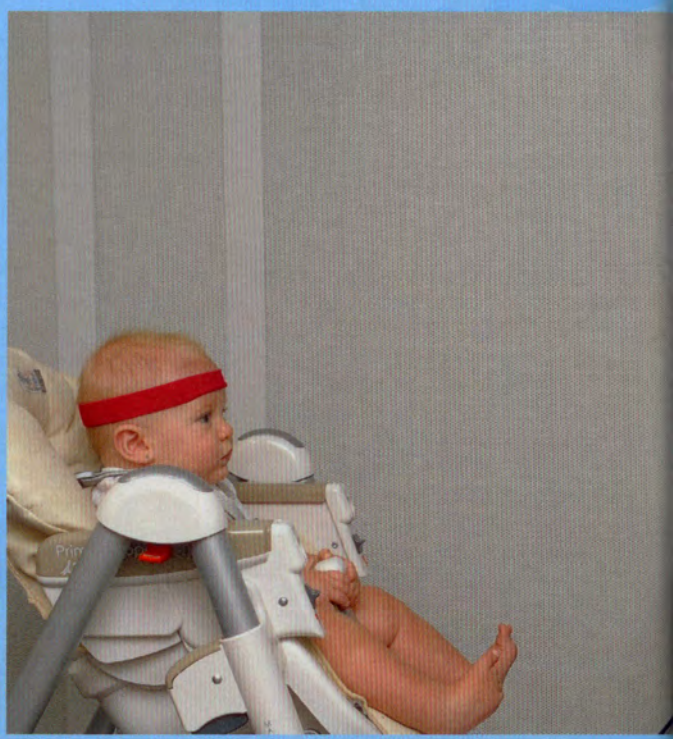
Sector Portrait

By Amy Keller

Research

Medical discoveries tend to dominate the headlines, but there's other research going on at Florida's universities — including projects that incorporate advanced technology into traditional disciplines like anthropology.



Florida

New technologies have enabled researchers to uncover previously unknown areas of the ancient city of Caracol in Belize.

ANTHROPOLOGY

Jungle Town

Arlen Chase examines remains from Caracol. Chase and his wife, both UCF professors, use new remote-sensing technology to explore the terrain.

Arlen and Diane Chase, a husband-and-wife anthropology team from the University of Central Florida, spent 28 years bushwhacking their way through the jungles of west-central Belize, mapping and excavating Caracol, an ancient Mayan city buried under a thick canopy of rainforest.

They and their students had mapped nine square miles of settlement, 1.5 square miles of agricultural terracing and 25 miles of roadways but believed there was more. They estimated that as many as 100,000 people had lived in the city — a figure that some archeologists questioned without more evidence.

In 2009, the Chases began using a new remote-sensing technology called LiDAR (Light Detection and Ranging) that enabled them — from the air — to see beneath the jungle's canopy and cover more terrain more quickly. Four days of laser-mapping revealed that Caracol had been a huge city encompassing approximately 70 square miles, an area roughly as big as Washington, D.C. The laser images also uncovered tens of thousands of agricultural terraces the Mayans had built to feed the inhabitants of their sprawling city, 11 previously unknown causeways and numerous hidden buildings and structures obscured by dense tropical overgrowth.

The results astonished the Chases. "We didn't expect it to go this well," says Diane Chase. The terraced fields they had mapped, for instance, were far more extensive than they'd thought and covered virtually the entire metropolis. "They modified the city landscape on a mind-boggling scale," she says.

The LiDAR data also verified the couple's previous population estimates for Caracol. "The data show the full extent of Caracol, how the settlement was structured and how the ancient Maya radically modified their landscape to create a sustainable urban environment, challenging long-held assumptions about the development of civilization in the tropics," Chase wrote in a 2010 article in *Archaelogy* magazine.

The Chases hope that the new technique and other emerging technologies will help answer one of the greatest

ANTHROPOLOGY

Diane Chase is hoping technological advances can help solve the mystery of Caracol's demise.

puzzles of modern archaeology — what led to the collapse of Maya civilization around 900 A.D.

