

THE STREAMLINE

AEROSPACE ENGINEERING, MECHANICS & ENGINEERING SCIENCE

AeMES Hosted US Congress on Applied Mechanics



Audience listening to a plenary lecture on Microelectromechanical Systems in Carlton auditorium.

The AeMES department, together with the College of Engineering, hosted the Thirteenth U.S. National Congress of Applied Mechanics (USNCAM13) on 21-26 Jun '98. There were almost 700 papers presented by participants from 36 nations. Held every four years, the Congress assembles members from 14 participating engineering science and mathematical professional societies. This year the event was coordinated by AeMES **Prof. M.A. Eisenberg** as the Congress Chairman. The Congress featured a full schedule of technical presentations, plenary talks, special symposia, banquets and award luncheons.



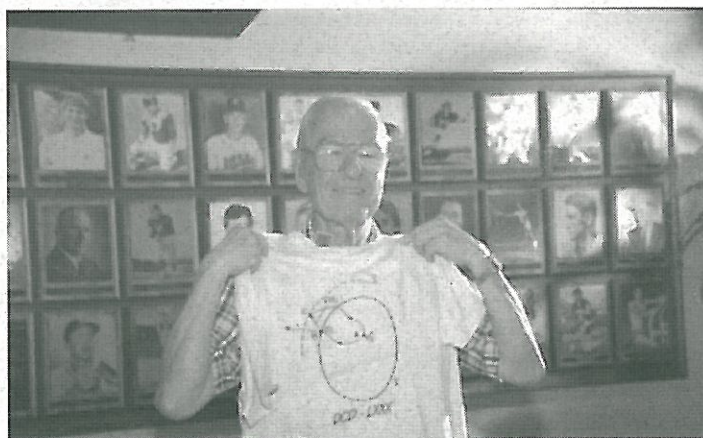
*Dr. M.A. Eisenberg,
Congress Chairman*

A panel discussion on the subject of *Engineering and Science in a Public Policy Context: Why Does the Public Care About What We Do?* was organized, and nationally televised. The event was sponsored by the U.S. National Committee for Theoretical and Applied Mechanics and the National Technological University. The moderator was Earl Dowell, Dean of Engineering at Duke University and chair of the sponsoring agency. The panelists were Harry Armen, R&D Director of Northrop/Grumman and ASME Vice President for public policy; Thomas Moss, executive director, Government, University and Industry Research Roundtable of the National

Research Council/NAS and NAE; and Winfred Phillips, Dean of the College of Engineering at UF.

The panelists agreed that engineers have a poor record in working with legislators, and do a poor job informing the public about engineering's contribution to the economy. Engineering runs a distant second to life sciences in research funding because engineers and scientists are uninformed about the political process. The current technological edge in the U.S. can be lost if legislators are not made more technically aware. The panel concluded that there is a need for better educating the public and politicians about engineering, for more engineers and scientists to be elected to office, and for public policy to be an integral part of the engineering curriculum.

To honor AeMES Graduate Research Prof. Emer. **Daniel C. Drucker** for his many significant research, education, and leadership contributions to applied mechanics, the American Society of Mechanical Engineers established the ASME Daniel C. Drucker Medal. Dr. Drucker was the inaugural recipient of the award which was presented at a luncheon during the



Dr. D.C. Drucker and a graphic representation of the famous Drucker Postulate on a T-Shirt given to him together with the ASME Drucker Medal.

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Department Chair: Wei Shyy

Editor:

Loc Vu-Quoc, Tel: (352) 392-6227,
E-mail: Vu-Quoc@ufl.edu

Associate Editors:

Roger Tran-Son-Tay
Peter Ifju

Design and layout:

Damon Clark

AeMES Web page URL:
<http://www.aero.ufl.edu/>

G.I. Taylor Memorial Lecture in Spring '99
by Prof. Stephen H. Davis,
Northwestern University (see page 3).



UNIVERSITY OF
FLORIDA



Dr. C.E. Taylor roasting Dr. Drucker at the award ceremony.

USNCAM conference on 25 Jun 98. The luncheon was held in the Touchdown Terrace of the Ben Hill Griffin Football Stadium on the UF campus.

The luncheon featured several of Dr. Drucker's friends providing praise, recognition of accomplishments and sometimes humorous stories of their own interaction with Dr. Drucker. Speakers included UF Engineering Dean W. Phillips, AeMES Prof. Emer. C. E. Taylor, Dr. R. Christensen of the Lawrence Livermore Lab, Dr. J. Rice of Harvard U., Dr. J. Achenbach of Northwestern U., and Dr. B. Boley of Columbia U. Each speaker conveyed praise for both Dr. Drucker and his wife Ann. The speakers attempted to "roast" Dr. Drucker, but after an intense search in their memory, they could not recall anything incriminating. Only one flaw in Dr. Drucker's past was revealed, on a humorous note, when Dr. Boley told a story that Dr. Drucker advised him that the best sandwich could be purchased at a particular restaurant. As the story unfolded, Dr. Bruno exclaimed that it was the only time that Dr. Drucker let him down, because it was not the best sandwich that he had ever eaten. As the speeches progressed, a true sense was conveyed of Dr. Drucker's contributions to mechanics as we know it today. Towards the end of the presentation, Dr. Drucker was awarded a T-shirt that had a graphic representation of the renowned Drucker Postulate in plasticity.



Dr. A. Rosakis, CalTech, giving a plenary lecture on experimental mechanics.

ASME bestows the Drucker Medal in recognition of sustained, outstanding contributions to applied mechanics and mechanical engineering through research, teaching and service to the community. The establishment of this medal in Dr. Drucker's name represents the first time such an award has been named after a UF College of Engineering faculty member. ASME has established an endowment to provide funds for the Drucker Medal. Significant progress has been made towards the goal amount, and further donations are appreciated. For information on how to donate, call our main office at (352) 392-0961. For more details on the career of Dr. Drucker, see the Spring '98 issue of *The Streamline*.

