productivity issues and supporting employees on international assignments are just some of I/O psychology's important and fascinating areas of study."

Karen Rhine

A job applicant tries to guess what an employer is looking for on a personality test.

Infiltrating the C.I.A.

Security is the code word at the Center for Information Assurance.



There is a certain aura of mystery surrounding Florida Tech's Center for Information Assurance, which could be due, in part, to their familiar acronym, C.I.A. Like the Central Intelligence Agency, the center's name sounds official, plausible, yet does little to convey just what the Center for Information Assurance is all about. But dig a little deeper and you'll find there's really no cloak and dagger mystery here. The mission of Florida Tech's largest research center is straightforward: to assure, or safeguard, information through safer computing.

It didn't always have that moniker. Back in 1996 it was founded by **Dr. James Whittaker** as the Center for Software Engineering Research. The name changed in 2002. Increasingly, technologies developed by the Center were being applied to computer security debugging solutions and the new name more accurately reflected its new focus. In 2003, Provost **Dwayne McCay** designated it a university-wide center. In just the past two years, the Center has earned more than $5.2 million in grants and awards to fund ongoing research in areas of network security, malicious code, virus attacks, software testing and improving software security.

Intelligence Agents

Dr. James Whittaker–Professor of Software Engineering and Center Director
Dr. Gerald Marin–Professor of Software Engineering
Dr. Kamel Rekab–Professor of Statistical Software Testing and Reliability
Dr. William Allen–Assistant Professor
Dr. Mike Andrews–Assistant Professor
Dr. Richard Ford–Research Professor
Helayne Ray–Senior Researcher
Carole Finnie–Contracts Administrator

The sleek but unassuming C.I.A. office is located on the ground floor of the F.W. Olin Engineering Complex although much of the work is done in "the Lab" (several computer-filled rooms on the second floor) and at off-campus facilities. In the past few years the staff has grown to 30 students, six faculty and two full-time staff members.

Success has followed success, attracting more funding and top-notch faculty. The Center's newest faculty member, **Dr. Richard Ford**, who came on board in August, 2003, is an internationally recognized expert on computer security.

Ford earned his doctorate in semiconductor physics from The Queens College, Oxford–England, and subsequently has held corporate positions with Command Software Systems, IBM Research, Hiway Technologies/Verio and Cenetec LLC. He was also Executive Editor at Virus Bulletin and co-authored *The Survivor's Guide to Computer Viruses*. But after 10 years of working in industry, Ford yearned to go back to "pure research."

"It would seem to be an odd choice for me, but after speaking with James, seeing the amazing things he was doing here, and meeting the team—there was no question, I just had to be part of it," Ford said, "The work being done here is as good as anywhere else on the planet."

Fighting the Code War

One of the projects Ford heads up, funded by a grant from the Office of Naval Research, is a proactive antivirus program with the ability to recognize malware (a virus, worm or Trojan) that it has never encountered before. Current antivirus software, explains Ford, is reactive and can only protect against known malware. By the time an antivirus program is updated to combat it, the malware has had ample time to do a lot of damage.

"We live in a delicately balanced, interconnected world," notes Ford, "Today, new malware can infect computers worldwide in only one hour via the Internet. A particularly aggressive virus could conceivably cause enough malfunction in communications to result in the loss of life—for instance, interrupting the transport of a heart or kidney to its intended recipient."

Yet Ford doesn't consider most individuals who write malware to be "evil" per se. "They are mostly younger, often in their teens, and nice kids—at least the ones I've met," he says, "They do it because it's a challenge, often with no real comprehension of the extent of damage they can do to a company's network and the cost to repair it—sometimes in the hundreds of thousands or even millions of dollars. As they mature, and begin to understand the consequences, they usually stop." The reality, Ford notes, is that malicious code writers are not going to go away any time soon.

The team celebrates Gatekeeper's successful test run. From left, Wagner, Michalske and Ford.

