Mechanical Engineering News

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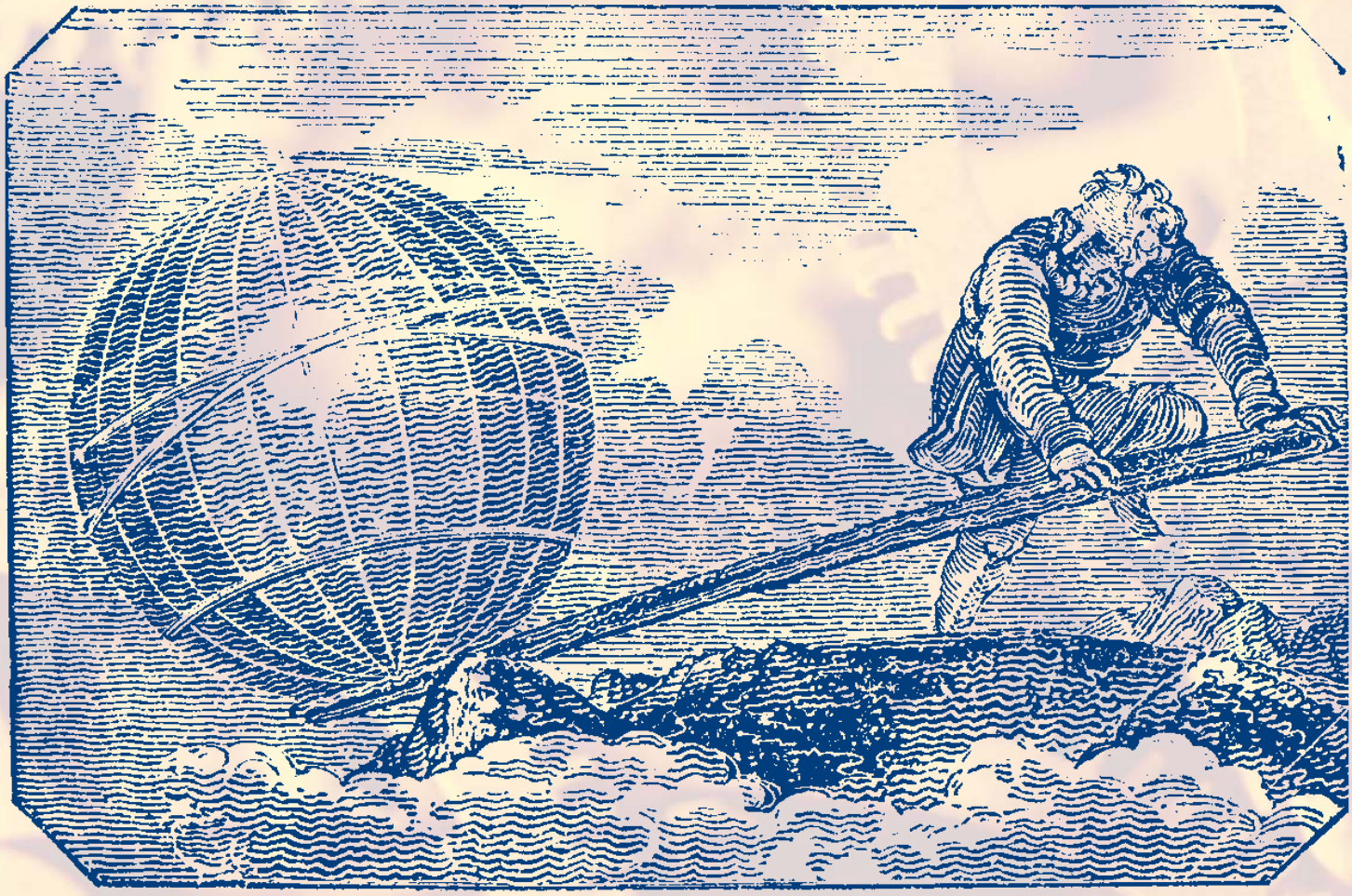


Engraving appeared in Mechanics Magazine, London, 1824

"Give me a place to stand and rest my lever on, and I can move the Earth."
—Archimedes

Inside: Faculty focus and research • Focus on students and undergraduate education • Awards • Alumni

Cheers from the Chair

Dr. Thomas S. Buchanan

The Department of Mechanical Engineering has undergone some exciting changes this year, most noticeably in personnel. We have recently hired two new faculty members to expand our efforts in biomechanics and robotics. Drs. Jill Higginson from Stanford and Xinyan Deng from Berkeley will begin in the fall as assistant professors. We will say more about them and their research activities in our next newsletter, but for now we look forward to having talented and energetic people joining us in these areas of research.

These are exciting areas of growth for us. Our biomechanics group has been very active and is expanding considerably in its research activities. In addition to having an NIH Center for Biomedical Research Excellence award, we have several research awards in the areas of osteoarthritis, stroke, sports medicine, radiology, and rehabilitation medicine. Our robotics and controls group has also developed several exciting new research projects, including new winged robots, gravity balanced robots, and smart fluid devices for physical rehabilitation. We look forward to having Drs. Higginson and Deng expand our research in these areas.

On the other side of the personnel changes, we have the retirements of Drs. Jack R. Vinson and Azar Parvizi-Majidi. Dr. Vinson is our most senior, most respected, and one of our most productive faculty members. A world expert in composite materials and sandwich structures, Dr. Vinson has been on the faculty for 40 years. Although he is stepping down from the roster of the regular faculty, he will continue to be with us as an emeritus professor and we look forward to interacting with him for the years to come. Dr. Parvizi-Majidi has been a mainstay of our department for many years, and we are sorry to see her depart as well. We are beginning to look for replacements for our retiring faculty, but we know that it will not be an easy task to hire people of their stature.

Another change in our department is the transition of the chairmanship. Dr. Tsu-Wei Chou has served as Department Chair for five years. Rather than renew for another five year sentence, he has handed the position to me. Dr. Chou put an enormous amount of time and energy into the chairmanship, and we greatly appreciate all of his hard work. He went beyond the call of duty in his service to the department, and he leaves me with rather large shoes to fill.

In assuming this position, I have stepped down as Director of our Center for Biomedical Engineering Research. I am pleased to have Dr. Kurt Manal assume the directorship of CBER. I am confident that Dr. Manal will bring fresh ideas and leadership to our center.

We look forward to a year of growth and renewal as we have opportunities to bring new faculty onboard with great, new ideas. These present terrific ways for us to expand both our academic and research activities.

Thomas S. Buchanan
Chair of Mechanical Engineering

IN THIS ISSUE

Editor's Notes

Archimedes was, by all historic accounts, a brilliant person, but his famous "give me a lever" quote suggests that he was a person who had ambition and grand visions. We chose this as our cover for this issue of ME News because we thought it was thematic of an initiative the Mechanical Engineering Alumni Association has embarked on to honor and celebrate the careers and lives of our alumni.

