

THE STREAMLINE

AEROSPACE ENGINEERING, MECHANICS & ENGINEERING SCIENCE

CHAIRMAN'S LETTER

It is my great pleasure to welcome you—alumni, friends, and students—to the first issue of the semi-annual newsletter of the department of Aerospace Engineering, Mechanics & Engineering Science (AeMES). This year, 1996, marks the 50th anniversary of the founding of the AeMES department. Having behind us a solid track record of 50 years of dedicated service to the State of Florida and to the Nation, I would also like to take this opportunity to give you an update of the present status and future direction of the department.

At the present time, we have 28 full-time faculty members including Dr. J.E. Milton, Director of the Graduate Engineering and Research Center at the Eglin Air Force Base. We have a total of about 320 students, divided into 240 upper division full-time undergraduate and 80 graduate students. We also host, on a regular basis, a number of postdoctoral fellows and visiting scholars through individual faculty arrangements. The main thrust and strength of our department is in Aerospace Engineering and Applied Mechanics.

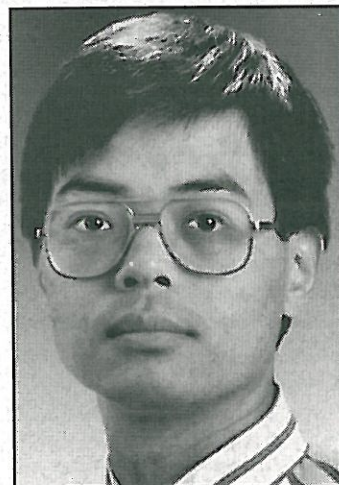
Many students come to our department because they are inspired by one of the oldest dreams of mankind: flight. However, recent downsizing in aerospace industries has created challenges for us. This period of uncertainty has forced us to improve our standards and productivity so that we can be more competitive. We have been striving to focus on activities that can lead to new insight or applications. Since Aerospace Engineering over years has been a leader in advanced technical development, we are also looking at applying our expertise to help solve the needs of other industrial sectors, such as power generation, automobiles, and advanced materials.

"Our goals are to make the AeMES department more effective as an educational organization, and more influential as a research organization."

Applied mechanics is a broad discipline, which serves as a foundation to many industrial activities. In this regard, we, as a department, have a worthy role to play since we serve as the link to many engineering disciplines. Mechanics of materials and biomechanics are two areas that have been of substantial interest to our faculty and students in recent years, as evidenced by our curriculum development, research initiatives, and student enrollment. A major effort is being made to combine these two highly demanded areas with Aerospace Engineering so that we can have a more coherent department.

To help us succeed in this endeavor, we would like to solicit comments and help from our alumni and friends. We want to do better and greater things so that all of you can be proud of your association with this department. Your help in identifying employment opportunities for our students at both undergraduate and graduate levels, and collaborative opportunities with industrial and governmental organizations for our department will be of great value to our overall goals. Simply put, our goals are to make the AeMES department more effective as an educational organization, and more influential as a research organization.

We—the faculty, staff, and students—look forward to your comments, and would like to share our experience and interests with you in the future.



Wei Shyy, Professor & Chairman

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**AeMES 50th Anniversary
celebration on
6-7 Sep '96; see detail
on back cover.**



**UNIVERSITY OF
FLORIDA**

NADAI AWARD

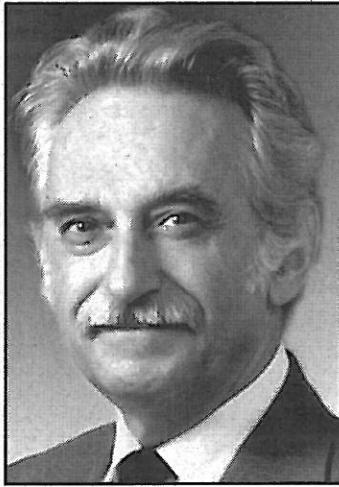
Graduate Research Prof. N. D. Cristescu was conferred the Nadai Award at the President's Luncheon at the ASME 1995 International Mechanical Engineering Congress and Exposition (IMECE), held in San Francisco, in November 1995. The Nadai Award was established in 1975 to recognize distinguished contributions to the field of engineering materials. Dr. Cristescu was cited for his outstanding contributions to the modeling of viscoplastic behavior of metallic materials, soils and rocks, leading to applications ranging from penetration mechanics to the excavation of tunnels.