While scientists have hypothesized that everything from drought to warfare to the overexploitation of natural resources decimated the Maya, the Chases say they believe that internal social and political stresses likely played a major role in the collapse. One potential clue: The distribution of goods and ritual items over the ages. Archaeological finds from 550 to 790 A.D. showed that the general population and the elite shared many of the same kinds of wares and tombs, for example. In later years, that "symbolic egalitarianism" vanished and may have, the Chases postulate, to Caracol's eventual collapse.

The Chases are hopeful that they'll be able to answer more questions as the technology evolves.

"As we have new technological advances — the LiDAR is certainly one (and) our ability to analyze skeletal material for dietary information is another — but I suspect there will be other things we'll be able to do. When we can get to a place where we can actually look at genetic ties among the population, that will help give us answers," says Diane Chase. "So we're going to keep getting closer. Whether we're going to be absolutely there, I'm not sure."

Interstate Commerce

Florida residents have apparently been cultivating business relationships with other regions for much longer than you might imagine. Keith Ashley and his students at the University of North Florida have unearthed evidence that the natives who lived in the Jacksonville area around 1000 A.D. participated in long-distance interaction and trade networks that brought mica, galena, copper and stone to the region. "We have copper that's been sourced to the Appalachian Mountains and to the Lake Superior region" in the upper midwest, says Ashley, an anthropology professor and coordinator of archaeological research for UNF. Ashley says they likely moved the goods via waterways. "It's just faster and easier to go by canoe, but undoubtedly there's going to be areas where they're going to have to move by land."

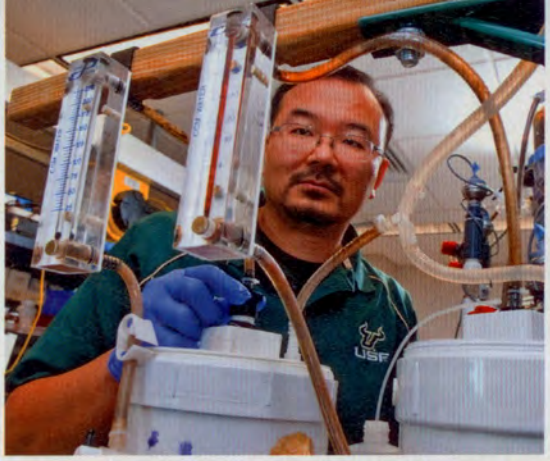
Ashley and his students, along with colleague Robert Thunen, are also searching for La Caroline Colony, known today as Fort Caroline, which was built in the Jacksonville area in 1564 by French Huguenots. "What we're trying to do is reconstruct the social geography of the Native American landscape in the 16th century," says Ashley.

UNF students dig for clues to Florida's past.

A Home for Freedom

Uzi Baram

In the late 1700s until around 1821, as many as 700 escaped slaves lived in a community they founded called Angola somewhere along the Manatee River in what is now Bradenton. What we know about Angola today was pieced together by Florida historian Canter Brown Jr., who first read references to Angola in historical documents when he was researching his book "Florida's Peace River Frontier" in the late 1980s. But the exact location of the settlement, which was destroyed in 1821 by members of the Lower Creek Native Americans, possibly under orders from Andrew Jackson, remains a mystery. Uzi Baram, a professor of anthropology at New College and lead archaeologist in the "Looking for Angola" research project that aims to locate the remains of the settlement, says its discovery would contribute significantly to African-American archaeology. "These communities show that people did not want to live as slaves. They refused to accept that tyranny, and they had to take great chances to escape it and live as free people," Baram said.



USF professor Daniel Yeh is working on a system to harvest nutrients, energy and water from human waste.