Like recent graduate Stephanie Frangakis (see article page 9) we all have stepped forth from the firm ground of our University of Delaware experience with a world of options for our next steps. Stephanie will no doubt leverage her degree with ambition, desire and vision and join those of you who have done the same in making a difference in our world — if not move it.

A team of Alums and faculty are working with the College of Engineering on the best way to celebrate these careers with you. I thoughts include an event in the Spring of 2005 at which we could come together for this purpose. Please stay tuned for more details!

Faculty/Staff Highlights

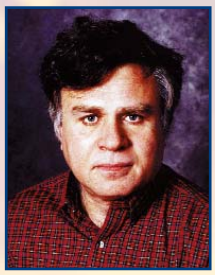
FACULTY

A symposium was held to honor Jack Vinson at Clayton Hall on July 6th to celebrate 30 years of the Center for Composite Materials, which he helped establish, and his 40 years of service to the University.

The 7th international conference on Flow Processes in Composite Materials followed on July 7-9. Both events were organized and chaired by **Suresh G. Advani**, Professor of Mechanical Engineering.

Professor **Advani** also co-chaired a workshop at the National Science Foundation, in which 40 researchers from academia, government, and industry participated on June 9–10 to establish the roadmap for future research needs in composites manufacturing.

Michael H. Santare co-Chaired the Kerr Symposium on Engineering Mechanics, April 29-30, 2004, held in honor of Arnold D. Kerr's retirement from Civil Engineering at the University of Delaware. The invited speakers included seven members of the National Academy of Engineering and nine other distinguished researchers speaking on topics of historical significance in the area of Engineering Mechanics. A hardbound version of the proceedings will be available later in the year.



Professor Len Schwartz gave the keynote address at the Australia and New Zealand Applied Mathematics Annual Meeting in Hobart, Australia, on February 2, 2004. His talk was entitled "Recent Progress in Thin-Layer Fluid Mechanics."

Professor Schwartz also gave an invited talk at the DuPont Stine-Haskell Laboratory in Newark on March 24, 2004. The title of the talk was "Flow of Drops and Thin Liquid Layers on Irregular Surfaces." The talk dealt with the use of theoretical and computational fluid mechanics to help design improved agricultural chemical treatments.

Professor Schwartz organized and ran a Winter Session program for engineering undergraduates in Australia from December 27, 2003, to January 29, 2004. The program, which took place during the Australian summer, is designed primarily for juniors in mechanical and civil/environmental engineering. Two courses were included: Introductory Fluid Mechanics, taught by Dr. Schwartz, and an Australian Geography course taught by Australian faculty. The geography course is an approved elective for engineering students. The weather was great, the natives were friendly, and the students all enjoyed the program enormously. The program is going to be run again during the upcoming winter.

STAFF

If you've visited the Mechanical Engineering Department's main office as of February 16, 2004, you've met our new Senior Secretary, **Mrs. Ann G. Connor.** Ann was with the DuPont Company at the Louviers building in Newark for 18 years as a Computer Systems Technician. When that building closed, she moved on to Anderson Consulting. Ann left that position after two years to raise her family, which includes husband, Dave, and 4 children (one set of twins!). As if she didn't have enough to do, she then took a job as substitute teacher in the Cecil County Public Schools. We welcome her to the University of Delaware, as she brings her many talents to our department. Please stop by and say hello.

Ms. Dawn M. Johnson, Records Analyst/Coordinator recently received an Honors Day Award from Professional and Continuing Studies, for maintaining an above average GPA while pursuing her studies at the University of Delaware.

UD Hosts Seventh International Conference on Flow Processes in Composite Materials

by Diane Kukich

From July 7–9, 2004, the Seventh International Conference on Flow Processes in Composite Materials (FPCM) took place at the University's Clayton Hall. First held in 1988, the FPCM Conference is devoted to the manufacturing and processing of polymer-matrix composites.

According to Conference Chair Suresh Advani, Associate Director of CCM, "FPCM has met every two to three years to attract high-quality research papers and provide a forum for discussion among academics and industrialists." The first five meetings were held in Europe, and the sixth was in New Zealand. FPCM-7 was the first to be held in the United States.

As an international center of excellence in composites, CCM was certainly an appropriate host for this global meeting. International Advisory Board members represented countries throughout the world, including New

Zealand, the United States, the United Kingdom, Italy, Germany, Sweden, Ireland, and Canada.

"We were very pleased to host this meeting and to have our Associate Director serve as the Chair," said CCM Director Jack Gillespie. "Suresh Advani is a well-recognized expert in the area of liquid molding processing and an excellent choice to lead the conference."

The three-day dual-session meeting featured 84 papers on themes ranging from traditional topics such as thermoplastic processing, short-fiber composites processing, and resin transfer molding to such emerging technologies as processing of nanocomposites, biodegradable and "green" processing, and flow in multifunctional composites.

Sponsored by the Boeing Company, the Office of Naval Research (ONR), and the Army Research Laboratory (ARL), the conference attracted some 170 attendees from 23 countries and 93 organizations. Speakers provided a range of perspectives from government agencies and academic institutions to large and small companies.

"We were very pleased to have this major meeting take place at the University of Delaware," said Advani. "The talks covered the entire gamut of issues in this field, and it was exciting to hear the latest findings in some emerging areas. New processes that can enhance flow and impregnation are enabling the manufacture of parts without the size and geometric limitations of earlier processes. Advances in flow control are helping to eliminate undesirable variabilities in the final product. And flow and cure simulations continue to be important in process design, optimization, and control."

"While the reputation of our Center helped us to attract participants and attendees," he concluded, "we couldn't have done it without the help of the scientific advisory board and the local organizing committee.

"In addition, the authors of the conference papers are all well-known and respected members of the composites community. I believe that their combined work, in the form of the conference proceedings, will enhance our understanding of manufacturing science in composite materials and will form the foundation for further improvement and discoveries in advanced materials."

Anyone who would like a copy of the FPCM-7 conference proceedings, please contact hamed@ccm.udel.edu.

Jack R. Vinson Research Symposium

by Diane Kukich

When Jack Vinson put forth his vision to create a "mecca for composite materials research and education" at the University of Delaware in 1974, he never dreamed that he would be celebrating the 30th anniversary of that mecca with a symposium that also honored his 40 years of service to UD. But that's exactly what happened on July 6, 2004, when 85 representatives of academia, industry, and government converged on Clayton Hall for the Jack R. Vinson Research Symposium.

But anyone who knows Vinson was not surprised at the Center's decision to commemorate its three decades of history with an event honoring Jack. Vinson's contributions are so numerous and varied that even forty years seems insufficient for him to have accomplished all that he has: seven seminal texts on composites authored or edited, hundreds of papers written, some 60 graduate students advised, thousands of students taught in the classroom. Consultant to over 40 corporations, expert witness for 94 law firms, and ASME/AIAA/ASC/ICCM session organizer par excellence.