Dr. Cristescu has published more than 150 papers and 16 books in the areas of dynamic plasticity, viscoplasticity of metals, and rheology of rocks and soils. His well known books include (i) *Dynamic Plasticity*, (ii) *Viscoplasticity*, and (iii) *Rock Rheology*.

Dr. Cristescu began his academic career in 1951 at the University of Bucharest, Romania, and served as Rector (President) of this university in 1990-92. During the period 1970-76, he spent half time at UF as a Graduate Research Professor, and half time in Bucharest. He joined the AeMES department at UF permanently in 1992. He has served as a senior editor of the *International Journal of Plasticity*, as associate editor of the *International Journal of Mechanical Science*, the *Mechanics Research Communications*, and the *Mechanics of Cohesive-Frictional Materials and Structures*. In 1995, he was inducted into the *The Johns Hopkins Society of Scholars*, with a lifetime membership.

At the Nadai Award ceremony, Dr. Cristescu delivered a lecture on "Viscoplasticity of porous and particulate materials," for which irreversible volumetric changes are to be accounted for in the constitutive laws. Examples of materials of this type are geomaterials, cement, powders, etc. After a demonstration of time

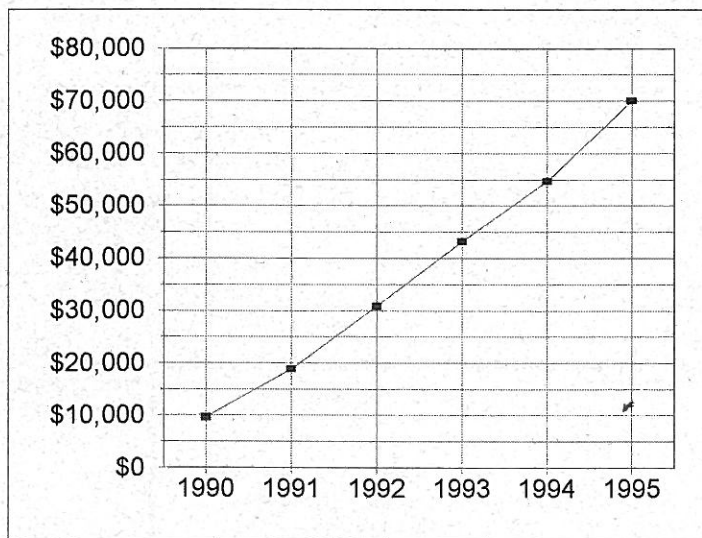
effects on irreversible volumetric changes by experimental evidence, and an introduction of the concept of compressibility/dilatancy boundary, he presented a general non-associated viscoplastic constitutive law that can model instantaneous response, transient and stationary creep, dilatancy and/or compressibility during creep, creep damage and failure. He gave examples of application of the proposed constitutive law to mining engineering problems: closure of borehole, tunnels, underground galleries.



Nicolaie D. Cristescu

KNOX MILSAPS ENDOWMENT MEMORIAL FUND

The *Knox Millsaps Memorial Fund* was established in December 1989 by family, friends and colleagues to support some of the intellectual activities nurtured by Dr. Millsaps during his career as Professor and Department Chairman at the University of Florida.



Knox Millsaps Fund Growth

There are two major functions of the *Knox Millsaps Memorial Endowment Fund*. One is to encourage and reward excellence in performance by students in the academic programs

of the Department of Aerospace Engineering, Mechanics & Engineering Science at the University of Florida. The second is to enhance the intellectual environment of faculty and students in the department by supporting visits from distinguished colleagues. These two functions will receive approximately equal support.

The *Knox Millsaps Award for Excellence in Statics* continues a tradition established by Prof. Millsaps during the years that he taught engineering statics; there is no publicity for this award and it is made privately each semester by the instructor of Statics. This award was initiated in 1991.