That's where the program, known as GateKeeper, comes in. Theoretically, computer users running GateKeeper would be alerted immediately to virus-like activity on their system. Not only can GateKeeper recognize and disable the program, it can actually "undo" any possible damage the program has done.

Ford and student team members, **Matthew Wagner** and **Jason Michalske**, recently tested GateKeeper's ability to "catch" the Mydoom worm. To their delight, it passed the test with flying colors. The Center is in the process of obtaining a patent on a component of the GateKeeper technology. Wagner presented his thesis paper about the project, "Behavior-oriented detection of malicious code at run-time," at a recent consortium for antivirus developers hosted by Florida Tech. Based on the interest it generated, they expect the software will be licensed for commercial use in the near future.

Meanwhile, C.I.A. members are working on a number of other research projects funded by the U.S. Navy and Air Force as well as corporations such as Microsoft, IBM, Harris Corp., Texas Instruments, Northrop Grumman, Cisco and others.

When asked how he likes his role at Florida Tech, Ford replies, "We're having fun and saving the world at the same time. It's great!"

Kathie Grant

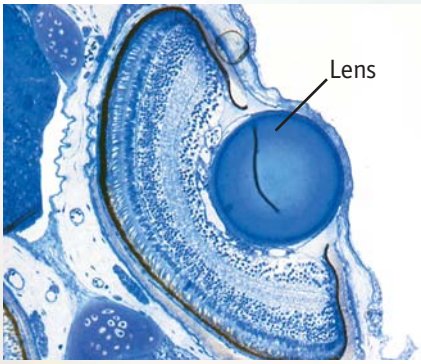
Student Makes Surprising Discovery

Research on Fish Eyes Shows Continuous Development—In Reverse

An unexpected discovery gave graduate student **Scott M. Taylor** a research project that could have stunning implications in fields ranging from nervous system development to fish conservation, according to his research adviser, **Dr. Michael Grace**, Florida Tech associate professor of biology.

The doctoral student was studying larvae of fish from the taxonomic subdivision Elopomorpha, which includes tarpon, bonefish, ladyfish and eels, when he found that they have more in common than their bizarre shape and sharp teeth.

Taylor began studying specimens collected for studies of larval recruitment, growth and survival rates, and feeding biology in the laboratory of **Dr. Jonathan Shenker**, director of Florida Tech's Sportfish Research Institute. What Taylor found was retinal development that confounded accepted fact.



The eye and pure-rod retina of a larval elopomorph eel magnified 100 times.

Apparently, these fish's visual receptor cells develop in a manner opposite almost all other fish.

"The retinas of nearly all larval fishes contain only cone cells (cones function in bright light, providing color information and high visual acuity—the ability to discriminate small objects; rod cells do the opposite). Presumably this maximizes visual acuity for tiny larval fishes to find minute morsels of food," Taylor explained. "However, all of the larval elopomorph fishes that we have studied thus far have only rods in their retinas." This is an amazing discovery in the field of vision research, but it is also important to fish biology because almost nothing is known about vision in this highly diverse, ecologically important and commercially valuable group of fish.

Taylor's goal, with the help of Dr. Grace, a sensory neurobiologist, is to determine why elopomorphs have eyes that develop so differently with respect to other fish species. Taylor uses high-resolution light microscopy and transmission electron microscopy to visually compare retinal cell types, and immunocytochemistry to selectively label specific cell types for microscopic analysis of biochemistry. He also uses microspectrophotometry to determine how different photoreceptor cells respond to light.

This is all done as the fish progress through distinct developmental stages. The results are building a fascinating picture of how retinal structure and function vary among species and change as development proceeds.

"These fish begin life as larvae that are nearly identical morphologically, but they mature to adults that are radically different in form and function (consider adult tarpon and eels!)," said Grace. "We hypothesize that different strategies for development of the visual system relate to different functional requirements as fish mature, move to new habitats, and alter their behaviors."