The list goes on, but Vinson's "career descriptors" were perhaps best enumerated by former CCM colleague R. Byron Pipes at the symposium: "vision, enthusiasm, cheerleader for composites, global reach, longevity, and legacy." Vinson pioneered research in areas ranging from laminated plates and shells to adhesive joints, high strain rate effects, and sandwich construction. One of his colleagues, in fact, refers to him as "the Earl of Sandwich."

The Symposium agenda comprised 13 technical talks by recognized experts in the field of composites from academia and government agencies including NASA, ONR, and AFRL (see sidebar). The program reads like a current "Who's Who" of the composites world. Many of these distinguished speakers contributed not only papers but also tributes to Vinson, including such accolades as role model, inspiration, heart and soul of the department, beloved teacher, and prolific scholar.

In his opening remarks, ME Department Chair Tom Buchanan referred to Vinson as a "professor in the best sense of the word." The foreword to the proceedings was written by four of Vinson's students who earned their doctoral degrees in the early 1970s. The four mention Vinson's legacies, thank him for his "teaching, mentoring, guidance, and friendship," and note how fortunate they were to have been part of his life.

Without Vinson's vision and dedication, it is doubtful that the Composites Center would have been established. However, the Center not only got off the ground but also thrived to celebrate three decades of research, education, and service to the composites industry. In welcoming attendees to the symposium, University Provost Daniel Rich referred to the Center as "a model—by design, not accident—for interdisciplinary research at UD. Its success has paralleled that of University research."

So a commemoration of the longevity of a man with vision and that of the Center he helped found brought together individuals with a wealth of knowledge about the ever-evolving field of advanced composites. Attendees heard about the latest research on topics ranging from fatigue, failure, and mechanics to advanced processing techniques and new engineered materials. And they also celebrated the accomplishments and contributions of one very special pioneer in the field.

Suresh Advani, Associate Director of CCM and Symposium chair, summed up the tributes that echoed throughout the day, "I think it is fitting that we are celebrating Jack Vinson's career and his legacy because he always found the time to celebrate the achievements, no matter how small, of those around him."

Faculty Focus and Research

Mike Santare

by Diane Kukich

Prof. Mike Santare joined the University of Delaware faculty in 1986, immediately after finishing his Ph.D. at Northwestern. With a strong background in mechanics and biomechanics, he was offered joint positions in medical schools and engineering departments but admits that the thought of teaching in a medical school didn't feel right to him: "I felt like I was educated as an engineer," he says, "so I decided to pursue my career in an engineering department."

"I became interested in biomechanics during my senior year at Rensselaer Polytechnic Institute," he continues. "That was a period when there was a lot of excitement about getting engineers more involved with biological issues."

Santare's focus in biomechanics is on medical devices and device/tissue interactions. "This is a key issue," he says. "We're now using nanotechnology to develop a series of new polymers that we hope will improve the performance of orthopedic devices."

But Santare's research interests are not limited to the biomedical field. "I'm continually attracted to new research areas," he says. "That's what keeps me interested and excited. I love moving into new application areas while still using my basic area of expertise in applied mechanics. I find I'm becoming more experimental and less theoretical as my career develops."

His most recent pursuit is fuel cells, where he is part of an ME team addressing a number of issues. His area is durability.

Santare frequently consults with lawyers on product liability, including the failure of medical devices, machinery, and structures. "It's enjoyable work, but I always tell the lawyers up front that I'll look at the evidence and form an opinion, which may or may not end up supporting their case."

Santare admits that he went into academia because he viewed it as an opportunity to do cutting-edge research in an open environment; he saw teaching as the price to pay for that freedom. Since then, however, he has come to take a much different view. "I've learned that it's really one of the better parts of the job," he says. "It's an enormous challenge to teach freshmen, but I enjoy it. I've come to really like mentoring students, writing papers, and teaching classes."

Married before he entered grad school, Santare and his wife Lisa are the parents of three daughters, ages 22, 14, and nine. "There's not an engineer among them," says Santare. "They're all singers and artists."

Mike Santare: Material Property Optimization Of Carbon Nanotube Reinforcement Of Polyethylene for Joint Prosthesis

by Diane Kukich

Associate Professor Mike Santare admits that his research interests have been many and varied during his 18-year career, but they have had a common theme: mechanics of materials.

One of his current efforts, in collaboration with fellow ME faculty members Suresh Advani and John Novotny, focuses on the development and testing of composites with carbon nanotubes at the reinforcing phase. "Our goal is to improve the wear and mechanical behavior of ultra-high molecular weight polyethylene, the current material of choice for orthopedic implants such as artificial hips," Santare says.

He explains that wear behavior is critical in such devices because wear particles migrate to the bone causing a syndrome known as osteolysis, in which bone is destroyed. "When this occurs, the joint loosens and has to be replaced, which is very traumatic," says Santare. "We want the artificial joint to last as long as possible. Each time the implant is replaced, there is less bone to work with the next time."

Like many researchers, Santare is excited about the potential of carbon-nanotube-reinforced composites. "Carbon nanotubes have been shown to reduce wear in many materials, including metals, polymers, and resins," he says. "Previous attempts to reduce wear in polyethylene by introducing chopped fibers have resulted in materials that are too brittle, so, while the wear problem is reduced, the materials are more likely to fracture."

"Carbon nanotubes don't contribute to embrittlement in the same way," he continues. "The size of the tubes is a major factor—they are so small that they behave differently from traditional carbon fibers. However, while carbon nanotubes are often viewed as the 'perfect reinforcement,' there are still issues to be addressed in applying these materials to medical devices."

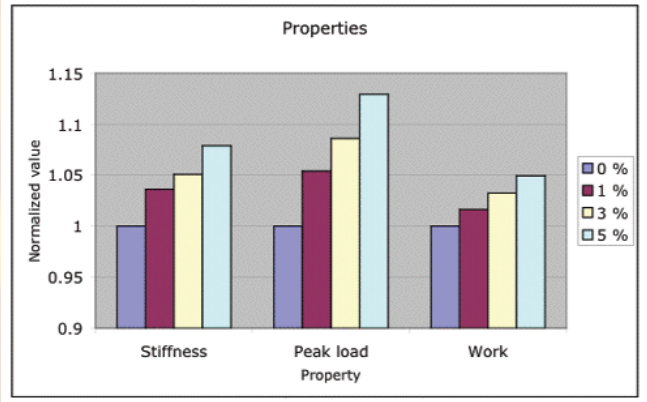
One of these issues is that the tiny tubes tend to clump together and fail to disperse well in the polymer. Santare's colleague Prof. Suresh Advani, who specializes in flow problems in composites manufacturing, is working on process optimization for these materials. Santare's contribution is to characterize the behavior of the produced materials and thereby determine which manufacturing techniques are the most effective at improving properties such as wear resistance, stiffness, strength, and fracture toughness.

