

# ihmc



FLORIDA INSTITUTE FOR HUMAN & MACHINE COGNITION

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Dear Friends,

Our outstanding robotics research group once again brought excitement and world-wide attention to IHMC. A team of 11, led by Senior Research Scientist Dr. Peter Neuhaus, traveled to Zurich, Switzerland, where 66 teams from 25 countries gathered to compete in the world's first Cybathlon, also referred to as "the bionic Olympics." The international competition was designed for people with disabilities supported by modern assistive technology.

Dr. Neuhaus and other robotics researchers have been developing powered exoskeletons since 2008, a wearable robotic device that helps paraplegics walk. I could not be prouder of these IHMC team members. Our silver medal and second-place finish in the Cybathlon follows the second-place finish our robotics team earned in the International DARPA Robotics Challenge.



To say we have a world-class robotics group is an understatement. Now we also have a state-of-the-art research facility for robotics, our sensory augmentation lab and other IHMC research as well as executive offices, a boardroom and conference facilities for Blue Sky meetings. More than 300 people gathered on the ground floor of our new 30,000-square-foot building for a ribbon cutting ceremony that featured naming the facility The Levin Center for IHMC Research. Because this facility was custom designed, it will allow IHMC to scientists and engineers to expand their research.

In this issue, we also look at the DARPA "World-Modelers" seedling project, a year-long \$1.2 million IHMC-led grant that's being led by IHMC Senior Research Scientist and Associate Director James Allen and Research Scientist Choh Man Teng.

IHMC and its scientists continue to gain outstanding recognition for their work and achievements. Recently, research scientist David Fries was inducted into the National Academy of Inventors and senior research scientist Bonnie Dorr was named a fellow of the Association of Computational Linguists. I am quite honored to also say that I will be inducted into the Florida Inventors Hall of Fame in September. Including this year's class, four of the 28 inductees in the Inventors Hall of Fame are associated with IHMC, which is truly impressive.

As the following pages will attest, IHMC is making its mark in Florida and around the world.

Best wishes,

Kenneth M. Ford, Director

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# IHMC robotics group wins silver medal in Cybathlon

Peter Neuhaus wasn't expecting a medal. No one from IHMC was.

"We just wanted to make a good showing," said Neuhaus.

IHMC sent a 10-member team to Zurich, Switzerland for the first international competition for people with disabilities supported by modern assistive technology. Called the Cybathlon, it attracted 66 teams from 25 countries.

The IHMC team didn't quite know what to expect when they showed up in Zurich. They certainly didn't expect more than 4,600 screaming people with cow bells and whistles packed into a hockey arena to watch the competition.

Most of all, they didn't expect to leave Zurich with a second-place finish and a silver medal.

Sponsored by the Swiss Federal Institute of Technology, the Cybathlon's 66 teams showed up last fall to participate in one of six categories: brain-computer interface race, FES bike race, powered arm prosthesis race, powered leg prosthesis race, powered exoskeleton race, and powered wheelchair race. Each event was designed to encourage the development of assistive devices for people with disabilities. The IHMC team competed in the powered exoskeleton race.

For the past decade, Neuhaus had been working on exoskeletons, wearable robotic devices that help paraplegics and people with other disabilities walk. He graduated from MIT and then headed to the University of California Berkeley to get a PhD in mechanical engineering.

He arrived at IHMC and Pensacola just in time for Hurricane Ivan in 2004. He came to be part of the robotics team and immediately started looking at wearables, which is an engineer's shorthand for smart electronic devices that can be worn on the body as implants or accessories.

"Wearables and exoskeletons are challenging applications for robotics," said Neuhaus. "We're trying to provide paraplegics with the capability to do something that without the aid of robotics there is no other way for them to do it."

The first time Neuhaus and the other engineers felt they had accomplished something significant was in 2010. That also was the year Neuhaus met Mark

Daniel, a paraplegic who grew up in the Pensacola area.

"When I ran into Mark I almost immediately could tell he was the right guy to test our exo," said Neuhaus.

Daniel grew up on dirt bikes as a child and in his teens fell into a routine of playing hard and partying hard. He entered rehab and subsequently learned the welding trade. He was 18 and finally had his life on the right track. But after a 14-hour shift at a Mobile shipyard, Daniel fell asleep behind the wheel of his car on the way back to Pensacola. He woke up in the hospital paralyzed from the waist down.

"Peter kind of saved me," said Daniel. "He gave me something to look forward



IHMC's Mark Daniel powers through the obstacle course



to, something to get me out of my funk.”

It was 2010, the same year of his spinal-cord injury, that Daniel starting working with Neuhaus and IHMC on the exoskeleton. Over a six-year period leading up to the Cybathlon, the team constantly tweaked the device and had Daniel test the changes.

People in the Cybathlon’s exoskeleton race are referred to as pilots. The exoskeleton Daniel uses does indeed look like a pilot’s seat with a computer attached to the back. He uses two hand crutches to balance himself, and maneuvers a joystick on the right handle of the crutch to help him not only stand up from a sitting position, but also control the exoskeleton’s stepping motions.

Funding for the exoskeleton and IHMC’s trip to the Cybathlon didn’t come from government grants, but private sponsors Stormy Dawn Anderson, Scivation Inc., the William and Karen Dalton Family, Allied Motion, Futek, Elmo Motion Control, Lord MicroStrain Sensing, inTec and Star Prototype.

The team went into overdrive to tweak and improve their exoskeleton for the Zurich competition.

“I watched these guys work 16- and 18-hour days as we got ready to leave,” said Daniel. “I remember seeing the guys with their hands on their foreheads, and I could tell they were miserable. They had a problem and were working it out. At some point, it just couldn’t be fun for them. But me? I enjoyed every minute of it. I was getting to walk.”

When the IHMC team arrived in Zurich they met Brian Blickenstaff, an American journalist based in Germany, who was looking to connect with one of the teams competing in the Cybathlon.

“There was just something captivating about this team, especially the juxtaposition of Peter and Mark,” said Blickenstaff, “that I felt would make a good story. You had Peter, this super educated guy who has lived all over the

place, and Mark, the local guy who grew up in the country and didn’t go to college. It was fascinating to watch how the two of them, from such different backgrounds, got along.”