The *Knox Millsaps Award for the Outstanding Technical Paper by an Undergraduate Student* recognizes the best overall technical paper presented by undergraduate students from the academic programs of the department during the current academic year. The award consists of cash, a framed certificate, and name, paper title and name of the faculty advisor added to a plaque that is on display. This award was initiated in 1993.

An honorarium for the speaker at the annual *Sir Geoffrey Taylor Memorial Lecture* is provided by the Fund. This lecture series was initiated by Professor Millsaps in 1976. The Fund contributed toward the honorarium in 1993 and

assumed full responsibility for the honorarium in 1994.

The *Knox Millsaps Award for the Outstanding Graduate Student*

Teaching Assistant will be initiated for the academic year 1995-1996.

The *Knox Millsaps Memorial Lecture* series will be initiated during the Fall Semester of 1996.

The *Distinguished Alumni Lecture Series* is under consideration. Let us know your suggestions for new awards as our department's endowment fund grows.

Gifts and Budget: Over eighty donors contributed a total of \$70,000 to the Fund by the end of June 1995. The current annual budget for awards and honoraria is about \$3,000. By the end of 1996, the basic set of awards and lecture series envisioned by the original donors will have been established. Our goal this year is to raise \$20,000 to endow increases in the number and amount of awards for student papers presented at regional and national conferences. For more information, please contact Dr. R. Fearn.

The *Knox Millsaps Memorial Endowment Fund* is part of the University of Florida Foundation, which is the primary endowment investment vehicle used by the University. There are two accounts associated with the fund. New gifts and investment earnings are credited to the Endowment Principal account. Quarterly distributions are made from the Endowment Principal account to a separate Endowment Spendable Income account from which awards are made. The Advisory Committee for the fund is Dr. Knox Millsaps, Jr. (Naval Postgraduate School), Dr. James E. Milton (University of Florida, Eglin Graduate Center) and Dr. Richard Fearn. The Advisory Committee approves all expenditures from the Spendable Income account.

G.I. TAYLOR MEMORIAL LECTURE

On 22 Mar '96, **Graduate Research Prof. Emeritus D.C. Drucker** delivered on UF campus a *G.I. Taylor Memorial Lecture* titled "Fundamental engineering research—Neglected key to competitiveness—Choice of areas & directions." Dr. Drucker's lecture is printed and being distributed. If you have not received a copy of his lecture, you can read his lecture on our department's Web page (see "AeMES on the World Wide Web"), or you can write to the editorial

board; we will be happy to send you a copy.

The G.I. Taylor Memorial Lecture committee—composed of Drs. N. Cristescu, D. Mikolaitis, R. Fearn—has announced the next G.I. Taylor speaker (Spring 1997): Prof. Jim R. Rice, a specialist in fracture mechanics from Harvard University.

Editor's note: *The readers—alumni, friends, and students—are invited to suggest speakers for the G.I. Taylor (Spring semesters) and the Knox Millsaps (Fall semesters) Memorial Lecture series. Candidates should be active and well established engineers and/or scientists. Please communicate your suggestions to the selection committee of these lecture series, or to the editorial board of the newsletter.*

KNOX MILLSAPS MEMORIAL LECTURE

We are happy to announce the first speaker for the *Knox Millsaps Memorial Lecture* series: **Dr. Sheila E. Widnall**, Secretary of the Air Force, on 24 Sep '96 (lecture title to be announced). Her responsibilities include research and development, and other activities prescribed by the President or the Secretary of Defense. In previous positions with the Air Force, Dr. Widnall served on the USAF Academy Board of Visitors, and on advisory committees to Military Airlift Command and Wright-Patterson Air Force Base, Ohio. Dr. Widnall, a faculty member of the Massachusetts Institute of Technology for 28 years, became an Associate Provost at MIT in January 1992. A professor of Aeronautics and Astronautics, she is internationally known for her work in fluid dynamics, specifically in the areas of aircraft turbulence and vortices created by helicopters. She has served on many boards, panels and committees in government, academia and industry. The Tacoma, Washington native is the author of some 70 publications. She assumed her current position on 6 Aug '93.

