ihmc

FLORIDA INSTITUTE FOR HUMAN & MACHINE COGNITION

Dear Friends:

Today, many people remain fixated on the wondrous new hardware that arrives with every press release. From the latest iPhone to Google Glass to brilliant thermostats that learn our energy habits, gadgets are technology's stars. But software remains the power behind the throne, and here at IHMC we are engaged in some "royal" research, aimed at ensuring that the complexities of today's modern systems don't frustrate the promises of all that shiny hardware.

IHMC is taking big steps—no pun intended —in writing software for humanoid robots. Walking algorithms have long been an IHMC strength, but the DARPA Robotics Challenge is pushing our researchers, who took first place in the initial stage of the Challenge, an international competition.

In this issue we'll also look at research, led by Research Scientist Dr. Niranjan Suri, into the complexities of managing tactical radio networks that control today's most important combat weapon: information. Dr. Suri's research specialty is Agile Computing, which focuses on creating flexible networks that remain functional in challenging environments.

But our own thinking skills are challenged by complex tasks, too. Senior Research Scientist Dr. Robert Hoffman is working on how best to teach the sound critical thinking skills that help us avoid errors in reasoning. Because this intensive sort of education can be, well, boring, educators need new tools and techniques to engage students. One of those tools? High-level video games.

What won't be boring are the meals served at our functions. To replace longtime chef Patti Caruso, who recently retired, meals at IHMC Pensacola events will be handled by Blake Rushing, a young chef nominated for the prestigious James Beard Award. I hope you enjoy the profile on Blake, and better yet, get a chance to sample his work at the Evening Lecture Series or other events.

We also introduce new Board Member Dr. Martha Saunders, the provost and vice president for academic affairs at the University of West Florida. Martha brings strong credentials in leadership, administration and academics to our board.

There's no question that technology will continue to grow more complex. But here at IHMC, we believe that there are always smart answers to hard questions.

Best Wishes,

Kenneth M. Ford, Director

IHMC BOARD OF DIRECTORS

System complexity demands agility

Tactical military communications networks present an extremely challenging environment not just for the users of the systems, but for those who design them.

Field networks can be cobbled together in an ad hoc manner, with changing numbers of users moving across challenging terrain, tied together through wireless peer-to-peer nodes providing unstable links, limited bandwidth and variable latency. Meanwhile, an ever-growing list of hardware assets and software applications are soaking up bandwidth at a time when information management has become the key to effective communication.

The answer? Agile Computing, a major research area for IHMC and Research Scientist Dr. Niranjan Suri. He designs complex, adaptive, fault-tolerant software applications that can ensure rapid, prioritized dissemination of crucial information despite unexpected problems.

For more than a decade, Dr. Suri has been at the forefront of research aimed at finding solutions to critical problems facing tactical communications networks used by the military.

"At a very high level you could say that my goal is to work on improving the ability for computers and applications to communicate over networks that are not reliable," he said.

A major problem is that even specialized military networks can depend on applications and protocols designed for more stable Internet or corporate networks. "These protocols don't work very well, or at all, when you try to run them on the kind of networks you see in the military," Dr. Suri said.

In the field, tactical communications

Dr. Niranjan Suri at his office at IHMC Pensacola.

networks expand and contract on a seemingly infinite variety of variables: terrain; distance; the number of communications nodes; whether those nodes are fixed or moving; the need to maintain radio silence or conserve power; the number of assets collecting or disseminating data; available bandwidth, which can grow or fall depending on many variables; the efforts of an enemy to jam or corrupt communications; and other factors thrown up by the fog of war.

Meanwhile, there is no time or ability to put stable infrastructure in place. And even if you could, an enemy could destroy it. That makes it critically important to have systems that can adapt on the fly.

'The fundamental theme behind Agile Computing is to build systems that are adaptive and resilient," Dr. Suri said. "We assume that the environment changes a lot, and really quickly, and we cannot count on all the (system) resources being there that you would

hope to be there. So the challenge of Agile Computing is how do you quickly adapt to whatever resources happen to be available, and then how do you exploit new resources that come around that you didn't plan for, and that maybe can help compensate for something you lost."

So, if you lose a set of sensors that were deployed in the field, the challenge is how to discover another asset (perhaps a UAV or other aircraft) that can be opportunistically leveraged to provide the desired data.

Another problem is that commercially available applications—called legacy applications—are built into off-the-shelf components that can also become part of military networks, he said. Modifying these applications — say, Internet Explorer or the Android operating system—is not an option.

Dr. Suri said that there are many approaches to fixing these problems. "Some people work on the actual

hardware itself, trying to make it act and look more like a commercial network. Some people try to hide the fact that it's running on a wireless tactical network, and make it look like a regular network."

> *"To me there isn't a single approach that is a panacea that would fix all these problems."*

That is all needed, he said, "but I feel that it's insufficient. We also need to work on improving the actual protocols themselves, and the applications that you are running on top of those networks, to do the data management, information management and exchange."

Dr. Suri cites middleware, which sits between the application and the underlying network protocols, as key to any solution.

"It's the mediation layer that is trying to help the applications run better, given that the networks are not what they expect," he said. "So we work on middleware to compensate for the fact that applications are set in stone, and are making assumptions about the network that are not true.

