ihmc

INSTITUTE FOR HUMAN & MACHINE COGNITION

VOLUME 1 ISSUE 3

![ihmc logo]

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INSTITUTE FOR HUMAN & MACHINE COGNITION

A very significant event for the future of IHMC occurred over the summer. The Florida Legislature passed a bill that enables the creation of the Florida Institute for Human & Machine Cognition (FIHMC), a not-for-profit, public benefit corporation. Governor Bush signed the bill into law on July 16th. We are extremely grateful to the legislators, particularly Senator Charlie Clary and Representative Holly Benson, and to the governor for their hard work and support for this important transformation.

As a part of the University of West Florida, IHMC has grown immensely since its inception in 1990 with only two faculty positions. We are appreciative of the leadership and support of UWF President John Cavanaugh as we move forward with this transition. The growth and now increasing independence of IHMC reflect positively on the ever expanding stature of UWF.

Efforts are well underway to accomplish the rather complex transition of IHMC to FIHMC—a process that will take some months to complete. During this period, IHMC in its current form will continue to operate as part of UWF. Following the completion of the transition, FIHMC will remain permanently affiliated with UWF but will also create and maintain affiliations and partnerships with other universities in the Florida state university system as well as universities around the country and the world.

The change in status will allow IHMC the needed flexibility to continue its growth trajectory. This flexibility will open new possibilities for discovery and innovation. A renewed entrepreneurial spirit will be evident in streamlined hiring practices and creative technology licensing as well as more partnerships with other institutions. We believe this transformation will be beneficial to the local community, state, and world.

Kenneth M. Ford, Director

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Institute for Human & Machine Cognition

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Knowledge Modeling and Sharing

"Where is the knowledge we have lost in information?"

— TS ELIOT

As denizens of the Information Age, we have access to vast troves of information. Making sense of this information and extracting and organizing the knowledge immersed within it, however, is challenging. IHMC researchers are developing tools to improve the construction, organization, and sharing of knowledge, bringing order to the information at our fingertips.

While still at Cornell, IHMC's Joe Novak explored many ways of representing the knowledge of students participating in a longitudinal study on student learning in science. He and his research team discovered that concept maps were an effective way for students to express their understanding. These maps, based on a theory of learning proposed by David Ausubel in 1963, contain concepts linked to form propositions. For example, in the figure on page 5, the concepts "plants" and "leaves" are linked by "have," forming the proposition "Plants have leaves." These concepts are arranged in a hierarchical system, with the more general concepts at the top. In his subsequent work with students of all levels, from elementary schools to corporations, Novak has shown that concept maps are an efficient way to express and organize knowledge.

IHMC researchers, led by Alberto Cañas, have taken concept mapping to a new level. In collaborations with the Navy, NASA, and others, they have developed CmapTools, a software toolkit that provides a powerful means for creating, organizing, and sharing knowledge. The Cmaps that are created using CmapTools are simple enough to be used by people of all ages, even preschoolers, yet powerful enough to be used in all domains of knowledge. Key features of CmapTools include the ability to link material through icons, collaboration tools, and search capabilities.

The icon feature in CmapTools allows users to organize large collections of media, using the concept map as a navigational tool. Icons attached to select concepts link web pages, documents, videos,
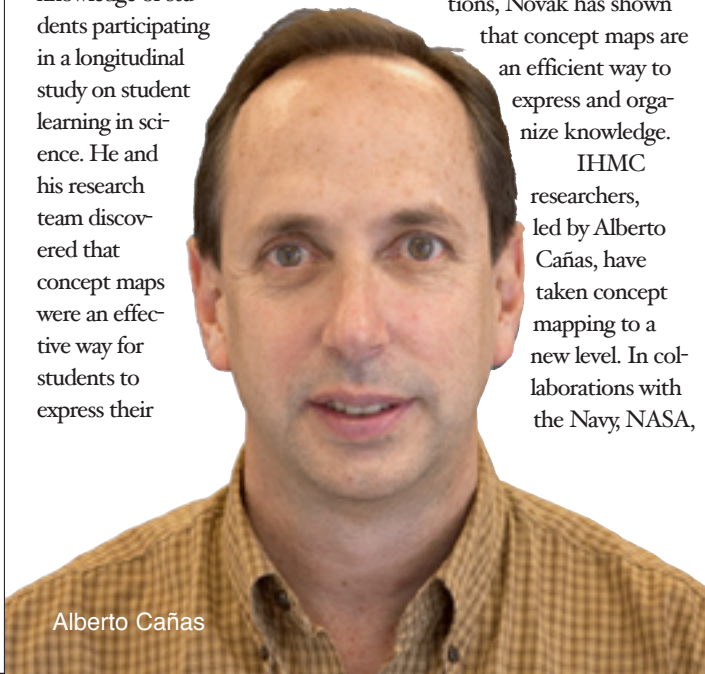
Alberto Cañas

