

MAE NEWS

**DEPARTMENT OF MECHANICAL
AND AEROSPACE ENGINEERING**

COLLEGE OF ENGINEERING
NORTH CAROLINA STATE UNIVERSITY
SPRING 2014



ALL IN THE DETAILS

*The Precision Engineering Center at NC State celebrates 30 years
of innovation through painstaking attention to the little things*

RESEARCH HIGHLIGHTS 02

ALUMNUS' COMPANY REACHES OLYMPIC HEIGHTS 06

SCHOLARSHIP HONORS MEMORY OF YOUNG GRAD 11

**NC STATE
UNIVERSITY**

College of
Engineering

IN THIS ISSUE



IN THE SPOTLIGHT

MAE HALL OF FAMERS PAGE 14

The Department held its inaugural Hall of Fame induction to celebrate the accomplishments of alumni who have used their talents to excel in a profession, career or service.



ABOUT THE COVER

The Precision Engineering Center on NC State's Centennial Campus celebrated its 30th anniversary with a reunion that brought about 30 alumni back to campus.



RESEARCH HIGHLIGHTS PAGE 02

MAE faculty work to improve on nature and minimize aerodynamic losses for jets.



ALUMNUS' COMPANY REACHES OLYMPIC HEIGHTS PAGE 06

Hans deBot's company received a lot of attention during the Sochi Olympics for its work building bobsleds for Team USA. But deBotech is a leader in the manufacture of all kinds of specialty composite products.



SCHOLARSHIP HONORS MEMORY OF YOUNG GRAD PAGE 11

MAE alumnus Alex Stuber had just started a promising career with NASA when his life was cut short. Now, his family is endowing a scholarship for students who want to follow in his footsteps.

UPDATE FROM THE DEPARTMENT HEAD



Richard D. Gould

DEAR FRIENDS AND ALUMNI,

Greetings from your home department at NC State! I'd first like to provide an update on our student education and research initiatives. In 2012-13, we graduated 382 students – the breakdown is provided in a new quick facts section on page 17 of our newsletter. We are proud of our MAE graduates who helped NC State rank No. 4 nationally on the Princeton Review/USA Today list of the best values in public higher education. We hope you enjoy the story in this newsletter about our Mechanical Engineering Systems BS degree program where our on-campus courses are delivered through distance education technology to Craven Community College. This program, along with the established BS in mechatronics program at UNC-Asheville that we help deliver, expands our reach across the state, and more importantly, provides additional access to NC State engineering programs.

On the research and innovation side, the MAE department had research expenditures of \$11.2 M, published 218 journal and conference papers, and filed 19 patents in 2012-13. As part of the on-going effort to continuously improve NC State engineering research and education, we hired two new faculty: Drs. Matthew Bryant and Katherine Saul, whose brief biographies are presented on page 13. Several faculty have new appointments: Drs. Chi Chang, Brendan O'Connor, and Yun Jing were reappointed as second term assistant professors. Dr. Scott Ferguson was granted tenure and promoted to associate professor, while Dr. Anna Howard was promoted to associate teaching professor.

Dr. Herbert Eckerlin, who founded both the NC Solar Center and the NC Solar House and who initiated our courses in renewable energy and solar energy among many other noteworthy accomplishments, retired after 45 years of service at NC State, 37 of which were in the MAE department. Dr. Eckerlin is now working part time in the phased retirement program.

In this newsletter, you will learn about many exciting things happening in the Department, including our 2013 Hall of Fame ceremony, the Precision Engineering Center's (PEC) 30th anniversary reunion, stories on groundbreaking research and outstanding alumni, and honors for our students, faculty and staff. You will also learn more about how an MAE graduate contributed to the USA's success at the Winter Olympics in Sochi.

We have been focused on enhancing alumni relations this past year. Specifically, we held our inaugural MAE Hall of Fame ceremony and our MAE pancake breakfast during Homecoming weekend. We plan to make these annual events. We are also planning to hold our inaugural alumni golf tournament this spring. The objective is to be better connected to our alumni, as all strong departments have strong ties with their alumni. Our alumni have been and will continue to be extremely important to our future. We sincerely hope that you join our efforts to improve our educational programs and student experiences. Your donations support critical activities that are not supported by state funds, including student scholarships and fellowships, endowed professorships, student clubs and organizations, student travel to conferences, and senior design.

I hope you enjoy this edition of our newsletter. If you have any questions or suggestions, or just want to know how you can help us, please contact me at gould@ncsu.edu.

Best regards,

Richard D. Gould
RJ Reynolds Professor and Head

RESEARCH HIGHLIGHTS



Photograph of Sukoi-T-50 inlet

Flow imaging for supersonic propulsion

Faculty: Dr. Venkat Narayanaswamy

Efficient supersonic transportation relies heavily on minimizing aerodynamics losses and enabling high-efficiency combustion. The engine inlets (shown in the photograph above) make the maximum contribution to the aerodynamic losses and the sources of the drag include shock waves inside the inlets, turbulent boundary layers that develop along the walls, and interference drag from the viscous corner flows. Among the three, the interference drag from the corners remains the least understood but accounts for more than 10 percent of the overall drag. Further ill-effects of the corner flows include aerodynamic blockage and flow-path destabilization, which significantly reduce the combustion efficiency. Questions still remain over the mechanisms of corner flow evolution which, when answered, can have a transformative impact on the way the propulsion systems are designed. The present understanding of the corner flow dynamics is limited because of its very complex three-dimensional nature that requires multi-dimensional flow measurements. Dr. Narayanaswamy’s team in the Turbulent Shear Flows Laboratory (TSFL) is taking a new look at the corner flows where the emphasis is placed on: 1) identifying and answering the important scientific questions that hold the key to progress in our understanding of these flows, 2) designing models that can reproduce the salient flow features of scramjet inlets, and 3) developing measurement tools that can probe the corner flow physics in university-scale facilities and in large-scale facilities found in several national laboratories.

