

Spring 2001

Dimensions Spring 2001

Iowa State University Department of Mechanical Engineering

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UPDATE

Mechanical Engineering

SPRING 2001 • VOLUME 11, NUMBER 1 IOWA STATE UNIVERSITY

Students spend spring break at NASA

Like thousands of other undergraduates, ME students Sibil Joseph, Jason Schmid, and Thomas Cauley III, along with ECpE's Joseph Hynek, found themselves Texas-bound for spring break.

But they didn't quite make it down to South Padre Island this year.

While many of their classmates headed for the beach, these four ISU engineering students detoured to the Johnson Space Center in Houston, where they joined NASA's Reduced Gravity Student Flight Opportunities Program in order to test the acoustic manipulation of objects in water aboard the agency's reduced-gravity aircraft.

The Johnson Space Center's Reduced Gravity program has provided a weightless environment to NASA space flight researchers since 1959. At first used solely

ME students Jason Schmid, left, and Sibil Joseph, right, experience weightlessness at a NASA test facility.



for astronaut training, recently the program's modified Boeing KC-135A has given academic and industrial researchers the opportunity to conduct reduced-gravity experiments.

Dubbed the "weightless wonder," the Boeing aircraft rocketed to fame several years ago when it was used to film weightless flight sequences for the motion picture *Apollo 13*.

The KC-135A mimics zero gravity by flying in a series of parabolic arcs. At the top of each arc the aircraft plunges into a free-fall that gives passengers—unfettered in the plane's amply padded fuselage—about 23 seconds of simulated weightlessness.

"During the zero-g portion of the flight you lose track of up and down, because gravity is what normally tells you which way you are pointing," observed Schmid.

"It's very interesting doing flips and other maneuvers in zero-g, because when you close your eyes you have no sensation that you're even spinning."

However, these would-be space walkers pay for these transitory thrills with a force against their bodies of almost two Gs as the plane pulls up through the bottom of the arc. And as if these extremes weren't enough, for variety the teams and their experiments are subjected as well to short, recurring episodes of lunar-g (1/6-g) and Martian-g (1.3g).

"The thing that surprised me was the pressure on my body during the first 1.8g portion of the flight,"

Schmid said. "It was so intense that I started to get light-headed before my body could adjust to the new situation. After the first 1.8g experience, though, I was pleased that I was more prepared for the pressure changes, and I had no negative effects from the added pressure."

Administered by the Texas Space Grant Consortium, the Reduced Gravity program encourages undergraduate students to develop, conduct, and evaluate a reduced-gravity experiment of their choosing. And while engineering and other technical and scientific disciplines represent the bulk of student participants, the program is sufficiently expansive and forward-looking to include artists and journalists as well.

No student attending an Iowa university had ever participated in the Reduced Gravity program before. Iowa State's team first became interested last fall, when NASA test director and ISU alum Drew Nash, BSME'98, contacted the Iowa State chapter of the American Society of Mechanical Engineers to encourage ISU students to form a team and submit a proposal.

Schmid, Joseph, Cauley, and Hynek accepted Nash's challenge and designed an experiment to explore the effects of zero gravity on the manipulation of air bubbles in a sealed tank of water. According to team members, the research could be adapted to actual space flight applications, such as the removal of bubbles from fuel lines without the use of filters or other mechanical devices. NASA was intrigued, and accepted the proposal for the spring 2001 program. A substantial grant from the Iowa Space Grant financed the trip, which involved towing the 475-pound experiment in a trailer to Houston's Johnson Space Center. The ISU students joined a dozen other

continued on page 2: Weightless

From the first page to the last, this issue of our newsletter is filled with information about our undergraduate students. We have a number of active student organizations, but this issue of ME Update highlights activities that have an ISU ASME section connection, ranging from page 1 on the NASA reduced-gravity project taken up as a challenge to the section by an ME alum employed at NASA, to the article about Alan Tkaczyk, an active ASME leader who recently participated in an ASME International conference in France, to the national coverage the section received in ASME News on an event hosted in frigid February. All these things happen because of great student leaders, an active group of students, but also a great faculty advisor, in this year Assistant Professor Francine Battaglia.