SCIENTIST PROFILES

Alberto Cañas

Hometown: San Jose, Costa Rica
Education: B.S. in computer engineering, Instituto Tecnológico, Monterrey, Mexico; M.Math. in computer science and Ph.D. in management science, University of Waterloo, Canada
Co-founded IHMC in 1990

Alberto's research in using technology for knowledge modeling and sharing is just one phase of a research career spanning many different areas. He has a bachelors and a masters degree in computer science but did his Ph.D. in management science under a cognitive scientist, studying how people categorize things. Following his Ph.D., he was in the computer science department at Tulane University for one year and then taught at INCAE, a business school in Costa Rica, for a year. He decided to come to UWF in 1987 to work with Ken Ford in the computer science department. Costa Rica's then-President, President Arias, however, tapped Alberto to join a team supervising the introduction of computers into the country's schools. Two years later, Alberto arrived at UWF and co-founded IHMC in 1990.

Alberto has left a strong mark on education. In Costa Rica, he started a computer science program at the Instituto Tecnológico de Costa Rica. Graduates from that program now have companies that receive funding from large companies such as Intel and Microsoft. That program and the computers in schools program he worked on in 1998 have driven the creation of a technology-literate workforce in Costa Rica. Now Intel and Proctor & Gamble, along with many other companies, have located facilities there to tap this strong workforce. Alberto hopes his work at IHMC will have a similar impact worldwide.

He has enjoyed watching IHMC grow and exceed all of his expectations. If you had told him what it would become, he wouldn't have believed you. "I would have said that it is not possible to do it at UWF in Pensacola," he stated.

Starting this fall, Alberto will be on a sabbatical in Pamplona, Spain. He is going to savor the opportunity to travel and explore small towns.

Joe Novak

Hometown: Minneapolis, MN
Education: B.S. and Ph.D. in science education, University of Minnesota
Joined IHMC in 2000

Joe never dreamed he would work to improve education. He thought schools were a "hopeless morass." He did have, however, a remarkable physics teacher who valued understanding, not just memorization, and an English teacher who got him to believe he was smart enough for college.

In college, he decided to major in science education. In his last year, though, he became interested in botany and did a project that drew the professor's attention. When Joe was offered a teaching assistant position in botany, he decided he could go to graduate school. His research was in science education, but he continued his botany teaching and research assistantships to pay the bills (and because he enjoyed it).

Throughout his research in science education, Joe strived to make a science out of education. He did his Ph.D. work using cybernetic models, thinking of the mind as input, processing, storage, and output. If such models are valid, there would be a better way to teach people problem solving and learning. When Ausubel's cognitive learning theory was published in 1963, he and his students found this to be a powerful and useful learning theory to guide research and teaching. Joe believes concept mapping and, thus, CmapTools are by-products of his attempt to create a science of education. The problem he has run into is that we are getting good ideas on how we learn, but it is very hard to change schools.

Joe is very passionate about his work and can't imagine stopping. He does still find time for some hobbies. He enjoys hiking and swimming and goes to all of the theater performances he can find. He has three grown kids and has been married for 50 years.

An enthusiastic teacher, he always encourages students to find something they care strongly about, something to push them to succeed—another way that Joe works to improve education.

other Cmaps, or any other resource the user wishes to include. Studies of this feature have shown that users can access information more accurately using Cmaps than when they use traditional web browsers. IHMC received a patent (#5,506,937) on this feature in 1996.

From its first version, CmapTools has been designed with the objective of enabling the sharing of knowledge and facilitating collaboration during construction of knowledge models. In CmapTools, users can easily browse servers anywhere on the Internet containing Cmaps created by others, link their Cmaps to those of others, add comments and criticize others' Cmaps, and collaborate in the construction of Cmaps. Version 3 of the software, now available as a beta test at http://cmap.ihmc.us, takes the collaboration features one step further by simplifying the process of constructing knowledge models and allowing people in distant locations to work on the same Cmap simultaneously. They can also use text windows to chat during the process.

Taking advantage of the topology and semantics of Cmaps, the software aids the user when searching through vast amounts of information. Taking the concept map as the context, the tools can search through the Web as well as through Cmap servers for information and resources related to a concept within a Cmap. Results are much more precise than those from a

key word search performed by a standard search engine, which often results in thousands of hits. This feature is particularly useful in cases when a word has multiple meanings. When searching using traditional search engines, the word "plant," for example, may turn up articles on factories or flora. In Cmaps, however, words are imbedded in context with other words, clarifying the particular meaning. Work continues on improving the search algorithms to increase the relevant hits. Algorithms under development include one that uses the context of a word in the Cmap along with synonyms of the word from WordNet, an online thesaurus of English words, to disambiguate the sense of a word in the Cmap.