owing to their several desirable features such as multi-dimensional measurements, non-intrusive nature, and minimal damage to the instrumentation. Over the last few decades, laser-based flow measurements have led to several path-breaking findings in fluid dynamics and continues to unravel the features of flow interactions that were hitherto hidden in measurements with traditional probes. Corner flows, however, pose a difficult challenge for laser-based measurements because of large scattering and reflections from the intersecting walls. The TSFL focuses on developing laser-based imaging techniques that overcome the challenges of the corner flows. In a recent work, Dr. Narayanaswamy developed a technique called krypton planar laser induced fluorescence (krypton PLIF) for making scalar concentration measurements in supersonic flows from which other properties like temperature and velocity can be derived. The main advantages of this technique that motivate its application in corner flow studies are the large offset between incident and fluorescence wavelengths that prevent laser scattering from walls and the ease of making quantitative measurements. The excellent comparison between the present results, empirical fit, and computer simulations show the effectiveness of the technique. Furthermore, the TSFL team is currently extending the krypton PLIF technique to make two-dimensional flow measurements in flow large-scale facilities at NASA Langley and AFRL that cannot handle particle-based flow tracers. •

Over the last year, the TSFL developed generic configurations to study supersonic corner flows that reproduce the fluid dynamic interactions that occur in a generic inlet corner. Thanks to the unique capabilities of NC State’s supersonic wind tunnel, the TSFL team studies the corner flows over a wide range of flow conditions to address some of the fundamental questions. TSFL’s graduate student Amruthkiran Hegde performed mean global flow visualization to delineate the corner growth rate at different Mach numbers and observed universal similarities in the mean evolution of the corner flows across the different Mach numbers tested. Laser-based techniques have become the state-of-the-art tool to make flowfield measurements

Multifunctional Nanostructured Materials

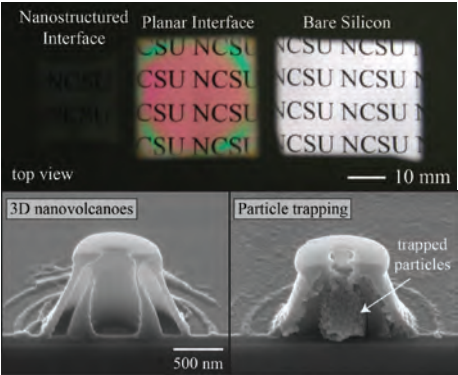
Faculty: Chih-Hao Chang | Students: Xu Zhang, Abhijeet Bagal, Jonathan Elek, Zhiting Wang, and Joong Hee Min

Recent advances in nanotechnology have enabled new materials with unique properties that are not found in traditional macroscopic materials. By having similar physical dimensions (~10-100 nm) to the length scale of any given system, nanostructured materials can exhibit unprecedented ability to manipulate physical, chemical, and biological interactions. Many of these materials are inspired by nature, such as the antireflection structures on moth eyes and non-wetting structures on lotus leaves. Examining these bio-inspired principles allows engineers and scientists to learn from and improve upon nature’s designs. Dr. Chang’s research group examines these nanoscale properties to develop high-performance materials. Recent work includes eliminating the iridescent color appearance of thin-film materials using engineered nanostructures. Optical reflection in thin layers of material results in thin-film interference, causing the commonly observed rainbow-like appearance of gasoline on water. While aesthetically pleasing, such an effect can lead to color-selective behavior and degrade efficiency of optoelectronic devices. Inspired by the moth eye, Dr. Chang and his group have developed a nanostructure that greatly suppresses such thin-film interference effects. This phenomenon can be seen in the top half of the image to the right, where a polymer thin film on silicon sample (middle) exhibits a colored appearance. When the nanostructure is introduced in the thin film, the color is greatly suppressed (left). Dr. Chang’s group is currently integrating such structures into multilayer solar cells to increase their efficiency.

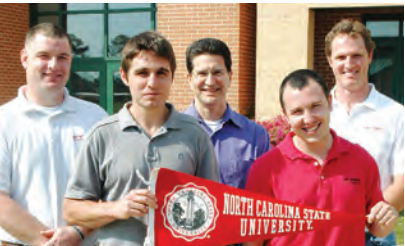
Dr. Chang’s group also conducts research on nanomanufacturing, developing processes that can better fabricate nanostructures over large areas with high precision. These areas will play a critical role in next-generation advanced manufacturing. The group focuses on 2-dimensional (2D) and 3-dimensional (3D) structures and investigates both “top-down” lithography and “bottom-up” assembly techniques. Recent work by the group has demonstrated using the interaction of light and nanoparticles (100-500 nm in diameter) for nanolithography. Such a process is capable of fabricating hollow shell-like nanostructures resembling volcanoes (hence named “nano-volcanoes”), as shown in the bottom half of the image to the right. These unique structures can be used to trap and store nanomaterials, and can lead to applications in controlled drug delivery. Dr. Chang’s research is supported by NASA and the NSF. •

MAE Alumni Help Bring Engineering to Eastern NC

In early 2000, NC State MAE alumni Dennis West (BS 84) and Chris Holder (BS 90) had the vision to “grow their own engineers” for the Naval Air Systems Command’s Fleet Readiness Center- East, Cherry Point. That vision is now a reality, and NC State’s site-based Mechanical Engineering Systems (MES) BSE program helps satisfy their need to maintain a workforce of over 500 engineers. The MES program is located on the campus of Craven Community College in Havelock and gives students a solid foundation in mechanical engineering principles, including mechanical and thermal design, while training them in the formal systems engineering approach to the design and realization of integrated systems. This academic content coupled with direct involvement from FRC-East engineers produces graduates well prepared to excel in the workplace. In the words of Research and Engineering Group Head Chris Holder, “With curriculum components that match unique military aviation requirements coupled with the proximity of the students allowing for direct interaction, and in some cases employment prior to graduation, we have exceeded our own vision’s expectations.” MES students receive MAE courses from Raleigh using interactive video technology and local NC State faculty teach the Systems Engineering content, laboratory experiences, and the two-semester capstone design experience. The program has given non-traditional working students such as Jordan Lewis the ability to make the dream of being an engineer a reality. Jordan says “Without the BSE program, I don’t think I would be an engineer. I now have the opportunity to apply my education and solve challenging engineering problems on a daily basis in support of Navy and Marine Corps aircraft.” •



Top: Fabricated thin-film structures next to a bare silicon. The rainbow-like appearance of the planar interface (middle) is greatly suppressed in the nanostructured sample (left). Bottom: Micrograph of fabricated hollow-core nano-volcano structures and its ability to trap and store nanoparticles.