"Unlike mammalian eyes, the eyes of fishes continuously grow throughout life.

Taylor and Grace working in Florida Tech's Electron Microscopy Lab

This includes the neural retina where photoreceptor cells are located," said Taylor. "The continuously growing fish retina might allow visual systems to change and continue to function appropriately as ecological changes (habitat, behavior, etc.) occur with development."

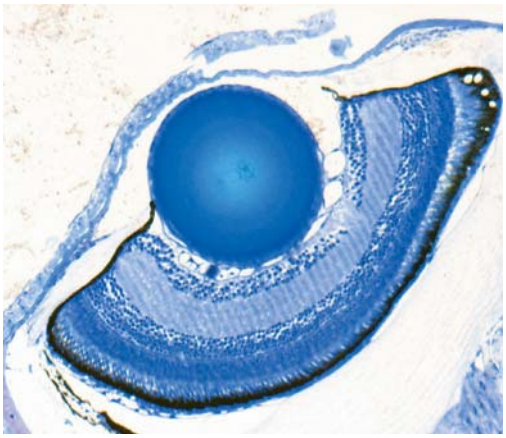
The lab's new discoveries suggest that elopomorph retinas all start out the same, but later change to distinct forms in different species. Taylor explained, "Although we have found that elopomorph larvae have similar retinas (although distinct from non-elopomorphs), the retinas of juvenile and adult elopomorphs differ dramatically, likely reflecting habitat and behavioral differences." Through their comparative developmental approach, Taylor and Grace hope to define relationships between retinal form and function.

Taylor's research should have a significant impact in the fields of visual neuroscience, fish biology, fisheries management and marine conservation. "This research also has important implications for human health and disease," said Grace. "Fish are important models for biomedical research, including studies of vision. Human infants, like most mammals, are born with eyes nearly the size they will have as adults. Sometime early in development cell division ceases, and in cases of disease or injury, the retina cannot regenerate. Not true for fishes' eyes, so research on fish might lead to new treatments for nervous system disorders."

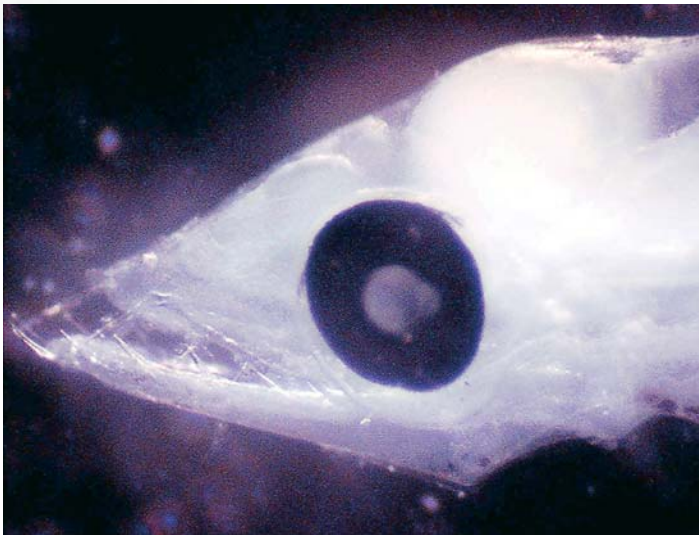
Taylor hopes to complete his research and doctoral dissertation within two years.

"Research is inherently unpredictable because it is novel. I have encountered some small setbacks, and likely will encounter more before finishing," he said. "But, with hard work and a little luck, I hope to finish the research by the beginning of 2005, with one or two additional semesters to analyze the data."

Taylor appreciates the assistance he has received. "Dr. Shenker is the expert on elopomorph fishes and has helped tremendously in acquiring specimens. He is an excellent source of knowledge," said Taylor. "Dr. Grace's expertise studying sensory systems of other animals (notably snakes) uses many of the same techniques that I am using." Taylor and Grace also collaborate with other laboratories for some of their specimen collection and data analysis. Dr. Robert Cowen and Michael Larkin (University of Miami), Dr. Ellis Loew (Cornell University), and Mr. Timothy Austin (Cayman Islands Department of Environment), have all contributed in important ways.