As an aid during Cmap construction, CmapTools will mine the Web to find additional related concepts that it presents to the user as possible enhancements to the map and suggests topics for other related maps. Preliminary studies of this function showed that the program prompted users to
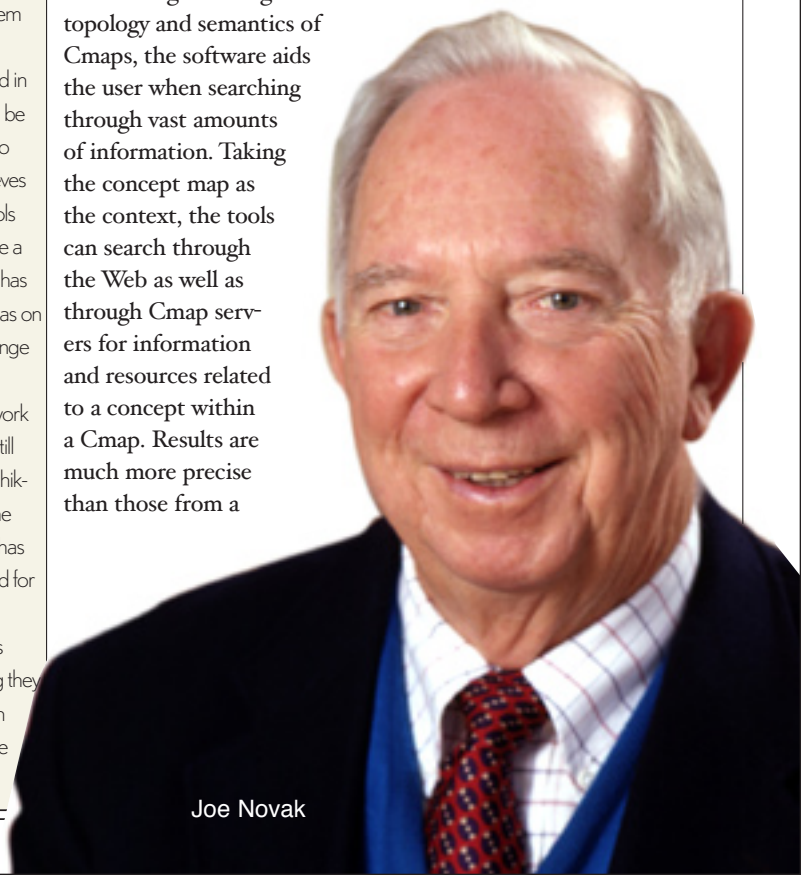
Joe Novak

Cmaps wonderful for training and performance support systems. IHMC has worked with partners to create such systems for cardiologist, electricians, and meteorologists. NUCES (Nuclear Cardiology Expert System) is a computational system which diagnoses first-pass cardiac functional images. To create NUCES, IHMC researchers collaborated with experts in cardiology to construct knowledge models in the form of Cmaps. El-Tech is a just-in-time training and performance support system for electronics technicians based on experts' diagnostic processes developed by IHMC researchers along with the Navy's Chief of Naval Education and Training. Cmaps of the diagnostic processes served as the basis of a rule-based advisory system that assists the user in task performance and provides context-dependent explanations. A similar system, developed in collaboration with the National Imagery and Mapping Agency, is STORM-LK, which provides performance support for weather forecasting (see the featured research article, "Expertise Studies," in the February 2003 issue of this newsletter for more information).

Of course, CmapTools also are applicable in education, the

■ ■ ■ **From organizing information on Mars to supporting the training and performance of cardiologists, electricians and meteorologists to educating children, CmapTools can bring information together to help users gain knowledge.** ■ ■ ■

include about half of the concepts that they eventually used in construction of their maps. Such coaching simplifies the construction of detailed maps.

IHMC researchers continue to develop modules to improve the utility of the tools. Modules in the pipeline include playback of the steps taken in constructing a Cmap, which can be used by teachers to examine the process of building a map by a student; a "presentation" feature to stepwise display a Cmap; a Cmap comparison tool; and a language translator.

In developing CmapTools, IHMC partnered with such a variety of organizations that the broad utility of the tools is clear. From organizing information on Mars to supporting the training and performance of cardiologists, electricians, and meteorologists to educating children, CmapTools can bring information together to help users gain knowledge.

Work with NASA's Center for Mars Exploration (CMEX) at Ames Research Center focused on organizing information on the challenges and opportunities of exploring Mars. Taking advantage of the icon feature in CmapTools, researchers at IHMC and NASA created Cmaps linking and crosslinking resources such as movies of the Viking missions and data on Mars meteorites. These Cmaps are available online at http://cmex.ihmc.us.