"To me there isn't a single approach that is a panacea that would fix all these problems. You have to try multiple approaches, and a combination of those things will work in different circumstances and systems."

Because major military radio systems can have a service life of 20 years, he said, making changes at the software

A display of equipment being tested in field exercises.

Agile Computing fosters efficiency

Agile Computing fosters the opportunistic discovery and exploitation of resources in dynamic, networked environments. It is critically important to the efficient functioning of tactical military radio networks.

But it has applications that stretch far beyond the battlefield.

Many networks lack the "end-to-end connectivity" that makes systems with stable infrastructure, like the Internet, so reliable, said IHMC Research Scientist Dr. Niranjan Suri. An information management technique called "store and forward" can help.

"You have to send the information you have to some intermediate node, which will then carry it to maybe another intermediate node, which will then carry it to the destination," he said. "NASA's deep space network is very much the same way."

It can also apply to today's "smart city" environments, he said. Consider the problem of adding security cameras to existing intersections.

"As we add more high-definition cameras, more video, more surveillance equipment, we don't necessarily have the bandwidth to get all this data back from the sensors," he said. "You could use cell phone networks, which have a lot bandwidth but are very expensive, or power-line networks, where the bandwidth is not very high, but it is cheap. You can install dedicated communications lines, which is expensive."

An innovative solution: "Use city buses like UAVs," he said. "The buses run regular routes, can gather the information when they pass through the intersection, bring it back to its base and upload all the data there." So just as on the battlefield, using existing resources more efficiently can create cost-effective solutions to problems.

A group of Marines participating in a field exercise involving tactical network communications.

Dr. Suri's path to IHMC

How does a research scientist like Dr. Niranjan Suri get from his birthplace in Bangalore, India, to his professional career and personal life in Pensacola?

It's a story of connections. Dr. Suri, 40, spent a year in the United States at age 4 when his father, an

Dr. Niranjan Suri.

aeronautical engineer, worked with NASA in Washington, D.C., in the late 1970s. He then spent his freshman college year at the University of Alabama, Huntsville, before transferring in 1991 to study computer science at the University of West Florida in Pensacola, where a cousin was a physics professor (and is now program director for physics in the School of Science and Engineering). That led to IHMC.

"The whole thing started because (IHMC co-founder and director) Ken Ford was my academic advisor as an undergraduate student," Dr. Suri said. "So he has been influential in my professional life now since 1991. It was pure chance that I came to UWF and he happened to be my academic adviser.

"I often wonder what path I would have taken if I had not met him 22 years ago."

Dr. Suri received his Master's and bachelor's degrees in computer science from UWF, and a Ph.D. in computer science from Lancaster University, England. He became a U.S. citizen in 2006. He is also a gourmet cook, traveler and mentor to many young IHMC researchers. He's known for hosting employees who are unable to travel home for Thanksgiving, or who have no family to visit, at his own home.

In Pensacola Dr. Suri met his now wife, Denise, who was stationed there as a Navy nurse. They are now the proud parents of a young daughter, Olivia Suri.

level is the main tool for managing systems that must prioritize information management.

When communications are limited, he said, it becomes crucial to understand not just how information will be delivered, but also which information should be delivered first. "You have to prioritize the data based on utility."

Dr. Suri and colleagues from academia and the military have put in extensive time observing demonstrations and field exercises to gain an understanding of how tactical networks actually perform.

"We can sit in the lab and do all these tests and experiments, but until you go out in the field you don't know how it's going to work," he said. He recently spent three weeks at Fort Story, Va., and has also visited Kaneohe Bay, Hawaii, Fort Benning, Ga., Fort Dix, N.J., Nellis AFB, Nev., and Camp Roberts, Calif.

That the research has received funding from the Army, Navy and Air Force creates synergies that serve all sides.

"It has helped me understand the similarities and differences in the problems they have," he said. That allows him to leverage both funding and research by avoiding duplication when the services have similar needs.

It also puts IHMC at the heart of the research effort.

"When we write papers we try to get people from these three branches to work with us, so it is a joint publication involving at least two or three branches of the military," he said. "It's a nice thing to get these people to collaborate through IHMC as the common mechanism."

Teaching critical thinking skills
Video games an engaging tool for young minds

We all do it.

"The guy who sits next to me in math class cheats on tests. He's a cheater. I did have to cheat once, but that was because the people next door partied all night and I couldn't study."

That's a very human reasoning trap called an "attribution bias." We attribute qualities to others—"He's a cheater"—but attribute our own actions to context. And unless people are trained to recognize and avoid this and other reasoning errors, they are also prone to making mistakes when carrying out complex tasks that depend on the application of sound critical thinking skills to make good decisions.

"The question is, can a high-end video game be interesting, and at the same time teach people critical thinking skills?"

Figuring out how to teach these critical thinking skills in the context of a serious game is a goal of IHMC Senior Research Scientist Dr. Robert Hoffman as part of an IARPA-Sirius project. He is working in collaboration with researchers from Advanced Research Associates, Inc. (ARA), Georgia Tech, Indiana University and Wright State University, under the lead of ARA. The project is funded by the Intelligence Advanced Research Projects Activity (IARPA), which according to its website is an organization that "invests in high-risk/high-payoff research programs that have the potential to provide our

nation with an overwhelming intelligence advantage over future adversaries."