The pure-rod retina of a larval tarpon, nearly identical to the larval eel retina.



All larval elopomorphs have small heads with sharp, fanglike, forward-pointing teeth, like this larval tarpon.

Juvenile tarpon are radically different from their larvae. Notice the different head shape and lack of fanglike teeth.

Taylor's background in fish biology along with Grace's research on the neurobiology of vision and infrared imaging in snakes and other animals have opened the door for research on visual mechanisms of elopomorph fishes.

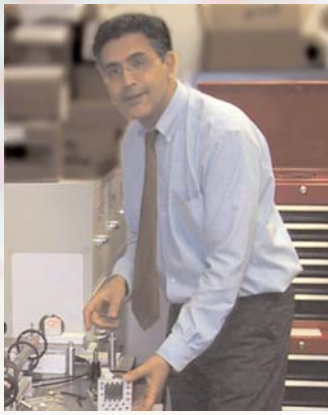
Even if diverging from his interest in snake vision, Dr. Grace is happy to be spending his time with fish.

"This is a wonderful project with broad application—it takes me back to my roots in retinal cell biology," said Grace. "We've worked hard to develop this project and I'm excited to contribute to Florida Tech's excellence in marine biology. We're very excited about the questions we've been asking—and the answers we're getting."

Liz Tottenham with Scott M. Taylor

Much Ado About a Little Matter

Sitting at his desk on the fifth floor of the Crawford Building, Florida Intitute of Technology particle physicist **Dr. Marc Baarmand** contemplates the largest questions of the universe at matter's smallest levels.



Dr. Marc Baarmand

Baarmand is one of a small army of scientists around the globe working to create the next generation of experiments at the CERN Particle Accelerator in Geneva, Switzerland. The multi-billion dollar Large Hadron Collider (LHC) project will investigate what he considers the three most important issues in subatomic physics.

"We want to learn three things," Baarmand said. "First, what is the origin of mass? Second, what has happened to antimatter? Third, can we have a unified theory of the four forces of nature, a theory of everything?"