The straightforward organization of information makes

A concept map about plants
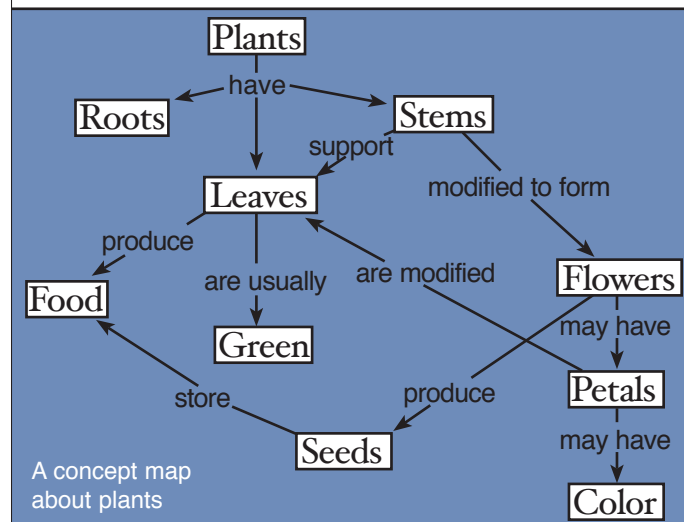
first home of concept maps. CmapTools are used in schools and universities worldwide to help students learn and construct their own knowledge. Both Cañas and Novak see great promise in using CmapTools in education. They have worked with schools locally (see the local section in the June 2003 newsletter, page 11) and around the world to take advantage of the power of Cmaps to help students learn. In particular, IHMC researchers are eager to use the new playback feature to study the construction of Cmaps. Further research on CmapTools in the classroom could provide leads into new modules that would enhance CmapTools in all settings.

People in over 150 countries are using CmapTools. With so many users working together to construct and share knowledge models, CmapTools can lead to improved learning and understanding.

RECENT LECTURES

■■■ IHMC LECTURE SERIES
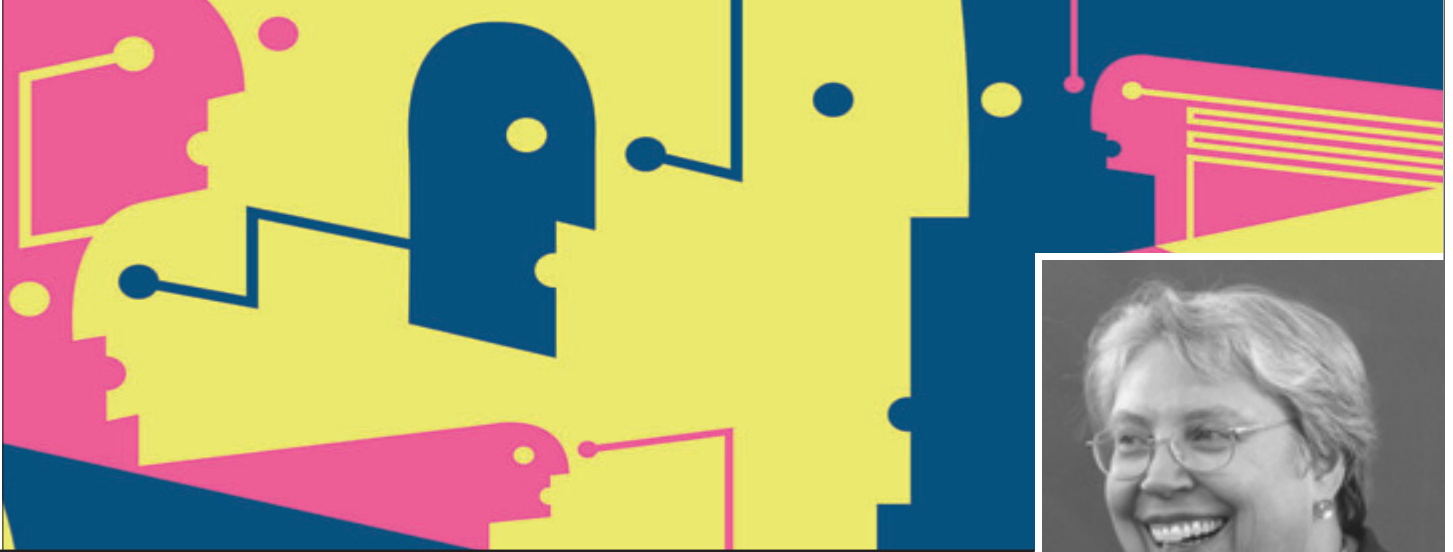
Judith Ramaley

NSF Assistant Director describes role of community outreach

"University outreach can change both the institution and society," Judith Ramaley said during her talk, "A Matter of Mutual Benefit: University-Community Partnerships," on May 1 at IHMC. Ramaley is the Assistant Director of the Education and Human Resources Directorate at the National Science Foundation, and her lecture was sponsored by UWF's Haas Center and IHMC.

Interaction with the community is imperative at universities, creating informed citizens with an understanding of civic responsibility, Ramaley believes. Many challenges

■■■ It is critical to "blend community assets with state and private resources to generate a supportive environment for the attraction and development of new businesses." ■■■

to successful partnerships between town and gown exist, but these can be overcome with perseverance and flexibility.

Communities benefit from partnerships with universities in myriad ways, most obviously in the civic growth of young citizens. Ramaley stressed, though, the economic and community development role of partnerships, pointing out

that such partnerships are the foundation of the highest stage of economic development. In this stage, it is critical to "blend community assets with state and private resources to generate a supportive environment for the attraction and development of new businesses."