In this issue, you will get an idea of both the sources and recipients of scholarship support, both from scholarships set up at Iowa State and from external sources like companies or organizations. You will also learn more about the recognition and honors our faculty and staff have received recently: Shyam Bahadur as University Professor, Dr. Gloria Starns receiving the ISU Foundation Award for Excellence in Academic Advising, Associate Professor Judy Vance elected the founding president of the Women's Engineering Leadership Institute, as well as one of our newest faculty members, Atul Kelkar. And then there are new developments that didn't get in, like Srinivas Garimella joining the Executive Committee of ASME's Advanced Energy Systems Division and Ted Okiishi serving as the ASME Vice President responsible for the International Gas Turbine Institute.

Next time when there is more space, I'll be able to tell you more. Until then, please keep in touch with the Department.



Weightless: continued from page 1

university teams, fine-tuning their experiments shoulder-to-shoulder with NASA technicians, pilots, and test directors.

Program participants were not allowed to make the leap skyward from their earth-bound lives without first training for simulated space flight. The ISU team members each underwent three days of rigorous orientation, including physical training, safety drills, test readiness reviews, flight-suit fittings, and a ride in a hypobaric chamber—as well as a crash course in controlling in-flight nausea. Only after successfully completing the three-day orientation was the team treated to 40 short “weightless” periods as the KC-135A maneuvered high above the Gulf of Mexico, allowing students to conduct experiments in an environment not available to earth-bound researchers.

The ISU experiment called upon team members to first create bubbles in the water-filled tank by vigorously shaking it, which in turn required that one of them be secured to the plane during weightlessness. Then another team member would “shoot” the bubbles with an acoustic transducer.

But shaking the tank could be hard work, as the apparatus weighed approximately 40 pounds. “Due to the transfer of momentum that it would cause,” Schmid noted, “we let the heavier of the two experimenters for each flight have the task of shaking the tank.”

Still, Schmid was determined to mix pleasure with his work, and, in order to experience the sensation of floating in zero gravity as often as possible, on his second flight attempted to shake the tank without first being strapped to the floor. Using his head and neck to pin his body between the tank and the wall of the plane's fuselage, Schmid found he could still shake the apparatus enough to produce an adequate amount of bubbles for his colleague to “zap” with the transducer.

Although occasionally breaking loose from his improvised moorings, Schmid claims that his method “worked better than most people would imagine.” Better yet, though, during periods of zero gravity team members could see that the bubbles were moving: their experiment had performed as predicted.

While NASA developed the program in part to encourage and develop the next generation of space and aeronautical engineers, your vision doesn't have to reach beyond earth's confines to take advantage of the program. Cauley, for one, is looking toward an eventual Ph.D., followed by research and teaching, and Joseph plans on going for her M.B.A.

As for Schmid? No move a-la-Luke Skywalker from the farm to the stars for him. “After graduation I plan to work for an automotive, agricultural implement, or industrial equipment manufacturer,” Schmid said.

But perhaps not before he continues on to South Padre for that well-deserved break. 

Busy spring for Tkaczyk

It's been a busy spring for senior Alan Tkaczyk. In addition to the studying for finals, preparing for commencement, and selecting a graduate school, he had to work in a trip to Nice, France, where he was an invited panelist and also presented a technical paper at the International Conference on Nuclear Engineering.

Tkaczyk, a senior from Carmel, Indiana, who has split his undergraduate studies between mechanical and materials engineering, presented on "The Future of the Nuclear Industry from the Point of View of the Young Generation." The panel featured five students; Tkaczyk was the only undergraduate. He also gave a paper titled "Sample Performance Assessment of a High-Level Radioactive Waste Repository: Sensitivity Analysis." Both presentations were well received, he said.

"I got some good feedback and someone working in the nuclear energy industry even asked for a copy of my comments," Tkaczyk said. The student program included technical tours to

Tkaczyk received support for his trip from the Department of Mechanical Engineering and the college. The event is premier technical conference on nuclear engineering with about 800 participants, including about 50 students from various countries.

Following graduation, Tkaczyk will attend graduate school at the University of Michigan on a National Science Foundation Graduate Fellowship. He plans to earn a Ph.D. degree in an interdisciplinary area that combines mechanical and materials engineering. His ultimate goal is to either start a research company or seek a faculty appointment.