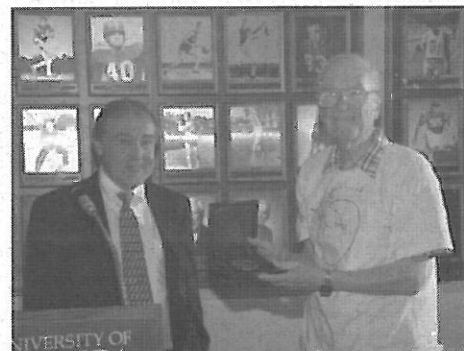
A special three-day memorial symposium honoring AeMES Graduate Research Prof. Emer. Chia-Shun Yih was organized by Professors Wei



Dr. P. Marcus, Berkeley, giving a plenary lecture on fluid mechanics.

Shyy (AeMES) and Ranga Narayanan (ChE). The event brought together distinguished scholars to celebrate the life and contributions of one of the world's leading contributors to fluid mechanics. There were scientists from all over the US and nine different countries from outside of the US. Among the attendants were Professors Prof. A. Acrivos (City College of New York), H. A. Stone (Harvard University), M.G. Worster (Cambridge University, UK), etc.

The symposium was composed of thirty six presentations grouped into nine technical sessions. This activity led to the writing of a book to be published by Cambridge University Press that covers five important topical areas: (1) Bernard and Thermo-Capillary Instabilities, (2) Shear and Pressure Driven Instabilities, (3) Waves and Dispersion, (4) Multiphase Systems, and (5) Complex Flows. This book collects 34 articles on interfacial fluid dynamics, multiphase systems and complex flows with relevance to the transport processes at an interface. The volume also includes an article authored by Prof. Y.C. Fung, who offers a biographical sketch and personal reminisces of Dr. Yih, a remarkable fluid physicist and a dignified person, whose work will be



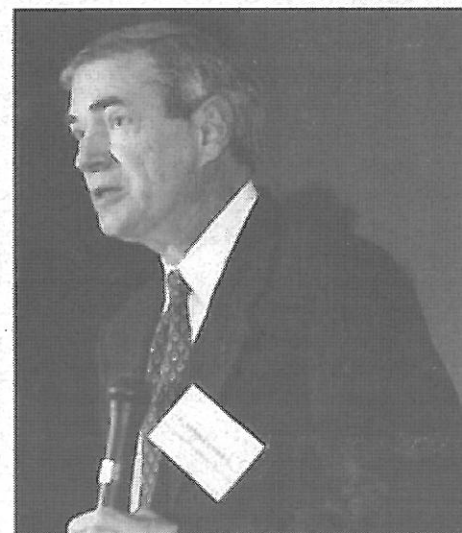
Dean Win Phillips presenting the ASME Drucker Medal to Dr. Drucker.

remembered, and whose memory will be cherished. A more detailed description of Dr. Yih's work and accomplishments can be found in the Fall '97 issue of *The Streamline*.

Following the opening ceremony, Prof. A. Prosperetti, Johns Hopkins University, gave a plenary lecture on "Bubble Dynamics and Single Bubble Sonoluminescence", which is the emission of light by bubbles pulsating under the action of an acoustic pressure field. He demonstrated through physical explanations and numerical simulations that it is unlikely that a bubble retains a spherical shape in a certain range of pressure. Dr. Prosperetti provided an explanation of sonoluminescence by the extremely fast rise time of the stress around the bubble; the liquid behaves therefore like a solid and fractures.

Prof. Y.C. Tai, CalTech, delivered his plenary lecture on Micro-Electro-Mechanical Systems (MEMS) on Tue, 23 Jun, in which he provided an introduction to the subject to a general audience. Starting with the famous prediction of the late Nobel laureate Richard Feynman that "there is plenty of room at the bottom", Dr. Tai went on to discuss three important issues in this field: Technologies, applications, and governing sciences.

On Wed, 24 Jun, Prof. J.T. Oden of the University of Texas at Austin gave a plenary lecture titled



Dr. J.T. Oden, Texas-Austin, giving a plenary lecture on computational mechanics.

"Hierarchical Modeling of Heterogeneous Materials: A Computational Approach Toward Resolving Problems of Multiple Scale". It is customary to employ the average or mathematically homogenized properties of composite (heterogeneous) materials. Because real materials seldom satisfy the highly idealized mathematical assumptions, the results of homogenized theory is often invalid. Here, Dr. Oden proposes a computational approach for highly heterogeneous elastic bodies.

On Thu, 25 Jun, Prof. A. Rosakis of the California Institute of Technology gave the plenary lecture titled "Intersonic Shear-Dominated Dynamic Crack Growth in Bimaterials and Composites". During the lecture, Dr. Rosakis traced his work in dynamic fracture behavior of such materials.

24TH G.I. TAYLOR MEMORIAL LECTURE

In Spring '99, **Dr. Stephen H. Davis**, Walter Murphy Professor at Northwestern University, a specialist in fluid mechanics, will be the speaker for the Taylor lecture. In 1994, Dr. Davis was elected to the National Academy of Engineering for his contributions to the mathematics of hydrodynamic stability theory and interfacial phenomena. In the same year, he received both the Alexander von Humboldt award and the Fluid Dynamics prize of the APS. Dr. Davis also holds a membership with the American Academy of Arts and Science, and is a Fellow of the American Physical Society (APS). For twenty years, 1969-1989, Dr. Davis served on the editorial board of the *Journal of Fluid Mechanics*. He was the director of the Center for Multiphase Fluid Flow and Transport from 1986 to 1988. Dr. Davis received his BEE in 1960, his M.S. and Ph.D. in mathematics, in 1962 and 1964, respectively, all from the Rensselaer Polytechnic Institute.

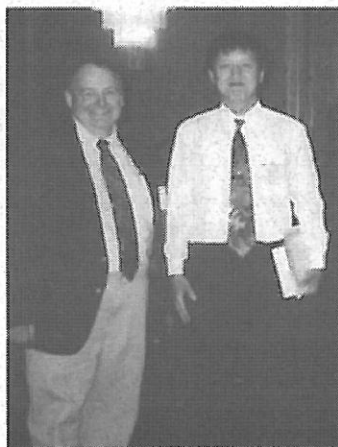
DEPT NEWS

Prof. R. Haftka received the third AIAA Multidisciplinary Optimization Award (AIAA MDO Award). This recent award was established by the technical committee on Multidisciplinary Optimization about 5 years ago. The first recipient was Professor Schmit from UCLA and the second was Dr. Jaroslaw Sobieski from NASA. The award is for major contribution to the field of Aerospace Multidisciplinary Design Optimization. Dr. Haftka's main focus has been the integration of Structures, Aerodynamics and Control in the design of aerospace vehicles.