"There are certain traps, reasoning traps people fall into, such as the attribution error," Dr. Hoffman said. Another is confirmation bias. We develop a preliminary hypothesis based on early evidence, and then fail to look for information that casts doubt on it. We don't seek evidence to disconfirm it.

But learning such reasoning skills requires practice, making it difficult to engage students' interest for sustained periods. So a primary goal is to make the learning engaging. The researchers are also examining the effect game features, such as real-time feedback, reward structures and third-person perspective,

have on learning to mitigate these biases

Enter "Heuristica," a 3-D video game that takes advantage of the computerized, graphically enhanced environment that modern techies grew up in.

This approach is not entirely new, Dr. Hoffman said. There are already versions of industrial process control software systems that are like video games and teach people specific decision-making skills. And there are detective-style video games that engage players in reasoning challenges.

"The question is, can a high-end video game be interesting, and at the same time teach people critical thinking skills?" Dr. Hoffman said. "Players of these games do learn reasoning skills; they learn to reason about the game. But we don't just want

Visualization of the Heuristica video game for teaching critical thinking skills.

them to get better at the game—avoid being killed by that android or something—in Heuristica, we are training them to learn how to reason."

So the goal is not to teach the "players" psychomotor or reaction time skills, he said, but to teach cognitive reasoning skills.

"Heuristica is set on a future space station where events challenge players' reasoning," Dr. Hoffman said. "For instance, crew members are injured in an accident and you must diagnose them in sickbay, based on a set of

Dr. Robert Hoffman.

symptoms. So the player works to confirm or disconfirm a diagnosis hypothesis."

For the game to succeed, the players have to learn the right skills, and be able to transfer those skills to real-world applications. "This is about measuring learning, performance and transfer," Dr. Hoffman said, with an emphasis on "transfer." Because whether these skills can be transferred to real life is a key question. Simple "logical" leaps that result from faulty thinking can cause real problems.

"For instance, you'd think someone who has been a pilot would be a good UAV operator. Wrong," he said. "When you are flying a plane, the angle of look is from the cockpit. With a UAV, the camera is on the belly. Your habits get you in trouble, and you end up crashing.

"Or, a farmer might be very good at judging the breeding quality of pigs, but

not of cattle. The variables are the same, but the way they combine is very different."

Dr. Hoffman is an experimental psychologist by training. In the Sirius project he is utilizing new methods he has developed for modeling learning curves, and applying methods of cognitive task analysis to understand how people reason as they are learning to play the decision-making game.

"Heuristica" is in its third cycle of experimentation, and Dr. Hoffman said that while people clearly get better at the game, the research must show that they learn what the researchers want them to learn.

"The game player has to solve problems," he said. "The skills have to be transferable. The question is how to measure progress. We've got pretests, post-tests and independent measures of performance and learning curves.

"This is why we call it research."

IHMC's technology on display

Visitors to IHMC Pensacola are greeted at the main lobby by a unique display: a real-time visualization of IHMC's impact on the world.

The display—called the Netflow Observatory—is itself a product of IHMC research. Shown on a monitor mounted above the main reception desk, it provides a continuous electronic visualization of the network flows that increasingly dominate the world of information sharing.

For network analysts, the new display provides a new way of seeing and understanding how their complex computer networks function.
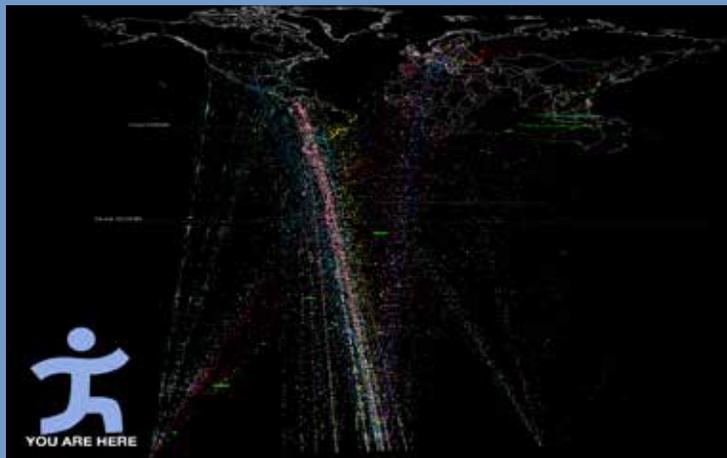
The display shows visitors a real-time use of IHMC network data flows..

The elegant, multi-colored lines flowing across the screen, and imposed on a world map, reflect the interaction scientists, educators, students and professionals in every region of the world have with IHMC on a daily basis. This connectivity fosters collaboration

and drives innovation across a diverse scientific and educational network.

The visualization reflects all forms of Internet traffic into IHMC: e-mail, video or the utilization of public servers hosted by the institute that facilitate the use of Concept Mapping tools, also developed at IHMC and used by educators around the world.

