



The Plasma Lab – Nearly 40 Years of Research Excellence

Dr. Paul Wilbur arrived at the Mechanical Engineering Department in 1968 when the Space Race was underway and was about to put U.S. citizens on the moon – the first time for the United States and for mankind. To start a plasma laboratory, he used a large vacuum tank that had been installed and tested at the Colorado State University Engineering Research Center by Virgil Sanborn and Lionel Baldwin. The tank provided the vital piece of research equipment needed to undertake studies of ion propulsion systems. By 1969, Dr. Wilbur had received funding from NASA and begun research. From the beginning, his work had an intense focus on student learning and success. He is very proud of 36 years of research that has led to clarifying and explaining the basic physics, theoretical modeling, performance prediction, experimental validation of the models and the development

of practical design capability applicable to ion propulsion systems.

Ion propulsion systems are used on space flight systems due to their large specific impulse (thrust/mass flow rate of propellant) compared to that of chemical rocket propulsion systems, albeit with low thrust. This gives ion propulsion systems major advantages for use in space missions to and beyond the planets and for satellite orbit transfer and station keeping applications. Electric power to drive the thrusters presently is supplied by solar panels, but nuclear reactor systems probably will be used on future deep-space missions.

Until the last few years, the CSU Department of Mechanical Engineering had the only university laboratory in the United States engaged in ion propulsion system research. Throughout its history, the lab has produced approximately eight articles, papers, and reports



Professor Paul Wilbur

per year and three journal articles per year and has attracted about \$150,000 to \$300,000 per year to fund the research. The lab has mentored nearly 20 Ph.D. and 20 M.S. graduates and continuously has had two undergraduate students working in the lab as well. For many years, Dr. Wilbur has taught the ME 567 course, which presents the knowledge gained from the research on ion sources and ion thrusters. In addition, the lab currently is supporting ME Senior Design Practicum projects for ME seniors.



Emissive Membrane Ion Thruster Test Facility

Throughout the history of the Plasma Lab research, there has been intense interest on the part of NASA in developing ion propulsion systems. In-space orbital experiments began with the successful launch of SERT II (Space Electric Rocket Test II) in 1970. CSU involvement grew from a few minor laboratory experiments needed to understand in-space observations for this program to heavy involvement in subsequent years. In fact, ion thrusters used on Deep Space 1 (launched

(continued on page 3)

Christian Puttlitz Joins the ME Faculty



We are very pleased to announce the appointment of a new faculty member this August. Dr. Christian Puttlitz hails from the University of California at San Francisco, where he served as a Research Fellow, a member of the

UCSF/Cal-Berkeley Joint Graduate Group in Bioengineering, and as assistant professor and director of the Orthopaedic Bioengineering Research Laboratory (OBRL). He received his baccalaureate in materials science engineering and mechanics at Michigan State, his M.S. in bioengineering at Clemson and, in 1999, his Ph.D. in biomedical engineering at the University of Iowa. He joins our Biomedical Engineering program and serves with Dr. Susan James as co-director of our OBRL.

Dr. Puttlitz is a strong researcher and prolific writer with

more than 20 journal articles published or in review and more than 50 book chapters, abstracts, and conference presentations. Much of his work is published in the journal *Spine*, which indicates his research focus is on mechanics issues of the human spine. He specifically focuses on large-scale finite element analyses and experimental studies of the spine examining issues such as the effects of spinal fusion on surrounding vertebra and tissue. While spinal fusion has been widely used for a very long time to “solve” spinal problems in humans, it is far from a panacea, and Dr. Puttlitz’s

work has gone a long way to elucidate the real issues.

Dr. Puttlitz is teaching our BE/ME 470/570 course, Orthopaedic Biomechanics, offered jointly by the ME department and Biomedical Engineering program, which attracts students from engineering majors as well as veterinary medicine/biomedical sciences and physics. Future teaching interests include adding graduate courses in biosolid mechanics and advanced biomechanics, emphasizing issues such as orthopaedic implant design to focus graduate students on issues such as writing and speaking skills

(continued on page 2)

ME Senior Design Practicum Adds Industry Component

This year we had 115 seniors participate in the ME Practicum. We also added industry-oriented projects while continuing with research and competition projects.