So far, the group has successfully manufactured CNT-reinforced high-density polyethylene. They are now beginning to work with the medical-grade UHMWPE used in implants, with the long-term goal of improving the longevity of these devices. "Right now, a replaced joint that lasts 20 years is considered a success," says Santare.

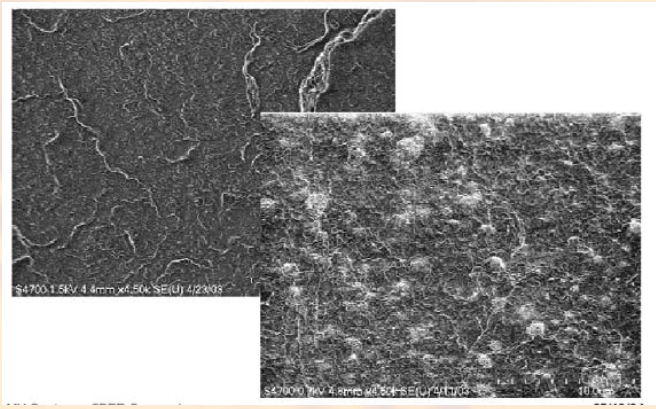
"We want to improve on this by extending the successful lifetime to as much as 30 years."

Santare's other current research projects also focus on mechanics of materials but for very different applications: fuel cells and impact-resistance. In the fuel cell work, he is collaborating with Anette Karlsson on the mechanical characterization of potential fuel-cell materials under various loading and temperature conditions.

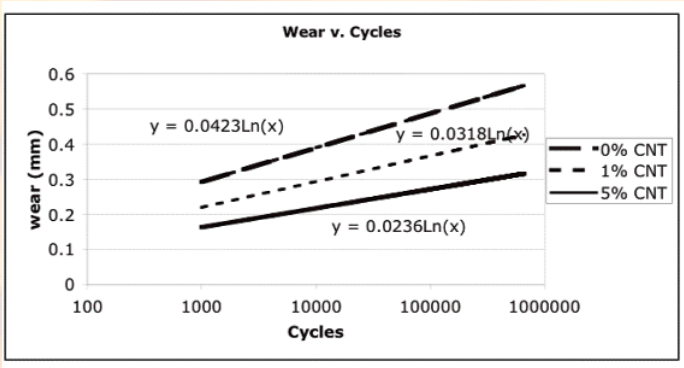
For applications requiring impact resistance, Santare is focusing on functionally graded materials, in which the mechanical properties vary continuously rather than discretely. "Most traditional composites materials are either homogenous or exhibit a fairly distinct difference in properties between the fiber and matrix phases," he explains, "but functional grading enables the design of materials with better impact and fracture resistance."



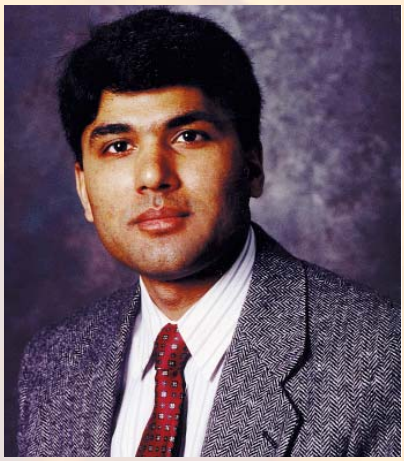
Here we compare mechanical properties of pure HDPE, and HDPE with 1, 3 and 5% CNT. All numerical values are normalized to the average value for the pure HDPE (0%). From this, we can see that the addition of CNT increases the stiffness by around 8%, the peak load by 13% and the work to failure by about 5%.



These are SEM micrographs of HDPE on the left and HDPE with 5% carbon nanotubes on the right. Showing the dispersion of the nanotubes in the polymer.



Here, we compare the wear rate for pure HDPE with 1 and 5% CNT composites. The graphs shows wear volume verses the log of wear cycles. These tests were conducted using a standard block-on-ring wear test, in de-ionized water with the rings made from polished stainless steel. The contact load was 100 pounds and the ring was rotated at 200 rpm. They show a 44% decrease in wear volume for the 5% CNT material relative to the pure HDPE.



Ajay Prasad

by Diane Kukich

When Ajay Prasad came to the United States in 1983 after earning his bachelor's degree in Bombay, he was pretty sure that he would not be returning to India. "At that time, there was not much opportunity in my native country to do cutting-edge research," he says, "although it's different now."

Prasad received his master's degree at the University of Miami in Coral Gables and his Ph.D. at Stanford. He went on to do a postdoc at the University of Illinois at Urbana Champaign and then joined the ME faculty at Delaware as an assistant professor in 1992.

Prasad recalls his first teaching experience, which occurred when he was about 14 years old. "Throughout India," he says, "there's an annual 'Teacher's Day,' which gives teachers a break from their classes while older students take over for them. In most cases, it turns into an opportunity for a chalk fight among the students, but I took my role seriously and came prepared to teach."

"The students were a bit taken aback when I told them that we were going to 'talk science,' but they did take me seriously," he continues. "That experience stayed with me, but my determination to teach didn't really crystallize until I began studying for my Ph.D. I liked the freedom that I saw on campuses—the ability for faculty to pursue what they wanted to pursue."

Prasad is now married and the father of a six-year-old son and a four-year-old daughter. Other family members have since joined him in the United States. In all, he has about a dozen cousins here, in addition to his immediate family.

His technical focus grew out of reading that he did as an undergraduate. "I used to read *Time* magazine," he recalls, and there was a lot of news about rising gas prices and the oil crisis back in the early 1980s. After that, I became interested in alternative energy technologies and power sources. By my senior year I had developed a definite preference for the thermal sciences."

"By the time I got to the U.S. in the mid-1980s, during the Reagan years, the trend toward alternative technologies was down, along with the oil prices, so I focused on basic science. But now it's turning full circle. After gaining all that knowledge in thermal sciences, I'm able to apply it an area that first drew me more than 20 years ago."

Prasad is currently part of a UD-ME team that is pursuing fuel cell research. "The technology is there," he says, "but the challenge is to make it affordable enough for daily use rather than just in niche applications like the space program."

He still enjoys teaching but admits that he prefers teaching undergraduates. "I teach fluid mechanics," he says, "and when the students come in on the first day, they know nothing about it. It's nice to lead them to a point at the end of the semester where they leave with a fundamental understanding. There's a real joy in imparting something new to students, and that happens best in the undergraduate environment."

"Teaching is a core part of being a professor," he concludes. "If I didn't want to do it, I would be at a national laboratory doing research. I think it should be your first love if you're at a university."