The screen shows the more than 1,000,000 interactions every hour between IHMC and the outside world.

One of IHMC's core missions is to create new ways of seeing—technologies that augment how people perceive and understand events.

That is research making a difference.

A big step for IHMC and humanoid robots

IHMC's strong showing in DARPA's Virtual Robotics Challenge (VRC) gave the institute a jolt of international publicity. At the same time the project itself is jump-starting advances in the abilities of bipedal humanoid robots. Including at IHMC.

Following its first-place finish in the initial stage of the competition, which was conducted as a computer simulation in June, the institute will receive a Boston Dynamics humanoid robot. It will be used in the next stage of the competition, scheduled for December.

Prior to the competition, the institute's researchers had a strong track record in writing walking algorithms for two-legged robots, said Research Scientist Jerry Pratt, IHMC team leader for the Robotics Challenge.

"Until recently most humanoid robots, if they were able to walk around on rough terrain, had to know exactly the layout of the terrain, to sense it almost perfectly," Dr. Pratt said. "That's where our strengths lay. One of the things we pioneered were some techniques for doing push recovery, how to prevent falls when a robot's tripped, being pushed and bumping into things, or just not knowing everything about the ground, like unexpected step-downs."

The competition drove the team members to develop their expertise in other functions, such as manipulation using arms and hands. But the next round will require far more.

"Up to this point in the competition there hasn't been any need for doing fine manipulation, like assembling small gadgets," Dr. Pratt said. "Most of the stuff has been grasping things—grasping

The latest version of the Atlas robot.
Photo credit: DARPA

a hose, turning the hose onto a spigot, grasping the car to get in. Now we will need to learn about fine manipulation, like picking up small objects or putting a nut on a bolt. Opening a door is going to be really important for the next phase of the competition, as well as picking up debris from in front of a door."

Accomplishing these tasks might not seem "sexy" to the techie on the street, he said, but they will mark significant achievements in the field of robotics.

"Already from this project you are seeing things that were on the forefront, but not really mainstream yet, becoming mainstream as they become integrated into the robot in simulation," Dr. Pratt said. "Until recently you had your walking and your hand things, and they were completely separate. Now we can walk while grabbing a hose and go put it

The IHMC DARPA Robotics Challenge team, from left to right: Twan Koolen, Brooke Layton, Peter Neuhaus, Doug Stephen, Sami Alsheikh, Marshall Floyd, Jerry Pratt, Nathan Mertins, Stephen McCrory, John Carff, Matt Johnson, Nolan Manor, Gray Thomas, Daniel Duran, Matthew Spain, Peter Abeles, Sam Munoz, Jesper Smith, Sylvain Bertrand, Maarten Griffioen, Johannes Englsberger.

on somewhere, so algorithms in that have made vast improvements."

Also extremely important is the expansion of the number of available robots. DARPA (Defense Advanced Research Projects Agency) is providing Atlas robots to the top teams.

"With the Atlas everyone will have the same robot, so we'll be able to share ideas," Dr. Pratt said. "Something that's really hard in the robotics field is reproducing results. In just about every other field, when you publish a paper you make it so that others can reproduce your experiment pretty easily. With robotics it's really hard because no one else has your robot and the infrastructure needed to get it up and running."

He said that as the number of robots increases and the costs decrease, more researchers will be able to use them, creating a beneficial cycle in which costs continue to fall as the number of advances continues to rise.

"You won't see Moore's Law with robots, but like any technology you have to get to the point where there are common platforms, so the price of the platform keeps dropping," he said. Once the price drops far enough, research will take off.

"It's tough with humanoid robots because to make them worth paying for in a real-world application, it has to be affordable, and what you're competing against is humans," Dr. Pratt said. "And because humans are relatively affordable and super-competent, the bar you have to get over is tremendous. If you want to make a humanoid robot to mow the lawn, it's kind of silly when the kid next door will do it for ten bucks."

But when the intense radiation inside a crippled nuclear power plant makes human presence risky at best, an expensive humanoid robot will look like a real bargain.

A 'big win' for IHMC

In June an IHMC team finished first in the initial stage of the DARPA Robotics Challenge, topping a roster of 26 of the top robotics research groups in the world.

Jerry Pratt.

IHMC's team scored 52 out of a possible 60 points in the first round of the DARPA competition, the Virtual Robotics Challenge, a computer simulation using software that will power a real-life humanoid robot in the future. Members of the top nine teams in the scoring are moving on to the next competition, with the top six getting funding from DARPA (Defense Advanced Research Projects Agency) and provision of a humanoid robot, built by Boston Dynamics, for the next stage of the two-year competition, which is almost halfway completed.

The next event in the competition, using actual robots, is scheduled for December 2013. The final challenge is set for December 2014, with $2 million in prize money at stake.

After the results of the first round of the competition were announced, institute co-founder and CEO Ken Ford called it "a big win for IHMC. Our team was up against some of the best and brightest robotics scientists and institutions in the world, and came out on top. We're very proud of the team.

"This sort of recognition can only be earned by performing at a very high level, and that's what our team did."