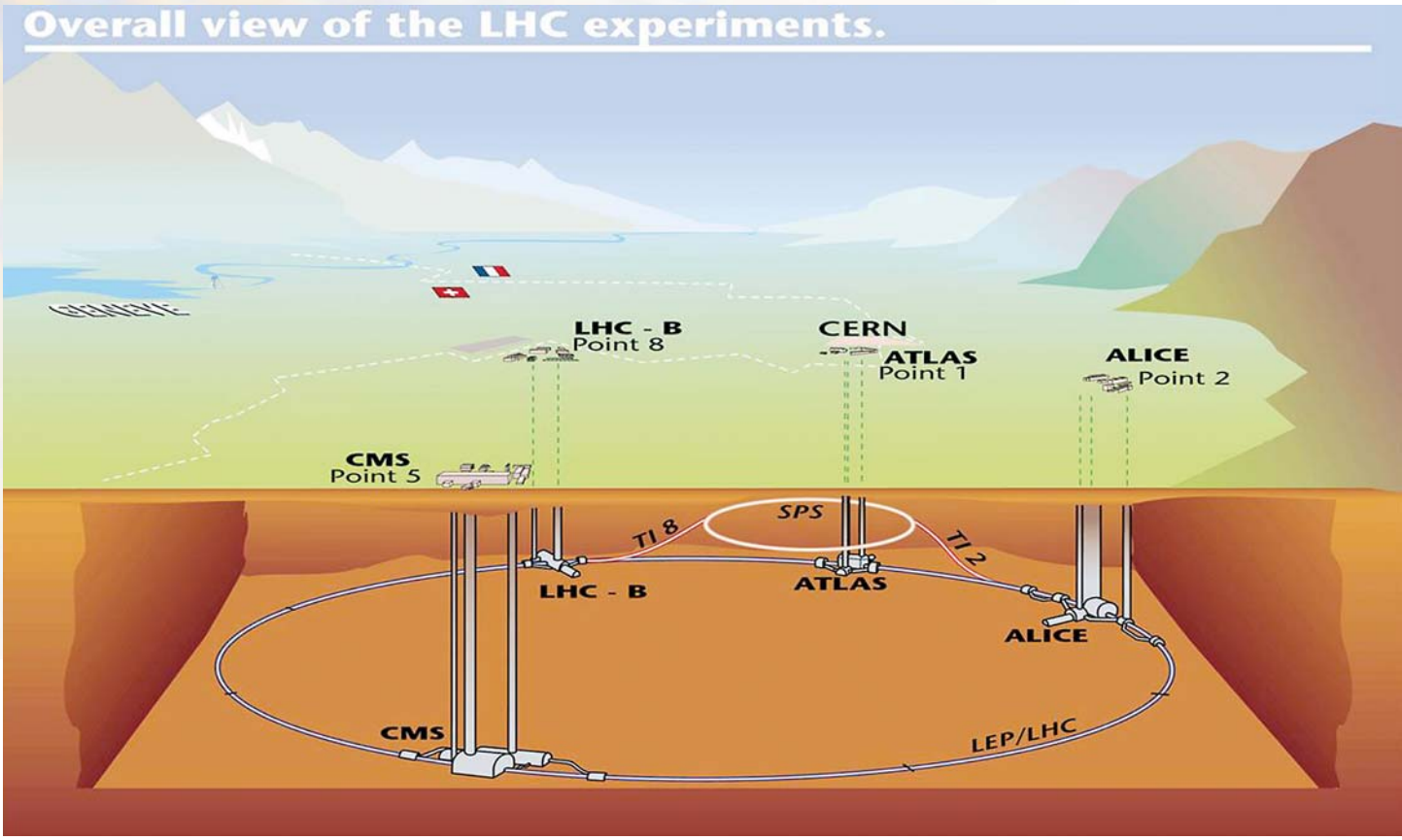
Baarmand said the disappearance of antimatter is a puzzle, because while antimatter can be created in a laboratory, it doesn't exist in present-day nature. He said that scientists believe that there was symmetry between matter and antimatter at the moment of the Big Bang some 14 billion years ago, but that some sort of asymmetry in favor of matter occurred within the first second after the Big Bang, which caused, over time, the presently observed dominance of matter.

The third question is often referred to as the quest for the theory of everything. Physicists agree that there are four underlying forces of nature: gravity, electromagnetic force, strong force (that holds nuclei together) and weak force (that causes, for example, certain radioactive decays). Scientists are searching for a unified theory that would show that these four forces are the manifestation of one force, a quest Baarmand compared to the search for the Holy Grail.

Baarmand's role, however, is to focus on the first question —the search for the origin of mass. To date, he has received over $650,000 in United States Department of Energy funding toward this research.

"We want to learn how particles get their masses, and why there is such a large range of masses for different particles," said Baarmand. "This is a mystery. We have ideas and models, but no proof. It is the primary goal of the next generation of experiments at the LHC at CERN."

To that end, Baarmand and others have undertaken



Several primary experiments encompass the Large Hadron Collider project in Geneva, Switzerland.

construction of the Compact Muon Solenoid (CMS) experiment, a set of large detectors for a price tag of more than $500 million. He and his colleagues, some 2,000 scientists from more than 35 nations, will use the CMS experiment to search for the Higgs particle; the physical manifestation of the field that scientists theorize is responsible for the generation of mass.

By discovering the Higgs particle, they hope to prove the validity of the Higgs field theory, proposed by British mathematical physicist Peter Higgs in 1964, a field occupying all of space and with which all matter in the universe interacts.