Ajay Prasad: Imaging-Based Diagnostic Tools for Problems In Laminar And Turbulent Mixing And Transport.

by Diane Kukich

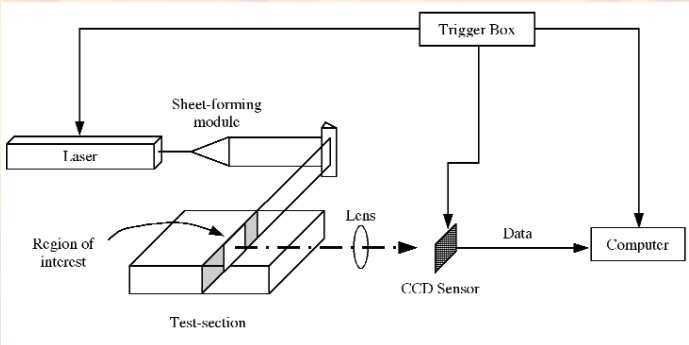
Professor Ajay Prasad applies imaging-based diagnostic tools to study problems in laminar and turbulent mixing and transport. His interests include turbulent entrainment during cumulus cloud formation using laboratory models, industrial mixing processes, mixing and dispersion within the human respiratory system, and most recently, transport phenomena within fuel cell stacks.

According to Prasad, modern imaging diagnostic tools represent a quantitative extension of classical flow visualization, which has been practiced for decades—for example, using smoke to visualize flow patterns in air or dye streaks in water. "Advances in lasers, high-resolution scientific cameras, and high-speed computing have allowed the development of tools that can provide instantaneous maps of velocity, temperature or species concentration over two or three-dimensional domains with high accuracy," he says. "Whereas conventional Pitot-tubes, thermocouples, and conductivity probes provide velocity, temperature, and concentration measurements respectively at a point, imaging tools can map information over thousands of points at the same instant."

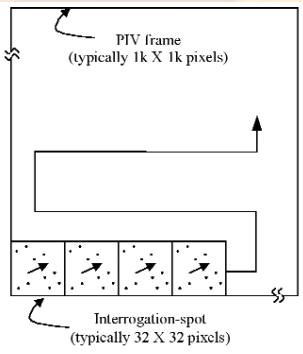
Such global maps can reveal flow features in rich detail and provide greater insights into the problem. To measure velocity, for example, the flow is seeded with tiny tracer particles and illuminated with a double pulse of intense laser light. A camera records the particle positions, and software "connects-the-dots" during post-processing to extract particle velocities. Current hardware is able to obtain detailed velocity maps at capture rates high enough to study transient phenomena with good time resolution. This technique, called Particle Image Velocimetry (PIV), has revolutionized fluid mechanics research over the past decade.

Prasad is credited with developing some of the basic algorithms that are now used by practitioners worldwide. In particular, he developed stereoscopic-PIV in which two cameras view the same object field from different off-axis views similar to binocular vision in humans. The two views are used to decode the three-dimensional motion of the flow.

Prasad has applied these techniques to bio-fluid mechanics, specifically the measurement of airflow and disper-

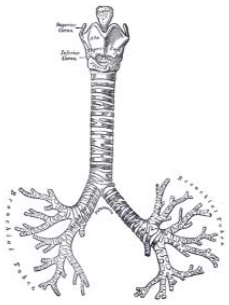


Recording configuration during a PIV experiment: A digital camera records particles illuminated by a sheet of light from a pulsed laser.

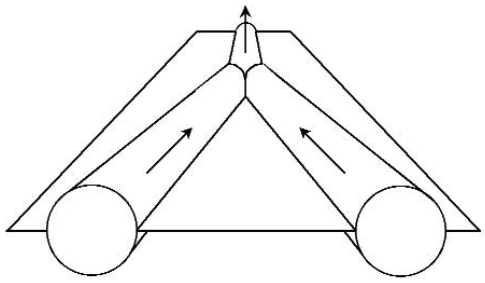


Interrogation stage: Particle positions are analyzed to extract velocity maps.

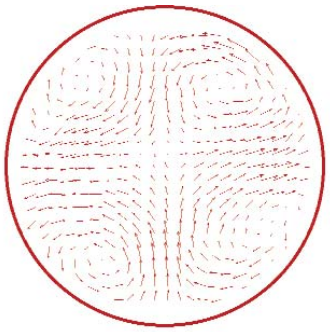
sion in the human respiratory passages. The work is motivated by current trends in the pharmaceutical industry to deliver drugs such as insulin or human growth hormone via the respiratory passages, as an alternative to multiple daily injections that must be endured by patients (including children) today. The intent is to inhale medications formulated as a dry powder and allow them to enter the bloodstream via the alveolar sacs. The necessary first step for predicting deposition sites within the lung is to measure the carrier airflow on which the particles ride. Prasad has conducted in-vitro measurements of airflow in anatomically accurate models of the human nasal passage, as well as a representative model of the upper respiratory airways. Experiments have provided the first measurements of the quadruple vortex that enhances particle dispersion during exhalation. This is an area of active research for Prasad and his students.



Upper respiratory airways



Exhalation flow merging from daughter tubes to parent tube creates a quadruple vortex that enhances dispersion



PIV measurement of quadruple vortex in parent tube in a model bifurcation

Most recently, Prasad and his colleagues in the ME Department have initiated research into fuel cells. Prasad also taught a new technical elective, "Introduction to Fuel Cells," to seniors during Spring 2004. Fuel cells, which have attracted attention with President Bush's Hydrogen Initiative, are two to three times more efficient than traditional internal combustion engines in extracting useful work from fuel, and equally important, they produce zero emissions. Miniaturized fuel cells are also envisioned as a replacement for the lithium-ion batteries currently used in laptop computers and cell-phones, with greatly increased times between "charges."

"New materials and methods have enabled fuel cells to become more affordable," Prasad points out, "but prices need to drop by another factor of ten before they'll become competitive in the marketplace." Topics that he and his colleagues plan to explore include optimization of heat and mass transport such as feeding reactant hydrogen and air to the stack, efficient removal of product water, and maintaining the correct operating temperature, pressure and humidity.

Undergraduate Education

Student Focus: John Fitzgibbons

by Diane Kukich

After spending the first 18 years of his life in Connecticut, John Fitzgibbons decided it was time to venture out and see a different place—preferably one with a warmer climate. He chose the University of Delaware because the campus impressed him at first sight. He isn't quite so sure about why he chose mechanical engineering. "I was also interested in business," he says, "but people advised me to major in engineering."

The ME major and UD proved to be a good match for Fitzgibbons, who has been not only a top student but also an active one in a number of areas. As a Science and Engineering Scholar, John carried out research on robotics under the advisorship of Prof. Sunil Agrawal. He is credited with developing the second-generation prototype of a robot with expanding wheels.

Fitzgibbons has also conducted research in the biomechanics area with visiting faculty member Abbas Fattah. The work, which involved developing a gait correction device for stroke patients, has been published in a paper and presented at a national conference.