For more information, visit: www.ihmc.us/news/20130627.php

Dr. Saunders joins IHMC Board

Dr. Martha Saunders, provost and vice president for academic affairs at the University of West Florida in Pensacola, has joined the IHMC Board of Directors.
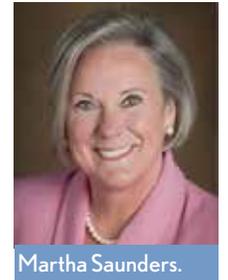
Martha Saunders.

"I was a new faculty member at UWF when IHMC was formed and have watched its development with keen interest and awe," Dr. Saunders said. "I hold (IHMC co-founder and director) Ken Ford and his brilliant staff in high regard and look forward to being part of the future of a great organization." Dr. Saunders brings a strong background in academics, administration, communication and leadership to IHMC's board.

Dr. Saunders returned to UWF as provost in January. She was a professor and administrator for more than 15 years at UWF before being promoted to dean of the College of Arts & Sciences in 2000. She left in 2002 to be vice president of academic affairs at Columbus State University in Georgia. She then spent five years as chancellor of the University of Wisconsin-Whitewater before serving as president and professor of communication at the University of Southern Mississippi, where she oversaw six teaching/research campuses.

Dr. Saunders holds a Ph.D. in Communication Theory & Research from Florida State University, a Master's in Journalism from the University of Georgia and a bachelor's in French from the University of Southern Mississippi.

Dr. Saunders is married to Joe Bailey; she has seven grown children and eight grandchildren and enjoys gardening, fishing, reading and traveling.

A new chef serving IHMC events

IHMC has brought on a young, locally renowned chef with an international pedigree to oversee food service at lectures, lunches, board meetings and other events at the Pensacola facility.

Only 31, Blake Rushing already has a prestigious James Beard Award nomination and experience with some of the world's most innovative chefs. But the area native returned home to be near Northwest Florida's beaches and woods—he's an avid hunter—and be part of the rebirth of downtown as an increasingly cosmopolitan urban center.

"I just love Pensacola, the beach, everything," said Rushing, who grew up Gulf Breeze, connected to downtown via the Pensacola Bay Bridge. "And it's getting better. The whole scene is getting better." Rushing has a company to handle catering, food service at IHMC and a new downtown restaurant—Type by Chef Blake Rushing.

He describes his cuisine as "modern American," using locally grown, seasonally available produce, meat and seafood. He's also a proponent of the cutting-edge "sous vide" method of cooking, using precisely controlled temperatures to cook food sealed in high-grade plastic bags or canning jars in a water bath.

His new restaurant will feature a different type of menu each week. "I don't like the same thing over and over," he said. "I like to mix foods and styles from different countries, and my recipes can change from one meal to the next. As the seasons change, the food changes."

Rushing said his menus for IHMC "will be ever-changing as well," closely following Type. He will also use produce

Chef Blake Rushing in the kitchen at IHMC Pensacola.

and fruit from the institute's on-site organic garden.

Rushing's path back home to Pensacola is remarkable. He has always enjoyed food—starting out by processing wild game harvested at the family hunting camp near Pensacola and cooking for family—but majored in business in college because "it seemed like the smart thing to do." After two years he changed course, enrolling in the Orlando Culinary Academy, an affiliate of Le Cordon Bleu Schools North America.

That led to an internship with renowned chef Gordon Ramsey at the Savoy Grill in London. "We were working 17-hour days," he said. "The first month I was like, 'You guys are all nuts.' One-and-a-half months in I said, 'This is amazing'."

After two years in London, he helped open Ramsey's first Manhattan restaurant, which earned two Michelin stars, before moving on to Vancouver, Canada, to work

Chef Blake Rushing.

at Lumiere with celebrity chef Daniel Boulud. He followed Boulud back to New York to work at Daniel and Epicure before following his heart and returning back to the South and Pensacola.

He opened Elise Coastal Dining in 2011, which earned a James Beard Award nomination as one of America's best new restaurants. Widely described as the "Oscar" of culinary awards, the James Beard Award is voted on by culinary professionals to honor the best of their peers, including chefs, restaurants, food writers, cookbook authors, restaurant designers and others. And Rushing was featured in a Southern Living magazine article on Pensacola.

Elise was a local hit, but Rushing left in less than a year and went into business with Norma Murray, the owner of several restaurants and a bed & breakfast near IHMC in the Seville Historic District. He and Murray are now also partners in Type.

"It never crossed my mind to cook as a living," he said of his early life. "But I took the plunge and it worked out well."

A colorful lunch salad.

IHMC Pensacola joins Bikes at Work program

Employees at IHMC Pensacola are finding it easier to get around downtown for lunch or work errands. The institute has joined Bikes at Work, a program to provide bicycles for local commutes.

Encouraging Pensacola businesses to provide bicycles is the brainchild of Think Beyond, a non-profit formed to support "a diverse community" that will serve "to educate, connect, inspire and develop a sustainable Pensacola," according to its website. IHMC General Counsel Julie Sheppard is the group's treasurer.

"There are a lot of reasons to support Bikes at Work," Sheppard said. "We want downtown to be more open to bicyclists and pedestrians instead of everyone getting in their cars to go a few blocks. And a lot of our international visitors at IHMC don't have cars. This will be a great way for them to see our community."