DIAMOND JUBILEE LECTURE

Graduate Research Prof. Emeritus D. C. Drucker gave a lecture titled "From instability and time dependence on the microscale to stability and time independence on the macroscale," at the ASME 1995

International Mechanical Engineering Congress & Exposition, held in San Francisco, in November 1995. This lecture is part of the Diamond Jubilee Lectures celebrating the 75th Anniversary of the ASME Materials Division, which was founded in 1920. A companion paper to Dr. Drucker's lecture appeared in the October 1955 issue of the *ASME Journal of Engineering Materials and Technology* (JEMT, Vol.117, No.4, pp.368-372) along with the companion papers to the other lectures. Dr. George Weng, the Editor of JEMT, wrote in the opening remark that individuals contributing to this special issue of the JEMT are "distinguished scientists or engineers working in the fields closely related to both mechanics and materials."

In his lecture, Dr. Drucker discusses the existence of dynamic inelastic processes that are going on at the microscale (e.g., generation of dislocations, growth of crack and voids, etc.) in quasistatic inelastic deformation of ductile structural metals. Dislocations also represent highly unstable processes at the microscale. Yet, engineers design structures and machines based on conventional plasticity, which is in turn based on assumptions of time-independence and stability. Dr. Drucker discussed the validity of engineering practice; such validity is indeed good news for design engineers! Because the events at the microscale occur at different points in space and in time (inhomogeneity in space and in time), he explained, one cannot perceive their effects at the macroscale, such that smooth stress-strain curves may be actually a collection of discontinuous, infinitesimally small pieces. Dr. Drucker emphasized that the various existing definitions of stability of materials are not laws of nature, but are only used for classifying material behaviors. In particular, he pointed out the genuine instabilities that exist in frictional, granular materials, which in general follow a non-associative flow law. These instabilities may generate difficulties in the use of computer programs dealing with granular materials.

Editor's note: *Dr. Drucker has made many fundamental contributions to the field of plasticity of materials. He received numerous honors for his works, among which are his membership in the National Academy of Engineering, the ASME Timoshenko*

Medal, and the National Medal of Science in 1988. Dr. Drucker has been with the department for more than ten years. Prior to that, he was Dean of the college of engineering at the University of Illinois at Urbana-Champaign for sixteen years.

DEPARTMENT NEWS

Honors and Awards

Graduate Research Prof. N. Cristescu has been selected for inclusion in the 3rd Edition of *Who's Who in Science and Engineering*. He also delivered a number of invited lectures, e.g., (i) "Viscoplasticity of Anisotropic Rock," co-authored with Dr. O. Cazacu, Plasticity '95: The Fifth Int. Symp. and its Current Applications, Osaka, Japan, 17-21 Jul '95, (ii) "Constitutive equations for geomaterials," University of Waterloo, Canada, 17 Nov '95, (iii) "Stability of underground caverns and galleries," Federal Institute for Geological Sciences and Natural Resources, Hannover, Germany, 17 Dec '95, etc.

Assoc. Prof. R. Mei delivered an invited lecture on "The dispersion of particles with non-linear drag and history force in homogeneous turbulence," at the Sixth International Symposium on Gas-Solid Flow, ASME Fluids Engineering Meeting, Aug. 13-18, 1995, Hilton Head Island, S.C.

Prof. M.A. Eisenberg, who served as AeMES Chairman from 1986 until this Jan '96, is currently on special assignment off-campus until Aug '97. From Jan '96 through Jun '96, he is serving as Visiting Professor of Aeronautical Engineering, Mechanical Engineering & Mechanics at Rensselaer Polytechnic Institute (RPI), Troy, New York, where he is conducting collaborative research on constitutive modeling of viscoplastic response in engineering materials with Drs. E. Krempl and P. Hajela. From Jul '96 to Jul '97, he will be Distinguished Visiting Professor of Engineering Mechanics at the U.S. Air Force Academy, Colorado Springs.