AeroDesign West

ME students and Dr. Hiroshi Sakurai took the airplane they built to the SAE Aero Design West competition held in Fort Worth, Texas. The team finished 12th. The airplane qualified with a 5.2 lb. payload and flew an unqualified flight with a 15 lb. payload.



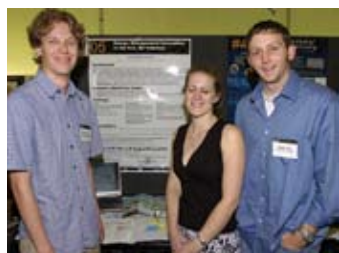
Human Powered Vehicle

ME students and Dr. Sakurai took their carbon-composite tricycle to the ASME Human Powered Vehicle competition held at California State University, Fresno. The team finished first in the design event and fourth in the endurance event, for an overall second-place finish, continuing the tradition of top five placement for the HPV team.



NetEnergy Team

Three students with Dr. Wade Troxell partnered with Vail Resorts, the National Ski Areas Association (NSAA), and the Brendle Group to explore onsite energy generation, renewable resources, and energy storage for ski resorts. The students received an EPA Award and traveled to Washington, D.C., to present their findings.



Roach Walking Robot

Six ME students and Dr. Troxell competed in the U.S. RoboCup Urban Search and Rescue competition held at Georgia Tech in Atlanta. Roach was the only legged robot in the competition and achieved the farthest penetration into the "red zone" (the toughest mobile course at the event) while identifying two victims.



Formula SAE

Twenty-three students and Dr. Don Radford worked directly on the development of a "new generation" CSU Formula SAE car. In addition, two other groups advised by Dr. Fitzhorn worked on projects that support the long-term development of the Formula SAE team.



Split-Engine Team

The Split-Engine Team was sponsored by the John Deere Corporation. This group, advised by Dr. Rudy Stanglmaier, modified a production 6-cylinder engine to operate as two independent 3-cylinder engines to enable the use of advanced exhaust aftertreatment systems. The group presented their results at the John Deere Product Engineering Center.



The ME Practicum is highly successful and would not be possible without the financial support provided by many of our alumni and industry friends. Thank you for your generosity!

From the Department Head



Dr. Allan T. Kirkpatrick

Welcome to the Fall 2005 edition of the *Mechanical Engineer*. As I write this note, another fall term is getting underway, and the campus is again filled with students and their parents. It is always great to see another year in engineering education unfold.

We have been successful in hiring new faculty this year, and Professor Christian Puttlitz joins us as an assistant professor this fall. His expertise is in the biomedical engineering area, and he will strengthen our orthopaedics teaching and research. Please refer to the article on Dr. Puttlitz on page 1 for more details.

We would like to thank all of the alumni, friends, faculty, staff, and students who gathered in the Lory Student Center in April 2005 for the College of Engineering Alumni Award Dinner. At the dinner, Mr. Scott Delp (1983) was given the 2005 Mechanical Engineering Distinguished Alumni Award. Mr. Robert Walker (1956) was given the 2005 University Distinguished Alumni Award. In addition, we will be dedicating the Brett (1987) and Danette Anderson Robotics and Autonomous Machine Laboratory (RAMLab) on October 7 this fall.

The University has adopted some additional goals – economic development and globalization. We have had activities in these areas, so we are in alignment with these initiatives. For example, we have set up a Global Innovation Center for Energy, Environment, and Health with Professor Bryan Willson as director. You will be hearing more about these activities in future newsletters. I hope that you have a great fall, and please stop by the Department of Mechanical Engineering to say hello if you are in the area.

Allan Kirkpatrick

Dr. Allan T. Kirkpatrick

Share Your News!

We enjoy hearing from our alumni. Please help us celebrate your personal and professional accomplishments by sending your update to

SupportEngineering@colostate.edu

You may also fax your update to (970) 491-3815 or submit your news online at

www.SupportEngineering.colostate.edu

(click on "Alumni")

Christian Puttlitz (continued from page 1)

in addition to their fundamental technical and research skills.