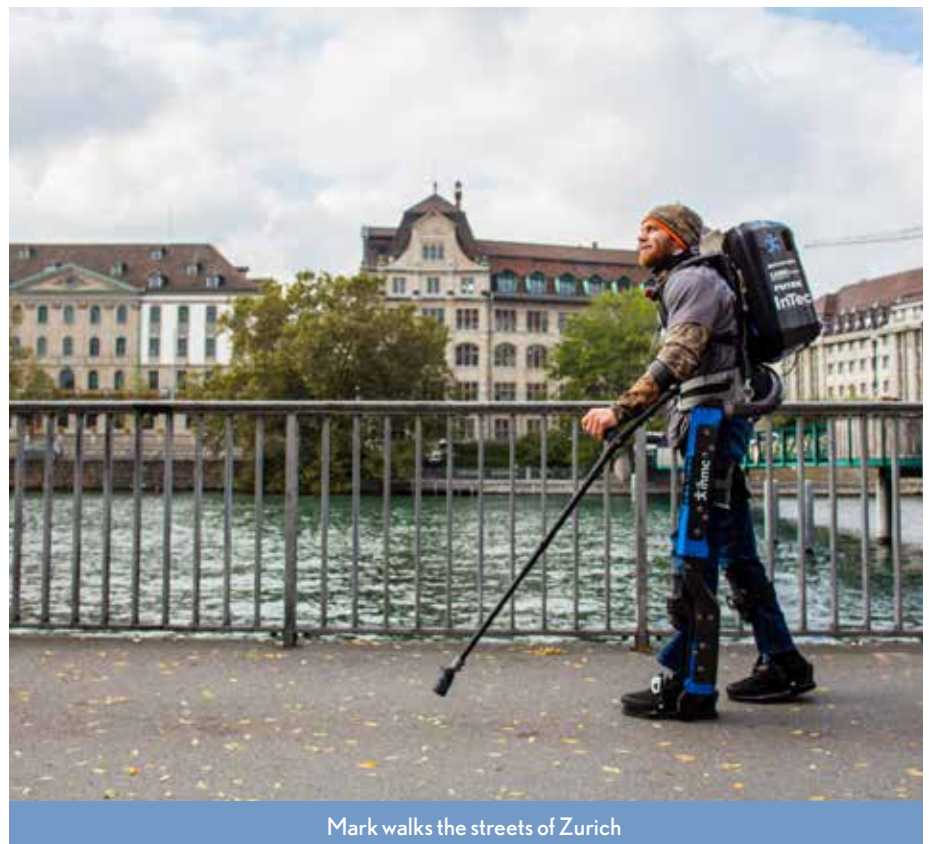
The IHMC team that traveled to Zurich for the Cybathlon with Neuhaus and Daniel included Tyson Cobb, Travis Craig, Jeremy Gines, Robert Griffin, Jesper Smith, Jerry Noreen, Billy Howell, Koen Kramer and Olger Siebinga.

Shortly after the team arrived in Zurich, Blickenstaff tagged along as Daniel, using his exoskeleton, walked the streets of Zurich as a way to practice for the competition. Neuhaus and the rest of the team followed Daniel, and everywhere they went, they drew crowds of onlookers. There was one thing Daniel did with the exoskeleton, however, that Brian said particularly stood out. Here’s how he described the scene in his story about IHMC and the Cybathlon that ran in VICE Sports.

*“During his first training session in Zurich, Mark had a particularly powerful experience. He walked to the hotel elevator, took it down to the bar, and ordered a drink - a glass of water. To not only stand and look people in the eye but order a drink from the bar? Put it on the list of experiences Mark who was injured at 18, never expected to have. He’s not the type to get emotional about this sort of thing, but the team knows what it means to him, and they tell everyone who will listen about his glass of water. Howell has a hard time recounting the episode without looking like he might burst into tears.”*

The exoskeleton competition featured 10 teams from around the world, including Austria, Mexico, Germany, Korea, Switzerland and Russia. IHMC was the only team from the U.S.

The exoskeleton race that Daniel and the IHMC team competed in featured an obstacle course that each exo pilot needed to finish in 10 minutes. Competitors first



Mark walks the streets of Zurich

had to sit and stand up from a couch, walk a slalom, walk up a ramp, open and shut a door, walk down a second ramp, maneuver along a series of 11 uneven stepping stones, cross two angled platforms, and walk up and down a flight of stairs to finish the race.

The race began with easy obstacles that gradually became more complex and difficult. Points were earned based on the difficulty of each obstacle and teams were allowed to skip any of the obstacles if it helped them finish the race in the 10-minute time frame.

"There was a lot of strategy involved," said Neuhaus. "I assumed at least three of the teams would finish all six tasks. About two weeks before the contest, Daniel was able to finish five of the six tasks in nine and a half minutes. So we decided to skip the third most valuable task because we wanted to make sure Daniel finished the race in the allotted time."

Daniel had been using the exo version that IHMC took to Zurich for only eight weeks. He competed against people who had more experience with their devices. The German team's pilot of the commercial ReWalk exoskeleton had been using his device for two years and even took it home with him at night.

Chalk that up as another reason

Neuhaus and the IHMC team weren't expecting a medal. Well, everybody except for Daniel.

"I wanted to win," he said. "I knew how hard these guys had worked to be in Zurich. I just thought of all those 16- and 18-hour days the guys put in and I really wanted to make them proud."

After the first round, IHMC was in second place, just seven points behind the German team with the pilot who had been using his exoskeleton for two years.

The finals featured IHMC against the German and Korean teams and PolyWalk, one of two Swiss teams in the competition. Daniel and the German pilot broke into the lead, and because of that, they were both unaware as they approached the final obstacles that the Korean and Swiss teams had stumbled and were out of the race. It came down to the German pilot and Daniel. On the last obstacle, Daniel was briefly ahead, but the German caught up and finished just seconds in front of Daniel.

"I remember just being so proud of everybody," said Neuhaus. "To go in just wanting to make a good showing and then to walk away with a silver medal was huge for us. It shows that we not only have a good idea, but that we can also be successful."


Back in Pensacola, Neuhaus and the team began using the lessons learned from Zurich to improve their device and think about the future.

"Humans are great at perception," said Neuhaus. "We can look around an area and see where we should go and what we should step on. But communicating that information to a computer is a pretty challenging task."

The problem right now is that if a person uses an exoskeleton on a daily basis, they're probably going to fall. There are still a lot of safety issues to consider, said Neuhaus, like figuring out what happens if a person falls and gets stuck somewhere and can't get up. That is still a major challenge for engineers.

"It's still unknown what the daily device is going to look like in 10 years. If you add more motors and more smart technology and more sensors, does it make the device safer and faster and more stable and capable? Those are the questions we need to answer, and that's why the really exciting science and research still lies ahead."