Attendance: continued from page 8

offers. This activity usually has a beneficial side effect — it's often an incentive for new student members to join ASME.

Within a week of Holm's presentation, approximately 10 new students from Iowa State applied for membership.

"The presentation was excellent and so much fun," said Clint Rabe, president of the Iowa State student section. "It contained all sorts of great information that engineers could apply to make themselves financially successful in and out of school. This event sent a charge through the student organization here at Iowa State, and we have seen lots of interest since."

The presentation also can be offered as part of the program for Regional Student Conferences. But whether it's part of the RSC program or scheduled independently, a minimum preregistration number must be met in order for the presentation to take place.

For more information about how to schedule a presentation of "Ten Big Financial Mistakes and How to Avoid Them" and tips on how to ensure its success, visit ASME's Student Center at www.asme.org/student. 



ME honors newest graduates

The members of the class of 2000 were honored in December at a pre-commencement reception hosted by the mechanical engineering department. Following is a list of the newest ME graduates.

Wade Scott Anderson	Thomas Anthony Karre*	Watsaraphone Meksay
Matthew Todd Bogan	Rachmad Karyadi	Andrew James Meschke
Jarold W. Burke*	Ben L. Klocke	Jonathan L. Olson
Shane P. Chesmore	Mark Rolland Knight*	Shawn Troy Peck
Kah-Leong Chong	Nagarajan	Allen Gordon Poppe*
Trevor M. Conrad	Krishnaswamy	Amanda Lou Richardson
Elmedani Saad Elmedani	Aaron Charles Lagrange	Eric Franklin Severson*
Ahmed	George Edward Losee*	Todd Dick Sheffield
Timothy David Fink	Nicholas Joseph	Paul Murphy Shirley*
Brian L. Grice	Luckerth*	Lloyd D. Snell
Ronald Maurice Hale	Mark Edwin Malmberg	Brent David Stanford
David Robert Hamers*	Jack Henry Manemann	Jesse Lee Swanson*
Grant Rakow Henn	Courtney William	Jeffrey Michael Vanek*
Brandon Todd Hitch	McCauley	Jesse E. Voga
Ben Richard Hoelsing	Luke C. McKee	Ryan Dean Witt
Jeremy Lynn Huisman	Don E. McKivitz	
Robbie Anthony Jondal	John E. McMartin	
Lars Rune Kaldestad	Keir Duncan	
Michael Christopher	McQuistan*	
Kampwirth	Timothy Isaac Meehan*	

*with distinction



A permanent display honoring Henry M. Black was unveiled last fall by the ME department. Present at the unveiling were (l-r): James Melsa, dean of the college; Bruce Black, Black's son; Richard Seagrave, interim president of ISU; and Warren DeVries, chair of the ME department. The display is located near the main entrance to the building.

Gifts support future engineers

The support of individuals and corporations enables the Department of Mechanical Engineering to award scholarships to its students. This academic year, 46 freshmen students received scholarships totaling over \$65,000. Scholarship support for upperclass students exceeded \$195,000.

Following is a list of current scholarship recipients, source of scholarship, and amount of award. The department and its students appreciate the generous contributions of its friends.

Alice Redington Black

Sara Stolmeier

Alliant Energy

Craig Bjorseth
Stephen Reid

Association for Facilities Engineers

Gary LaFayette

Betty Van Winkle

Lucas Busard

Bill C. Fox

Ken Kleemeier

Black Hillstrom-ME

Michael Larson
Scott Larson
Timothy Meehan
Robin Sauser
Michael Taylor
Michael Williams