PRECISION ENGINEERING CENTER CELEBRATES 30 YEARS OF INNOVATION

by Kimberly Conley

Thomas Bifano, David Grigg, Michelle Miller and Gene Storz

The Precision Engineering Center (PEC) and its acting director, Dr. Thomas Dow, are wildly enthusiastic about their graduates. As a matter of fact, walking the halls of the PEC is almost like experiencing a “who’s who” of precision engineering. The group that began as a result of a grant from the Office of Naval Research (ONR) back in 1982 has produced about 120 master’s and PhD graduates. These graduates contribute to increasing precision — the accuracy and repeatability of a mechanism or process, which many believe to be critical to our country’s competitive position in the world of high-tech.

CORNERSTONE OF CENTENNIAL

Each master’s and PhD graduate has a framed picture lining the hallways of Research I, the location of the center, which also happens to be the first building built on Centennial Campus in 1988. The PEC functions in the true spirit of collaboration as intended by the founders of Centennial Campus, as a research space where faculty, corporate researchers and government entities work together to solve real-world problems.

The study of precision engineering can be defined as painstaking attention to detail, requiring input from multidisciplinary studies such as mechanical, aerospace and electrical engineering; materials and computer sciences; physics; chemistry; textiles and other disciplines.

The PEC helps develop technology for high precision

measurement and production, and works closely with innovative industries that apply that technology to make products better, faster and smaller. In addition to providing insightful research and skilled engineers and scientists, the PEC also provides engineering consultation, prototype fabrication, and metrology services.

30 YEARS STRONG

The 30th reunion took place in 2013, and in keeping with its theme, was attended by about 30 graduates. The event began in typical academic fashion — slide presentations from each graduate sharing their professional accomplishments, be it within academia or private sector pursuits. It included presentations from graduates like:

Thomas Bifano, PhD, (Mechanical Engineering ‘88) professor and director of the Boston University Photonics Center (BUPC). The BUPC is a core facility and academic center of excellence comprised of 35 faculty members from seven academic departments, 80 graduate students, and 10 staff members. Professor Bifano's research focuses on modeling, design, production, and use of micro-electro-mechanical systems (MEMS) in optical applications. He is a founder and chief technology officer of Boston Micromachines Corporation in Cambridge, MA, and a leading producer of deformable mirrors for applications in astronomy, bio imaging, and defense.



LIST OF ATTENDEES

Tom Bifano	Laura Lamonds
Peter Blake	Lucas Lamonds
Brett Brocato	Brandon Lane
Melanie Brocato	Dan Luttrell
Nathan Buscher	Zach Marston
Chunyi Chen	Michele Miller
Kathy Dow	Joy Minor
Tom Dow	Paul Minor
Joe Drescher	Nobu Negishi
Karl Falter	John Nowak
Kara Folkert	Guillaume Robishaud
Karl Freitag	Keith Sharp
Steve Furst	Barbara Storz
Ken Garrard	Gene Storz
Dave Grigg	Erik Zdanowicz
Matias Heinrich	

David Grigg, PhD, (Materials Science, ‘92), director, Atomic Force Microscopes, Asylum Research. Asylum Research is based in Santa Barbara, CA, with subsidiaries in the United Kingdom, Germany and Taiwan. Its Scanning Probe Metrology technology is used to image and characterize the properties of surfaces and structures down to the atomic scale, providing invaluable information to enable development and exploitation at the nanoscale. Dr. Grigg was previously the director of technology at Zygo Corporation in Middlefield, CT, and Digital Instruments in Santa Barbara, CA.

Michelle Miller, PhD, (Mechanical Engineering ‘94) associate professor, associate chair and director of undergraduate studies, Mechanical Engineering–Engineering Mechanics at Michigan Tech. Dr. Miller uses analytical and experimental methods to develop models for the grinding of brittle materials. The goal is to develop techniques that improve material removal rates for the machining of brittle materials. Dr. Miller also works with graduate students on research projects involving the development of MEMS.

Gene Storz, MS (Mechanical Engineering ‘94) and PhD candidate, and co-founder of e2020. As CEO, Storz oversaw the acquisition of e2020 by Weld North. The company is now known as Edgenuity™ and provides engaging online education solutions that propel success for every student, empower every teacher to deliver more effective instruction, and enable schools and districts to meet their academic goals.

NOT ALL BUSINESS

After a fabulous lunch at Mission Valley’s Vietnamese restaurant, a smaller group went for a round of golf at Lonnie Poole Golf Course, also on Centennial Campus. Then the whole group gathered for dinner and a rousing game of doubles table tennis at the Dows’ house. In addition to being the Center’s director since its inception, Dow also acted as advisor to most of the students, seeing them through their classes and thesis/dissertations in this highly specialized area of study.

“This is an amazing group of individuals and it has been my pleasure to know them and follow them through their life and technical careers,” said Dow. However, just as precision engineering requires diversity and innovative problem solving, the table tennis game itself had its own added level of complexity — one paddle per doubles team. •



Dr. Thomas Dow, second from left, hosted a table tennis tournament as part of the reunion.

FEATURED ALUMNUS



DeBot was first asked to build a bobsled using composites in 2002.

Alumnus' company goes for the gold

Hans deBot graduated in 1993 with a Bachelor of Science in mechanical engineering from NC State and embarked on a career path that would take him all the way to the Olympics.

Upon graduation, he immediately accepted a position as a design engineer with a company located in Munich, Germany. He worked for Kraftanlagen AG, designing and manufacturing machinery for the plastics PVC film industry to be used in a film production plant in the United States.