BUSINESS

Socialized

A study of 200 online shoppers indicates that Facebook-like buttons, the Twitter symbol or other social media icons on a website influence buyers' decisions. The study by the University of Miami School of Business Administration, Empirica Research and StyleCaster Media Group found that consumers were 25% more likely to buy status-reinforcing goods like sportswear or a fragrance if the icons were present. With products viewed as more intimate — Spanx or Clearasil, for example — consumers were 25% less likely to buy with icons on the site. Other research by UM's business school:

Sticker Shock

Retailers can substantially increase sales and profits if they raise the price of a sale item back to its original cost gradually rather than in one move.

Retailers can make more money by bumping up sale prices gradually.

Color Barriers

Investors think firms with colorful annual reports have revenue at least 1% higher than those that put out drab reports.

Short Leash

CEOs with fewer than five years on the job are five to six times more likely to be fired for poor performance than longer-tenured CEOs. Additionally, each negative quarterly report increases the likelihood of being fired by 34% to 43% for shorter-tenured CEOs but by only 4% to 11% for CEOs who've been around longer.

ENGINEERING

Poop Power

Daniel Yeh, an associate professor of engineering at the University of South Florida, received $100,000 from the Bill & Melinda Gates Foundation to support the development of a generator that harvests nutrients, energy and water from human waste using microorganisms and filters to turn sewage into products like carbon, nitrogen, phosphorus and water suitable for crop irrigation or other household uses, such as in cooling systems or for flushing toilets. The process also creates methane gas, which can be captured and used as a clean-energy source.

Solar Roll

Prototype rolled solar cell

A University of Florida team of researchers including chemistry professor John Reynolds and Franky So, a professor in the department of materials science and engineering, has developed a prototype solar cell that could be manufactured using a roll-to-roll process, much like printing a newspaper. In theory, the photovoltaic sheets could be incorporated into the exteriors of buildings, automobiles and even personal accessories such as clothing and purses.

COMPUTER SCIENCE

Bandwidth Bandits

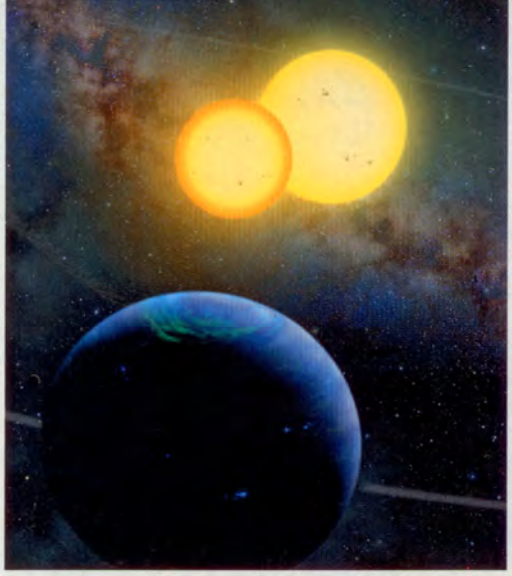
When it comes to watching movies online, you don't need to get what you don't see. Hari Kalva, an associate professor in Florida Atlantic University's College of Engineering and Computer Science, is working on ways to whittle down the bandwidth needs of video services. Netflix alone eats up nearly a third of the internet's bandwidth during peak viewing hours from 7 to 10 p.m. daily. Kalva's research focuses on not transmitting all the data that comprise a movie without affecting the viewer's perception of quality. "It turns out, when you're watching a video, you're not seeing everything that's on the screen," says Kalva. When a movie cuts from one scene to another, for example, viewers experience "temporal masking" — for a fraction of a second before and after the transition, they can't perceive any reductions in video quality. Such moments create opportunities for bit-rate decreases without degrading the viewer's experience, says Kalva.

Florida Fly-Baiter

AGRICULTURE

Fly-Baiting

Flies like blue. University of Florida researcher have found out that flies prefer to fly toward it more than other colors and react to it more. Application: A new, blue, insecticide-laced fly control device called the Florida Fly-Baiter.



UF's Eric Ford and other astronomers have recently discovered planets that orbit two suns.