Prof. B.V. Sankar, has been elected to the grade of Fellow by the American Society of Mechanical Engineers (ASME). He has been cited for his contributions to the mechanics of composite materials and structures, particularly to impact damage in composites. ASME, which has a membership of 125,000, is the premier organization for promoting the art, science and practice of mechanical engineering throughout the world. Dr. B.V. Sankar was also invited to serve as an opponent (examiner) for a doctoral thesis examination in the Department of Aeronautics at the Royal Institute of Technology (KTH), Stockholm, Sweden. The thesis was entitled "Impact response and delamination of composite plates". He presented several seminars on mechanics of composite materials and structures at KTH, and also at the Aeronautical Research Institute of Sweden.

AeMES Student Won National Competition

Mr. Xiaokai Niu, a doctoral student working in the Experimental Stress Analysis Lab under the guidance of Assist. Prof. P. Ifju, was awarded the first-place prize from



Mr. X. Niu (right) with his award.

The development of his dynamic fracture theories were guided by the extensive use of advanced experimental stress analysis methods and high speed photography.

The second fluid mechanics plenary session was on "Turbulent Bursts" given by Prof. P.S. Marcus, University of California at Berkeley. He presented calculations of a three-dimensional fluid flow which oscillates in time between a laminar, spatially coherent state and turbulence. He also presented his model of the bursts, and gave a prediction of the scaling of the burst cycle periods with the Reynolds number. It was shown that bursts occur because the flow's inner region is centrifugally unstable, while the outer is stable.

the Society for Experimental Mechanics (SEM) for the annual Student Paper Competition. The contest was held at the Spring conference of the SEM in Houston, Texas, on 1 Jun '98. Xiaokai competed against twelve finalists from universities across the country, with a paper titled "Interlaminar Shear Testing of Paperboard". He received a framed certificate, books on experimental mechanics valued at \$200, and a \$300 check. The first-place winner each year is invited to come back the following year to give a plenary talk at the paper competition. Additionally, he is eligible to submit his work to the *Experimental Techniques*, a SEM magazine. We congratulate Xiaokai Niu for this accomplishment.

RESEARCH ACTIVITIES

2nd Annual Micro Air Vehicle Competition

On Sat, 9 May 98, at the Flying Gators Model Airplane Club's (FGMAC) Archer Field, the weather was good, with only mild winds, a slight haze, and warm temperature. The stage was set for the second annual Micro Air Vehicle (mAV) competition. This year there were two disciplines. The first followed the same rules as last years competition where the mAV was required to fly to a target 600 meters away, and to send back an image of a target place on the ground. Each vehicle was guided by its pilot through a TV monitor with a video camera on board the mAV. The smallest vehicle to accomplish this task would then win the competition. The second discipline, which was adopted to keep expenses down, required that each mAV, carrying a payload equivalent to a camera and transmitter, stay airborne for two minutes under radio control. The competi-



Mr. S. Morris with the winning mAV

tions were judged by UF Alumna Dr. Christina Bloebaum (faculty member at the University of Buffalo), Mr. Kevin Ailinger (Naval Research Labs) and Mr. Martin Cowly (AeroVironment), who is also developing mAV technology.

In the first discipline, last year's winner, Mr. Steve Morris again won the competition. After numerous attempts his frisbee shaped entry, with a maximum dimension of 14.5 inches, completed the mission requirements. This year's entry was less than half as large as his winning design only one year ago. UF fielded one entry with a mAV that had a maximum dimension of 15.8 inches. After a few unlucky crashes, the plane was damaged beyond repair and the team could not complete the mission. Mr. Morris walk away with the \$1750.00 purse.

In the second discipline, there were three entries. First, Mr. Ed-



Mr. B. Massenberg with UF entry.

ward Smith flew for nearly the entire two minutes with a plane that had a wing span of 14.5 inches until he lost control, and crashed short of the field. Next, Mr. Matt White also nearly completed the mission until his engine prematurely quit. Mr. Smith then flew his 23.5 inch plane that won last Fall's competition, and easily completed the mission. He received \$250.00 for his efforts.

SERVICE TO PROFESSION

International activities

Cooperation between AeMES and KTH, Sweden

An academic exchange program between the AeMES department and the Kungliga Tekniska Hogskolan (The Royal Institute of Technology) of Sweden has been active since 1972. For ten years, from 1972 to 1982, **Prof. R. Lindgren** spent six months every year to help extend the then largely theoretical Department of Mechanics at KTH to become also home of the largest experimental facility for basic research in fluid dynamics at any institution in Sweden. From 1982 to 1995, Prof. Lindgren also taught at KTH a laboratory course called "Experimental Deduction". Since 1982, Prof. Lindgren has also arranged for students from the KTH to carry out their Master's thesis work at various departments at UF, especially in the College of Engineering. This arrangement has proven to be a success for both KTH students and for their UF faculty advisors. In 1992, a formal Cooperative Agreement for Academic Exchange between UF and KTH was signed by UF President J.V. Lombardi and KTH Rector J. Carlsson. To date, some 250 KTH students have completed their Master's theses at UF. Broader collaboration between the AeMES department and the KTH Mechanics department is being forged ahead with the mutual visit of the two department chairs, Prof. A. Johansson to the AeMES department on 6-11 Oct '98, and [Prof. W. Shyy] to the KTH Mechanics department on 13-20 Nov '98. On 9 Oct '98, Mr. I. Lind, Program Manager at the Aeronautical Research Institute, Sweden, made a presentation on the institute's on-going and

planned research activities. On 23 Oct '98, Dr. G. Svedberg of KTH will present a seminar titled "Biomass-Based Power Generation" in the AeMES department. Other departments at KTH have also expressed their interest in collaborating on research projects with the AeMES department.