His first task with the German company was to implement specific design changes from previous machine designs and develop the full drawing package for this specialty equipment, which put both his engineering degree as well as his foreign language skills to the test. He was expected to be able to read and translate the necessary elements of the original equipment to be able to accurately develop the build package for the new machine. After adjusting to the certain different specifications

and European nuances, he was able to complete the requirements and meet the deadlines. The company then put his practical engineering abilities to the test when he was transferred to the small town of Landshut, where his drawing package and his assistance were needed to build this equipment. He proved his worth and that of the degree he had earned at NC State by implementing not only the knowledge but the confidence and determination that came from his time at the university.

Upon his return to the United States in 1995, deBot secured a job as a design engineer for Sparcraft Inc., building America's Cup Sailing Spars. He worked closely with another design engineer in New Zealand to provide the company with 24-hour engineering capabilities while becoming an accomplished competition sailboat racer in the process. While there, deBot developed the process to build a continuous fiber, one-piece, hollow, competition sail boat spar, using composite tooling and autoclave curing technology for the America's Cup and other various racing syndicates. While there he also began to develop relationships within the automotive racing community to implement similar strong but lightweight products for the NASCAR racing series. Composites were a relatively new idea to the NASCAR racing community but through deBot's contacts he began to develop racing applications utilizing the waste material



from the America's Cup spar builds. It was a win-win for all parties because even holding to a 2 percent waste ratio for a 100-foot spar translates to a lot of smaller racing products. Unfortunately, the ownership of Sparcraft dissolved before any of these products were able to get to the market.

It has been said that whenever a door closes, a window of opportunity is open. DeBot already knew there was demand for composite parts within the racing industry, so he embraced this opportunity for what it was and began developing his brand of composite racing parts from his garage in Cornelius, NC. His company deBotech, Inc. was founded in 1998. He utilized his household oven to produce molds and tooling to build the composite racing parts and refit his garage to house several workbenches. He stated, "It was easy to spot the neighbors that were true car guys or race enthusiasts within the tight-knit community because they were the ones that wanted to see what I had created after an all-nighter of manufacturing keeping half the neighborhood awake."

DeBotech is housed in a 20,000-square-foot facility in Mooresville, NC and currently serves many industries including aerospace, automotive, military, motorsports and several racing series. Composites are also beginning to make headlines in the mainstream as car designers and builders are looking to apply composite technology used in industries such as racing to utilize materials that are light weight but super strong to better the performance and fuel economy of vehicles. But as deBot explains, the company also uses carbon fiber because it looks cool. Some of deBotech's recent automotive programs include products for General Motors as well as Chrysler. The company builds the 100 percent carbon fiber air extractor for the production Camaro ZL1, for which General Motors and deBotech were awarded the 2012 SPE Innovation Award in the category of Performance and Customization.

"NC State is an engineering school that helps you to believe and have faith in yourself."

– Hans deBot

The company also builds several carbon fiber components for the newly released SRT Viper for Chrysler, including brake ducts, roof inlets and rear fascia. Being a car guy himself, deBot truly enjoys developing and building composite products for the automotive mainstream. As Ed Laura, Chrysler's supplier quality engineer, stated about deBotech, "The company mission statement speaks volumes of

FEATURED ALUMNUS

Noelle Pikus-Pace won a gold medal in the women's skeleton World Cup in December 2013 with help from Hans deBot and his company.

The composite materials produced in Mooresville by deBotech also find uses in automobile and sailboat racing.

their core values and their limitless abilities. Customer service and top quality oozes from their every word, not like a well-rehearsed used car salesman, but like someone truly passionate and proud of their home grown, homemade, family run business, made in America."

The team at deBotech achieved its ISO: 9001 and AS: 9100 Aerospace Quality Certification in 2009. DeBotech teamed with NC State's Industrial Extension Service to provide the training necessary for this illustrious certification, and with their help, achieved the certification within an unprecedented nine months. "The NC State IES team performed as true professionals and the training that my staff received was invaluable to our success," stated deBot. DeBotech is currently one of only two North Carolina companies to be ISO:9001 and AS:9100 certified for composites, and based on the work that deBotech currently does

at the automotive OEM level, the company will soon add the TS Automotive Quality Standard to its list of achievements. One of deBot's personal passions has always been the Olympics. In 2002, he was asked to design and build a bobsled using composites. He was only given a deadline. From there, he researched the Olympic rules and regulations and built the advanced carbon fiber sled, bringing his knowledge of light-weight racing products, techniques, and experience to deliver it on-time for the 2002 games. Throughout the past few years, deBotech has been involved in building the Olympic skeleton pods out of carbon fiber as well and most recently worked very closely with the USBSF (United States Bobsled & Skeleton Federation) to provide fast, light-weight bobsleds, skeleton pods, and saddles to the US teams for the 2014 Olympic Games in Sochi, Russia. The company partnered with racing legend Jeff Bodine to

build the Night Train 2 for the four-man bobsled competition, and deBot formed a strategic alliance with BMW North America to design and develop a fleet of carbon fiber bobsleds for the two-man bobsled competition for both the men's and women's teams. As such, the US bobsled and skeleton teams have had unprecedented results on the World Cup Tour, taking home a record number of medals and setting track records in the process. In November 2013, deBot had the distinct honor of being inducted into the NC State MAE Hall of Fame. This was the inaugural celebration that included 41 engineering alumni who were selected from a field of over 10,000 MAE graduates. The various honorees graduated between 1950 and 1996 and represented various accomplishments in the entrepreneurial and corporate world. Several honorees were also distinguished military veterans, and deBot was very honored to be in the company of such

passionate and accomplished individuals. A recurring theme of this inaugural event was that NC State University had instilled in each of these individuals a belief in one's self and, with that, anything can be accomplished. This statement is verified by the varied achievements of the honorees, and deBot reiterated this sentiment in his acceptance remarks by stating that, "NC State is an engineering school that helps you to believe and have faith in yourself," without which he never would have had the knowledge or the courage to see and act on the opportunities that have presented themselves. Visit www.debotech.com to learn more. •

MAE alumnus is a super Wolfpack fan



Chris Hathcock is shown, left, at the 2011 ACC Women's Basketball Tournament; top right, at an NC State home football game; and at the College World Series in Omaha, Neb.

by Chris Hathcock

A 2009 graduate of the Department with a BS in aerospace engineering, Chris Hathcock is known around campus for his devotion to NC State athletics. A native of Gastonia, NC, he is working on a master's and PhD in aerospace engineering at NC State.