John has also worked on a number of ASME activities and contributed to Discovery Days, Decision Days, and Biomechanics Days.

Although his long-term goals include the possibility of earning a doctoral degree and teaching at the college level, for now, Fitzgibbons has accepted a position with the Army Research Laboratory in Aberdeen, Maryland, in the organization's simulation and analysis lab.

"I plan to earn my master's degree while I'm working there," he says. "Then, my decision about whether to go on for a Ph.D. will depend a lot on what the workplace looks like."

John's activities and academic record haven't kept him from having a good time at Delaware. In his free time, he plays golf and co-ed flag football.

Stephanie Frangakis

by Diane Kukich

Like most winners of the Laird Fellowship, Stephanie Frangakis was both surprised and grateful when she got the news that she had been selected.

The Fellowship—named in honor of George ("Geordie") Laird (68BME, 71MMAE), who was killed in a car accident at the age of 35—is given annually to a graduate student in engineering "to encourage the recipient to become engaged in a broadening intellectual pursuit that may or may not be of direct application to the recipient's chosen field of study."

For Frangakis, the broadening experience will be one in which she has participated since she was seven years old—playing the piano. "I have a small piano," she says, "one that my mom had since she was about ten. This money will enable me to buy a baby grand. It's a very generous fellowship."

If there is any money left over after the purchase of the piano, Stephanie will use it to pursue another of her passions—bicycling. Already a competitive mountain biker sponsored by Bikeline, she would like to buy a good road bike to enable her to enter road races as well.

Frangakis is skilled at balancing these two passions with a third—engineering. She is realistic enough to know that mechanical engineering will be her career, while cycling and playing the piano will be "just hobbies," despite her high skill level.

She earned her bachelor's in ME at UD and is now working on her master's under the advisorship of Prof. Jian Sun. Her research focuses on acoustics, which she says is unrelated to her interest in music. "It's kind of funny, though," she says, "that all of Dr. Sun's students in the acoustics area are musicians." After completing the master's, she plans to go somewhere else for her Ph.D.

Grad school has kept Frangakis too busy to formally pursue her music studies, although she practices about an hour a day to keep her hands from atrophying. She also finds that she has to be careful in her attempts to balance cycling and the piano. "Before big concerts, I don't get on the bike for a few weeks," she says, "because of the risk of injury to my hands."

For Frangakis, the triumvirate of engineering, music, and cycling has proved ideal. "They all fit together well for me," she says. "I know that I can't make a living with my music, but I like it because it allows me to express myself and it's also technically challenging."

It's obvious that Stephanie Frangakis exemplifies the Laird Fellow—a well-rounded engineering student with lots of interests and a balanced approach to life.

MECHANICAL ENGINEERING

HONORS DAY AWARDS

MAY 7, 2004

SENIOR YEAR AWARDS

W. Francis Lindell Mechanical Engineering Award to the Distinguished Senior

Ryan Basch
James Moore
Richard Slack

Mary and George Nowinski Award for Excellence in Undergraduate Research

Richard Herseim

JUNIOR YEAR AWARDS

W. Francis Lindell Mechanical Engineering Award to the Distinguished Junior

Christine tate
Michaedl Kutzer

W .Francis Lindell Mechanical Engineering Achievement Award

Janelle Konchar

SOPHOMORE YEAR AWARD

W.J. Renton Award for Outstanding Sophomore

Douglas Brunner

OTHER DEPARTMENT AWARDS

Delaware Section of The American Society of Mechanical Engineers Outstanding Student

Gwen Thorson

American Society of Mechanical Engineers Student Section

Scott Kasprzak

Robert T. Bosworth Scholarship

Mark Deaver

Redden Scholarship

John Hamnett
Angela Huenerfauth
Michael Zeitz

Helwig Graduate Fellowship

Joseph Feser
Christina Turka

COLLEGE AWARDS

Charles B. Evans Prize

John T. Fitzgibbons

Conectiv Power and Light Scholarship

Christine M. Tate

Liston Houston Scholarship

Brett L. Entrekin
Beth E. Miller

Slocomb Scholarship

Brian V. Hufe

Boeing Company Scholarship

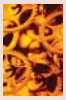
Mark W. Deaver

George W. Laird Merit Fellowship

Stephanie Frangakis

Bill N. Baron Fellowship

Gregory Hayes



SENIOR DESIGN - Seniors Learn "The Design Process"

By Nate Cloud

Blending: Innovation, Business Process Structure; Engineering, Teamwork; and Continuous Communication in pursuit of converting Ideas to Reality.

Cool Projects keep interest level high

Ten student teams completed their Senior Design projects for industrial sponsors this past December. Projects covered a wide range of challenges including process improvements and new product designs. Tackling real problems with "fresh minds", and exposure to students as potential associates in their businesses, continued to be key values expressed by sponsors in post project interviews early this year. Several students elected to continue developing their projects in the Spring semester.

The Local ASME Chapter presented awards on February 25, to the student teams that were judged by an ASME panel to have accomplished the most outstanding projects. The awards were presented at ASME's annual dinner meeting, which also served as a "senior send-off" celebration. Outstanding 2003 projects were:

Air Products Team – Boiler Blowdown System

Dade Behring Team – Coating Inspection System

Northrop Grumman Team – Tile Insertion Tool

Alumni, faculty, and parents of

students attended the dinner, which has developed into a tradition, and enjoyed the opportunity to talk informally with the students about their project experience.

A large version of this two-page picture, created by Liz Dunkle, University Publications, is on display in the Senior Design display case in the main hallway in Spencer Lab. The display case also includes a plaque with the outstanding team (above) from each year engraved on it. We welcome you to stop by Spencer Lab if you are in the Newark area to see the display.

A growing number of Alumni have been an integral part of project sponsorship, and some* have participated as the primary student team contact for the project:

*Mike Smoot, '82 - Xymid, LLC
Matt Savage '00 - Daimler Chrysler
Dave Friemuth '90 – Harley Davidson
*Bob Andrews '92 - Johnson Controls
Ralph Weis '72 - ILC Dover
*Jim Kegelman '88 - Dade Behring
*Alexis Cox '01 – AstroPower
*Deb Grohol '94 - Terumo Medical
Tom Embley '87 - Precision AirConvey

For more information contact*: Nate Cloud, cloud@me.udel.edu, 302-778-4567; Dick Wilkins, wilkins@udel.edu, 302-831-2006; Michael Keefe, keefe@me.udel.edu, 302-831-8009; Jim Glancey, jglancey@UDel.Edu, 302-831-0712/1179

Alumni

ME Alum Wins Coveted Colburn Prize

by Diane Kukich

Dr. Erik T. Thostenson (99MME, 03PhD) is the recipient of the 2004 Allan P. Colburn Prize in mathematics and engineering. His dissertation, which was successfully defended in November of 2003, is entitled, "Carbon Nanotube-Reinforced Composites: Processing, Characterization and Modeling."