ASTRONOMY

Double Suns

Star Wars aficionados may recall that Luke Skywalker came from a planet called Tatooine that orbits two suns. Using data from NASA's Kepler telescope, researchers including UF astronomer Eric Ford recently discovered two new planets each orbiting twin suns. In addition to the novelty of the discovery, it also contributes to "our understanding of planet formation," says Ford. "This is another example of a completely different type of solar system where the planets orbit a pair of stars that orbit each other in an even more compact orbit than the planets' orbit." Kepler-16b, the first discovery of a Tatooine-like planet last year, is 200 light years from Earth. The two newly discovered planets, Kepler-34b and Kepler-35b, are 4,900 and 5,400 light years away, making them among the most distant planets discovered. Ford says the planets were detected by virtue of their silhouettes when they passed in front of the stars and temporarily blocked a portion of the star's light.

PHYSICAL EDUCATION

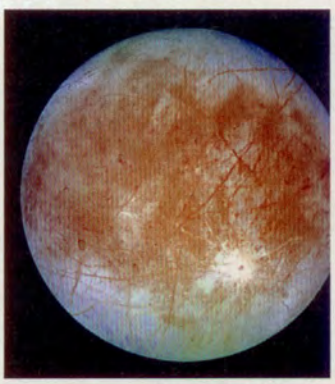
Exercise and Learning

Scientists who investigate how the brain responds to stimuli have found connections between "thinking" activities and physical activities. Research has shown, for example, that spinning stimulates the same part of the brain as learning math; skipping stimulates a part of the brain that's also linked to reading.

Nancy H. Cummings, chair of the physical education department at Florida Southern College in Lakeland, is trying to use that knowledge to determine whether physical activities can help children with dyslexia improve their reading and literacy scores with a "movement and performance" curriculum for elementary school children with dyslexia. "If a child has difficulty skipping by a certain age, then we also know the way the brain is wired they're most likely struggling with reading as well," she says.

"We are finding with certain activities that jumping jacks, balancing and fine motor coordination with the upper extremity is correlated to the reading and the literacy test scores," says Cummings. "You can trick the brain into learning because it does not know the difference between a physical stimulus or a cognitive stimulus, and if we can create a stimulus through a physical activity, then that pathway is open when they go into the classroom."

Acidic Moon



Iced-over Europa

Jupiter's moon, Europa, is roughly the same size as Earth's moon but far smoother because its surface is composed of ice. While scientists have theorized for decades that some form of life might exist in the saltwater ocean believed to lie underneath Europa's crust, Matthew Pasek, an astrobiologist at the University of South Florida, says that's highly unlikely. By feeding data collected from the Galileo probe into computer models, Pasek and University of Arizona researcher Richard Greenberg were able to conduct a chemical analysis of Europa that showed that moon's ocean is likely too acidic for life. Their computer models predicted that the high levels of oxygen in Europa's crust would likely combine with sulfur and other materials from the rocks at the bottom of the ocean to generate sulfuric acid. That would produce water with a pH of about 2.6 — about the same as your average soft drink, Pasek says. "Fish, corals, whales or other large animals would find it difficult to live within the ocean of Europa."

An FAU study can help detect autism earlier.

HISTORY

Fat Chance

Heather Parker

Heather Parker, a history professor at Saint Leo University in Pasco County, says she got interested in researching the history of obesity in this country from 1850 to 1960 because of her physician husband's experience treating numerous patients with weight-related health problems. What Parker found was that Americans have always worried about being fat but saw it as an aesthetic issue rather than a health issue until the 1940s and 1950s. Since the late 1800s, she says, health care professionals have counseled that the only way to lose weight is to eat less and exercise more. But people have continuously looked for easier ways, and diet "charlatans have continued to take advantage of them." In the late 19th century, Parker says, the so-called "summersault cure for obesity" became the rage and caused one woman to end up "stuck between the wall and a door."