I was born and raised a State fan, so it was no surprise to anyone who knew me when I decided to attend NC State for college, but little did they or I know what would start in the fall of 2005. When I got to State, I knew I had to do well academic wise but also find something fun to do when not doing course work. For me, that was sports, and when I say sports I don't just mean football and basketball but also soccer, volleyball, baseball, and any other varsity sport at State. For the past nine years, I haven't missed a home football game and have only missed a handful of other home athletics events of the remaining 24 varsity teams. I wasn't just there to be there; I would lead the student section during games no matter if it was just a couple of us or a jam packed section. My constant attendance at athletic events and the passion I showed for State led to my nickname of Super Fan. Being at all the games and having great seats in the student section also allowed me to get plenty of airtime during our televised games. So much airtime, that people tell me they play "Where's Chris?" to see who can find me first at one of our games. Many people have thanked me for my support of our teams, especially the Olympic sports, which

don't have as big a following as football and basketball. Eventually my reputation made it easy to become the Mic Man for football, a position I've held for four seasons.

During my time at State, I've seen many great events and games. In Carter-Finley Stadium, I was front row for our last second win over Boston College, victories over Florida State, and the OT victory over ECU, ending any BCS hopes they had. Nothing was sweeter than the home games against UNC during our five-game win streak over them. I've rushed the PNC Arena court several times to celebrate the big men's basketball victories during my time at State, mostly ones against our Triangle rivals. One night I'll never forget is February 16, 2007; that night the basketball court in historic Reynolds Coliseum became Kay Yow Court, and our Wolfpack women upset 2nd ranked North Carolina 72-65. It was a great night for the university to honor Coach Yow, and it's always great to beat UNC. I've also been able to attend many postseason games during my time at State including every bowl game starting in 2005 along with every ACC Baseball Tournament since 2006. The best postseason game memory would have to be making it out to Omaha for the College World Series with our baseball team last season after winning the Regional and Super Regional at Doak Field. I've had a blast going to our games and have made plenty of memories that will last a lifetime. There's no better feeling than being a part of the Pack. •

Scholarship honors bright, young engineering alumnus

For Alex Stuber, an impromptu weekend trip to see NC State's football team take on the University of Maryland Terrapins made perfect sense. The spontaneous move fell right in line with his zest for living life to the fullest and experiencing the moment with the ones he cherished the most — family and friends.

Alex graduated from NC State in 2010 with bachelor's degrees in both mechanical and aerospace engineering; he maintained a perfect 4.0 and was among the valedictorians. Two years later, he earned his master's degree in aerospace engineering. The hard work was a build up toward a promising career with one of the top organizations in the aerospace industry — NASA.

Tragically, Alex's life ended June 14, 2013, when he passed away following a car accident. He was 25 years old.

In his honor, Alex's family has endowed the Alexander Lee Stuber Memorial Scholarship to support undergraduate students in the Department of Mechanical and Aerospace Engineering. The family has strong ties to NC State. Alex's father, Charles "Chuck" Stuber Jr., and paternal grandparents are alumni; his paternal grandfather, Dr. Charles Stuber, is professor emeritus of genetics and director of NC State's Center for Plant Breeding and Applied Plant Genomics.

"If we can help someone who has a dream of being an engineer and needs some financial help, NC State is a good place to put those resources," said Chuck Stuber, a special agent with the FBI. "Maybe one of those students will end up going to NASA and following in Alex's footsteps."

Alex's journey with NASA began when he received a prestigious scholarship in 2008.

"I think one of the things that attracted Alex to NASA was that the people were incredible," Chuck Stuber said. "Their mission was different — it wasn't about making money. It was about maybe doing something that had never been done — exploring new frontiers."

While a student at NC State, Alex completed summer internships and was in the Co-op program in Edwards, CA, at NASA's Dryden Flight Research Center, which was recently



Alex Stuber

renamed the Armstrong Flight Research Center. During one of his assignments, he had a chance to work on the Stratospheric Observatory for Infrared Astronomy (SOFIA), the world's largest airborne astronomical observatory. Flying to an altitude of 45,000 feet, SOFIA captures infrared images that ground telescopes can't. Alex flew on one of SOFIA's missions.

Shortly after receiving his master's degree, Alex received a full-time job offer from NASA — he'd be working in the Aerostructures Branch on ways to improve how future planes are designed and constructed as both an analyst and test engineer. The skills and techniques he'd learned as an engineering student at NC State were on full display.

Alex was in the sixth month of his new position when he passed away. His family and friends remember his passion for traveling, skiing and capturing life's moments through photography. Today, his memory lives on through the lives he touched as an organ donor and the future lives he will impact through an endowed scholarship.

"Alex would definitely want something like this to help NC State students," Chuck Stuber said. "I don't think there's any question." •

AWARDS & HONORS

FACULTY HONORS

Dr. Yuan receives Structural Health Monitoring Person of the Year Award

Dr. Fuh-Gwo Yuan received the SHM-POY (Structural Health Monitoring Person of the Year) Award from the 9th International Workshop for Structural Health Monitoring (IWSHM) at Stanford University, which is held on September 10-12. This is the largest SHM workshop held at Stanford University every other year. It began in 1997 (1st IWSHM) with only 70 participants. There were more than 500 participants this past year. As stated at the workshop's website (<http://structure.stanford.edu/workshop/awards.html>), "A structural health monitoring person of the year (SHM-POY) is selected by the editors and associate editors of Structural Health Monitoring: An International Journal. The Person of the Year should have made an outstanding contribution to the field of SHM that will benefit society. This contribution can be in the form of theory, analysis, applications, education, or other ways that support the discipline of SHM and benefit society. The award is meant to recognize accomplishments within the past year or few years."

Chang Receives Ralph E. Powe Junior Faculty Award from ORAU

MAE Assistant Professor **Chih-Hao Chang** has won the 2013 Ralph E. Powe Junior Faculty Enhancement Award from Oak Ridge Associated Universities (ORAU), a 109-member university consortium affiliated with Oak Ridge National Laboratory (ORNL).