Graduate Research Prof. N.D. Cristescu served as Vice-Chair of the Scientific Program Committee of the 13th US National Congress of Applied Mechanics. There, three papers that he co-authored with A. Matei, O. Cazacu, and I. Paraschiv-Munteanu, respectively, were presented. Dr. Cristescu was invited to present the paper "Granular Materials", co-authored with O. Cazacu and C. Cristescu, at the *35th Annual Technical Meeting of the Society of Engineering Science*, Washington State University, 27-30 Sep '98. At the same time, he is organizing the symposium "Advanced Technologies in Powder Mechanics", at the *AICHE Annual Meeting* in Miami Beach, 15-20 Nov '98, where the paper titled "Consolidation and creep flow of granular materials on inclined planes" that he co-authored with O. Cazacu and C. Cristescu will be presented. He is also organizing the *Mechanical Behavior of Salt Conference (MECASALT 5)* to be held at the University of Bucharest, Romania, 8-11 Aug '99. In Jan '98, Dr. Cristescu was invited to join the Editorial Board of the *Italian Journal of Geotechnical Engineering*.

Prof. R. Haftka is the current President of the International Society of Structural and Multidisciplinary Optimization (ISSMO), which has about 450 members from 33 countries, mostly from Europe. It holds bi-annual congress, with the last one held in Zakopane, Poland in May '97, and the next one to be held in Amherst, New York in May '99. In intermediate years, ISSMO co-sponsors with the AIAA, the Conference on Multidisciplinary Analysis and Optimization. Besides being involved in these conferences, Prof. Haftka also organized in Jun '98 an international internet conference on the use of approximations in engineering, optimization, which drew 30 participants from the US, England, France, Germany, Holland, Israel, and Poland.

He also works with a steady stream of visiting scholars from other countries. The following list includes names of visitors who came for stays longer than a month:

Mehmet Akgun, Associate Professor, Middle East Technical University, Ankara, Turkey, two years, 1997-1998. Hiroshi Furuya, Associate Professor, Tokyo Institute of Technology, Tokyo, Japan, two months, 1996. Itsuro Kajiura, Research Associate, Tokyo Institute of Technology, Tokyo, Japan, ten months, 1997-1998. Fred van Keulen, Associate Professor, University of Delft, Holland, two months, 1998. Luciano Lamberti, PhD student, Bari Technical University, Bari, Italy, eleven months, 1998-1999. Jens Madsen, Ph.D student, Aalborg University of Technology, Aalborg, Denmark, six months, 1997. Yoshiaki Ohta, Assistant Professor, Hokkaido Institute of Technology, Sapporo, Japan, ten months, 1995-1996. Akira Todoroki, Associate Professor, Tokyo Institute of Technology, Japan, ten months, 1995-1996.

In addition he has set up a program for visiting French undergraduate students from the University of Lyon, France, who come to work with him on their undergraduate theses. Two students have already come to UF under this arrangement, and two more will come this spring. He has also worked with a couple of visiting students from the Royal Institute of Technology in Stockholm, Sweden.

Adj. Assoc. Prof. G. Miller was a guest faculty member for the short course on "Biomechanics of Joints" at the International House of Japan, Tokyo, Japan, 26-27 Sep 98. The course was sponsored by the Hospital for Special Surgery (HSS), New York. Two other faculty members who co-taught the short course were from HSS.

Dr. Miller was invited to present a lecture on "The influence of Knee Design on Intra-articular Stresses" in a symposium on *Advanced Concepts in Total Knee Replacement*, organized by the *Istituto Ortopedici Rizzoli*, Bologna, Italy.

Prof. W. Shyy attended a recent NATO AGARD Conference on Missile Aerodynamics in Sorrento, Italy, May '98, where he presented a paper in collaboration with colleagues from the Eglin AFB. He

also visited Prof. G. Comini and colleagues of the University of Udine to discuss research ideas between Finite Element and Finite Volume computations.

In Jun '98, Dr. Shyy attended the *International Conference on Multiphase Flows* in Lyon, France, where he presented a paper. He also gave a seminar at the *Universite Pierre et Marie Curie (UPMC/Paris 6)*, and visited Prof. S. Zaleski and colleagues there.

Drs. W. Shyy and R. Tran-Son-Tay were invited to present a paper on "Deformation, Recovery, and Adhesion of a Viscous Drop" at the *Third International Conference on Multiphase Flow*, 8-12 Jun 98, in Lyon (France). They also presented their work on "Effects of Cell Deformation on Leukocyte Adhesion" at the *Third World Congress of Biomechanics*, 2-8 Aug '98, in Sapporo (Japan). Both topics were done in collaboration with Drs. **H-C. Kan** and **H.S. Udaykumar**.

Assoc. Prof. L. Vu-Quoc was invited to present a paper at the Conference on *Nonlinear and Stochastic Mechanics*, held at the Mathematisches Forschungsinstitut Oberwolfach, Oberwolfach-Walke, Germany, 16-22 Aug '98. The math institute is located in an idyllic area of the Black Forest in South Western Germany, about an hour by train from Strasbourg, France. On his way to Germany, Prof. Vu-Quoc also visited the Laboratoire de Mecanique des Solides (Laboratory for Solid Mechanics) at the Ecole Polytechnique, Palaiseau, France, where he met and worked with several colleagues, including Prof. Nguyen Quoc Son (stability of structures under plastic deformation), Prof. Marc Bonnet (boundary element methods).

In May '98, Dr. Vu-Quoc was invited to present a keynote lecture at the *Japan-USA-Vietnam Workshop on Research and Education in System, Computation, and Control Engineering*, at the Hanoi Mathematics Institute, Hanoi, Vietnam, 12-15 May '98. He was a member of the US delegation, and a member of the workshop organizing committee. On the US delegation were two program directors at NSF, and thirteen faculty from various US universities: Berkeley, Boston U., Cal. State U. at Sacramento, Harvard, MIT, Stanford, U. of Colorado at Boul-

der, UF, U. of Illinois at Urbana-Champaign, and U. of New Mexico at Las Cruces. The travel expenses of the US delegation were funded by NSF. Dr. Vu-Quoc also visited several universities in Vietnam, in particular the University of Technology (UT) in Hanoi, its sister university in Ho Chi Minh City (UT-HCMC), and the University of Hue. He is working with officials at these universities to establish cooperative agreements with UF. At UT-Hanoi, he met and worked with the Rector, Prof. Hoang Van Phong, and several other colleagues. At UT-HCMC, he met and worked with Prof. Nguyen Thien Tong (Ph.D. '74, University of Sydney, Australia, and MPA '95, Harvard) and Dr. Le Chi Hiep, UT-HCMC International Relations Director. Overall, the JUV workshop was described by Dr. Dev Garg, NSF Director of the Dynamics and Control Program, as a "huge success". For more information, see the NSF report at <http://www.nsf.gov/pubs/1998/int9822/int9822.txt>.