The medical benefits of an exoskeleton are significant. Being able to stand on their own and walk helps paraplegics with cardio, bowel and bladder function, as well as improving bone density and decreasing body fat. But from Daniel's perspective, the most important benefit is more emotional than medical. It's about taking an elevator to the lobby and walking up to a bar to get a glass of water.

"Most of the time I'm looking up at everybody. People talk to me differently now that I'm in a wheelchair. They'll even slow down their speech as if I'm deaf or someone not capable of understanding them. To be able to get back on my feet, to stand in a room and look at somebody eye-to-eye, that's huge. This technology, it's really about the way it makes you feel, not just what you can do with it. Neuhaus and the guys and the exo...they gave me back my humanity." 



Tyson Cobb, left, and Peter Neuhaus congratulate Mark

## DARPA seedling applies AI to predictive analysis

First came the droughts. Then oil prices rose in 2006. Next there was a spike in the price of fertilizers. And while all this was happening, more and more farmers in developed countries switched to growing grains for fuel rather than food. The price of rice, wheat and corn shot up.

It didn't take very long for the food riots to break out.

Civil unrest broke out in Asia, Africa and the Middle East. According to the World Bank, a huge hike in food prices played a leading role. The price of rice went up 217 percent between 2006 and 2008. Wheat prices rose 136 percent, and corn 125 percent.

The price of basic food staples, however, came down in 2008 and the riots stopped. But not for long. Food prices again rose dramatically in 2010 and sparked more unrest, including the Arab Spring. The World Bank warned of an impending global food-price crisis. But once again, conditions stabilized, prices came down, and the world avoided another food crisis.

This time.

In thinking about the next time, what if there were a system in place that allowed scientists and analysts to rapidly predict how certain crop yields could affect food prices and which of those outcomes could trigger social unrest?

Right now, such a system doesn't exist, said IHMC Senior Research Scientist and Associate Director James Allen. But the possibility of developing such a predictive system is the concept behind "An Exploratory System for Complex World Modeling," a year-long \$1.2 IHMC-led

pilot funded by the Defense Advanced Research Projects Agency (DARPA).

"The basic idea of World Modeling is to try and develop more predictive analysis tools for decision making on a scale that is very hard to do these days," said Allen, who, along with IHMC research scientist Choh Man Teng, is heading up the seedling grant.

Nick-named the "World Modelers" project, the pilot is a follow-up to Dr. Allen's Big Mechanism project, where IHMC's deep language-understanding technology is being enhanced to read biology research abstracts and papers to extract pieces of causal mechanisms

of a possible World Modelers' question is: Analyze the level of food insecurity in each district of South Sudan two years into the future.

The idea, said Allen, is that you would be able to describe a scenario in natural language. "So you'd say, 'This is what we're going to do. Now what happens if we double agricultural subsidies for fertilizer? How might this affect economics, and how might that affect civil unrest? Maybe if we don't increase subsidies enough, that's going to cause a scarcity over here and ultimately lead to riots in the street.'"

Allen and Teng are putting together a team to develop technology that can read and build pre-causal models that would depict a scenario like this and then figure out which simulation and specialized engines are out there that could be connected and also be capable of running a big simulation.

With current technology, that's all done by hand, said Allen, who heard of a large modeling project that, if done by hand, would have taken 20 years to put together.

"The idea of this program is to see if we can bring that down to a couple of days using automation. That's sort of the holy grail we're aiming for," said Allen.

IHMC is partnering with four institutions on the seedling project:

- The University of Florida, which is providing its agricultural expertise and modeling capabilities.
- Praedictus, which uses climate data to drive the simulations.
- The University of Arizona, which will bring its fast information extraction and text processing expertise to the pilot.
- IFPRI, the International Food Policy



Choh Man Teng and James Allen head up the DARPA seedling grant

and then assemble those pieces to build complete models. These models are being used to produce explanations in the fairly homogeneous domain of cancer biology.

The new DARPA seedling project is particularly focused on integrating existing climate, crop and market models to determine how factors such as climate change and economic policies impact agriculture and the distribution of food. The issue becomes how these combined factors might affect food security, which in turn could lead to social unrest and perhaps eventually an exodus of people migrating out of a country. An example



Research Institute in Washington DC, which models agriculture and economics

Dr. Teng, who is co-leading and co-managing the project with Allen, said she is excited about the challenge because it encompasses so many problems, both in terms of modeling the world and in terms of the technology needed to model such problems and situations.

"There are a lot of fairly sophisticated models out there for each individual part of the problem," she said, "not just the crop models, but also economic models and climate models and water-irrigation models and so on. All these could be connected together, but that will be a very long-term goal. We are now just starting the crop modeling part of it."

For this initial phase of the pilot, Allen said one of the motivating factors behind the decision to model crops was to see how agriculture and economics relate to social unrest.

"Can you predict where social unrest is going to happen?" said Allen. "Apparently, right now, no we can't. When the Arab Spring happened, it just

seemed like a spontaneous event. I think a lot of the motivation behind this project is to develop much better analytical tools to anticipate future events. As you can imagine, a lot of intelligence agencies are very interested in this tool."

"It's an overwhelmingly challenging problem," said Allen. "Of course, Paul Cohen has a knack of putting out challenges like this."

Cohen is a program manager in DARPA's Information Innovation Office. The World Modelers challenge follows DARPA's Big Mechanism program, which Allen and Teng also worked on.

DARPA explains the thinking behind the Big Mechanism this way:

"Some of the systems that matter most to the Defense Department are very complicated. Ecosystems, brains and economic and social systems have many parts and processes, but they are studied piecewise, and their literatures and data are fragmented, distributed and inconsistent. It is difficult to build complete, explanatory models of complicated systems, and so effects in

these systems that are brought about by many interacting factors are poorly understood today."

Cohen has a penchant for putting out impossible challenges, said Allen.

"When people start working on one of these challenges, they think, 'What can we possibly do on this?' But, you know, you start working on these seemingly impossible problems and lots of interesting things start to happen."

Allen and Teng said what excites them about World Modelers is that it fits so perfectly within the mission of IHMC.

"We have this very strong kind of philosophical dream here about the role of the computer and how we can use it to enhance human capabilities," said Allen. "We're not trying to build computers that can just do everything by themselves. We're trying to build things that augment human capabilities."

"Ultimately, this system (World Modelers) should improve analysts' tools. It's a better tool when they can work and do things better and faster. Again, that's the holy grail we're aiming for." ✧

## The dream of building things to augment human capabilities drives IHMC

The World Modelers project is a follow-up to Dr. James Allen's Big Mechanism project, a three-year, \$3 million grant that also was funded by DARPA.