Caterpillar

Nkwmkweruka Ohia
Elizabeth Schmerr

Celanese-ME

Amber Hasche
Sibil Joseph
Erin Will

Clarence H. Ford

David Muff

Claude & Christina Summers

Timothy McCollough
Michael Strope

Clayton H. Cooper

Bryan Walter

College of Engineering

Seth Alberty
William Allen
Gustavo Aramayo
William Babler
George Barnes
Allen Barrow
Ryan Baum
Brian Billman
John Burnett
Craig Cagney
Todd Cannegieter
Ryan Cherry
Alexander Coleman
Ryan Davisson
Derek Dolezal
Hanna Eastvold
Kimberly Elliott
Victoria Evan
Rebekah Gable
Benjamin Geelhoed
Dennis Griffin
Joseph Haller
Benjamin Hanson
Brian Hartsel
Paul Hattan
Peter Hemmings
Justin Henson
Chad Holst
Kevin James
Ryan Johnson
Anna Jones
Scott Kaldenberg
Mary Kaul
Kenneth Kopecky
Joshua Krakos
Michael Larson
Scott Larson
Derek Lehman
Yangyang Liu
Aaron Madsen
Cory Mass
Ryan McBreen
Andrew McCalley
Andrew McKean
David Mohamed
Brian Nash
Aaron Nelson
Jonathan Nielsen

Adam Niewoehner

Daniel Olig
Kimberly Otterpohl
Tim Patterson
John Platt
Cliff Plymesser
Chad Raymer
Andrew Ring
Valerie Sandefur
Robin Sauser
Brad Schmidgall
Stephen Smith
Andrew Snyder
Gregory Sommer
Dustin Springer
Samuel Stineman
Anthony Straub
Michael Taylor
Katherine Venes
Michael Williams
Robert Young
Stephanie Yungk

Dean's Leadership

John Meacham

Deere & Company

Ashlee Schmidt
Sara Sparks

Deere & Company Minority

Vernon Gambleton

Deere & Company Women

Lesley McNaught

Dorothy Avery & Maurice R. Clark

Nathan Harty
Jodi Krayenhagen

E-Week

Ryan Christenson
Joshua Decker
Daniel Klocke

Frank H. Ricker

Nicholas Mohr
Luke Wadsley

Gary & Donna Hoover

John Cao
Alan Kastengren

Guy Morrison

Matthew Waite

H. Stuart Kuyper

Caroline Graeve
Kathleen Spees
Abby Wakefield

Harry Oakley Price

Steven Block
Mark Bly
Luke Cummings
Randall Mathison
Timothy Meehan
Matt Romig
Kyle Schilling
Chad Wickman

Henry M. Black

Jeremy Cloutier
Nathanael Greene
Timothy Hess
Gabe O'Connor
Jeremy Schmidt

John Deere Foundation

Ellen Brockmann
David Kapparos
Benjamin Pelisek
Brian Petersen

John P. Keller-ME

Mark Bly
Joshua Krakos
Andrew McKean
Brian Nash
Jonathan Nielsen
Adam Niewoehner
Matt Romig

Jordan L. Larson

Bret Olson
Eric Sutterlin

Kermit B. Myers

Keir McQuistan
Alex Mohning

Your support makes a difference

Generous gifts from ISU ME alums, industry, and others enable our department to continue our tradition of academic excellence. Our ongoing success is linked closely to your contributions, which are used for the following:

- Scholarships and fellowships
- Start-up funds to attract top-notch new faculty
- Seed money for development of new projects
- Laboratory equipment

The Black-Hilstrom Mechanical Engineering Development Fund grew out of a fund started more than 30 years ago by Hollis "Pete" Hilstrom, ME'34. In 1980, Henry Black, department head from 1946 to 1972, joined with Hilstrom to invite other alumni to contribute to the fund. Since then, the endowment has grown to more than \$2 million with gifts from more than 475 alumni.

You can participate in the Black-Hilstrom Fund using the form included here. Or call us at (515) 294-1423 to learn about other ways you can support ISU ME.

The Black-Hilstrom Fund

An Endowment for Mechanical Engineering

- To provide support for the Department of Mechanical Engineering, I enclose \$_____ by check made payable to the ISU Achievement Foundation and designated to the Black-Hilstrom Fund.
- To provide support for the Department of Mechanical Engineering, I pledge \$_____ to be paid in ___ installments over ___ years. Please remind me each year in _____ (month). Enclosed is my first check for \$_____ made payable to the ISU Achievement Foundation and designated to the Black-Hilstrom Fund.
- I am interested in learning about other ways I can help the Department of Mechanical Engineering.

Name _____ Date _____

Degree(s) _____ Year(s) granted _____

Address _____

City _____ State _____ Zip _____

My gift does does not qualify for a company matching gift.

Please return to: The ISU Foundation, Alumni Suite, Memorial Union, 2229 Lincoln Way, Ames, Iowa 50010-7164.