Along with managing the NSF EHR directorate, Dr. Ramaley holds a presidential professorship in biomedical

sciences at the University of Maine-Orono and is a Fellow of the Margaret Chase Smith Center for Public Policy. She was President and professor of biology at the University of Vermont for four years before joining NSF. Prior to her service at UVM, she was President and professor of biology at Portland State University, Portland, Oregon, for seven years.

RECENT LECTURES

■■■ IHMC LECTURE SERIES

Army researcher outlines future of combat systems

The future combat system will be a system of systems, including men, unmanned air systems, and unmanned ground systems, said John Gowens, Chief of Computer & Communication Sciences Division at the Army Research Lab. Unmanned air systems have been used successfully, but unmanned ground systems still are in their infancy. In his April 22 talk, "Computer Science and the Future of the Army," Gowens described some of the challenges to the creation of networked, autonomous, unattended ground sensors. Making sense from the range of data these sensors will provide, including visual, seismic, and infrared, will require both automation and human cognition. Additional hurdles include the creation of robust, tamper-proof communication and networking systems.

Author offers insight into intuitions

"If I ask you why you think what you think, can I trust your answer?" Malcolm Gladwell asked at his presentation, "The Kenna Problem: Why asking people what they like is sometimes a bad idea," on May 16. The presentation focused on his upcoming book, which examines "first impressions and snap judgments." Based on examples from New Coke to margarine to rock music, Gladwell showed how many tools of marketing studies fail to accurately predict the impact of a product. For example, forcing people to give reasons for their preferences changes their preferences, steering them to choose a

Malcolm Gladwell

product with which they are likely to be unsatisfied. Gladwell is a staff writer for The New Yorker and previously was a science writer and later the New York City bureau chief for the Washington Post. His previous book, "The Tipping Point: How Little Things Can Make a Big Difference," presented a new way of understanding change.

National security expert discusses homeland security

The current efforts towards homeland security are reminiscent of our nation's activities during the cold war, Bill Mularie showed in his June 10 talk, "Back to the 50's: A Contrarian's View of Homeland Security." He explained that we need to change our approach to analyzing our enemy and his intentions from the old way, which relied primarily on unaided human reasoning and perception, toward a new way that incorporates computational prostheses grounded in cognitive and behavioral sciences in order to make meaning from the available data. He illustrated how such tools have been created to predict the activities of one terrorist group based solely on the analysis of reams of news accounts. In addition, these tools detected a scarlet fever

epidemic in the D.C. metro region months before the traditional medical establishment discovered it. Mularie was the Director of the Information Systems Office (ISO) at the Defense Advanced Research Projects Agency (DARPA) from August 1998 to September 2001. In this capacity he was responsible for the advanced research in cybersecurity and information technologies. He also served a term assignment at the CIA Office of Technical Services (OTS). He is currently CEO of the Telework Consortium, Inc. and Assistant Director for National Security Technologies at IHMC. His presentation was sponsored by WUWF-TV along with IHMC.

Bill Mularie

Medical leaders describe impact of technology on health care

Four new technologies will soon cause a profound shift in health, each with the impact of the discovery of penicillin, said William Dwyer in a presentation on July 24, "Technology and the Future of Medicine." He and Alain Rappaport outlined how genomics, cloning, biopharma, and nanotechnology will revolutionize the delivery of health care. In addition, Rappaport stressed the importance of new tools in data mining to the personalized

medicine of the future. This presentation was sponsored by IHMC, WUWF-TV, and Gulf Coast Community Bank.

Dwyer is Divisional Vice President of Strategic Marketing for the Abbott HealthSystems Division. He has been responsible for a broad variety of activities at Abbott over the past 25 years including: Specialty Sales, Marketing Research, Strategic Planning, and the annual development of a national health care assessment program.

Rappaport is Founder and CEO of Medstory. He was previously co-founder, President, and Chief Scientist of Neuron Data, Inc. (now Blaze Software, Inc.), a world leader in artificial intelligence and other business-critical software components. He has served on the IHMC Advisory Board since its inception.

Researcher describes assistive walking robot

By studying human gait, Peter Neuhaus designed and built a "walking wheelbarrow" which can carry a 100 pound load over rough terrain, including stairs. His presentation, "Human Assisted Walking Robot," on the design of this device, was on May 2. The machine is self-contained, carrying all of its power and computers, and uses a single actuator to increase robustness and reduce cost. The design takes advantage of the intelligence of the human operator, simplifying the control and allowing minimal sensors. Neuhaus, now at IHMC, created this device as his PhD work under Homayoon Kazerooni at the University of California, Berkeley.