"We have this very strong kind of philosophical dream at IHMC about the role of the computer and how we can use it to enhance human capabilities," said Allen. "We're not trying to build computers that can just do everything by themselves. We're trying to build things that augment human capabilities."

What are Big Mechanisms?

They are large models of complicated systems where interactions have causal effects. While the collection of big data is increasingly automated, the piecing together of Big Mechanisms largely remains a human task that is made

difficult by the fragmentation and distribution of knowledge. The extent to which constructions of Big Mechanisms can be automated could change how science is done.

In the Big Mechanism project, IHMC's deep language-understanding technology is being used to read biology research abstracts and papers to cull pieces of causal mechanisms which are then assembled to build complete models. These models were used in the project to produce explanations in the fairly homogeneous domain of cancer biology.

The project is a collaboration with Smart Information Flow Technologies (SIFT), Harvard Medical School, and the Moffitt Cancer Center and Research Institute. In addition to Dr. Allen, the

Big Mechanisms research team features five other IHMC scientists: Tomas By, Choh Man Teng, Adam Dalton and Lucian Galescu.

Allen has been at IHMC since 2002 and is an international leader in the areas of natural language understanding and collaborative human-machine interaction. He is a Founding Fellow of the American Association for Artificial Intelligence

"I came to IHMC because I was attracted by the diversity of the researchers here, their different interests and backgrounds. We have an environment here where there's a strong focus on collaborative projects, not just within IHMC, but also with other organizations. It's what makes this kind of research possible."

## New IHMC research center named after Fred Levin

Former University of West Florida President Morris Marx laughed and shook his head as he surveyed IHMC's new facility.

"To be honest, I didn't think IHMC would ever get this big," he said.

Dr. Marx, who worked with IHMC founders Ken Ford and Alberto Canas to launch IHMC in 1990, wasn't just talking about the institute's new three-story building. He also was talking about IHMC's ground-breaking research that's being done by a team of entrepreneurial scientists from around the world in fields

ranging from artificial intelligence to natural language understanding to cyber security to robotics.

"I thought maybe the institute would have an impact on the state and the region," said Marx. "I had no idea it would have an impact on the world."

Close to 300 people gathered in September on the ground floor of the institute's new 30,000-square-foot building for a ribbon cutting ceremony that included naming the facility The Levin Center of IHMC Research.

Ford, the institute's director and CEO,

said the new facility was an idea that he and others at IHMC had been working toward for a long time.

"It will allow us to do things we couldn't do before because it's custom designed for research as opposed to a building we repurposed for research," he said. "Also, the new space allows us to have room to expand and to bring in new people. Finally, it allows us to consolidate so we'll all be near each other and research really benefits when scientists can be together face to face."

Pensacola attorney Fred Levin donated



The new 30,000 square foot Levin Center for IHMC research



\$1 million toward the construction of the facility because he views IHMC as critical to the community's future.

"Pensacola is my home," said Levin. "I have been a long-time supporter of the IHMC because it's good for this community. They're doing cutting-edge research that attracts some of the best and brightest from around the country and provides opportunities that keep homegrown talent here at home. IHMC is helping to create a bright future for my hometown that will benefit my children, grandchildren, and great grandchildren, for generations to come."

The naming of the facility and the ribbon-cutting ceremony on the front steps of the new Levin Center of IHMC Research came after two years of incredible momentum and world-wide recognition for the institute.

Marx remembers when Ford and Canas had tiny offices the size of a storage room in the back of UWF's computer center. For more than two decades, he said, he has watched in awe as Ford assembled




Ken Ford (holding scissors) is flanked by IHMC board chair William Dalton (left) and Pensacola attorney Fred Levin (right) during the ribbon cutting. Next to Levin are Pensacola Mayor Ashton Hayward, Escambia County Commissioner Grover Robinson, and IHMC board members Eric Nickelsen and Mort O'Sullivan.

a team of world-class scientists and engineers who have become global leaders in their high-tech fields.

"Like I said, I sure didn't see the institute becoming this big," said Marx.

"But I certainly have enjoyed seeing all the magic Ken has created over the years."

And now with a facility custom-designed for research, it's a safe bet that lot more magic is sure to come. 



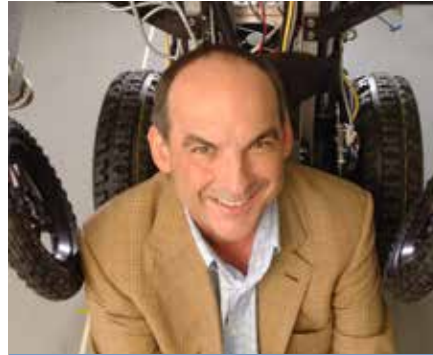
Fred Levin gives the keynote address at the ribbon cutting.

## Inventors Hall of Fame to induct Ken Ford

The Florida Inventors Hall of Fame announced today that the Florida Institute for Human and Machine Cognition co-founder and CEO Ken Ford is among the eight inventors who will be inducted into the 2017 Florida Inventors Hall of Fame in September.

Dr. Ford is being recognized for his pioneering work in artificial intelligence and human-centered computing, as well as his significant contributions to the United States and Florida's technology and research communities. The Hall of Fame highlighted Ford's role in co-founding IHMC in 1990.

The not-for-profit research institute, which is headquartered in Pensacola and has a second location in Ocala, has grown into one of the world's premier research organizations. Ford was instrumental in bringing scientists and engineers from around the globe to Florida and



Dr. Ken Ford

IHMC to investigate a broad range of topics related to building technological systems aimed at amplifying and extending human cognition, perception, locomotion and resilience.

"The list of inductees and their accomplishments is quite amazing," said Ford. "I am very honored to be included with such distinguished people."

Ford holds two patents and is the

author of hundreds of scientific papers and six books whose topics include artificial intelligence, cognitive science, human-centered computing, and entrepreneurship in government and academia. He joins IHMC senior research scientist Jerry Pratt, who was inducted into the 2015 Hall of Fame class, as well as Dwayne and Mary Helen McCay, who join Ford this year. Dwayne McCay is president of the Florida Institute of Technology and a member of IHMC's scientific advisory board.