We appreciate your support!

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William W. Bathie
Matthew Rodgers

Department Dynamics

Vance heads new leadership institute

Judy Vance, associate professor in the mechanical engineering department and faculty fellow of the Virtual Reality Applications Center at Iowa State University, was elected president of the Women's Engineering Leadership Institute (WELI), a newly formed national organization that promotes diversity in engineering academic leadership.



encouraging. We hope to see more women engineering faculty assume these leadership roles," said Vance.


The WELI programs will include conferences, workshops, and training material aimed at mid-career and mature-career women

engineering faculty to educate them on advancement opportunities in academia. WELI will also develop training material for institutions across the country to train department chairs, deans, and others in leadership positions.

WELI was created as a result of the National Science Foundation's Women in Engineering Leadership conference held last October in Winter Park, Colorado. Vance was one of 32 women engineering faculty selected nationwide to attend this conference. She will serve as the first president of WELI and oversee its efforts to establish training, mentoring, and networking programs for women engineering faculty.

One particular effort of WELI will focus on encouraging female Ph.D. students and women faculty to choose a career path that includes academic leadership. The institute will offer scholarships to women engineering Ph.D. students to support their attendance at workshops on careers in academia.

"Currently there are few women engineering professors in academic leadership roles, especially the departmental chair position. We have seen an increase recently in the number of women engineering deans, which is


WELI will also serve as an information resource for issues and data related to women in academic leadership and provide advice to academic institutions in their efforts to improve gender equity. 

Motorola creates scholarships

The college has received a \$24,000 grant from the Motorola Foundation, which will be used to support undergraduate and graduate education, establish an engineering recruitment program, and provide support for student-run professional organizations.

Six \$1,000 scholarships have been established for juniors and sophomores working towards degrees in either computer, electrical, or mechanical engineering, with four of the scholarships designated for minorities and women.

A \$4,000 graduate fellowship is available for students to pursue an advanced degree in engineering. A portion of the grant will be used for a new program in the electrical and computer engineering department to recruit and retain women and minority students.

Other organizations that will receive money include ISU's solar car team, the Society of Women Engineers, and the Iowa Alpha Chapter of Tau Beta Pi, an engineering society that encourages community outreach projects. 


Bahadur is university professor



Shyam Bahadur has been named a university professor, a title bestowed on a senior faculty member who has had a significant impact on his or her department and the university in the areas of teaching, research, and professional service. He was honored at the Spring Awards Convocation held in April at the Memorial Union.

A scholar with an international reputation in the field of tribology and an outstanding educator who has devoted more than 40 years to student learning, Bahadur's contributions are well documented in his list of over 100 journal publications, a steady stream of graduate students, and continuous research activity. His mechanical engineering courses are widely known for their rigor and usefulness.

A distinguished lecturer who has given presentations on three continents, Dr. Bahadur is a Fellow of two societies—the American Society of Mechanical Engineers and the American Society of Testing of Materials, which recognized his distinguished service with their top award, the Award of Merit, in 1999. He has provided exemplary service to the College of Engineering and Iowa State through his thoughtful leadership, including service as interim chair of the Department of Mechanical Engineering.

Bahadur received his B.S. from the University of Roorkee in India, where he remained as a lecturer while completing his M.S. degree. He has a Ph.D. degree from the University of Michigan. Dr. Bahadur joined the Iowa State faculty as an assistant professor in 1970 and was promoted to professor in 1977. 

Kelkar: At the controls of a rocketing career

Ask new ME Associate Professor Atul Kelkar what he likes about Iowa State, and he might mention an active research group in controls spanning the Departments of Mathematics, Mechanical, Electrical, and Aerospace Engineering.

Then there are ISU's top-flight facilities, such as the Virtual Reality Application Center. And, of course, ISU has "great people to work with," according to Kelkar.

Oh, yes. There's cricket, too.

"I used to play cricket back in India," Kelkar remarked. "I discovered they play cricket here, and I'll be joining them soon."

It's a wonder someone as busy as Kelkar has time for cricket. Co-author of two books and many articles since earning his Ph.D. from Old Dominion in 1993, the Bombay native is tearing up more than cricket fields these days.