HAPPENINGS

■ ■ ■ EVENTS, HONORS, AND AWARDS

Conference Committee: Gary Klein, Jan Maarten Schraagen, Laura Militello, Robert Hoffman, Peter Thunholm, Raanan Lipshitz, Henry Montgomery, and Rhona Flin

Naturalistic Decision Making Conference

Problem solving and decision making are skills that people exercise with varying degrees of proficiency or expertise. A new and very active research field seeks to understand these skills, particularly examining how experts make decisions in "real world" domains. Traditional theories do not adequately represent how experts solve problems and make decisions in such settings. Furthermore, traditional psychological laboratory research on cognition involves simplified, abstract materials and artificial tasks that can be conducted in single experimental sessions. The emerging paradigm of "Naturalistic Decision Making" (NDM), however, involves the study of effective decision making in complex environments. IHMC

hosted the 6th International Conference on Naturalistic Decision Making from May 15 through 18 as a forum for discussion of advances in the field.

The 200 participants and attendees included world leaders in the areas of applied psychology, expertise studies, and human factors; representatives of a number of private-sector firms that conduct research and development projects in the area of cognitive engineering; and representatives of a number of government agencies and conference sponsors, including the Army, Navy, Air Force, and NASA. IHMC's Bill Clancey, currently on leave at NASA/Ames Research Center, discussed simulating and modeling for work crews on Mars. Other invited

Earl Hunt

speakers included Gerd Gigerenzer, director of the Max Planck Institute for Human Development in Berlin; Malcolm Gladwell, staff writer for the New Yorker; Scott Snook of the Harvard Business School; and Kim Vicente of the University of Toronto.

The NDM meetings are held during alternate years, with the next tentatively slated for the Netherlands in 2006. For more information, contact Dr. Robert Hoffman at rhoffman@ihmc.us. 🏃

IHMC PLANNING CONCEPT MAPPING CONFERENCE

IHMC and the Universidad Publica de Navarra are sponsoring a conference on concept mapping, to be held September 14-17, 2004, in Navarra, Spain. The meeting will bring together scholars and practitioners interested in the use of the concept mapping tool first developed at Cornell University in 1972. For more information, including the call for papers, please visit http://cmc.ihmc.us.

HOFFMAN RECEIVES RECOGNITION

Robert Hoffman was awarded a Recognition of Excellence for an Outstanding Instructional Presentation at the Cognitive Systems Engineering Seminar, sponsored by the Air Force Research Laboratory's Information Directorate. He presented a lecture on knowledge elicitation, including concept mapping, in upstate New York during August. The event was a forum for a select group of leaders in cognitive engineering to interface with information technology workers in the Air Force.

NOVAK HONORED FOR TEACHING

Joe Novak received the Botanical Society of America's Charles E. Bessey Award in recognition of his contributions to the improvement of botany teaching. He received the award at the society's annual meeting in Mobile, AL. This year was the first year they presented the award.

FORD ELECTED TO FLORIDA CHAMBER

The Florida Chamber of Commerce Foundation appointed Ken Ford to its

ARRIVALS

■ ■ ■ MAY THROUGH OCTOBER 2003

MULARIE INDUCTED INTO MINNESOTA ACADEMY

William Mularie was recently inducted into the Academy of Science and Engineering in the College of Science and Engineering at the University of Minnesota-Duluth. The Academy was established to give public recognition to distinguished alumni and special friends of the College of Science and Engineering who have brought distinction to themselves through their participation, commitment, and leadership in their chosen profession. Mularie received his B.A. in Physics and Mathematics from UMD in 1961 and his Ph.D. in Electrical Engineering from UM-Twin Cities in 1971.

FORD APPOINTED TO TULANE BOARD

Ken Ford was selected to serve on the Board of Advisors of the Tulane University School of Engineering. The board provides assistance to the Dean of Engineering primarily for academic planning, research program expansion, and financial management of the School. Ford received his Ph.D. in Computer Science from Tulane.

Brian Bonnlander: Brian is working with Clark Glymour on using machine learning techniques to predict phenomena such as forest fires from weather observations. He has a Ph.D. in Computer Science from the University of Colorado, Boulder. He previously taught college and helped design fluid dynamics simulations at Eglin AFB. His interests include the design of new machine learning algorithms for specialized applications.

Tianjiao Chu: Having recently received his Ph.D. in Logic, Computation, and Methodology from Carnegie Mellon University, Tianjiao is interested in the theory and applications of statistical learning and causal discovery. Currently he is working on the development of data mining algorithms for NASA's Earth Observation data.

David Eaton: After eight years in the Air Force as a mechanic on F-15 aircraft at Eglin AFB, David is now working toward a dual degree in Electrical and Computer Engineering from UWF. He is using his experience from working on the UWF Autonomous Submarine on the unmanned underwater vehicles project.

Hyuckchul Jung: Hyuckchul is working with Jeff Bradshaw and James Allen on software agents and natural language processing. He received a B.S. and M.S. in Computer Science from Seoul National University in Korea and will soon receive a Ph.D. in Computer Science from University of Southern California.