Dr. Puttlitz will continue his research on large-scale finite element analyses at the OBRL and he plans to build additional testing equipment for data comparison. He also plans to add computing capability including an ABAQUS license for the lab. With these upgrades, he can analyze and test both spinal fusions and vertebral disk implants in the spine to develop capability for presurgery prediction of spinal outcomes on patients – a

long sought-after but very elusive capability. His research currently is funded by private companies, and he plans to submit proposals to the National Science Foundation and the National Institutes of Health to further fund his ongoing research.

Dr. Puttlitz; Tonya, his wife; and their daughter, Hayden, are just getting settled into Fort Collins and the ME department at CSU. If you have a chance, please stop by and welcome Dr. Puttlitz to our faculty.

Dr. Scott L. Delp Receives the 2005 Distinguished Alumni Award

Each year, the College of Engineering honors one outstanding alumnus from each of our academic departments. Recipients of our Distinguished Alumni Awards are former students who, by their distinguished career and service to the college, university, state, nation, or world, have brought honor to the College of Engineering, Colorado State University, and themselves.

Dr. Scott L. Delp (1983) is the recipient of the 2005 Mechanical Engineering Distinguished Alumni Award. This prestigious award was presented at the College of Engineering's Alumni Awards Dinner and Dance held at CSU in April 2005.

Dr. Delp is a professor of bioengineering and mechanical engineering at Stanford University. He was employed by Hewlett-Packard in Fort Collins for two years follow-

ing graduation from Colorado State University and subsequently earned his Ph.D. from Stanford University in 1990. Dr. Delp joined the faculty at Northwestern University in 1991, and in 1999, he returned to Stanford and began serving as the chairman of the biomechanical engineering division of Stanford's mechanical engineering department. In 2002, he was named the founding chairman of Stanford's bioengineering department, a new department based in the Schools of Engineering and Medicine.

Dr. Delp's research focuses on improving treatments for movement disorders that arise from cerebral palsy, stroke, and Parkinson's disease, and he has published more than 200 scientific articles and conference papers on these topics. He has received faculty fellowships from the Baxter and Powell

Foundations, was the recipient of the National Science Foundation's Young Investigator Award, and is a fellow of the American Institute of Medical and Biological Engineering.

While a student at Colorado State University, Dr. Delp was a member of the rugby and lacrosse teams and the student chapter of the American Society of Mechanical Engineers.



Wade Troxell presents 2005 Alumni Award to Scott Delp

Joining Dr. Delp at the College of Engineering Alumni Awards Dinner and Dance was his father, Dr. Charles Delp (B.S. in botany, 1950) of Tampa, Florida. Dr. Charles Delp received CSU's William E. Morgan Achievement Award in 1985 and was pleased to be on hand to congratulate his son on the receipt of his own alumni award.

Dr. Scott Delp currently resides in Stanford, California.



Scott Delp and Charles Delp

Research Excellence *(continued from page 1)*

in 1998) and on more than 20 geosynchronous communications satellites (launched in 1997) were proposed, promoted, designed, and tested by former CSU students. The Deep Space 1 mission (www.nmp.jpl.nasa.gov/ds1), which lasted for more than three years and could only be done with ion propulsion, was one of NASA's most successful planetary missions. Commercial Earth satellites positioned by ion thrusters continue to provide a wide range of communication services including XM radio.

Dr. Wilbur proudly states the greatest accomplishment of the Plasma Lab is the students. Many have become the technical leaders and/or presidents and CEOs of companies that have built the many ion propulsion systems and ion sources operating today. Future missions that will use ion propulsion presently include one called DAWN that will go to the two largest asteroids known, and once again, former CSU students are involved. More on this mission can be seen at the JPL Web site at www.jpl.nasa.gov.

The research to date has dealt with XIPS (pronounced "zips") for xenon ion propulsion systems. Dr. Wilbur currently is working with a former Boy Scout (from his days as a Scout leader) in creating a new technology for ion propulsion that he calls EMIT (Emissive Membrane Ion Thruster). This technology makes use of industry proprietary ceramic membranes similar to those used in lithium ion batteries to ionize propellant atoms. This approach will have a significant weight-saving advantage over the conventional XIPS technology.