Besides helping lay the groundwork for further developing control theory and systems at ISU, Kelkar is also a high flyer in research and publishing circles. His work has attracted support from both NASA and the National Science Foundation. While at Kansas State University in 1997, he received the NSF's prestigious CAREER award. The four-year grant helped launch his work on the robust control of passive and non-passive aerospace systems into orbit.


"The research focused on designing controllers for the next generation of aerospace systems," Kelkar said. "These are critical for delivering stability and performance in the presence of unforeseen changes."

Kelkar was a postdoctoral fellow at NASA's Langley Research Center and has since served as chair of ASME's Technical Panel on Aerospace Systems. A frequent organizer and speaker at international conferences, he is also Associate Editor of the Conference Editorial Board of the IEEE Control System Society.

Kelkar's research reflects a long-standing interest in control systems, including multi-body dynamics, acoustic noise control, nonlinear and robust controls, robotics, and neural networks. Projects on Acoustic Noise Control in Aircraft Cabins and the Verification of Controllers Based on Adaptive Neural Networks were recently cleared for major support by NASA.

Yet Kelkar's work has taken him beyond research and development to embrace his larger mission as an educator. As part of his CAREER project at KSU, Kelkar fostered cooperative efforts between industry and academia for undergraduates and advanced high school students, as well as developing an innovative study-abroad program. Today his research informs his upper-level and graduate teaching, including courses in Robotics, Robust Control, and Modern Control Theory.

As if all that weren't enough, those prospective cricket matches got even more competition last year with the birth of daughter Rucha to Kelkar and his wife Kshitija.

Given the scope of his work, family life, and off-the-job pursuits, it's not surprising that Atul Kelkar was attracted to the theory and practice of control. 


Starns is honored

Gloria Starns is the recipient of an Iowa State University Foundation Award for Excellence in Academic Advising in recognition of her efforts for the mechanical engineering department.

Starns was instrumental in establishing the Mechanical Engineering Advising Center, which now provides services to approximately 900 undergraduate students annually. She has direct advising responsibility for nearly 300 students a year, many of them transfer students and graduating seniors.

She works tirelessly at helping students to succeed at Iowa State and make thoughtful, informed career decisions. Her effective management of the advising center has resulted in an increase in the retention rate among all mechanical

engineering students as well as an increase in the female enrollment in mechanical engineering. In the words of one of her nominators, "The mechanical engineering department is fortunate to have Gloria Starns spearheading the advising efforts on their behalf. The ME Advising Center is a testimony to (her) professional, organized, results-oriented student advocacy."

Starns has B.S. degrees in microbiology and mechanical engineering from the University of Kentucky. She also has M.S. and Ph.D. degrees in mechanical engineering from Iowa State. She joined Iowa State as an academic adviser in Engineering Student Services in 1988, serving in that position until 1994 when she became interim director of Engineering Career Services. She was named coordinator of the Mechanical Engineering Advising Center in 1997. 



In this issue:

- 01 **Spring break at NASA**
- 02 **Notes from the Chair**
- 03 **Henry Black honored**
- 04 **Support helps future engineers**
- 06 **Motorola scholarship**
- 07 **Kelkar joins faculty**
- 08 **Students break records**

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(Note: The efforts of our ASME student chapter to build attendance for an event they sponsored were so overwhelming that a feature about the group's success was carried in the March issue of ASME News. A copy of the article is reprinted here, with permission of ASME News.)

Subzero temperatures had no chilling effect on the student turnout for ASME's latest presentation of "Ten Big Financial Mistakes and How to Avoid Them."

In fact, the 225 people attending the talk last month on the campus of Iowa State University in Ames broke all attendance records for the presentation given by Joseph Holm, who is the managing director of finance and administration for ASME.

"Through an extensive publicity drive to the entire College of Engineering, we were able to achieve spectacular attendance and are confident that this will lead to amplified ASME student membership and participation in the long-term," said Alan Tkaczyk, the social chair of ASME's student section at Iowa State University. "The prestige of a national-level speaker allowed us to reach out to all engineering students with M.E. interests, and we are hoping to see them at our future meetings."

The presentation is available to all ASME student sections as a method of increasing the Society's visibility among engineering students and make them more aware of the services that ASME

continued on page 3: Attendance

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