Dr. Chang is one of 30 young faculty members to receive this research award, which is intended to enrich the research and professional growth of young faculty at ORAU member institutions. The awards recognize faculty members for their work in any of five science and technology disciplines: engineering or applied science, life sciences, mathematics and computer science, physical sciences; and policy, management or education.

This award will support Chang's research on 3D nanoporous medium in microfluidic channels for synthetic biological systems. This work aims to enable deterministic design of 3D synthetic environments, and lead to a new platform to better study biomolecular mechanisms. Dr. Chang will collaborate with Drs. Scott Retterer and Mitchel Doktycz at the Biological and Nanoscale Systems Group at Oak Ridge National Laboratory on this project.

Humboldt Research Award

Dr. Andrey V. Kuznetsov, Professor of Mechanical and Aerospace Engineering, has received the Humboldt Research Award from the Alexander von Humboldt Foundation in Germany.

The award recognizes the achievements of outstanding academics worldwide whose discoveries, insights, or theories have made significant impacts on their scientific disciplines, and who are expected to continue producing cutting-edge research. By honoring the internationally recognized scientists and scholars from abroad, the Humboldt Foundation aims to bring top experts to Germany in order to promote international cooperation between German scholars and research institutions and their foreign counterparts.

Outstanding Teacher Award

Dr. Ashok Gopalathnam, Associate Professor of Mechanical and Aerospace Engineering, won NC State's 2014 Outstanding Teacher Award. This is a recognition of Dr. Gopalathnam's commitment to creative and innovative teaching and learning practices.

Ralph R. Teetor Educational Award

Dr. Tiegang Fang, Associate Professor of Mechanical and Aerospace Engineering, has received the 2014 SAE Ralph R. Teetor Educational Award from SAE International. Established in 1953, the Teetor Award recognizes outstanding young engineering educators and provides them the opportunity to connect with practicing engineers in their fields.

Alcoa Foundation Engineering Research Achievement Award

Dr. Tiegang Fang, Associate Professor of Mechanical and Aerospace Engineering, won the 2013 Alcoa Foundation Engineering Research Achievement Award from the College of Engineering at NC State University. This award is intended to recognize young faculty from the College of Engineering who are not older than 40 years on December 31, 2012, based on their outstanding research achievements during the preceding three years

STUDENT HONORS

MAE student wins Electric Tournament of Champions-ETOC

The Electric Tournament of Champions, or ETOC, an annual competition between the top pilots of indoor radio-control precision and freestyle aerobatics, held its annual World Championship. Precision sequence flying involves pilots flying the same, pre-defined sequence of maneuvers. They are judged on the precision of flying those maneuvers. Freestyle is a 2-minute flight choreographed to music in which the flights are judged on areas such as originality, precision, choreography, and full use of the flight envelope. Congratulations to **RJ Gritter** for this great accomplishment!

MAE Students Make National News with Invention

Several MAE students invented a product called "Jar with a Twist." They were featured on Good Morning America on July 30, 2013.

Check out the YouTube video at:

www.youtube.com/watch?v=tf1eEN7JHRQ

Check out the news broadcast as well at:

abcnews.go.com/GMA/video/jar-tomorrow-19816364

NC State takes first place in ASME student design competition

A team of NC State MAE students captured first place at the ASME UAV Student Design Competition on March 29th at Clemson University. The team was challenged to design, build, and fly an unmanned aerial vehicle (UAV) that could carry a cargo through two obstacle gates, deliver its payload to a target area, and return to the starting point. As an added challenge, the vehicle needed to be as heavy as possible, meet size restrictions, and was allotted 5 minutes to complete the course.

The NC State team built a quadrotor UAV dubbed "Airwolf" and competed against 24 other university teams from across the region. "We faced a wide variety of competitors ranging from 50 lb vehicles with as many as ten rotors, to small, highly agile UAVs. The team's design struck the right balance of power, high mass, stability in flight, and maneuverability to best all competitors," said Dr. Matthew Bryant, the team's faculty advisor. Pilot Warren Weisler controlled the vehicle flawlessly to complete the course

NEW FACULTY AND STAFF



Dr. Katherine Saul, Associate Professor, received her ScB degree in engineering from Brown University in 2000 and her MS and PhD degrees in mechanical engineering from Stanford University. Prior to joining the NC State faculty, she had been an assistant professor of biomedical engineering and orthopaedic surgery at the Wake Forest School of Medicine in Winston-Salem, NC, since 2007. Her research draws from mechanical engineering analyses of dynamics and controls to answer clinically relevant questions regarding dysfunctional upper limb movement and altered motor coordination with a goal to improve treatment outcomes for patients with neuromusculoskeletal disorders. Recent applications have included age-related rotator cuff injury and brachial plexus nerve injury. Dr. Saul's research program has been supported from many sources, including the NSF, Office of Naval Research, and NIH, and her work has been recognized with several awards, including the American Society of Biomechanics Pre-doctoral Young Scientist Award in 2005.

in only 96 seconds. The team will go on to compete internationally at the ASME International Mechanical Engineering Congress and Exposition (IMECE) in Montreal, Canada this fall.

In addition, Colton Doty was awarded the Best Technical Content Prize for his presentation during the Old Guard Oral Presentation Competition. His presentation was titled "Front Wing Aerodynamics" and involved his research with the Formula SAE car team. In his presentation Colton combined his knowledge of vehicle dynamics and how aero-devices such as wings affect the performance. His work is partially sponsored by an NC State Undergraduate Research Grant. Colton is a dual major ME/AE student.

NC State places high in AIAA student design competition

The 2014 Southeastern Regional Student Conference of AIAA was held in Memphis, Tenn. on April 7th and 8th. Twelve seniors from our AE program attended the conference and gave two team presentations. Both teams were successful in placing in the top three in the Regional Design Team competition:

- **Second place:** "Design of a Flexible Wing UAS" (**Students:** Matthew Willams and David Muse)
- **Third place** (tie with U. of Alabama): "Dynamic Response of a Supersonic Sounding Rocket" (**Students:** Ryan Jones, Stephen West, Chris Buck, and Jacob Reedy)

Congratulation to the students and their instructor, Dr. Chuck Hall.