Including this year's class, four of the 28 Inventors Hall of Fame inductees are associated with IHMC. Ford joins IHMC senior research scientist Jerry Pratt; founder and CEO of M2Gen® as well as IHMC board chairman Bill Dalton; and Dwayne McCay, president of the Florida Institute of Technology and a member of IHMC's scientific advisory board. ✚

## Inventors Academy honors prolific David Fries

The National Academy of Inventors inducted David Fries into its 2016 class of fellows. Fries is an interdisciplinary research scientist at IHMC who holds 45 U.S. patents.

The academy recognized Fries for his work as an expert and true innovator in undersea technologies, especially microsystems and robotics for sensing applications, advanced sensor development, and mobile robotic systems for field applications.

Fries has "demonstrated a highly prolific spirit of innovation in creating or facilitating outstanding inventions that have made a tangible impact on quality of life, economic development, and the welfare of society," noted the academy in naming Fries a fellow.

The National Academy of Inventors has 757 fellows worldwide representing

nearly 230 universities and governmental and non-profit research institutions.

Fries, who joined IHMC in November 2015, is a member of the Marine Technology Society, the American Association for the Advancement of

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“A highly prolific spirit of innovation in creating...outstanding inventions that have made a tangible impact on quality of life...and the welfare of society.”

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David Fries

Sciences, the American Chemical Society, and the Oceanography Society. He was an original member of the University of South Florida's Center for Ocean Technology, where he began the field of underwater mass spectrometry. He also sits on the Board of Directors of the Thunderdome Project, and several other non-profit service organizations. ✚



## Bonnie Dorr named 2016 ACL fellow

Dr. Bonnie Dorr became one of four people that the Association of Computational Linguists named to its 2016 class of fellows.

Dorr is an IHMC associate director and senior research scientist whose contributions to the field of computational linguistics earned her the ACL recognition. ACL specifically highlighted Dorr's "significant contributions to machine translation, summarization and human evaluation."

Her research spans several areas of broad-scale multilingual processing, including machine translation, summarization, and cross-language information retrieval.

Dorr leads a team of scientists and researchers at IHMC's Ocala facility. She is the former associate dean of the College of Computer, Mathematical, and Natural Sciences at the University of Maryland. She also co-founded the Computational Linguistics and Information Processing Laboratory at Maryland. ✧



Dr. Bonnie Dorr

## Ocala resolution recognizes IHMC

The Ocala City Council presented IHMC with a resolution recognizing the institute's work and especially the achievements of senior research scientist Peter Neuhaus and an IHMC team of 11 people who won a silver medal in Zurich, Switzerland during the first ever Cybathlon, a global competition for disabled athletes aided by wearable robotic devices.

Neuhaus and several team members

traveled to Ocala to give more than 100 high school students and community leaders demonstrations of the exoskeleton, a wearable robotic device that helps paraplegics and people with other disabilities stand and walk. The IHMC team finished second in the Cybathlon's powered exoskeleton race.

Ocala Mayor Kent Guinn, who presented the resolution to IHMC, was on hand to watch the demonstrations of

the exoskeleton. "I helped recruit them to Ocala, so it's a special organization to me," said Guinn.

IHMC General Counsel Julie Sheppard and other IHMC employees attended the city council meeting to receive the resolution. "This was such a wonderful gesture by the city," said Sheppard. "People here have opened their arms to us, and we are so grateful. We look forward to a long partnership with Ocala." ✧

## Jordan Litman wins "Oscar of Higher Education"

IHMC and Dr. Jordan Litman walked away from the 2016 Reimagine Education Conference in Philadelphia with a gold medal in the competition's "Cultivating Curiosity" category.

Reimagine Education is a yearlong global competition designed to uncover transformative initiatives in education. The competition, which is referred to as the "Oscars of Higher Education," is organized by the University of Pennsylvania Wharton Business School and its SEI Center for Advanced Studies in Management.



Dr. Jordan Litman

Litman, a psychometrician and visiting research scientist at IHMC, shared the

Reimagine award with the University of Maine at Marchias, where Litman is a part-time associate professor of psychology.

Litman's winning project was titled, "Facilitating Self-Directed Knowledge-Seeking and Problem-Solving in the Classroom." Its goal is to apply novel and innovative learning techniques that are easily tailored to individual learners. The project provided an outline for self-regulatory strategies in learning and problem-solving that were tied to specific learning goals. ✧



## IEEE elevates Robert Hoffman to senior membership

IHMC Senior Research Scientist Robert Hoffman has become a senior member of the Institute of Electrical and Electronics Engineers.

IEEE senior membership is an honor bestowed only to those who have made significant contributions to the profession. The institute is the world's largest professional organization that promotes the advancement of technology for humanity.

"It is a great pleasure to congratulate you on your elevation to the grade of IEEE senior member," said the institute in notifying Hoffman of the recognition.

Dr. Hoffman has made contributions



in the area of language understanding and analyses of the theoretical and computational foundations for metaphor and analogy. He is regarded as one

of the pioneers of Cognitive Systems Engineering methodologies to support the design of intelligent systems.

He was a pioneer in the area of knowledge elicitation and representation. His book, *The Psychology of Expertise* (1992), is regarded as a classic. He has made significant contributions to the areas of intelligent systems that has defined human-centered computing. He co-founded and has co-edited the Regular Department on Human-Centered Computing that has appeared in *IEEE: Intelligent Systems* magazine since 2001. This is the longest-running Regular Department in an IEEE magazine. ✧

## IHMC helps debut new platform at Mobile World Congress

IHMC and InterDigital, Inc., a mobile technology research and development company, were invited to debut their Contextual Driving Platform (CDP) at the Mobile World Congress (MWC) in Barcelona in February.

IHMC and InterDigital's Innovation Partners collaborated to develop a contextual driving platform to demonstrate cooperative sensor techniques based on data from on-board

sensors and vehicle-to-X communications for situational awareness.

Through an interactive demonstration, MWC attendees were able to experience the contextual services offered by the platform through a virtual reality driving experience. The technology demonstration showed how the vehicles sense and collaborate with each other, compute risk exposure, improve performance, optimize trajectories and adapt self-driving behavior.

"Vehicle safety should be a collaborative process, informed by prior knowledge of historical risk collected from surrounding vehicles," said IHMC Research Associate Tim Hutcheson who led the IHMC team that traveled to Barcelona. "This is basically the way that humans go about reducing risk."

"We notice the driving manner of an approaching

vehicle, the closing speeds and proximity and make a risk assessment that helps us to reduce or increase speed for a better safety margin. Part of that

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“Vehicle safety should be a collaborative process, informed by prior knowledge of historical risk collected by surrounding vehicles.”