As a Ph.D. student in the Department of Materials Science and Engineering, Thostenson made pioneering contributions to the development of nanocomposite materials and received national and international recognition for his research. His dissertation work is the first to give thorough and careful characterization of the multi-walled carbon nanotube nanoscale structure, which is fundamental to the study of nanocomposite mechanical and physical properties.

Thostenson has made substantial contributions to the scientific literature, and his Ph.D. research resulted in six journal papers (four published and two under review) and two patent applications.

"I'm very pleased with Erik's performance," says Tsu-Wei Chou, Pierre S. DuPont Chair of Engineering and Tostenson's advisor. "His publications in archival journals have already attracted a lot of attention. As of right now, his dissertation-related papers have been cited 147 times by other researchers. One paper in particular has been cited 125 times."

"The quality of his research is reflected by not only the number of times his papers have been cited in the literature," Chou continues, "but also by comments from other researchers in the field. For example, in a paper published in the May/June 2002 issue of the SAMPE Journal, the authors write, '...an excellent review published recently by Thostenson et al.'"

Thostenson was also the recipient of the 2002 Society for the Advancement of Material and Process Engineering (SAMPE) Outstanding Graduate Student Award, taking first place in the Ph.D. Student Symposium. This award is particularly significant because it is based on technical merit as judged by experts in the field of advanced materials. For winning 1st prize in the Ph.D. competitions, he received expenses-paid trips to both Los Angeles and Paris to present his research in nanomaterials at the SAMPE international conferences.

Donald McCoy Wins Second Major Alumni Award

by Diane Kukich

Donald McCoy, 75BME, has received major University of Delaware awards two years in a row. In 2003, he was recognized by the Engineering Alumni Association with its Outstanding Alumni Award, and in 2004, he was named to the University's Wall of Fame.

The latter award honors members of the University of Delaware Alumni Association from around the nation and the world who have distinguished themselves in professional and community endeavors. The Alumni Wall of Fame is located in the Alumni Room of the Perkins Student Center. McCoy was honored, along with three other alumni, during a ceremony on May 7 at Bayard Sharp Hall on the Newark campus.

McCoy is a Deputy Associate Director for Weapons Physics at the Los Alamos National Laboratory, where he utilizes his expertise in nuclear weapons certification. He is currently responsible for "pit" (also known as a plutonium trigger) manufacturing and certification programmatic activities at the laboratory. The main goal of the pit manufacturing and certification program is to certify a warhead with a Los Alamos manufactured pit by 2007 without additional nuclear testing.

McCoy began his career at the national lab in 1980, after completing his MS and Ph.D. degrees in nuclear engineering at Northwestern University. "I came to Los Alamos because the laboratory had the fastest and most capable computers in the world," said McCoy. "I enjoyed using this capability and used it to develop improved numerical methods and publish several papers."

Starting with a postdoctoral appointment to the Transport and Reactor Theory group at Los Alamos, he had extensive collaboration with the Reactor Analysis Division at Argonne National Lab. Two years later, he moved into the Diagnostic Physics group at Los Alamos, where he earned the Distinguished Performance Award in 1985 and was named section leader in 1988.

McCoy met with a major challenge in his work with developing predictive codes: "I remember traveling to the Nevada Test Site for the first time in 1983 to provide the predicted currents to the Physics Division experimentalists," he recalled. "They took me aside and told me, 'If your predictions are a factor of two incorrect high or low, we don't produce useful data. If this happens, we'll take you to the nearest subsidence crater and beat you up and leave you.' I suddenly realized I wasn't performing theoretical research in my new job."

"Fortunately, after eight years of typically three nuclear tests a year," he continued, "I was never rolled in a subsidence crater, although I worked with technical staff that came close. The nuclear test and weapon development programs provided the most enjoyable work experience I have had at the laboratory by providing a strong sense of mission and value to my job."

From 1986 to 1993, McCoy earned five DOE Awards of Excellence in the

Nuclear Weapons Program. As Technical Advisor to the Director of the Testing Division of the U.S. Department of Energy for nearly two years, McCoy coordinated DOE Defense Programs input with the DOE Arms Control Office, Arms Control and Disarmament Agency, State Department, and Department of Defense input to the Bush and Clinton administrations' nuclear testing reports to Congress.

Since returning to Los Alamos National Lab in 1993, McCoy has served in a variety of program management positions in areas such as NTS/Test Readiness, Weapons Physics and Evaluation, and Nuclear Simulation and Computing. McCoy contributes articles to professional journals and is a member of the American Nuclear Society. He is also credited with helping UD grads find jobs at Los Alamos.

ME Alum Initiates Scholarship Project

Jim Laser ('69EG) had such a good experience at UD—playing football and earning a degree in mechanical engineering administration—that he decided to give back to the school that had given him an education. But he downplays his role in the scholarship that he is funding. "I plagiarized Nate Cloud's idea," he says modestly.

Laser recalls talking with Deirdre Smith, development officer for the College of Engineering; Smith mentioned that Cloud had initiated a scholarship for basketball players majoring in engineering. That gave Laser the idea to establish a similar fund for football players, and possibly other athletes in the College of Engineering. He worked with the College of Engineering to develop selection criteria for the scholarship.

Now retired and working for himself, Laser spent 28 years with Merck. "I very much appreciated my experience at UD," he says, "and my degree prepared me to work in both engineering and management during my career. I decided that if I could help out a little, I wanted to do that."

Laser has made a five-year commitment, and the first Jim Laser Scholarship will be awarded in 2005.

Alumni Feedback

Andy Kaplan, BSME '91, lives in Portland, Oregon and was recently promoted to Sales and Marketing Manager for Hinds Instruments. Hinds designs and builds opto-electronic systems for the semiconductor industry and received the R&D 100 award in 2001 and 2003. Andy is recently engaged and will be married in August.

Jack S. Garhart III BME '92 and Susan Garhart (AS '92) just had their third child on May 19th. Jack Sanford Garhart IV was born at 9:20 am. His two sisters, Samantha (7) & Alexis (5) are thrilled to have a brother.

Jonas A. Zukas MME '69 lives in Baltimore and is President of Computational Mechanics Association. His book, Introduction to Hydrocodes, was recently published by Elsevier as part of the publisher's "Studies in Applied Mechanics" Series.

William S. Patterson BME '58 retired in 1992 from PECO/Exelon/PJM and is now a part-time sales representative for College Consultants of America, Inc. He and his wife, Elisabeth Snowberger Patterson BHE56, live in Dagsboro, Delaware, and have 10 grandchildren.