PSYCHOLOGY

Lip Readers

Watching how infants respond to speech over time could lead to earlier diagnoses of autism. Research by David Lewkowicz, a psychology professor at Florida Atlantic University, and FAU doctoral student Amy Hansen-Tift reveals that when infants enter the "babbling stage" at around 6 months old, they shift their focus of attention from the speaker's eyes to the speaker's mouth and continue to do so until about 1 year old, when they begin to shift their gaze back to the speaker's eyes.

"In other words, infants become lip readers when they first begin producing their speech-like sounds," says Lewkowicz.

Autistic children, by contrast, are still focused on a speaker's mouth by 2 years of age. Lewkowicz's findings suggest that if the shift does not occur by the time an infant is 14 months he may be at risk for developing autism. "If so, this would provide the earliest behavioral confirmation of impending developmental disability and would give clinicians an early start on intervention procedures."

Michael McCullough

Religious Experience

A study by Michael McCullough, a psychology professor at the University of Miami, finds that religious people are better able to forgo immediate rewards in order to gain larger rewards in the future. Some 277 students who participated in the study were given a "monetary choice questionnaire" in which they were offered a small immediate monetary reward today or a larger reward later. By a wide margin, more religious students were willing to receive more money later.

POLITICS

A Vote for the Voice

University of Miami and Duke University researchers have confirmed conventional wisdom among political consultants that voters prefer candidates who have lower-pitched voices. Casey Klofstad, an associate professor of political science, teamed up with colleagues at Duke University who are experts in acoustic analysis and recorded "candidates" saying, "I urge you to vote for me this November." The recordings were then manipulated to create a higher-pitched version and a lower-pitched version. Regardless of gender of the listener or the gender of the speaker, the "voter" preferred the "candidate" with the lower-pitched voice.

Winners have lower-pitched voices.

MARINE SCIENCE

Hello, Old Chum

In 2001, after a spate of highly publicized shark attacks, the Florida Fish and Wildlife Conservation Commission banned shark feeding on the basis that it was altering the animals' natural foraging behavior. But research out of the University of Miami suggests otherwise. Neil Hammerschlag and his team monitored the movement of tiger sharks along the coast of Florida, where feeding is banned, and in the Bahamas, where dive operators use chum to attract sharks. Hammerschlag expected the tiger sharks in the Bahamas to hang around the chumming sites year-round. "But it's not influencing their long-term migrations," he says. "The take-home message of this study," Hammerschlag says, "is rather than rushing to make conclusions based on fear, we should actually do the science and base our policies on fact and the data."

A musical pacifer helps premature babies learn the breathe-suck-swallow reflex.

MUSIC

Preemie Pacifier

One of the biggest hurdles that premature babies face is learning the breathe-suck-swallow reflex. A device invented by Jayne Standley, a longtime researcher and professor in the Florida State University College of Music, helps speed the process. Stanley invented a musical pacifier that encourages babies to learn this reflex through a pacifier that plays a soft lullaby every time they successfully suck on it. FSU has licensed the PAL (Pacifier Activated Lullaby) device to a startup in St. Johns County called Powers Device Technologies. The company expects its first units to begin reaching hospitals in the next couple of months.

photographs: Jim Abernathy top left ; Bill Lax/Florida State University top right

Medical Research

ALZHEIMER'S

Caffeine Boost

Researchers at the University of South Florida's Byrd Alzheimer's Institute have found that the caffeine in coffee may help ward off Alzheimer's disease. Their findings, recently published in the Journal of Alzheimer's Disease, showed that the caffeine and an unknown component of the coffee interact to boost blood levels of a critical growth factor that appears to prevent Alzheimer's disease. Their research backs previous studies that found a reduced risk of Alzheimer's among individuals who take up coffee drinking during middle age.

TRAUMATIC BRAIN INJURY

Battle Scars

The University of South Florida has received $1.6 million from the Department of Defense to research traumatic brain injuries and other battlefield-related injuries and diseases. The grant involves four major projects, several of which will be conducted in collaboration with the James A. Haley Veterans' Hospital next to the USF campus.