Dr. Wilbur's enthusiasm is infectious and creates more enthusiasm among his students, colleagues, and funding sources. One of his former students, Dr. John Williams (see the Fall 2002 *Mechanical Engineer*), now the director of the lab, keeps a strong focus on the XIPS technology so Dr. Wilbur can "play in the lab" and do the fun experimental stuff. Dr. Wilbur is very excited about the potential of the EMIT technology and is busy conducting experiments and seeking financial support for them.

Submit Nominations for 2006 Distinguished Alumni Awards

The College of Engineering is accepting nominations for awards to be presented to an outstanding alumnus from each of the five academic departments as well as to one Engineering Science alumnus and one college-wide honoree. Recipients of these awards are former students who, by their distinguished career and service to the college, university, state, nation or world, have brought honor to the College of Engineering, Colorado State University, and themselves.

Submit your nomination for these awards online at: www.SupportEngineering.colostate.edu (click on "Alumni") by November 30, 2005.

You also may submit the following information by e-mail or regular mail:

- Designate the department for which you are submitting the nomination (Mechanical Engineering, Engineering Science, etc.)
- List the name of the nominee, along with his/her home address, and phone number; business name, address, phone, and title; e-mail address; and a very brief statement regarding why you believe this nominee deserves this award.
- If you are nominating another individual (i.e., this is not a self-nomination), please also include your name, home address and phone number; business name, address, phone, and title; and e-mail address.

The ASME Annual Regional Student Design Conference was held on April 8-9, 2005, in Tucson, Arizona. The CSU ASME Student Section received numerous awards: Kilometer – the CSU team traveled the farthest; Ingersoll Rand – for the Most Active Student Section (\$300) and the Most People in Attendance (\$100). Individual awards were received by Katherine Rudell – 1st Place Old Guard Technical Poster Competition (\$100); Steve Tranby – 2nd Place Technical Web Contest (\$125); Mike Conboy – 4th Place Old Guard Technical Oral Presentation (\$50); and Matt Wiley – 5th Place Old Guard Technical Oral Presentation and Most Technical Award (\$25). In the Bulk Material Transporter Contest, Katherine Rudell, Forrest Blackburn, and Ross MacGregor placed second (\$200) and Ravi Singaraju, Adam Marshall, Amanda Kaiser, and Jay Waterman placed third (\$100). Congratulations to our fine students!

Department of Mechanical Engineering

1374 Campus Delivery

Fort Collins, CO 80523-1374

(970) 491-6558

mec@engr.colostate.edu

Class Notes

David G. Robinson ('73) retired from the military as a tenured Associate Professor of Aerospace and Systems Engineering at AFIT and now serves as a distinguished member of the technical staff at Sandia National Laboratories. His professional interests include uncertainty analysis and structural reliability, and he enjoys fly fishing and coaching youth and high school rugby and soccer.

Steven Jackson ('79) is living and working in Lakewood, Colorado, as the Manager and Chief Investigator of the Intelligence Unit for the Law Enforcement Group at the U.S. Bureau of Reclamation, which provides threat information for infrastructure protection. He is also detailed to the FBI-Joint Terrorist Task Force and a two-term chairman of the Interagency Forum on Infrastructure Protection.

Scott Kittinger ('81) works for Rocketdyne, a division of Boeing, and manages several teams that control software for the main engine computer and health management for the engine systems of the Space Shuttle Main Engine project.

Brad Nolan ('94) is working as a Senior Manager of Global Support Services at Oracle Corporation. In 1994 Brad joined JD Edwards/PeopleSoft, which combined with Oracle this year. He is enjoying living in Denver with his partner, Eric, and they are busy traveling in their free time, as Eric is now working for Frontier Airlines.

Kimi Ceridon ('99) continued her education at MIT on an NSF Fellowship and received her Master's degree. She is currently a Project Engineer and Laboratory Manager for Lytron Incorporated, located in Massachusetts. Lytron

designs thermal management products for military, medical, electronics, and industry.