The LHC will accelerate two beams of protons, one clockwise, one counterclockwise. The beams, once reaching practically the speed of light, will be forced to collide. The energy of the collision will create matter and perhaps new particles. This process creates 10 to 20 collisions every 25 nanoseconds.

This aerial view of Geneva, Switzerland shows the scale of the underground Large Hadron Collider experiment. The outer thin, white line encompasses the area.

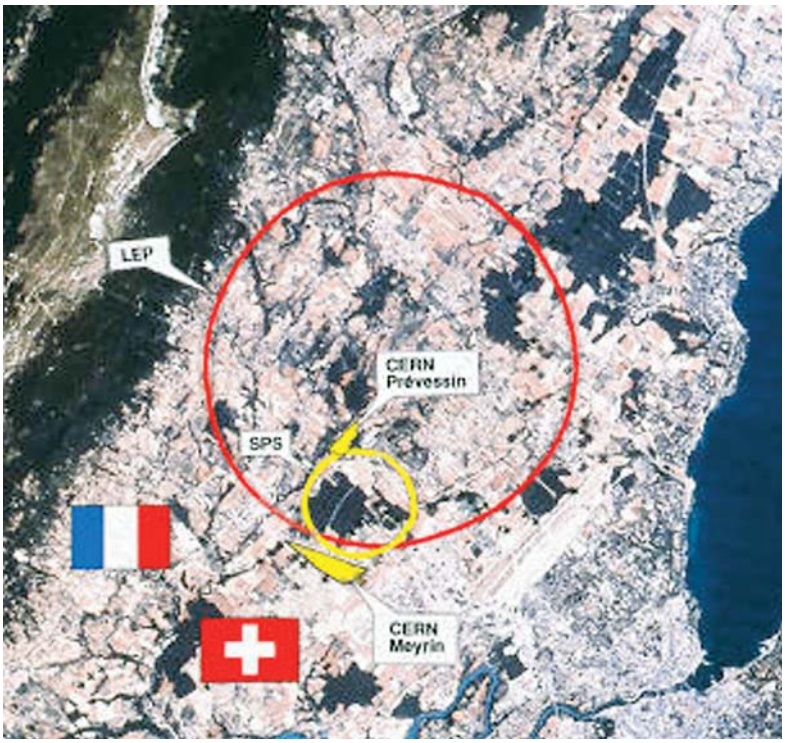
The potentially new particles created in these collisions are the focus for Baarmand and his fellow scientists.

"After you run the experiment, you must reconstruct the collision, and one in a billion collisions will perhaps produce interesting results," said Baarmand. "A few hundred is a reasonable sample to discover something unique, but to truly explore your findings will take several thousand interesting collisions."

Presently, Baarmand is part of a team designing and constructing detectors to enable scientists to understand the various interesting phenomena. He is responsible for construction of a light calibration system for the CMS calorimeters, detectors measuring the energy of particles produced in proton collisions. The experiments will begin at CERN in 2007.

"We are perhaps on the verge of a huge discovery in this field," said Baarmand. "We now have the experimental facilities to study the behavior of matter at subnuclear levels never explored before. If we are able to answer these three basic questions, it will be a huge leap in our understanding of the universe."

Jay Wilson



In this view from a higher altitude, the CERN particle accelerator, where Dr. Baarmand works on proton collisions in the Compact Muon Solenoid experiment, is circled.

"Grant and Contract Growth" continued from page 8

Dr. Kunal Mitra—$50,000 from the Florida Dept. of Health to develop a new technique to locate lung cancer and tumors. His proposed technique, which involves lasers, will add a high-tech approach to the current array of location methods.

Dr. "Sharif" Sharaf-Eldeen—earned approximately $50,000 in funding from the Florida Solar Energy Center to install 500-square-foot solar electric panels atop the F.W. Olin Engineering Complex. The installation is part of the U.S. Dept. of Energy's Million Solar Roofs project and will be used for teaching and energy saving.