MACULAR DEGENERATION

Dry Run

The Bascom Palmer Eye Institute of the University of Miami Miller School of Medicine is conducting clinical trials of a treatment to stop the progression of the dry form of age-related macular degeneration and studies to discover ways to regenerate optic nerves.

PARKINSON'S DISEASE

Protein Attack

A study led by neuroscientists at Mayo Clinic in Jacksonville has unveiled a gene mutation that causes Parkinson's disease. Using advanced DNA sequencing technology, the researchers examined the DNA of a large Swiss family — 11 members suffered from Parkinson's — and discovered mutations in a protein responsible for recycling other proteins within cells. Disruption of that process by mutatations of a specific gene may be responsible for the buildup of proteins in brains of people suffering from Parkinson's and other neurodegenerative diseases like Alzheimer's.

'Junk' Enzymes

Phil LoGrasso

Scientists at Scripps Florida have created a compound that successfully protected brain cells in rats and mice from Parkinson's. The new small molecule, known as SR-3306, works by inhibiting a class of enzymes called c-jun-N-terminal kinases, so-called "junk" enzymes, which play an important role in nerve cell survival. Professor Phil LoGrasso, who led the study, says the compound isn't a cure for Parkinson's, but it does have the potential to halt the progression of the disease.

Motor Functions

Envoy Therapeutics, a drug discovery company in Jupiter, received a grant from the Michael J. Fox Foundation to develop compounds targeting a motor circuit compromised in Parkinson's disease via modulation of a receptor that Envoy recently identified.

HIV

Tat Offensive

Jay McLaughlin

Researchers at Scripps and Torrey Pines are studying a viral protein known as Tat that could lead to new therapies to treat HIV. Dr. Jay McLaughlin won a five-year, $2.2-million grant from the National Institute of Mental Health to study how the HIV virus produces related neuropathology and mood disorders. McLaughlin believes that Tat, which is a potent activator of HIV gene expression, may be involved in that process and the protein could serve as a target for new treatments that block or reduce HIV-related neuropathology and mood disorders. Susana Valente, an assistant professor at Scripps Florida, received $3.4 million from the National Institutes of Health to investigate a Tat inhibitor that is extremely effective at reducing viral output from acutely and chronically infected cells in culture.

Herpes Virus

Fanxiu Zhu

Dr. Fanxiu Zhu, an assistant professor of biology at Florida State University, won $1.5 million from the National Institutes of Health to continue his work on human herpes virus 8 (HHV-8), which causes a rare cancer called Kaposi's sarcoma in patients with HIV. Zhu's research provides a target for potential new drug therapies to treat the AIDS-related disease.

Therapeutics

Dr. Massimo Caputi, an associate professor of biomedical science at Florida Atlantic University's Charles E. Schmidt College of Medicine, received $433,500 from NIH to further his research into identifying novel therapeutics for HIV.

STEM CELLS

'Humans on a Chip'

Using stem cells, researchers at the University of Central Florida were able to grow neuromuscular junctions between human muscle cells and human spinal cord cells — a scientific first that is a critical step in creating so-called "human-on-a-chip" systems. Such systems, which are essentially models that re-create how organs or organ systems function in the body, could play a key role in fast-tracking medical research and drug testing.

UCF researchers take a critical leap toward a 'human-on-a-chip' systems.

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Back Row (L-R): *Andrew B. Demers, Glenn M. Cooper, Arnold M. Zipper, Florian J. Dauny, Kelly H. Kolb, Nicholas Banegas, John R. Keller, David B. Mankuta, Steven W. Marcus, Andrew M. Gordon, Joseph T. Ducanis, Jr., Heather B. Brock, Kenneth L. Bednar, Margaret Z. Villella, Joel Stewart*

Front Row (L-R): *Sean P. Sullivan, Kimberly Gessner, Howard Allen Cohen, Lawrence M. Ploucha, Robert A. Butterworth, Jesse H. Diner, Terrence Russell, Wilson C. Atkinson, Adale I. Stone, S. Carey Villeneuve, Shari B. Olefson, Frank Zincone, Kathy J. Tayon*