Plus, she said, "we want our employees to remain healthy."

IHMC has offices in three buildings located within a two-block stretch of Alcaniz Street in the Seville Historic District in the heart of downtown. The institute has purchased five bicycles, spread among the sites. IHMC Director and co-founder Ken Ford often stresses that the downtown Pensacola location of the institute is a key asset for recruiting employees. Recent years have seen a rebirth of downtown as a vibrant commercial and lifestyle center, with restaurants, retail shops, entertainment, offices and professional and service businesses. Streets that used to be empty are now often crowded, even on weekend mornings as people come downtown for Broadway shows, a Double-A professional minor league baseball team, shopping, a growing residential sector and a Saturday farmer's market.

According to Think Beyond, downtown Pensacola is perfect for bicycling because it retains the human-scale grid of its

IHMC employees show off the bicycles for employee use, in Ferdinand Plaza in downtown Pensacola. From left: Carl Wernicke, Jason Conrad, Andrew Raines, Colton Black and Robert Mandel.

pre-automobile past. That includes narrow street widths and short blocks, keeping traffic slow. Downtown planners have incorporated wide use of four-way-stop intersections to further accommodate pedestrians and bikers.

Also, the core of downtown, while expanding, remains comfortably compact. Its density and short travel lengths make it a natural setting for bicycling and walking.

Jessie Bell, a Bikes at Work project leader, said the group is also working with the City of Pensacola and businesses to install bike racks around downtown.

Tom Jones makes news on asteroid mission

IHMC and Senior Research Scientist Tom Jones were in the news with the announcement of an envisioned NASA mission to capture a small asteroid and redirect it to a location where researchers can access it. If approved, the project would proceed early in the next decade.

Dr. Jones, a former astronaut, was a member of the original study team analyzing the concept of asteroid capture for the Keck Institute of Space Studies. He was the co-author of a Keck study report, released last year, on the feasibility of such a project.

He said the plan is for a robotic spacecraft to capture a 500-ton asteroid. Astronauts using the new Orion spacecraft would collect rock and dust

and return it to earth for study. Dr. Jones said the success of the mission would also establish asteroids as a "science- and resource-rich destination for astronauts," and provide missions that build human spaceflight experience.

Dr. Jones authored an article on the Fox News website after the announcement, writing that "the concept is a bold combination of our robotic and human spaceflight technologies, propelling astronauts beyond the moon, and opening a new economic frontier to harness the wealth of natural resources waiting for us in space."

He told ABC News that "if the current budget is flat or declining, NASA will go nowhere. This could be the dawn of space mining. We have finite resources on earth and this program might open the door for

Tom Jones.

businesses interested in exploring space."

President Obama's budget included $105 million for the project. That includes doubling the approximately $20 million NASA is currently allocated for tracking and identifying asteroids.

IHMC supports a variety of advanced planning studies and discussions for NASA human space exploration programs. Dr. Jones is a regular participant in those studies and meetings.

Summer Camp News

Ocala

IHMC Ocala hosted its second annual Summer Robotics Camps in June and July. The program is designed to accommodate 60 students in grades 6-9.

Each session involves putting "bots" together, working through exercises via instructional Carnegie Mellon and Florida Advanced Technological Education Center (FL-ATE) curriculum and computer software—all of which is directed at stimulating interest in learning and applying concepts related to science, technology, engineering and math (STEM).

The campers also take a half-day tour through the Lockheed Martin Ocala facility to gain perspective on how robotics translates into the "real world."

The camp instructor is Dr. Gregory Cruz, a nationally certified teacher, past Marion County teacher of the year, and the robotics team advisor for Vanguard High School's International Baccalaureate program. James Peoples, the assistant instructor, is a Marion County School District IT advisor.

Included in the 60 camper slots are 22 scholarship positions offered through IHMC's partnership with Workforce Connection, the local workforce board for Citrus, Levy and Marion counties.

Workforce Connection is expanding the program into Citrus and Levy counties with additional funding for instructors and program resources in those areas. As an added benefit, they also purchased new robot kits (10 sets for each county) to maximize the learning experience for the kids.

Additional sponsors supporting the program are Cheney Brothers, Inc., College of Central Florida, Daniel Sturm, FL-ATE, Lockheed Martin, Marion Technical Institute and the Ocala Star Banner.

Science Saturdays a big success in Ocala

The spring Science Saturdays program at IHMC Ocala was a big success, with full sessions and even waiting lists of students marking the second year of the program in Ocala.

This year, IHMC offered a total of nine exciting science topics, one Saturday per month, September through May, with five sessions in the spring. Each session is led by an expert from IHMC's research staff or a community volunteer.

In addition, IHMC's educational outreach program hosted a science teacher training session for the Marion County School District. IHMC offered three identical sessions, one each for teachers of grades three, four and five. The participating teachers had been identified by fellow teachers as having aptitude for and interest in improving the district's impact in teaching science.

IHMC staff and community volunteers now accommodate 30 students per session (60 per Saturday) in Ocala, plus five or six high school volunteers as assistants. The spring program included sessions on: Bridges; Wind Energy; Fun with Fossils; Investigating Florida's Springs; and Rockets and Robots.