Lisa Karnes: Lisa graduated from the University of Iowa with a B.A. in Journalism & Mass Communications and a B.A. in Communication Studies. She has worked at several public radio stations, including WUWF in Pensacola. She is the receptionist at IHMC's 40 S. Alcaniz St. building.

Rebekah Ann Lee: Rebekah graduated from the University of Alabama with a B.S. in Secondary Education Language Arts. She has experience in grant writing and worked as a teacher in Alabama. She is now an executive administrative assistant for Larry Warrenfeltz, Tim Wright, and Jack Hansen.

Mike Lindsey: A computer science major at UWF, Mike is currently a junior and is testing CmapTools at IHMC. In his free time he plays classical guitar.

Edvadio Major: A junior, Ed is majoring in economics at UWF. He is working as a clerk at IHMC.

Will Martin: Will is a computer science major at UWF, currently in his junior year. At IHMC he is working as a clerk, answering phones and running errands.

Nicholas Monteleone: Nick comes to IHMC after working as a local music promoter and now works in administration with Paula Wisnowski. With a background in music education and theatre performance, he is currently a second year student majoring in interdisciplinary studies with an emphasis in philosophy.

Peter Neuhaus: Peter joins IHMC as a research scientist working on robotic systems, with an interest in haptic interfaces. He has spent the last five years working in industrial factory automation and robot control. He received his Ph.D. from the University of California, Berkeley where he designed and built a human assisted walking robot.

Michelle Nguyen: Michelle is a senior at UWF and majoring in computer science. She is currently working as a tester on the CmapTools software.

James Vallese: James is a sophomore computer science major at UWF. As a tester for CmapTools, he is enjoying the opportunity to apply what he's been learning in his coursework.

Paula Wisnowski: At IHMC, Paula oversees administrative functions and provides support to the associate directors, faculty, and students. She previously worked as a technical writer and office manager for Williams Environmental Services and continues to work toward a degree in Sociology at PJC.

Mike Wooten: Mike is working with John Coffey on a LEO module for CmapTools. He is a senior computer information systems major at UWF and is planning to enter graduate school.

GRANTS

Between May and October 2003, IHMC was awarded over $2.5 million

■ ■ ■ NEW GRANTS AWARDED TO IHMC FROM MAY THROUGH OCTOBER 2003

Coalition Search and Rescue Task Support (CoSAR-TS)

PI: Dr. Jeff Bradshaw

Amount: $107,500

Granting Agency: Air Force Research Laboratory/DARPA

In developing tools for software agents, IHMC researchers have partnered with researchers at AIAI at the University of Edinburgh and others through coalition activity simulations. These simulations provide a framework for developing links between a variety of agent programs. This project is a follow-on to the CoAX project (see page 9 of the February 2003 newsletter), aimed at exploring Search and Rescue scenarios. Initially, this work will concentrate on forging links between current work on the DAML and DAML-S projects within the DARPA program and linking these effectively to emerging concepts in coalition and collaborative settings from joint work at AIAI and IHMC. The goal is to accelerate progress on emerging standards and technologies for Semantic Web Services (http://www.w3.org), which will rely on richer markup languages and more capable agent-based computing to increase the usability and power of the Internet.

Augmented Cognition, Phase II

PI: Dr. Anil Raj

Amount: $315,000

Granting Agency: DARPA

A soldier in the battlefield is frequently faced with more decisions than he can handle at any given time. IHMC researchers have previously investigated methodologies for detecting cognitive workload which would monitor when a person is over- (or under-) loaded and modulate task sharing between humans and computers. Under this grant, they will apply the detection methods they developed, including pupil dilation, arousal, and high-frequency microvolt cardiac activity, in real time scenarios. Emphasis will be placed on technologies that can be transitioned to the dismounted soldier doing standard activities in support of the Objective Force Warrior.

Naval Automation and Information Management Technology

PIs: Dr. Jerry Pratt, Dr. Jeff Bradshaw, and Dr. James Allen

Amount: $1,062,500

Granting Agency: Office of Naval Research

Military uses of unmanned vehicles, autonomous robots, and independent systems are growing rapidly. In future military scenarios, large numbers of unmanned ground, air, underwater, and surface vehicles will work together, coordinated by a small number of human operators. These robots must have competent physical and sensing abilities, must be able to perform complex tasks semi-autonomously, must be able to coordinate with each other, and must ultimately be observable and controllable in a useful and intuitive fashion by human operators. Toward this goal, IHMC researchers will use these funds to investigate three areas: unmanned underwater vehicle mobility, led by Dr. Pratt; human-agent teamwork and agile computing, led by Dr. Bradshaw; and dialogue-based mixed-initiative planning and control, led by Dr. Allen.

Exploiting Computational Mobility for Space Exploration

PIs: Dr. Ken Ford and Mr. Niranjan Suri

Amount: $190,841

Granting Agency: NASA

Several future NASA mission scenarios for the surface exploration of Mars will involve multiple autonomous robotic vehicles that must work in a coordinated fashion to accomplish the mission. This grant will fund the formation of an IHMC/NASA study group to consider a novel approach to the control and coordination of multiple robotic platforms. The notion of computational mobility will be exploited, which will allow the various robots to be considered as distributed parts of a single entity.