The statewide Florida law firm of Fowler White Boggs (Fowler) and the Ft. Lauderdale based firm of Atkinson, Diner, Stone, Mankuta, & Ploucha, P.A. (Atkinson) merged May 1, 2012. This merger is a continuation of the dynamic expansion of the Ft. Lauderdale office of Fowler which has grown to nearly thirty attorneys in less than two years. The Firm is meeting its goal of attracting quality lawyers through the addition of the highly regarded and successful Atkinson attorneys.

The Atkinson attorneys have a long standing history of excellence, community accomplishment, leadership in the legal profession, and a distinguished law practice for more than 40 years. Fowler, established in 1943, has grown from its original roots on the west coast of Florida into a strong state wide presence.

The combined firm will continue the tradition of outstanding representation for clients that comprise the economic engine of Florida. Business and Construction Litigation, Land Use, Real Estate, Corporate, Immigration, Tax, Intellectual Property, Health Care and Wealth Management are some of the areas of practice that the Ft. Lauderdale office of the combined full service Firm will offer.

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CANCER

pH D's

Susan Frost

Researchers at the University of Florida's Shands Cancer Center have discovered that whether a tumor thrives or dies depends to some extent on the acidity, or pH level, of the environment in which it is growing. According to UF biochemist Susan Frost, tumors seem to flourish in a more acidic environment, and an enzyme called carbonic anhydrase IX appears to play a key role in maintaining an acidic environment. Thus, carbonic anhydrase IX's role in tumor growth and survival makes the enzyme an important target for future anti-cancer drugs.

Response Predictions

OvaGene Oncology in California has signed an agreement with Moffitt Cancer Center in Tampa for the exclusive rights to develop and commercialize a microRNA-based procedure that predicts drug response for currently used cancer drugs. The procedure was developed and validated at Moffitt under the leadership of Dr. Johnathan Lancaster, director of women's oncology at Moffitt Cancer Center.

Research at Moffitt Cancer Center in Tampa can help predict how effective cancer drugs will be on different patients.

Personalized Medicine

Biovest International's BiovaxID personalized cancer vaccine for treatment of non-Hodgkin's lymphoma is moving toward the final regulatory approval. The results of a long-term clinical trial of the vaccine, which was developed with the U.S. National Cancer Institute, showed an extended disease-free survival for patients who developed a strong immune response after receiving the vaccine. Biovest International is headquartered in Tampa and manufactures its vaccine in Minneapolis.

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DIABETES

Insulin Producers

Juan Dominguez-Bendala

Researchers at the Diabetes Research Institute at the University of Miami Miller School of Medicine have successfully transformed stem cells into insulin-producing beta cells that might potentially be used to treat of diabetes. The next phase of that research, which is being spearheaded by Dr. Juan Dominguez-Bendala, involves introducing "suicide genes" into the cells to get rid of non-insulin-producing beta cells and other proliferating cells that form tumors.

Sugar Burner

Researchers at Sanford-Burnham Medical Research Institute have discovered a protein that can make muscles store and burn sugar faster. Meanwhile, Dr. Layton Smith, an assistant professor and director of drug discovery at Sanford-Burnham, recently received a $477,500 Novo Nordisk Diabetes Innovation Award to further his research into apelin, a compound that plays an important role in glucose uptake by cells and that could have potential as a protein-based therapy for treating type 2 diabetes.

Other key developments in diabetes research at Sanford-Burnham:

Drug Reactions

Researchers have identified genetic variations that cause diabetics to respond differently to beta blockers, a class of drugs used to treat cardio-vascular disease.

Fighting Fat

Scientists have isolated a hormone produced by the brain called orexin that activates calorie-burning brown fat in mice. Since an orexin deficiency is associated with obesity, orexin-based therapy could form the basis for a new class of fat-fighting drugs. FT

ON THE CUTTING EDGE

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