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assessment is an intuitive notion based on the surrounding vehicles, road conditions, situational awareness and driving experience. The Contextual Driving Platform allows us to explore these possibilities as a V2X networked solution,” he explained. ✧



Interactive demonstration at Mobile World Congress

## IHMC open house showcases its cutting-edge technology



IHMC's humanoid robot, Running Man, was a big hit at the open house

Brooke Layton has coordinated all of the open houses IHMC has held over the years for National Robotics Week.

"I just love it, especially seeing all of the kids show up" said Brooke, a project manager and research librarian for the robotics group. "We try to gear our demos for children so they can do hands-on stuff. They don't get an opportunity like that very much, so it's cool when they do and I love watching how super excited the kids get."

Close to 800 people weaved their way through the first two floors of IHMC's new research facility for the Eighth Annual National Robotics Week event. People were able to view demonstrations that featured IHMC's six-foot-tall Atlas robot as well as the exoskeleton, a wearable robotic device that helps paraplegics stand and walk, and

a two-legged elliptical runner that can sprint 12 miles an hour on a treadmill.

This year IHMC also partnered with the Naval Aviation Museum Foundation for a second day of robotics demonstrations held at NAS, which drew more than 3,000 people. The day also featured three sold out screenings of the National Geographic movie "Robots."

Robotics Week is about showcasing robotic technology and development in a way that inspires students of all ages to pursue careers in science and technology, said Brooke.

"The benefit of these open houses is that

it makes it real for people. It's not just something they see in a sci-fi movie or on TV anymore. People usually only see robots doing things and they don't get to see the work that goes into actually making the robot move. At the open house, we get to show people there are a lot of algorithms and other work that goes into making the robot do what a person wants it to do." 🦾



IHMC's Stephen McCrory helps a child with a demonstration

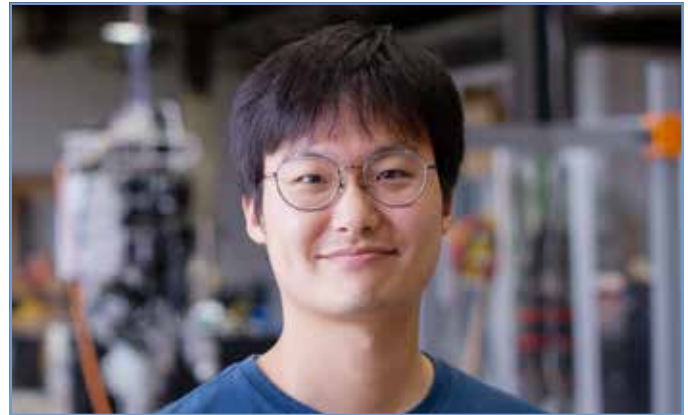


# New team members at IHMC



Gregory Grefenstette

**Gregory Grefenstette** is a specialist in natural language processing and information retrieval who joins IHMC as a senior research scientist. Dr. Grefenstette earned his PhD in computer science at the University of Pittsburg and is one of the pioneers of distributional semantics. He holds 19 patents and likes to run, paint and play piano in his spare time.



Inho Lee

**Inho Lee** is a native of South Korea. He joins IHMC's robotics lab as a research associate who will work with Jerry Pratt and Peter Neuhaus on humanoid research. Dr. Lee received his B.S. degree, M.S. and PhD degree in mechanical engineering from Korea Advanced Institute of Science and Technology in Daejeon, South Korea.



Randy Hammer

**Randy Hammer** is IHMC's communications director. He is the former editor of the Pensacola News Journal and CEO of the Asheville Citizen-Times in North Carolina. He retired from newspapers in 2013 and returned to Pensacola as CEO of the Studer Institute. The PNJ was a two-time finalist for the Pulitzer under Randy's leadership. Hammer also was a two-time winner of the Gannett Company's editor of the year award.



Philip Fatolitis

**Philip Fatolitis** began working with Anil Raj's team as a research associate. He is a Retired US Navy Lieutenant Commander/Hospital Corpsman, with a PhD in Experimental (Applied) and Human Factors Psychology. Dr. Fatolitis worked at IHMC in 2001 and since that time has worked as an Aerospace Psychologist and Principal Investigator at NAMRL and as an Adjunct Professor at Embry-Riddle.





Gordon Badgett

### Gordon Badgett

is a Pensacola Christian College graduate who joins IHMC as a computer technician for the Pensacola and Ocala offices. Following graduation, he worked at the college as a network administrator. Gordon enjoys water sports and is an accomplished pianist.



Shari Biery

### Shari Biery

realized that following a Navy husband around the world would bring new adventures. Her newest is special projects coordinator for IHMC Pensacola. She and her husband moved to Pensacola from Annapolis, where Shari worked at the United States Naval Academy.



Naisha Ramirez

### Naisha Ramirez

provides administrative and facility support for the researchers and staff in Ocala. She is a student at the College of Central Florida working on a bachelor's degree in biomedical engineering. She enjoys spending time with her family making traditional Puerto Rican dishes.



Bart Keulen

### Bart Keulen

is working with the IHMC Robotics team on deep-learning algorithms and helping with the bipedal robots. He is currently pursuing a masters of science in Systems and Control at Delft University of Technology, which is located in the Netherlands.



Tim Seyde

### Tim Seyde

joins the robotics team as a research intern. He is a German robotics student who is currently pursuing his Master's degree at ETH Zurich, a Swiss science and technology university that dates back to 1855. He loves basketball, windsurfing, and (trying) to cook.



Edoardo Amadei

### Edoardo Amadei

is an Italian student working with Jerry Pratt and Peter Neuhaus. Edoardo earned his B.S. degree in mechanical engineering in Turin, participated in a double degree program in Shanghai, and is currently involved in a master program in BioRobotics in Delft.



Vyacheslav Kryosheya

### Vyacheslav Kryosheya

is a native of Ukraine and joins IHMC as an intern who will work on humanoid research. He has degrees in control systems and automation and is currently finishing his master degree program in computer science at RWTH Aachen University in Germany.



Stephen McCrory

### Stephen McCrory

joins IHMC as a research assistant. A Pensacola native who interned at IHMC during the DARPA Robotics Challenge, he graduated from MIT with a B.S. degree in physics and computer engineering. His interests include unicycling, running, and playing chess.

## Science Saturday continues to grow with 60 students a session

Science Saturday continues to be a huge success at both the Pensacola and Ocala facilities. Last year, over 960 students attended each of the eight sessions that were held at both locations.

This program, which is administrated by both IHMC researchers and professionals in the community, provides science enrichment for students in third, fourth and fifth grade.