Students at Science Saturdays in Ocala role play how a robot's sensors work together.

Pensacola

Summer activities at IHMC Pensacola include the fourth year of TechConnect, a joint volunteer/training program for teens by the institute and the Pensacola MESS Hall, a hands-on museum for kids focused on stimulating interest in science and technology.

The MESS Hall (Math, Engineering, Science and Stuff) was organized by IHMC Science Writer & Educational Outreach Coordinator Megan Pratt. For a small fee it provides a different experience than most museums for kids.

Rather than finding exhibits with planned outcomes, visitors work like real scientists, developing their own questions and creating experiments to learn scientific facts and, more importantly, complex reasoning.

Students at Science Saturdays in Pensacola work together to complete a task.

Rather than finding exhibits with planned outcomes, visitors work like real scientists.

High school students volunteer to lead the younger students through the MESS Hall experience, expanding their knowledge of computer science, physics, mathematics and engineering.

The older teens organize and oversee the activities, instructing the younger students with MESS Kits—self-contained mini science experiments designed, prototyped and tested by the TechConnect volunteers. The MESS kits contain the necessary components for kids to complete projects such as building circuits, isolating their own DNA or building a kaleidoscope, helping them uncover for themselves the principles of electronics, chemistry and light.

The TechConnect volunteers also get the opportunity to meet with researchers at IHMC and learn about projects at the institute to further their own interest in joining the scientific community.

The volunteers meet weekly at IHMC over the summer to participate in Java programming, mechanical design lessons, lab tours, robot demonstrations and lunches with researchers. All high school students are encouraged to participate.

This year's program is scheduled to run through August, with 20 participants.

These Tech Connect high school volunteers are learning computer programming at IHMC.

IHMC'S EVENING LECTURE SERIES
www.ihmc.us/evening_lecture.php

CHARLES CARLSON

Charles "Chuck" Carlson's Ocala talk was his fourth Evening Lecture Series appearance. He promotes "unemotional investing" based on statistical models that track stock performance. "Don't be a hero" with bold moves in or out of the market, he said. "You get it right once and it's a heady experience." But getting it wrong once can reverse the gains from nine "right" calls. Carlson sees long-term strength in stocks based on the theory of "reversion to the mean." In the short term, he said, stock prices can move to the extremes, up or down. But over the long term they return to equilibrium. Despite the strong bull market in the spring, he said, investors remain skittish because of the financial crash of 2008. But there's no reason to abandon stocks during the coming corrections; they "skim the froth" and push out speculators.

Carlson is CEO of Horizon Publishing and of Horizon Investment Services. He is editor of DRIP Investor newsletter and a contributing editor of Dow Theory Forecasts newsletter. His comments appear in The Wall Street Journal, New York Times, Business Week and more.

MICHAEL HOLICK

Dermatologists have been so successful at "demonizing" exposure to sunlight, Dr. Michael Holick told a Pensacola audience, that they have exacerbated a growing epidemic: Vitamin D deficiency. He focused on the benefits of this hormone in his talk, "The D-Lightful Vitamin D for Good Health." Because "we were born, and we evolved, under sunlight," Dr. Holick said, we have an evolutionary requirement for high levels of Vitamin D. But it is essentially impossible to get sufficient amounts from our diet, and the "demonization" of the sun has cut us off from the highest-quality source of natural Vitamin D, that produced by our bodies. Dr. Holick said that 50 percent of infants are born with Vitamin D deficiency. That can have a negative, lifelong impact on cancer, bone loss, diabetes, heart disease and more.

Dr. Holick is a medical doctor and professor of medicine, physiology and biophysics at Boston University Medical Center, where he is also director of the Vitamin D, Skin and Bone Research Laboratory. His latest book is "The Vitamin D Solution: A 3-Step Strategy to Cure our Most Common Health Problems."

TOM DAYSPRING

Thomas Dayspring, M.D., told an Ocala audience that the clinical consequences of atherosclerotic vascular disease are due to arterial wall accumulation of cholesterol and other sterols and the subsequent inflammatory response. To mitigate the problem, we need to know early in life who is destined to develop atherosclerosis and then identify and act upon treatable risk factors. For decades the major diagnostic tool has been plasma lipid measurements, specifically cholesterol levels. However, today 55 percent of those admitted to hospitals for heart disease have normal cholesterol levels. His talk, "Arteriosclerosis: It's the Cholesterol, Stupid—or is it?" surveyed the changes taking place in how we evaluate cholesterol and its impact and causes.

Dr. Dayspring is a Diplomate of both the American Board of Internal Medicine and American Board of Clinical Lipidology. He is a Fellow of both the American College of Physicians and the National Lipid Association. He is the director of cardiovascular education at the Foundation for Health Improvement and Technology in Richmond, Va.

(Note: This lecture is not available on the IHMC website.)