Congratulations

Effective 7 Aug '98, **Dr. Corin Segal** achieved tenure status at UF, and was promoted to Associate Professor. At the same time, **Dr. Roger Tran-Son-Tay** was promoted to Full Professor.

Ms. Jennifer Mindock, a 3.95 GPA undergraduate student, was appointed to a NASA Space Academy position at the NASA Goddard Space Flight Center, Greenbelt, Maryland, during Summer '98, where she designed an electrostatic deflector for use in a plasma analyzer of a Solar Probe that will fly through the corona of the Sun. She also investigated the feasibility of sending a small payload to the moon to verify the existence of ice at the poles. She received the *Director's Award* for leadership and dedication to the Academy.

Jenny was also selected to receive a \$3,000 *Boeing Scholarship* in Apr '98. She will begin an internship at Boeing in Seattle in Summer '99. In awarding the scholarship to Jenny, Dr. Luis

Figueroa, Boeing's Executive Focal for UF, said that "Her record is outstanding, and we hope she will continue her excellent progress". Jenny is the second undergraduate from AeMES who obtains a Boeing



Ms. Jennifer Mindock

scholarship and internship. The first student was Jimmy Rojas, whose story was featured in *The Streamline* Spring '97 issue. Jenny is the current AIAA UF Chapter Secretary, and a member of Sigma Gamma Tau.

Mr. Richard Prazenica received the *Knox Millsaps Award for Graduate-Student Teaching Assistant with Outstanding Mention* for the academic year 1997-98. He received a cash award of \$500, and had his name added to the award plaque on display outside the large classroom 303 Aerospace Building. **Mr. Philippe Vigneron** re-

ceived the same award with an *Honorable Mention* and \$250. The awards were made at the annual departmental awards banquet on 24 Apr '98. The funding for these awards came from the Knox Millsaps Memorial Fund.

Ms. Jan Machnik, a long-time member of our staff, received the accolade of being the College of Engineering *Customer of the Quarter* (second quarter of 1998) for her upbeat, positive attitude, and willingness to learn and to share valuable information with co-workers. She was also a previous winner of a Superior Accomplishment Award.



Mr. M. Riedy receiving his award.

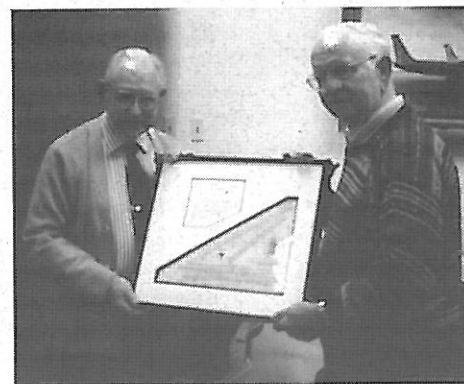
Ms. Jan Rockey and **Mr. Mark Riedy** were winners of the 1998 *Superior Achievement Award* that honors employees who contribute outstanding and meritorious service in their field. The award recognizes those employees who have made exceptional contributions to the University of Florida's efficiency and economy, or to the quality of life of students and other employees. The award ceremony took place at the Friends of Music room at the University Auditorium on 8 Apr '98. This year, there are altogether four staff members in the College of Engineering who won this award, with the AeMES department leading with two winners.



Mrs. J. Rockey receiving her award.

AeMES Faculty's Work at National Air & Space Museum

On 6 May '98, **Prof. Emer. B. Leadon** presented to Dr. S. Fishbein, Chairman of the Technology Committee of the Smithsonian National Air & Space Museum in Washington, DC, a frame containing the *Logarithmic Performance Com-*



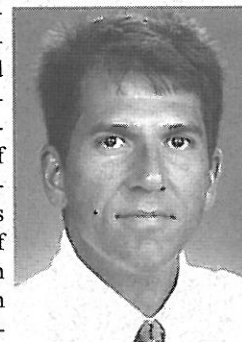
Dr. B. Leadon (right) presented the LPC to Dr. S. Fishbein.

puter (LPC) that Dr. Leadon developed with the late Dr. J.V. Foa while both were working at the Curtiss-Wright Research Laboratory in Buffalo, NY, from 1943 to 1946. The framed LPC will be in a display on the development of the computer. The LPC—a special measuring rule (see inset figure), not an electronic computer—helped shorten the computation of the performance of new airplane designs (e.g., the determination of the flight characteristics based on the knowledge of the coefficient of lift versus the coefficient of drag, etc.) from one design per week to more than a dozen designs per week. In addition, while the old methods relied on the slide rule and a dozen graphs, the LPC could complete the task with greater accuracy and efficiency. Drs. Foa and Leadon published their work on the LPC in the *Journal of the Aeronautical Science* in 1944. The use of the LPC ceased after Curtiss-Wright stopped designing new airplanes. After 1946, Dr. Leadon returned to the University of Minnesota to work toward his Ph.D. In the mid '50s, he took up a position at General Dynamics in San Diego, and since 1964, Dr. Leadon has been on the faculty at UF.

New faculty

Assist. Prof. A.J. Rapoff is welcomed as a new faculty member in AeMES and the Biomedical Engineering Program. Dr. Rapoff arrived in Apr '98 after receiving his Ph.D. from the University of Wisconsin. His Ph.D. degree was in Mechanical Engineering, but his research was conducted with bioengineers and surgeons in Orthopedic Surgery. His research interests are in spinal and orthopedic biomechanics, clinical outcomes, and probabilistic methods.