Congratulations to **Ms. Janice Rockey** for her 20 years of service at UF, where she began to work in 1975. Jan joined the AeMES department in 1984 to work in Student Records, after having held several positions in Extension Dairy Science and Mechanical Engineering. She

was promoted to Administrative Assistant, and then Senior Secretary. Her service to UF is recognized with a 20-year service PIN.

Assist. Prof. C. Segal was invited to give a lecture on "Combustion of High-Energy-Density Fuels in Supersonic Flows" Rocketdyne, Inc., a division of Rockwell International, December 1995.

Assoc. Prof. R. Tran-Son-Tay was nominated by the United States National Committee of Biomechanics to join the US Delegation of 35 members to attend the 4th China-Japan-US-Singapore Conference on Biomechanics, Taiyuan, Shanxi, China, May 1995. There, he presented a paper titled "A Microrheometer for Studying the Rheological Properties of Sick Cell Suspensions and Hemoglobin."

Prof. B.V. Sankar has been selected for inclusion in the fourth edition of *Who's Who Among America's Teachers*, 1996. A select 5% of the nation's teachers are recognized. These teachers are nominated by students who have been cited for academic excellence in Deans' lists.

Assoc. Prof. L. Vu-Quoc was among the twenty two faculty members of the College of Engineering to receive the University of Florida 1995-96 Teaching Improvement Program Award. The awardees were selected based on the evaluation of students, peers, and on the recommendation to the Dean of a college committee made up of a representative from each department, together with a student. The Dean then recommended the awardees to the UF President.

Tenure and Promotion

Graduate Research Prof. N. Cristescu has been approved for tenure, effective Aug '96. See "Nadai award" for Dr. Cristescu's research accomplishments and current research interests.

Dr. N. Fitz-Coy has been approved for tenure and for promotion from Assistant to Associate Professor, effective Aug '96. See the list of "Current AeMES faculty" for Dr. Fitz-Coy's research interests.

Dr. B.V. Sankar has been promoted to the rank of full professor, effective Aug '95. Currently the Director for the Center for Studies of Advanced Structural Composites, he is exploring,

via experiments and modeling, various types of translaminar reinforcements (including stitching) to improve the delamination fracture toughness of laminated composite materials. He is also working on fracture and attrition of particles in granular flow.

Assoc. Prof. R. Tran-Son-Tay has been approved for tenure, effective Aug '96. See the list of "Current AeMES faculty" for Dr. Tran-Son-Tay's research interests.

Service to Profession

Dr. Dolores S. Krausche chaired the Education sessions at the 34th AIAA Aerospace Sciences Conference, Reno, Nevada, January 1996. The programs featured innovation in curricula, partnerships with industry, and an open forum, *New Frontiers in Aerospace Engineering*. The forum highlighted the latest developments in megaplanes, maglevs, mems, uavs, and the Pluto Express and debated the impact of ABET's Engineering Criteria 2000 on advancing innovation in education and industry. **Dr. Jeffrey Wright**, a graduate of our department, brought a student's perspective to the panel's discussion. To join the ongoing dialogue, please contact Dr. Krausche, (352) 378-1304.

Assoc. Prof. R. Mei organized a one-day workshop on the "Simulation and Measurement of Suspension Flows" on Friday, November 17, 1995 for the Engineering Research Center on Particle Science & Technology, at University of Florida. Invited to give lectures were well known researchers in the field, e.g., Dr. J. Brady of CalTech, Dr. T. Ladd of Lawrence Livermore National Lab, Dr. R. Adrian of University of Illinois at Urbana-Champaign, Dr. A. Sangani of Syracuse University, etc. **Assoc. Prof. L. Vu-Quoc** gave a presentation on his research on granular flow.

Assoc. Prof. R. Tran-Son-Tay co-organized the Cell Mechanics Symposium at the 1995 Bioengineering Conference, Beaver Creek, Colorado, Jun-Jul, '95. He also chaired the session on "Cell Mechanics - Biological Responses to Shear Stresses," and coauthored a paper titled "Hydrodynamics Force on a Viscous Cell Sticking to a Flat Surface" with Dr. W. Shyy, Mr. P. Jubin (a MS student working under the direction of Dr.