MIRIAM JOHN

"My intent is not to scare you" about weapons of mass destruction, Dr. Miriam John told a Pensacola audience in her talk, "Defending the Homeland Against Weapons of Mass Destruction." But, she warned, "I won't leave you with any sweet dreams." She delivered a sobering appraisal of efforts to protect the United States from nuclear, chemical or biological warfare. The needed approach? "Defense in depth," starting with good intelligence. Because politicians generally have a short-term view, but want to accomplish something, they tend to push for immediate "point solutions" when what's needed, she said, is a strategy to manage what is a long-term problem. Her biggest worry regarding an attack is "figuring out who did it." But even knowing where a WMD attack comes from doesn't always tell us who is responsible, she said.

Dr. John has wide experience studying threats from nuclear, chemical and biological weapons. Retired from government service, she is a Senior Fellow of the Department of Defense's Science Board and a member of its Threat Reduction Advisory Committee. She serves on the Board of Directors of the National Institute for Hometown Security.

MARY NEWPORT

Can the food you eat slow Alzheimer's disease? That's the question Mary Newport, M.D., raised to an Ocala audience in her talk, "Medium Chain Triglycerides and Ketones: An Alternative Fuel for Alzheimer's and Other Diseases." Dr. Newport's husband suffers from early-onset Alzheimer's, so she began to research it, and found potential for relief in foods, such as coconut milk and MCT oil, that help the liver produce ketones. Research on the effectiveness of ketones is just beginning, but by 2050, 15 million people could be affected by Alzheimer's. She said some research links the disease to the inability of the brain to utilize glucose. But ketone bodies, an alternative fuel, can be stimulated by a diet based on very high fats, very low carbs and protein.

Dr. Newport graduated from the University of Cincinnati College of Medicine, and is the founding medical director of the newborn intensive care unit at Spring Hill Regional Hospital in Florida.

LEWIS VON THAER

There is a real threat that the United States' most powerful and sophisticated weapons can be compromised through cyber attacks. But, Lewis Von Thaer told a Pensacola audience, "We are really good at solving hard problems." His talk: "Cyber Resiliency of DOD Systems and the Need for Response at NET-Speed." Defending against cyber attack "is a cat and mouse game, you against the adversary; it never ends," he said. Securing U.S. forces starts with isolating a portion of the strategic weapons arsenal from the grid. Then, a president has secure weapons with which to threaten an adversary considering a cyber attack.

Von Thaer is president of General Dynamics Advanced Information Systems, which provides a wide variety of cyber-related services to the U.S. government. He is a member of the Defense Science Board, and serves on the board of the Intelligence and National Security Alliance (INSA) and chairs its Cyber Security Council.

PETER ATTIA

Peter Attia, M.D., was doing everything right. His diet followed modern guidelines and he exercised 3-4 hours a day. But, he told a Pensacola audience, he was almost 40 pounds overweight, suffered from metabolic syndrome and "I was headed for a heart attack in 20 years." He turned to a ketogenic diet that provides, by accepted standards, huge amounts of fat, while eliminating almost all sugar and most carbohydrates. He explained the diet in his talk, "An Advantaged Metabolic State: Human Performance, Resilience & Health." He lost 35 pounds, drastically cut his body-fat index and brought all his biometric markers well into the healthy scale.

Dr. Attia is co-founder of the Nutrition Science Initiative, a non-profit supporting independent research into health and nutrition. He was a general surgery resident at Johns Hopkins Hospital, and a surgical oncology fellow at the National Cancer Institute. He has an M.D. from Stanford.

SUSAN MACMANUS

The 2012 presidential race in Florida was the most competitive in the nation, with President Barack Obama beating Republican challenger Mitt Romney by just 74,309 votes out of 8 million cast. And it could be just as close in 2016 said Susan MacManus, distinguished professor of public administration and political science in the Department of Government and International Affairs at the University of South Florida, in her Ocala talk, "Campaign 2012: What Florida Taught the Nation." Florida is a bellwether state because its 29 electoral votes are the most of any "swing" state, and its demographics mirror the nation's. Florida has a large percentage of young voters and its growing minority population reflects future electoral trends. But winning Florida is costly: Running a TV ad for one week in each of its 10 major media markets costs $2 million.

MacManus was chair of the Florida Elections Commission from 1999 to 2003.

SUE SKEMP

Energy from the ocean can't totally replace more conventional sources. But it can be a serious, sustainable part of the alternative energy puzzle, Sue Skemp told an Ocala audience in her talk,"Ocean Energy: The Next Blue Source of Power." She said the steady ocean currents flowing between Florida and the Bahamas could produce as much power as the Turkey Point electric generation plant in South Florida. Turkey Point is the sixth-largest power plant in the United States, and uses a mix of nuclear fuel, oil and natural gas to power its generators. She said ocean testing could soon begin after years of preparation. Getting the permits meant answering questions about the impact on everything from military submarines to sea turtles to commercial shipping—as well as concerns about whether tapping ocean currents could alter them enough to change global weather.

Skemp is director of the Southeast National Marine Renewable Energy Center at Florida Atlantic University.

ihmc
FLORIDA INSTITUTE FOR HUMAN & MACHINE COGNITION

40 South Alcaniz Street
Pensacola, Florida 32502
850-202-4462 phone

15 SE Osceola Avenue
Ocala, Florida 34471
352-387-3050 phone

850-202-4440 fax
www.ihmc.us