He is busy with teaching solid biomechanics this fall and building his laboratory and research program. Dr. Rapoff received a M.S. in Engineering Mechanics from the University of Missouri-Rolla in 1989 and a B.S. in Mechanical Engineering from the Univer-



Dr. A.J. Rapoff

sity of Missouri in 1983. He worked at McDonnell Aircraft in St. Louis in ground support engineering and composite structural design, analysis, and research from 1983 to 1990. He is married to Pamela Zaber, D.V.M., since 1990. They, and their two-year old daughter Eva Rapoff, love it here at UF and in Gainesville.

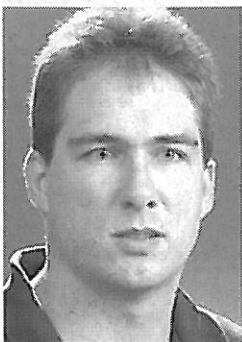
Dr. Pasquale (Pat) Sforza joined the AeMES faculty in 1998 as the current Program Director of the UF Graduate Engineering & Research Center (GERC) at Eglin Air Force Base. GERC was established in 1969 to support the growing graduate engineering education needs of Northwest Florida. In 1995, GERC moved into a new, 45,000 square foot educational and research facility situated just outside the west gate of Eglin Air Force Base, in the Emerald Coast town of Shalimar. Graduate degrees are offered there in



Dr. P. Sforza

aerospace engineering, engineering mechanics, electrical and computer engineering, and industrial and systems engineering. Before joining UF, Dr. Sforza was a Professor of Mechanical and Aerospace Engineering at the Polytechnic Institute of Brooklyn, where he was on the faculty since 1965. He was the Head of the department of Mechanical and Aerospace Engineering from 1983 to 1986, and Head of the department of Aerospace Engineering from 1988 to 1995. Dr. Sforza is an Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA). He was an Associate Editor of the *AIAA Journal* from 1980 to 1983, and is a member of the editorial board of the *Journal of Applied Fire Science* since 1996. Dr. Sforza's research in turbulent jet mixing, vortex aerodynamics, and energy transfer. He received the Technology Achievement Award from AIAA Long Island Section in 1977, and an Outstanding Technical Paper Award from AIAA in 1992.

Assist. Prof. Mark Sheplak joined AeMES in Apr '98 after his postdoctoral studies at MIT, where he performed research in the area of microelectromechanical systems (MEMS). Prior to that, he received a Ph.D. in Mechanical Engineering from Syracuse University while conducting his dissertation research over a three-year period at NASA-Langley Research Center in the area of turbulence instrumentation for hypersonic flows. His current research interest focuses on the design, fabrication, and characterization of high-performance,

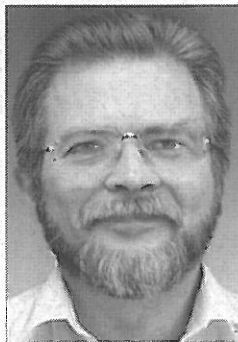


Dr. M. Sheplak

instrumentation-grade, silicon-micromachined sensors and actuators that enable the measurement, modeling, and control of various physical properties. Since arriving at UF, Dr. Sheplak has teamed up with EE Assoc. Prof. T. Nishida to establish the Interdisciplinary Microsystems Group (IMG) to develop a research and education program in MEMS. From an educational viewpoint, IMG is complementing research by developing several cross-departmental, multidisciplinary MEMS courses.

Retirement

Prof. James E. (Ed) Milton retired from the department after thirty-two years on the faculty. He received his BS degree in Aerospace Engineering from the University of Florida in 1960 and his PhD in Physics, in 1966. Dr. Milton joined the Aerospace Engineering Department at UF as an Assistant Professor in 1966, and became the Director of the UF Graduate Engineering & Research Center (GERC) at Eglin Air Force Base in 1972. As Director, Dr. Milton was able to expand GERC from offering a few courses on Eglin AFB to a fullfledged graduate program, including the PhD degree. GERC is housed in a new center in Shalimar. During his career, Dr. Milton also worked as an engineer at Martin Company and as a consultant to the U. S. Air Force. He has been active in the AIAA including serving as charter Chairman of the Northwest Florida Section (1975-76) and as secretary of the national technical committee for Atmospheric Flight Mechanics (1980-83).



Dr. J.E. Milton

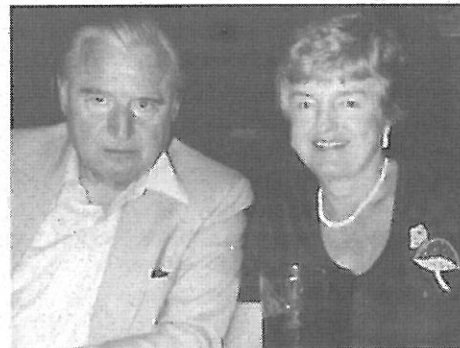
An informal dinner (and story-telling session) was given in honor of Dr. Milton by the faculty and staff of GERC at the Eglin AFB officers club on Halloween night of last year. A formal reception was held at the GERC in honor of Dr. Milton last spring. This reception was well attended by friends, faculty and staff including Dean Phillips of the College of Engineering, Major General Kostelnik, Commander of the Air Force Development Test Center at Eglin AFB and Lieutenant General Cranston, former Commander of the Test Center. Additionally, a retirement party hosted by Dr. and Mrs. Shyy in their home in Gainesville was given in honor of Dr. Milton last April.

Dr. Milton is participating in the phased retirement program, and plans to return to teaching at GERC in Spring '99.

OBITUARY

Hans von Ohain, 86, inventor of the jet engine and AeMES faculty

Dr. Hans Joachim Pabst von Ohain, an in-



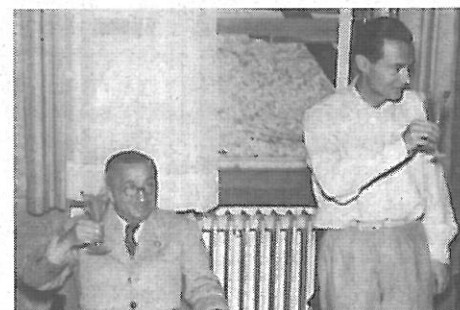
Dr. Hans von Ohain and his wife at UF in 1984.

ventor of the jet engine and a Visiting Professor of Aerospace Engineering in the AeMES department, who taught Propulsion from 1981-1986, passed away on 13 Mar '98 at the age of 86 in Melbourne, FL.