Tran-Son-Tay), and Dr. H.S. Udaykumar (a postdoc working with Dr. Shyy).

Prof. B.V. Sankar has been elected as the Chairman of the Education Committee of the American Society for Composites for a two-year period. The primary mission of the Committee will be to survey the composite materials curriculum in US universities, and to suggest improvements so that young engineers will be better prepared for tackling the engineering and environmental issues as the use of composite materials is expected to grow tremendously in the beginning of the next century.

Prof. B.V. Sankar, Prof. C.T. Sun of Purdue University and Dr. Y. Rajapakse of ONR organized a symposium on Dynamic Behavior of Composites at the ASME/IMECE in San Francisco last November. About 20 papers were presented at the Symposium, and the papers appeared in a bound volume entitled *Dynamic Response and Behavior of Composites* (1995) edited by C.T. Sun, B.V. Sankar and Y.D.S. Rajapakse, AD-Vol. 46, ASME, New York, NY.

Prof. B.V. Sankar and Prof. C. T. Sun of Purdue University are organizing a symposium on *Damage and Fracture of Composite Structures* at the ASME International Mechanical Engineering Congress and Exhibition to be held in Atlanta in Nov '96. For further information, please contact Dr. Sankar.

Assoc. Prof. L. Vu-Quoc was invited to serve on the ASME Dynamics of Structures and Systems Committee, starting in July 1995. The committee meets every year at the ASME International Mechanical Engineering Congress & Exposition (IMECE). In Nov '96, the IMECE will be held in Atlanta, GA.

Assoc. Prof. L. Vu-Quoc is organizing a symposium on the *Mechanics of Granular Materials*, as part of the joint ASME/ASCE/SES Summer meeting to be held at Northwestern University, Chicago, in Summer '97. The symposium is intended to provide a forum for exchanging ideas among researchers interested on the development of constitutive laws and computational tools for predicting the behaviors of granular materials. For more information, please contact Dr. Vu-Quoc; see also the Web page at <http://www.mech.nwu.edu/>

McNU97 for information on the conference.

Other Activities

We welcome **Dr. Oana Cazacu**, who joined our department as a Postdoctoral Fellow to work with Graduate Research Prof. Nick Cristescu. Oana is working on developing a constitutive law for powders, a research project funded by the NSF Engineering Research Center on Particle Science and Technology. Oana is also collaborating with Assoc. Prof. L. Vu-Quoc on the development of a finite element code for simulating the behavior of powders under consolidation. Oana received her Ph.D. in Civil Engineering from the University of Lille 1, in Lille, France, with a dissertation titled "Contributions to the elasto-viscoplastic modeling of an anisotropic rock." She gave a presentation on "Failure criterion for anisotropic shale," an outgrowth of her Ph.D. work, in the Solid Mechanics Seminar series in our department on 6 Feb '96.

In November 1995, **Assoc. Prof. D. Mikolaitis** was invited to present a seminar at the University of Central Florida on his work in combustion. His talk was about using fluid transients to alter flame chemistry for the purpose of reducing pollutant emissions. He also presented a paper co-authored **Assist. Prof. J. Abbitt**, titled "Using unsteady and non-uniform flows to alter flame chemistry" at the 6th International Conference on Numerical Combustion, New Orleans, March '96 (see the presentation graphics at URL: <http://grumpy.aero.ufl.edu/siam/siam1.htm> using Netscape 2.0).

Also welcomed to our department is **Dr. Akira Todoroki**, Assistant Professor at the Tokyo Institute of Technology, Japan, and a visiting scholar working with Prof. R. Haftka, since Oct '95, on the application of genetic algorithm to the design of composite laminates. From May '95 till Mar '96, Prof. Haftka also hosted Dr. Yoshiki Ohta, Associate Professor at Hokkaido Institute of Technology, Sapporo, Japan, who also worked on the same topic. In May '96, Prof. Haftka will host **Dr. Hiroshi Furuya**, Associate Professor at the Tokyo Institute of Technology; Dr. Furuya will stay at UF for two months to work with Prof. Haftka on the shape control of space structures.