Dr. John Trefry—$95,000 from the St. Johns River Water Management District to conduct research on suspended particles in the Indian River Lagoon.

Dr. James Whittaker—$50,000 from Security Innovation Inc., representing a royalty for licensing information assurance technology developed in Whittaker's Center for Information Assurance. Whittaker also earned a $70,000 Air Force Research Laboratory grant to model all possible computer hacker exploits.

SCHOOL OF MANAGEMENT

Dr. Andrew Cudmore—Websurveyor software from the WebSurveyor Corporation of Herndon, Va. for creating and administering Web-based surveys. The software's estimated commercial value is $250,000.

SCHOOL OF PSYCHOLOGY

Dr. Philip Farber—$86,400 from the Department of Health and Human Services, Bureau of Health Professions to help prepare Florida Tech doctoral students for integrated health service work with underserved populations. He also earned a $50,000 Fellsmere Medical Center Behavioral Health contract to provide services to the primarily Hispanic, migrant population of Fellsmere, Fla.

SOAR(ing) at Florida Tech

As a newcomer at Florida Tech, I have the joy of being surprised every day about what we are doing and how well. The research in image and speech processing, computer and network security, aquaculture, marine materials and space physics gives me plenty of chances to be awed and impressed. The quality of our faculty is on par with any university—anywhere!

The fact that undergraduate students are directly involved with many of these efforts is almost incredible. It is this aspect of Florida Tech that is unique and leads me to realize we may be the only university in the country (possibly the world) where our students, new and old, can truly SOAR.

T. Dwayne McCay

SOAR: Space, Ocean, Aeronautics and Research—that's pretty straightforward.

Our students have Kennedy Space Center just down the road. And every one of them has the chance to see a space launch and rub elbows with astronauts. Many have even been involved in building and launching major rocket systems.

Florida Tech students can really get their feet wet, literally. They scuba, snorkel and sail in lagoons and the great Atlantic itself—and all that as part of their class work in marine biology and ocean sciences.

There is a beehive of activity every day at the Melbourne International Airport. These bees have white and crimson stripes and belong to Florida Tech. They are piloted by Florida Tech students, who are learning to fly. Many are preparing for a lifetime career in aviation.

Finally we get to research at Florida Tech. Every single student will participate in a creative, team-oriented research experience before they graduate.

The bottom line is that Florida Tech is a university where students can truly SOAR.

T. Dwayne McCay
Provost and Chief Academic Officer

Grant and Contract Growth

Today, at any given time, the value of Florida Tech research contracts and grants exceeds $22 million. Following are highlights of awards earned by faculty between September 2003 and February 2004.

COLLEGE OF SCIENCE AND LIBERAL ARTS

Dr. Michael Babich—$290,000 from the National Science Foundation to purchase a nuclear magnetic resonance spectrometer (NMR). The NMRs are the most heavily used pieces of equipment in the chemistry department for teaching and research.

Dr. Sydney Barnes—$80,000 from the National Science Foundation's Stellar Astronomy and Astrophysics Division to research the rotation rates of late-type stars in open clusters and to probe the changes that occur as stars age.

Dr. Virender Sharma—$43,000 from the National Science Foundation for a collaborative project with Eotvos Lorand University, Budapest, to advance scientific understanding of iron chemistry in aqueous solution and to solve organics-related water pollution problems in Hungary.

Dr. Ralph Turingan—$60,000 Florida Sea Grant to research the key factors that affect the survival of marine ornamental fish, such as angelfish and anemone-fish in their larval stage.

COLLEGE OF ENGINEERING

Dr. Philip Chan—$500,000 from NASA for an investigation into artificial intelligence to detect any unusual functioning of a space shuttle component. The grant is in collaboration with Interface & Control Systems of Melbourne. Florida Tech's portion is $175,000.

Dr. Richard Ford—$76,000 from Cisco System's Critical Infrastructure Assurance Group to investigate the spread of computer worms in a "realistic" computing environment.

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