Dr. Bakhtier Farouk Receives Named Professorship at Drexel

Dr. Bakhtier Farouk (MME '78 and Ph.D. '81) has been named the J. Harland Billings Professor of Mechanical Engineering at Drexel University. Farouk received his BS degree in Mechanical Engineering from the Bangladesh University of Engineering and Technology in 1975. After completing his Ph.D. at Delaware, he joined the Mechanical Engineering and Mechanics Department at Drexel. Dr. Farouk received the Presidential Citation for outstanding achievement from the University of Delaware in 2000.

Farouk was awarded the Society of Automotive Engineering's Ralph Teetor Educational Award in 1986 and the American Society of Metals Henry Marion Howe Medal in 1989. He is also an ASME Fellow. Farouk's other accomplishments include graduating 16 Ph.D. and 21 M.S. students, receiving 42 grants and contracts, and publishing 90 journal articles.

The Billings Professorship was named after Professor J. Harland Billings. Professor Billings taught at Drexel University for 50 years and retired in 1969. Billings was instrumental in the development of mechanical engineering laboratories at Drexel. The professorship in his name was established in 1973. Farouk is only the second person to be named Billings Professor.

Thanks for the Memories

John Pursell BME49 is a wealth of memories. A story he wrote for the UD Messenger in 1993, "Tales Told out of School," triggered an interchange that brought to a light a strange set of coincidences spanning half a century. Then, his story about the Army Specialized Training Program (ASTP) at UD was published in the Fall/Winter 2003-04 issue of ME News. Most recently, the Winter 2004 issue of ME News featured a story that elicited the following response from Pursell:

Dear Nate,
Re. Your p. 11 piece on Bob Veazey, Winter 2004 News.
You mention that Bob Veazey joined AAE at the former du Pont Airfield in Wilmington.
In August 1939, our family moved from Union Park Gardens at the outskirts of' Wilmington to DuPont Road in Lancaster Village. DuPont Road runs between Elsmere and Silverbrook Cemetary. From our new home, the distance to du Pont Airport was only a few miles.
I was then 12 years old, and sometimes in the summer, my friends and I would pack lunches and walk out to the airport to see the airplanes. These were scattered within and without the hangers, and no one seemed to mind if two or three small boys wandered about looking at them.
It was here that All American Aviation (I believe that was a previous name) was developing an aerial pickup system for snatching cargo suspended above the ground between two masts by a low-flying airplane with a dangling hook.
In later literature the idea was presented for rescuing downed flyers who were equipped with (or upon whom was dropped) a small helium bottle, a balloon, a harness, and a long cable, so that the passing airplane could engage the balloon-supported cable and pull the downed flyer off the ground.
If the cable were vertical when snagged, the initial lift direction would also be vertical even though the airplane was traveling horizontally, since force upon a cable can be only in the direction of the cable, so a rescue could be accomplished from among trees if not too tall. I do not know if such a system was ever implemented.
There was once a book published on the history of the company, but I do not know if is currently available: The Airway to Everywhere W.D. Lewis, F.R.F. Trimble.
The airplane used in the tests was, I believe, a 4-place Stinson, possibly a Stinson Reliant.
During the summers following my sophomore and junior years at Alexis I. du Pont High School, I worked at the Laird Farm diagonally across the intersection from the du Pont Airport.

Upcoming Events

Homecoming Luncheon

The College of Engineering will be hosting our homecoming luncheon on Friday October 1st – all alumni are welcome. The link to our website announcement: https://www.engr.udel.edu/alumni/04_Homecoming_Luncheon.html

Alumni Tailgate

The newly reinvigorated Engineering Alumni Association is sponsoring a tailgate at the September 11th football game. The link for that is: https://www.engr.udel.edu/alumni/sept_11_04_EA2Tailgate.html

Outstanding Alumni Awards

The following Mechanical Engineering Alumni have been recognized for their outstanding achievement and service by being honored with the highest level awards offered by the University of Delaware and the Engineering School.

UD Outstanding Alumni Award

1995 Mr. William B. Clements '44 BME '50 MME

1986 C. Jackson Levis '50 BME

1970 Mr. Milton L. Draper '22 BSME

1968 Mr. Harry W. Loose '20 BSME

1967 Dr. Karl L. Herrmann '07 BSME

UD Wall of Fame

2004 Donald R. McCoy '75 BME

1989 Henry R. Folsom Jr. '36 BSME

1988 E. Fenton Carey Jr. '67 BME '70 MMAE

1986 Clark P. Lattin Jr. '38 BME

1985 Margaretmary Torelli Weidert '72 BEA

1984 W. Murray Campbell BME '50

UD Presidential Citation

2001 Nancy R. Sottos '86 BME '90 PhD

1993 David R. Helwig '73 BME

College of Engineering Outstanding Alumni Award

2003 Donald R. McCoy '75 BME

2002 Frederick H. Kohloss '51 MME

2000 David R. Helwig '73 BME

1999 E. Douglas Huggard '55BME '61 MME

1998 George R. Long '52 BME

1997 Eric P. Beyeler '85MMAE '88 PhD

1996 Mark W. Hopkins '80 BME

1995 David R. Helwig '73 BME

1994 Edward S. Atman '76 BME

1993 Richard L. Daugherty '69 MMAE '71 PhD

1991 George T. Singley III '68 BMAE

Information on the awards sponsored by the University's Alumni and University Relations Office can be found at http://www.udel.edu/alumni/awards/index.html, including past winners, nomination criteria, and instructions on the nomination process.

The Engineering School's Outstanding Alumni Award is conferred on Honors day in the Spring, and nominations are received and reviewed in the fourth quarter of the preceding year. We urge you to submit nominations for these awards per the instructions at the above referenced web site.

Nominations for Engineering's Outstanding Alumni Award can be submitted to the Dean's office directly, or if you wish let me* know what your thoughts are on a candidate, and I will be pleased to help with the nomination process.

*Nate Cloud, University of Delaware, 126 Spencer Laboratory, Newark DE, 19716

Contacts

Contact information for faculty/staff features in this newsletter is included below. We urge you to contact these people if you have any questions or would simply like to talk with them about the topics in this newsletter.

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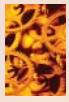

ALUMNI FEEDBACK - What's New With You?

Do you have any feedback (comments, questions)? Or let us know any current events or info not covered by the data sheet below.

INFORMATION FORM FOR THE DEPARTMENT'S RECORDS

Name _____
First Middle Last Maiden

Delaware Degree BME Date_____ MME Date_____ Ph.D. Date _____

Spouse's Name _____ DE Alum? _____

Mailing Address _____

Home Phone _____ E-mail _____

Company _____ Your Position _____

Mailing Address _____

Business Phone _____ Fax _____

E-mail_____ Web Address _____

Please identify if your company is an affiliate or subsidiary of a larger company _____

Return this form to: Nate Cloud, 126 Spencer Lab, University of Delaware, Newark DE 19716 and/or contact me anytime at cloud@me.udel.edu or 302-778-4567

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