Aaron Pankonin ('99) works for Austin Commercial, a construction management company from Dallas, Texas, currently managing the commissioning program for the Miami International Airport project.

Seth Gregg ('03) recently relocated from the Synchrotron Facility at Cornell University (Cornell High Energy Synchrotron Source or CHESS) to Pioneer Engineering in Fort Collins, Colorado. He currently works as a design and vibration analysis consultant.

Steve Brandl ('04) is an Engine Application Engineer at Woodward Governor in Loveland, Colorado. His work includes engine emissions control calibration and customer support.

Nicolas Ferrington ('04) is employed as an Orbiter Mechanisms Engineer with United Space Alliance, located at the Kennedy Space Center. Nic and his wife, Katie Ford (also a CSU grad and currently pursuing a doctorate at the University of St. Augustine), reside in Daytona Beach, Florida.

Nick Smith ('04) is a Mechanical Design Engineer with Samson Design, located in Boulder, Colorado.

Vijay Surla ('04) is continuing his education here at CSU in the Ph.D. program in mechanical engineering. Under the guidance of Dr. Azer Yalin, he is working on developing a laser-based diagnostic to characterize erosion rate in ion thrusters, which will be implemented on a real-time thruster at the Jet Propulsion Lab.

2005-2006 ME Scholarship Recipients

Scholarship Name	Recipient
George T. Abell	Eric C. Johns
Nicholas Angelopoulos	Blake R. Teipel
	Eric J. Versluys
ARCS Foundation	Kelly H. Zuehlsdorff
Douglas D. Dreher Memorial	Christina L. K. Black
Omnia El-Hakim Diversity	Lisa J. Smith
Engineering College Scholars	Kathryn M. Fosha
	Cole St. John
Ival V. Goslin Engineering	Jonathan S. Fenstermacher
	Kevin M. Wills
Graham W. Howard Memorial	Andrew G. Redden
Guire Family Memorial	Jacob L. Nelson
Frank Kimball Memorial	Jacob G. Barker
Kirkpatrick Family	Breigh N. Roszelle
ME Alumni/Faculty	Nicholas I. Denning
Micromotion Engineering	Bradley L. Walpole
Robert Mock Memorial	Jennifer L. Harmel
Allen Porter Mowry Memorial	Jonathan D. Woodworth
	Adam D. York
A. J. Parfet	Lauren M. Crawford
	Justin L. Koehn
Delano F. Scott	Ryan L. Shannon
	Kyle Siler-Evans
Walter Scott, Jr.	Aaron M. Bell
	Gregory M. Dutro
	Joseph D. Gerdome
	Andrew K. Holsteen
	Jonathan S. Robinson
StorageTek	Benjamin N. Dalton
	Mark W. Huang
Robert L. and Bonnie J. Walker	Caleb O. Brown
	Kelly D. Fagerstone
	Miloe A. Lewis
	Judd C. Nutting
C. Byron and Donna T. Winn	Heather M. Menzer
Claude W. Wood	Andrew R. Blackstock
	Laura J. Davis
	Caleb J. Dean
	Luke J. Jackson
	Geoffrey M. Lodall
	Beau M. Moore
	Robert J. Senser
	Jay L. Waterman
	Elizabeth M. Williams
	Daniel L. Wilson
	Daniel J. Woldtved

Calendar of Events



Student Competitions (dates and locations to be announced):

- SAE Aero Design West
- Human Powered Vehicle
- U.S. Open RoboCup Rescue Robot League
- Formula SAE Race Car

University (CSU) and College of Engineering (COE) Events:

12/17/05	COE Undergraduate Commencement	Lory Student Center Main Ballroom
2/17/06	CSU Distinguished Alumni Awards Dinner	Fort Collins Marriott
3/23/06	COE Scholarship Recognition Luncheon	Lory Student Center West Ballroom
4/1/06	CSU Green and Gold Gala	
4/14/06	Engineering Days/ME Senior Design Practicum Project Demonstrations	
4/22/06	COE Alumni Awards Dinner	Hilton Fort Collins
5/12/06	COE Undergraduate Commencement	Moby Arena
6/14-	World Open RoboCup Rescue	
6-20/06	Robot League	Bremen, Germany