The Pensacola spring programs featured a wide variety of topics including: "Brain Games," presented by Dr. Jerry Pratt of IHMC; "Programming Robots" with University of West Florida professor Dr. Lakshmi Prayaga; "Fun with Polymers," by Dr. David Fries of IHMC; and "Computer Game Design," by Mr. Doug Stephen of IHMC.

The Ocala spring programs included: "Candy Chromatography," presented by Dr. Manal Fahkoury, a clinical pharmacologist; "The Gravity of It All," by Dr. Row Rogacki of IHMC; "3D Printing," with Mr. James Dees and Ms. Julee McCammon from the College of Central Florida; and "Paper Helicopters," by Dr. Ian Perera of IHMC.

Science Saturday, which also draws volunteers from local high schools to help the younger students, will resume once school starts after the summer break. There are four sessions in the fall and four sessions in the spring at both locations.

A schedule of the upcoming topics and presentations for the fall season will be posted on the IHMC website for both the Pensacola and Ocala locations.

### Science Saturdays

*Science Saturdays is a hands-on science program for kids in third, fourth and fifth grade. High school students also volunteer at the sessions, which are held one Saturday a month during the school year.*

*Past topics include bottle rockets, chemistry, computer game design, secret codes, and roller coasters.*



Dr. Jerry Pratt inspires children at a robotics class







## JAMES BRISCIONE

Briscione started his culinary career as a dishwasher on Pensacola Beach before moving on to culinary stardom as a two-time champion of the Food Network's series "Chopped," a reality-based cooking television game-show. Today, he is the director of culinary development at the Institute of Culinary Education in NYC. Briscione gave an insider's perspective of what is involved in teaching cooks to cook. Each year, more than 30,000 people visit ICE for career training and cooking classes. Briscione also talked about his time at Birmingham's Highland's Bar and Grill, which Gourmet magazine named one of the top five restaurants in the nation during Briscione's time there. From Highland's, Briscione moved to NYC to become sous chef for Daniel Boulud, one of the nation's top French chefs. Briscione is married to Pensacola native Brooke Parkhurst, and has co-authored a cookbook with her, "Just Married and Cooking."



## LEONARD WONG

Wong conducted a groundbreaking study that uncovered a culture of dishonesty in the Army. The U.S. Army War College study found that many Army officers have become ethically numb in verifying all the requirements the military demands. "Untruthfulness is surprisingly common in the U.S. military even though members of the profession are loath to admit it," according to Wong. His talk at IHMC focused on his study's findings and his role as a research professor in the Strategic Studies Institute at the U.S. Army War College. Wong is a retired Army officer whose career included teaching leadership at West Point and serving as an analyst for the Chief of Staff of the Army. His research has led him to locations such as Iraq, Afghanistan, Kosovo, Bosnia and Vietnam. He has testified before Congress and his work was featured in national media ranging from the New York Times to 60 Minutes.



## ROBB WOLF

Wolf is the author two New York Times bestsellers, "The Paleo Solution - The Original Human Diet," and "Wired to Eat: Turn Off Cravings, Rewire Your Appetite for Weight Loss and Determine the Foods That Work for You." He is a former research biochemist who co-founded the nutrition and athletic training journal "The Performance Menu." He also is the co-owner of NorCal Strength & Conditioning, which Men's Health magazine named one of the top 30 gyms in America. Wolfe has transformed thousands of lives via his top-ranked iTunes podcast, books and seminars. He has provided seminars in nutrition and strength training for NASA, Naval Special Warfare, the Canadian Light Infantry and the United States Marine Corps. Wolf talked about the practical processes for integrating evolutionary theory in both medical research and clinical practice.



## GREG SMITH

The majority of human viruses infect people through their airways and digestive tracts. A few rare viruses, like the commonplace herpes simplex, have become proficient at invading our nervous systems. Smith's talk examined the genetics underlying the herpes simplex virus and how the DNA code encased in this minute particle is translated into a complex infection program that brings the virus into the nervous system and back out again. Smith's research is focused on the interface of human-pathogen interactions. He has produced tools to genetically reprogram viruses that are being used to develop vaccines and cancer treatments at several biotech companies and his own lab. He is a fellow of the Burroughs Wellcome Fund, Life Science Research Foundation and the Schweppe Foundation. His research is featured in college textbooks ranging from "Molecular Biology of the Cell" to "Principles of Virology."



## ART DE VANY

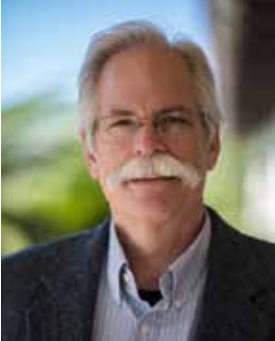
De Vany is a professor emeritus of economics at the Institute for Mathematical Behavioral Sciences of the University of California. He is perhaps best known as the grandfather of the paleo diet, a high-protein, high-fiber way of eating similar to the way our hunter-gatherer ancestors ate. De Vany, a robust 80-year-old, has spent the past 40 years living the paleo way, which he writes about in "The New Evolution Diet: What Our Ancestors Can Teach Us About Weight Loss, Fitness and Aging." His IHMC talk focused on healing the wounds of aging through improved cellular defense and systemic renewal signaling. He spent most of his academic career studying Hollywood and the film industry. His papers and studies ranged from "Hollywood Economics: How Extreme Uncertainty Shapes the Film Industry" to "Quality Revaluations and the Breakdown of Statistical Herding in the Dynamics of Box Office Revenues."





## CLAIRE FRASER

Fraser is a pioneer and global leader in genomic medicine and one of the most highly cited investigators in microbiology. Her IHMC lecture focused on the role the gut microbiota plays in improving people's health and preventing disease. In 2007, she launched the Institute for Genome Sciences at the University of Maryland, and from 1998 to 2007 she was the director of the Institute for Genomic Research in Rockville, Maryland. She has led teams that sequenced the genomes of several microbial organisms, including important human and animal pathogens. In 1995, she became the first person to map the complete genetic code of a free-living organism, *Haemophilus Influenza*, the bacterium that causes lower respiratory tract infections and meningitis in infants and young children. This discovery forever changed microbiology and launched a new field of study, microbial genomics.