Dr. von Ohain won many honors and distinctions, including the Charles Starke Draper Medal for Outstanding Engineering Achievement (given along with Frank Whittle) for the invention of the jet engine. Each winner received the medal with a \$375,000 cash prize from the National Academy of Engineering. The Draper Medal is a prestigious award given to engineers; some compare this prize to the Nobel Prize for scientists / economists, and to the Fields Medal for mathematicians. Dr. von Ohain was a Distinguished Fellow of the AIAA.

Dr. von Ohain became interested in aircraft propulsion in Fall 1933 when he was a 21-year old doctoral student in Physics at the University of Gottingen, with a minor in Applied Mechanics under Ludwig Prandtl, a well-known mechanistic who made many fundamental contributions to fluid and solid mechanics.

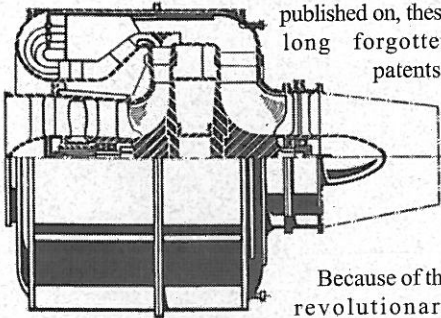
Working without knowing the patented principles of the jet engines by Lorin in 1908 and 1913, and by Guillaume in 1921, and independent of his other contemporary inventor Frank Whittle (also known as Sir Frank), Dr. von Ohain was fascinated by his idea of creating an engine based on a steady, thermodynamic flow process to reduce the vibration and noise that were generated by reciprocating piston engines. Such an engine would be lighter, more powerful, and with much greater mass flow of working medium per cross section; these are the characteristics that are cardinal to achieving higher flight speeds.



Industrialist Ernst Heinkel (left) and Dr. von Ohain (right). (National Air and Space Museum.)

After making several performance estimates for several steady-flow engine types, he finally chose a special gas-turbine configuration that he patented in early 1935.

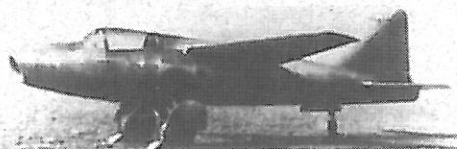
Dr. von Ohain only learned of the patent by Frank Whittle two years later, in 1937, from the German patent office. The earlier patents of turbojet engines by Lorin and by Guillaume were forgotten because there was no aerovehicle that could support flight speed above 200 mi/hr. Not until 1939 that a retired German patent examiner found out about, and published on, these long forgotten patents.



The 1937 design of the He.S3 turbojet engine.

Because of the revolutionary idea in his turbojet engine, Dr. von Ohain had

considerable trouble in finding support for its development. In fact, by his own recount, no aircraft engine company would accept his idea, except Ernst Heinkel, the then famous pioneer of high-speed aircraft and sole owner of the Heinkel company. Equipped with a very nice letter of recommendation by his former Ph.D. advisor, Dr. von Ohain landed a job in Apr 1936 with the Heinkel company, which funded the development of his turbojet engine completely independent of the German government. E. Heinkel gave Dr. von Ohain (see inset photos) complete freedom to pursue his work. By Mar 1937, the first turbojet engine using a hydrogen



World's first flight: The He-178 with von Ohain's He.S3B jet engine. (National Air and Space Museum.)

combustion system was demonstrated to work, and by early 1939, the first liquid-fuel turbojet engine was constructed and mounted on a specially design aircraft, the He-178 (see inset photos). On 27 Aug 1939, the He-178 demonstrated the first successful flight of a turbojet aircraft in the world. For further information, see, e.g., the book titled *Elements of Gas Turbine Propulsion* by J.D. Mattingly, McGraw-Hill, 1996, in which Dr. von Ohain himself wrote a detailed foreword.

After WWII, Dr. von Ohain came to the United States, along with several other top German scientists and engineers, in a program known as Operation Paper Clip. He worked at the Wright Aeronautical Laboratory in Dayton, Ohio. Dr. von

Ohain remained at Wright Field for the next 32 years, working as a researcher in propulsion and related fields. In 1963, he became Chief Scientist of the Aerospace Research Laboratories (ARL), which was responsible for conducting basic research for the Air Force. In 1975, he became Chief Scientist of the Aero Propulsion Laboratory of the Air Force Wright Aeronautical Laboratories. He retired from this position and civil service in 1979.

In addition to his seminal work in gas turbine technology, Dr. von Ohain held 19 U.S. patents, and published more than 30 technical papers. His areas of research included compressor aerodynamics, turbine cooling, electrohydrodynamic power generation, laser aerodynamics, thrust augmentation systems using fluid dynamic energy transfer for STOL and VSTOL aircraft, enhanced mixing and ejector devices. As Chief Scientist of ARL, he headed the development of a nuclear core reactor for propulsion.

Following his retirement from the USAF, Dr. von Ohain became a professor at the University of Dayton Research Institute and visiting professor in the AeMES department at UF. He served as the Charles A. Lindbergh Professor at the National Air and Space Museum, Smithsonian Institution in Washington D.C. during the 1984-85 academic year.

Dr. Knox Millsaps, Jr., an AeMES alumnus and a professor at the Naval Postgraduate School, Monterey, CA, still recalls many fond memories from the first propulsion course at UF taught by Dr. von Ohain, who "never gave tests, just quizzes". To Dr. von Ohain, "tests or exams do not sound like fun ... and after all, propulsion is supposed to be fun!". Dr. Millsaps recounted: "By the end of the first week all of the students were at ease with him. His door was always open. He took students to lunch, and asked them about their lives and their career goals. He quickly became a favorite professor." Under the influence of this favorite teacher, Dr. Millsaps, Jr. and many of his classmates decided to focus their work on propulsion.