Dr. Matthew Bryant, Assistant Professor, received his BS degree in mechanical engineering from Bucknell University in 2007. He received his MS and PhD degrees in mechanical engineering from Cornell University in 2011 and 2012, respectively. Prior to joining the NC State faculty, he was a postdoctoral research associate and lecturer at Cornell. Dr. Bryant's research emphasizes a multidisciplinary approach that combines smart materials, dynamical systems, and fluid-structure interaction phenomena to create novel devices and systems for energy harvesting, sensing, and actuation. This work has applications ranging from robot mobility, to self-powered electronics, to scalable power generation.



Mr. **Gary Lofton** joined the MAE department as a Specialty Trades Technician and supports ME senior design.

MAE Hall of Fame Induction



Dr. and Mrs. Pugh

The MAE department held its inaugural Hall of Fame Induction this past November (Fall 2013). The MAE Hall of Fame was established to celebrate accomplishments of those extraordinary graduates who have used their education to excel in a profession, career, or service. Additionally, the MAE Hall of Fame is intended to inspire current students working hard to achieve greatness. A nomination is based on professional and service achievement, entrepreneurship and contributions to professional societies. This festive occasion was held in Engineering Building III, and each inductee shared memories about the department and highlighted their careers. We invite alumni to visit and view the new MAE Hall of Fame display that was recently placed in the MAE department award hall. Concurrently, we hosted alumni at the annual pancake breakfast, which was also held in EB III. Many of our alumni, faculty and students enjoyed food and fellowship. We look forward to seeing many new faces at this event next fall.

The hall of fame ceremony along with our pancake breakfast will be held each fall. Please visit our alumni webpage (<http://www.mae.ncsu.edu/alumni/>) for more information about upcoming alumni engagement events. •

MAE HALL OF FAME

Inductees to the MAE Hall of Fame are distinguished alumni whose professional excellence inspires students. Nominations are based on professional and service achievements, entrepreneurial activities and contributions to professional societies. Members are listed with their NC State degrees.

Charles E. Edwards
BSME 1950

Gerald D. Mann
BSME 1952

Gerald B. Hurst
BSME 1956

Claud E. Pugh
BSME 1961, MSME 1964,
PhD ME 1968

Hank G. Hoomani
BSME 1962, MSME 1977,
PhD ME 1977

James E. Ingram
BSME 1962

David D. Jones
BSME 1965, MSME 1970,
PhD ME 1981

John L. Parker
MSAE 1966, PhD AE 1969

Fred Ellington
BSME 1967, MSME 1969

George Georgopoulos
BSME 1968, MSME 1969,
PhD ME 1973

Jerry N. Hefner
MSME & MSAE 1968

Noral D. Stewart
SME 1969, MSME 1974,
PhD ME 1981

William W. Rickard
BSAE 1969

Randy S. Swartz
BSME 1971

John W. Sheffield
MSME 1973, PhD ME
1975

James C. Chastain, III
BSME 1977

Selcuk I. Gucer
PhD ME 1976

Robert C. Cagle
BSME 1977

Richard A. Reed
BSAE 1977

Joseph R. Davis
BSME 1978

William C. Hall
BSME 1978, MSME 1980

Donald I. Lamonds
BSME 1978

Robert W. Walters
MSME 1978, PhD AE
1984

Gregory A. Riffe
BSME 1981

Richard G. Wolfe
MSME 1981

Floyd B. Goodwin
BSME 1981

David S. Stabler
BSME 1982

Christopher J. Fitzgerald
BSAE 1986, MSAE 1989

Gina L. Morton
BSME 1986

Alex W. Beltzhoover
BSME 1987

Timothy P. Howard
BSME 1987

Lane R. Miller
PhD ME 1988

Erik L. Dixon
BSME 1988

David B. Ledford
BSME 1989, MSME

Gregory N. Washington
BSME 1989, MSME 1991,
PhD ME 1994

Gary E. Kilpatrick
BSME 1990

Christopher S. Holder
BSAE 1990

Rolin F. Barrett, Jr.
BSME 1991, MSME 1996,
PhD ME 2005

Dung C. Nguyen
BSAE 1992

Hans A. deBot
BSME 1993

Michael S. Matson
BSME 1996

DONOR LIST

CORPORATE GIFTS

(Senior Design, Corporate Partners & Research)

ATI Industrial Automation
The Boeing Company
Corning Incorporated
Dean S. Edmonds Foundation
Deere Foundation
Deloitte Foundation
Denso Manufacturing
Duke Energy Foundation
Eastman Chemical Company
Elk Fork Technologies
Exxon Mobil Corporation
Fluor Enterprises, Inc.
General Electric Company
Grace Jones Richardson Trust
Industrial Machine Solutions, Inc.
Lord Corporation
Mobile Veterinary Practices of Raleigh
Nelson Stud Welding
Norfolk Southern Foundation
Northrop Grumman
Nucor Steel
P & A Industrial Fabrications, LLC
Pentair Water Pool & Spa, Inc.
Saint-Gobain Corporate Foundation
Sirtex Medical, Inc.
Southern Access Technologies
Sunstone Water Group
Surefire Medical, Inc.
Volvo Trucks North America, Inc.
Wells Fargo Foundation

ALUMNI & FRIENDS

\$25,000 and above
Brian D. Garrett
Stuber NC LLC

\$10,000 -24,999

Andrew Adams
Dr. Carl F. Zorowski

\$1,000 -9,999

Dr. Barbara J. Adams
Virginia Adams
Bruce & Jill Baldwin
Dr. Robert & Alice Cassanova
Robert M. Chapman
James C. III & Janet Chastain
Lawrence & Jana Clayton
Erik & Amy Dixon
Charles & Linda Edwards
Dr. David & Lynn Gill

The Department of Mechanical & Aerospace Engineering at NC State is grateful to our donors for their generous support. This list represents donations between January 2013 and February 2014. While we make every effort to be accurate and thorough, it is possible to accidentally omit or misspell a name. Please contact us at 919.515.3241 with any additions or corrections.