Intergovernmental Personnel Act (IPA) Agreement

PI: Dr. David Blower

Amount: $86,782

Granting Agency: Naval Aerospace Medical Research Laboratory (NAMRL)

Dr. Blower will apply a general theory of inference to the analysis of data gathered from ongoing projects at NAMRL. These projects will include biopsychological responses to threat, personnel selection and classification issues, analysis of personality and biographical inventory questionnaires, development of a selection system for UAV operators, and heart rate variability studies. He will present seminars on the results to NAMRL, Naval Health Research Center (NHRC), Office of Naval Research (ONR), and other interested Navy program mangers and principal investigators.

## Human Centered Computing for the Intelligence Community.

PI: Dr. Alberto Cañas

Amount: $790,000

Granting agency: Department of Defense

IHMC's research in human centered computing has simplified work in many domains. This grant will fund applications of these principles to intelligence analysis. IHMC researchers, led by Dr. Robert Hoffman and Dr. Alberto Cañas, will work on four related tasks in parallel. In Task I, the team will use subject matter experts in the field of Social Network Analysis to understand how new technologies might be evaluated for use by DOD. Training DOD personnel in concept mapping and using IHMC's concept mapping toolkit (CmapTools) in Task II will lead to extending the tools to searches of the intelligence domain in Task III. Finally, a Collaborative Cmapping Pilot Study will be done in task IV. This research effort could lead to improved use of new hard and soft technologies by the intelligence community.

LOCAL NEWS
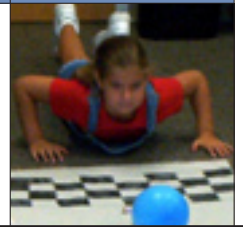
■ ■ ■ IHMC SCIENTISTS LEAD KIDS TOWARD SCIENCE

Eric Gordon tests his balloon car

■ ■ ■ **By getting their hands dirty and becoming skilled at a science activity, the kids saw science in a new light, very different from the rote learning common in their science classes in school.** ■ ■ ■

Dion Leverette and LaDarius Green build their lemon battery.

Brianna Rivers and Charles Davis race their balloon cars.

IHMC's Science Saturdays

As part of our commitment to the strength of our local community, IHMC kicked off Science Saturdays, a science enrichment program this fall. Science Saturdays provide hands-on science activities for kids in grades 3, 4, and 5 once a month.

Activities are not like those found in a traditional science class where lessons are focused on rote learning or watching demonstrations by adults. Instead, kids dig in, testing, building, and trying new things. There is no right answer. "We want kids to look forward to science, to have increased confidence in their science abilities, and to understand that science is part of their everyday world," says Megan Pratt, an IHMC scientist and organizer of the program.

Our first activity, held August 23, was balloon cars. Kids from many different public schools as well as home schools and private schools were given simple materials, including wheels, lollipop sticks, straws, spools, foam board, scissors, and tape. They experimented with a variety of designs,

with some kids trying multiple balloons, fewer wheels, or other changes. In experimenting they saw, for example, how the balloon's friction with the floor could keep their cars from moving or the importance of straight axles in going far. Activities on subsequent Saturdays included delta wing fliers and cotton ball catapults.

The response to the program has been tremendous, with enrollment filling two months in advance. IHMC hopes to expand the program to meet the demand by working with other local scientific organizations or other scientists generally in order to provide a constant stream of volunteers.

By sharing their enthusiasm for science, IHMC scientists are eager to increase the enthusiasm of area students for science, whether they become scientists,

engineers, or other types of community leaders.

Boys and Girls Club Summer Program

IHMC scientists love science and are eager to share their passion with others. During the summer of 2003, IHMC worked in partnership with the Escambia County Boys and Girls Club to bring science to their 10-week summer program. Each week, our scientists visited the clubhouse to provide inquiry-based activities to the kids, ages 9-14.

The activities the researchers led used inexpensive household materials and included lemon batteries, bottle rockets, and an egg drop, among others. A number of the kids then repeated their experiments at home, sharing their excitement with friends and family. Some parents even learned something, too. One boy report-

ed that he showed his parents the motor he made and they "clapped and said, 'Very interesting.'" Kids reported that the activities changed their view of science by showing that science is "cool." By getting their hands dirty and becoming skilled at a science activity, the kids saw science in a new light, very different from the rote learning common in their science classes in school.

IHMC's researchers also benefited from volunteering with the Boys and Girls Club. Often a crowd would gather around those designing and testing the activity for the week. Pat Hayes, a senior scientist who volunteered for several activities, said, "Tinkering with things and making them work always fascinated me as a kid. Still does. I hope that making balloon cars and bottle rockets will spark an interest in science by one of these kids." ■