Prof. M.A. Eisenberg offered a recollection from a different angle on this favorite teacher: Upon the conclusion of his first semester teaching propulsion at UF, Dr. von Ohain commented, "I have never worked so hard in my life as I did preparing or teaching the class. I was terrified that I would not live up to the students' expectations." Dr. von Ohain was a man whose self-expectations were very high, a man who took his responsibilities very seriously.

Hans von Ohain is survived by his wife, Hanny (Melbourne, FL), and four children: Stephen (St Louis), Christopher (Cincinnati, OH), Catherine (Lebanon, OH), and Stephanie (Stockholm, Sweden).

Many of us in the Department will greatly miss Hans von Ohain. His work changed the world, and his influence changed many of our lives very much for the better.

ALUMNI CORNER

Alumni news

Young AeMES alumnus named NASA Branch Chief



Mr. Robert Garcia

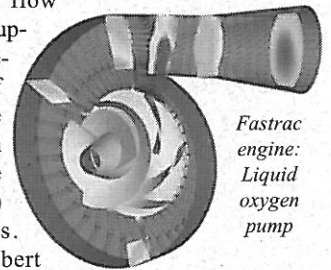
We cordially congratulate Mr. Robert Garcia, an alumnus of the AeMES department, for his recent promotion to Branch Chief of the Fluid Dynamics Analysis Branch at NASA Marshall Space Flight Center (MSFC) in May '98.

Robert attended UF from 1981 until 1986, when he graduated with a B.S. in Aerospace Engineering. Soon after his graduation, he immediately began working at the NASA MSFC, where he was initially assigned to perform one-dimensional flow

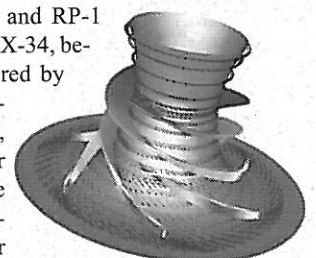
analysis in support of the development of the Space Shuttle Main Engine (SSME) turbopumps.

In 1987, Robert was assigned to the then newly formed Computational Fluid Dynamics (CFD) Branch, which was subsequently renamed Fluid Dynamics Analysis Branch (FDAB). The mission of his branch is to develop and apply advanced fluid dynamics analysis techniques in support of MSFC's propulsion and space vehicle development. During the period of ten years following his assignment to FDAB, Robert performed CFD analysis on a broad range of rocket engine components, with primary emphasis on pumps. He led a technology development team (1990-1994)---with the participation of government, industry, and academia---which made significant advances in rocket engine design and performance.

More recently (1996-1997), Robert was responsible for the hydrodynamic design of the pumps on the Fastrac engine, which will be a single-use rocket that powers the single-stage-to-orbit (SSTO) X-34 spaceplane. The Fastrac engine, probably the world's simplest turbopump rocket engine, is a gas generator-cycle engine that produces 60,000 lb of thrust by burning a mixture of liquid oxygen and RP-1 kerosene. The X-34, being manufactured by the Orbital Sciences Corp., Dulles, VA, for NASA at the cost of \$50 million, will be air



Fastrac engine: Liquid oxygen pump



Fastrac engine: RP-1 fuel pump impeller



launched (dropped from an L-1011 airliner), propelled into space by the Fastrac engine, and return back to a wing-borne landing. This space-plane is designed to reach a speed

of Mach 8 or above, and to carry small commercial and research payloads to sun-synchronous orbits at one-tenth of the cost the current expendable launch systems. The first flight of the X-34 is scheduled in Aug'99. For more information on the federally-funded projects to develop new rocket engines that will significantly bring down the cost of launching payloads into orbits, see the recent article titled "Bringing launch costs down to earth" in the *Mechanical Engineering*, October 1998. A

detailed description of the work on the Fastrac engine is given in that article.

In May 1998, Robert was promoted to Branch Chief. His primary responsibility is to ensure that the branch personnel have the skills and the tools necessary to support the design and development of NASA's space transportation systems. Robert said that the greatest challenge facing his branch is to remain at the leading edge of technology in the face of reduced

government budget. To accomplish that goal, he seeks to improve the efficiency and accuracy of analysis tools and to increase the breadth of applicability of these tools. Robert is currently guiding his branch in various improvements such as code parallelization, unstructured and hybrid methodologies suitable for viscous flows, increased unsteady flow analysis efficiency, and automated design optimization methodologies.

Graduate Student Fellowship Endowment Fund

The AeMES Department has initiated a graduate student fellowship endowment fund. Graduate students are a vital component for the teaching and research effort of our Department. There is increasing competition among the better engineering colleges in the United States to recruit first-rate graduate students. Many universities use special funds to supplement regular graduate assistantships to be competitive. To compete against other universities in recruiting the brightest graduate students,

we need to supplement the stipend in our existing teaching and research assistantships.

Dependable funding for support of graduate students provided by an endowment will enhance our long-term ability to compete at the national and international levels for the best entering graduate students. In recognition of the importance of graduate students to our Department's teaching and research endeavors, our faculty, alumni, and corporate friends are initiating a graduate student fellowship endowment fund. Such fund will qualify for 50%

state matching if we raise at least \$100,000. This matter is critical to the Department; a group of our faculty already pledged \$25,000 to start the fund.

We invite you—our alumni and friends—to join this effort, and solicit your comments, suggestions, and your financial support. For more information, please contact our chairman, **Dr. Wei Shyy** at wei-shyy@ufl.edu or through the departmental office at PO Box 116250, University of Florida, Gainesville, FL 32611. Donations or pledges can be sent directly to

the *Graduate Student Fellowship Fund* at our departmental address. Another way is to specify the *Graduate Student Fellowship Endowment Fund* for the AeMES Department, when you respond to the mailings or phone solicitations from the University of Florida Capital Campaign. The progress of this effort will be reported in subsequent issues of *The Streamline*.

Editor's note: All news items and articles that did not appear in the present issue of the newsletter will appear in future issues. We thank you for your support and understanding.



UNIVERSITY OF
FLORIDA

Aerospace Engineering, Mechanics & Engineering Science

PO Box 116250

Gainesville FL 32611-6250