## STUART MCGILL

Back pain is the world's leading cause of disability, affecting one in 10 people, according to a 2014 report in the *Annals of the Rheumatic Diseases*. McGill, a professor of spine biomechanics at Canada's University of Waterloo, is one of the world's most renowned back specialists. He has written more than 300 scientific papers and three textbooks. His lecture at IHMC followed the release of his new book, "Back Mechanic: The Secrets to a Healthy Spine Your Doctor Isn't Telling You." The book addresses common misperceptions about back pain and how to address that pain. McGill heads a laboratory at the University of Waterloo that has become a mecca for Olympic and professional athletes struggling with back issues. His landmark book, "Low Back Disorders: Evidence-Based Prevention and Rehabilitation," changed the way coaches, bodybuilders, athletes and non-athletes approached core training.



## DOUG MCGUFF

The average American begins a physical decline that starts in their mid-20s. Although this is commonplace, it's not normal, explained McGuff, an assistant clinical professor of emergency medicine at the University of South Carolina School of Medicine in Greenville, who also practices full-time emergency medicine for the Blue Ridge Emergency Physicians. McGuff's Ocala lecture focused on strength training for health and longevity. McGuff is the author of "Body by Science" which advocates a brief and infrequent regimen of high intensity exercise. McGuff's lecture highlighted how fitness and strength training can reverse the diseases of modern civilization. In 1997, McGuff opened Ultimate Exercise, a fitness facility in Greenville that teaches his efficient-exercise regime and helps people develop into the best shape of their lives.



## ROGER SMITH

Smith runs a small raptor conservation center in Jackson Hole, Wyoming and traveled to Ocala to talk about the people he has met in his career who exemplify why conservation is a truly human endeavor. Smith, who has spent his professional life in the natural sciences and environmental education, began his career in the 1970s as a field biologist researching grizzly bear demographics in Montana. He eventually joined the Teton Science School in Jackson Hole and designed a field-oriented natural science curriculum for all ages. He is on the staff of the National Outdoor Leadership School and leads courses in Wyoming, Texas, Mexico and Kenya. For the past 20 years, his research has focused on raptors and ravens in the Grand Teton National Park. He and his wife and fellow wildlife biologist Margaret Creel run the Teton Raptor Center and help educate people on the raptors of the Greater Yellowstone Ecosystem.



## KIRK PARSLEY

Parsley's Ocala lecture laid out why he believes that sleep is the most misunderstood and underutilized tool that people have for optimizing their health. He has been a member of the American Academy of Sleep Medicine since 2006 and has served as Naval Special Warfare's expert on sleep medicine. Parsley gives lectures around the world on sleep, wellness, and hormonal optimization and consults corporations, professional athletes and sports teams. His work focuses on what he refers to as the four pillars of health: sleep, nutrition, exercise and stress control. Parsley is a former SEAL who received his medical degree from the Uniformed Services University of the Health Sciences in Bethesda, Maryland. His Ocala lecture, titled "The Most Overlooked Factor in Health and Longevity," highlighted what actually happens when we sleep, and why we should all cherish sleep as the "best elixir of health known."



## JOHN SWANSON

Swanson has spent the past 10 years traveling the country to talk about renewable energy and solar energy. An engineer by training, he won the John Fritz Medal in 2004. The medal is regarded as the highest professional recognition an engineer can receive. Swanson also has helped fund startups in photovoltaics (PV), biodiesel, and battery technology. He is active in Green Key Village, an energy efficient (net-zero) community in Lake County, Florida. He has installed photovoltaics on residences, animal shelters, and houses of worship, and helped others design their own PV systems. In his talk, Swanson covered the spectrum of renewable energy technologies that ranged from the generation of renewable energy to its conservation, and storage and transmission. Swanson received his doctorate from the University of Pittsburg.



## DAWN KERNAGIS

Kernagis is an IHMC research scientist who co-hosts the institute's STEM-Talk podcast. Last summer, Kernagis spent eight days underwater as a researcher aboard NASA's NEEMO mission. NEEMO sends groups of astronauts, engineers and scientists to live in Aquarius, the world's only undersea research station. Kernagis chronicled her eight days underwater with five other crew members and explained how the Aquarius habitat and its surroundings provide a convincing analog for space exploration and for testing emerging technology and protocol for long-duration space operations. Kernagis studies human performance optimization and risk mitigation for operators in extreme environments. Prior to her career as a research scientist, Dawn was a diver and leader of underwater exploration, research and conservation projects around the world and was inducted into the Women's Divers Hall of Fame in 2016.



## LAURA REILEY

Reiley is an award-winning food journalist whose "Farm to Fable" expose revealed a pattern of fraudulent claims by some restaurants and vendors at farmers' markets who claimed their food was locally produced. Reiley documented how some farmers and farm-to-table restaurants misrepresented what they sold because they could charge three times as much for "locally produced" food. Reiley works at the Tampa Bay Times and has been the news organization's most-read writer for the past four years. She won the Association of Food Journalists' gold medal for criticism in 2013 and another gold medal in 2014 for special-project work. Her journalism has received top awards from the Florida Society of News Editors, the National Headliner Awards, the Green Eyeshade Awards and the Sunshine State Awards. Reiley is regularly featured on 970 WFLA radio station and is a James Beard Foundation judge.



## MARK LUPO

Thyroid cancer trails only melanoma skin cancer as Florida's fastest rising cancer. Lupo is the founder and medical director of the Thyroid and Endocrine Center of Florida in Sarasota. His Ocala talk focused on thyroid nodules, which are abnormal growths of thyroid cells that form a lump within the thyroid gland. Although the vast majority of thyroid nodules are benign, a small proportion contain thyroid cancer. His practice is centered on diagnosing and treating thyroid cancer at the earliest stage and helping people avoid unnecessary surgeries. Lupo is involved in teaching neck ultrasound, thyroid cancer and general thyroid disease to other physicians at the national level. He has published book chapters and several articles on thyroid disease and thyroid ultrasound. In addition to his work at the Sarasota center, he also is a clinical assistant professor on the faculty of the Florida State University College of Medicine.



## COLIN CHAMP

Champ has spent years reviewing a century of evidence on the role that diet plays in helping people reduce the risk of cancer. An oncologist and assistant professor at the University of Pittsburgh Medical Center, Champ practices radiation oncology and integrative medicine. His research on the impact of diet as well as exercise on cancer incidence and treatment has been published in the New England Journal of Medicine, the Journal of Clinical Oncology and other peer-reviewed journals. He recently founded the Cancer Prevention Project, an initiative to provide the public with recommendations to help prevent cancer through tangible lifestyle changes. He is author of "Misguided Medicine" and "Misguided Medicine: Second Edition." He has been featured in the Boston Globe, the National Cancer Institute, the Gupta Guide with Sanjay Gupta, and the American Society for Clinical Oncology.



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