Dr. Richard & Eva Gould
William & Sandra Hall
Jerry N. Sr. & Betty Hefner.
Dr. David & Ginger Jones
Carolyn D. Knaup
Donald & Donna Lamonds
Mark & Missy Moore
Sang Don Mun
Jonathan D. Parker
Louise B. Smith
Charles W. Stuber, Jr.
William B. Thompson, Jr.
Philippe & Carol Vercaemert
Randy Werneth

\$500-999

Nathan & Kawanta Durham
Claus Fey
Luther E. Jr. & Cynthia Galyon
Oscar D. III & Christie Lee
Mark & Naomi McMillin
Dr. Lee & Betty Parker
James A. Raymond
Dr. Yidong Xia

\$101-499

Omeed & Barbara Alahverdizadeh
Corey & Jennifer Brown
C. H. Jr. & Rebecca Cline
Mengliang Dai
Mark & Theresa Davidson
Ms. Madeline DeSouza
Steve & Nira Fox
Robert & Allison Greiner
Wayne & Susan Harris
Dr. Basil & Mina Hassan
Korey S. Hite
Richard O. Lewis
William E. McBride
William & Elizabeth McGuire
Cynthia Mitchell
James & Keller Mulligan
Col. John J. & Louise Privette
James A. Scheld
Dr. William & Katherine Sutton
John & Sharon Tanner
Lt. David J. Walker
George & Nancy White
V. Gregory Weir
Dr. A. Leigh Winfrey
Christopher & Margaret Yahnker
Robert & Vicki Yountz

\$1-100

Mackenzie M. Adams
Salathiel L. Adams, Jr.
LtCol. Donald & Dorothy Aikin
Charles A. & Stephanie Barker
Colleen S. Baron
Dr. C. Kearney Barton
Charles M. Behrhorst
Kelly L. Bishop
Britt & Julia Bobbitt
Kurt & Karen Breitinger
Mrs. Laura Bulso
Dr. Siou-Ming Chu
Robert & Lee Ann Clark
Richard & Jeri Collmann
John C. Cotter
David & Elizabeth Craig
Kushal & Sharbari Dasgupta
David L. & Carole Davis, Jr.
Dr. William O. Engler, III
Dr. George & Mildred Georgopoulos
James M. Giarelli
Don & Sandra Hartley
Donald & Linda Haith
Ryan T. James
Lawson F. Jenkins III
Dr. Michael & Lela Jones
John & Patricia Jordan
Robert & Pamela Lease
Maureen O. McKinney
Jamie R. Nickerson
Dr. John R. II & Melinda Olds
Karl & Christina Orthner
Stephen M. Page
Richard & Wanda Panosh
Brad & Terri Pearce
Dr. Joseph T. Jr. & Temple Pearson
Ms. Tamara L. Robertson
Richard M. Ross, II
George W. Sanford
Dr. Lonnie Jr. & Davida Sharpe
Matthew B. Siler
Harry Jr. & Delores Tune
G. Rodney & Brenda Wesp
John C. Wallace
Harriet Weissman
Carrol & Martha Wilson
Alan & Kendra Young
Trenton & Brittany Young

MESSAGE FROM THE ADVISORY BOARD CHAIRS



Bruce Baldwin

GREETINGS FROM THE MAE ADVISORY BOARD.

These are exciting times for the MAE Department. We currently boast the largest number of living alumni (nearly 11,000) of any department at NC State. We have one of the newest homes for a department at in Engineering Building III (EB-III), and we have direct access via a few minutes walk to Hunt Library, the 14th most beautiful library in the world. If you haven't been back in the last five years, you won't recognize the campus. I say all this

to entice you to make a trip back to your alma mater and take in the changes over the past 5, 10, 15, or more years, depending on your last visit.

The MAE Advisory Board is dedicated to helping place NC State at the forefront of mechanical and aerospace engineering education and research. One of our most important goals is to get our alumni reconnected and more active with the MAE Department. To help foster the reconnection, we have a marquee event to place on your calendar: a welcome back event that will take place on Homecoming Weekend, which is scheduled for Nov. 7-9. By attending, you can connect with students and other alumni, tour the new facilities and, hopefully, enjoy a few strolls down memory lane.

If you would like to hear more about what your Advisory Board is doing or how you can get involved in what is happening in the MAE department, please contact me or the Vice Chair – Carol Vercaemert (BSME 1976). I can be reached by email at brbaldwin@deloitte.com and Carol can be reached at vercaemert@bellsouth.net.

I look forward to seeing you at a future event!

Bruce Baldwin – BSME 1992
MAE Advisory Board Chair
Go Wolfpack!

QUICK FACTS

A look at some of the figures that shape the Department of Mechanical and Aerospace Engineering at NC State.



1

Place won by a team of NC State MAE students at the ASME UAV Student Design Competition. The team designed, built and flew an unmanned aerial vehicle.

2012-2013 Research Expenditures

\$11,200,000

MAE Patents 2011-2013

37 Disclosures / 26 Filed / 22 Issued

Total living alumni

10,964

19

Graduates named Distinguished Engineering Alumni by the College of Engineering

	Total 2012-2013 MAE Graduates		
	BS	MS	PhD
Aerospace Engineering	53	28	5
Mechanical Engineering	210	74	12

382

North Carolina State University
Department of Mechanical and Aerospace Engineering
Campus Box 7910
Raleigh, NC 27695-7910

SUPPORT MAE AT NC STATE

A gift to the Department of Mechanical and Aerospace Engineering is an investment in the future.

Gifts support scholarships, fellowships, professorships, academic programs, faculty and student research and other initiatives that are not typically supported through state appropriations. This private philanthropy empowers the Department to achieve excellence in research and education.

To learn more about supporting the Department, contact Whitney Wilson-Botts.



Whitney Wilson-Botts
919.515.3241
whwilson@ncsu.edu

www.mae.ncsu.edu

10,000 copies of this document were printed at a cost of \$4,992.