Assoc. Prof. L. Vu-Quoc presented a paper titled "Galerkin projection for geometrically-exact sandwich beams allowing for ply drop-off," co-authored with his doctoral student, **Mr. H. Deng**, at the ASME Joint Applied Mechanics and Materials Summer Meeting, held at the University of California at Los Angeles, on 28-30 June 1995. The paper (no. 95-APM-7), a contribution by the ASME Applied Mechanics Division to this conference, appeared in the ASME Journal of Applied Mechanics, June 1995, as a dedication to the memory of Prof. Juan Carlos Simo, who was a former Chair of the Applied Mechanics Division, Mechanical Engineering, Stanford University, and who was a teacher and a friend of Dr. Vu-Quoc.

In Spring '96, the AeMES department received a trophy for "Department Award for Highest Employee Participation" in the UF Community Campaign. The Trophy will reside in the department for one year. Next year, the trophy will be given to the department with the highest participation in the College of Engineering. At the "Appreciation Party," Prof. M. Shuster and Prof. E. Partheniades respectively won a Gator Engineering hat and a T-Shirt in the drawing. The department and the college thank those who participated.

Congratulations

We share the happiness with **Mr. Hui Deng** and his wife, Mingxiu Che, for the birth of their first son, Matthew Deng, weight 9.5 lbs, on 27 Dec '95, in Gainesville. Both mother and son are doing very well. Hui is a doctoral student working on non-linear structural dynamics and geometrically-exact structural theories under the guidance of Dr. L. Vu-Quoc.

Congratulations to **Mr. Philippe Jubin** and his wife, Laurel, who are the proud parents of an 8 pounds 3 ounces, 20 1/2 inches boy, Marc Conner, born on February 20, 1996, in Gainesville. Philippe is a graduate student, working on the numerical simulation of cell adhesion and deformation for his M.S. thesis under the supervision of Dr. R. Tran-Son-Tay.

Congratulations to **Mr. Mahidhar Gundepudi**, a doctoral student work-

ing on the fracture mechanics of particles in granular flow under the direction of Prof. B. V. Sankar, on his being elected as the new President of the Indian Students Association at UF.

Assoc. Prof. D. Mikolaitis is happy to announce the birth of his second child, George Xavier Mikolaitis, on November 1, 1995. You can see a picture of George by pointing your Web browser to <http://grumpy.aero.ufl.edu/george.htm>. Harold Mikolaitis (age 4) was the first person associated with the department to have a personal Web page. You can find out more about him at <http://grumpy.aero.ufl.edu/harold.htm>.

Retirement

At the end of the Spring '96 semester, **Prof. C.T. Sun** will retire. He has been teaching in the AeMES department since coming from Iowa State University in 1979, where he held the positions of Assistant and Associate Professor. Dr. Sun holds a Ph.D. from Yale, a Master's degree from Stevens Institute of Technology, and a Bachelor's Degree from the National Taiwan University, Taipei, Taiwan. He came to the United States after serving two years in the Taiwanese army. In 1963, while attending Yale, he met his wife, Jenny, who was attending New York University. Dr. Sun has been active in research while at the University of Florida. His major interests include analytical and experimental investigation of damping, vibration control, damage and fracture of fiber reinforced composite materials. He has authored one book and more than fifty journal articles. He plans to remain

active in research, all be it, at a reduced level, and will continue to act as an advisor during his retirement. Dr. and Mrs. Sun are planning to remain in Gainesville, at least during the winters. He says he is looking forward to traveling around the country. He wants to visit mountainous areas such as Colorado, Utah, Alberta and Nova Scotia. The Suns have

three children: A son in Gainesville and two daughters, one in Boston and the other in Cleveland. Retirement will allow Dr. and Mrs. Sun to visit their daughters more often. We thank Prof. C.T. Sun for his excellent departmental contributions in teaching, research and service and hope that he enjoys retirement. A reception honoring the contributions of Prof. C.T. Sun was given at Dr. Shyy's home on 4 Apr '96.

RESEARCH AND TEACHING ACTIVITIES

Particle Science & Technology

A semi-annual Industrial Advisory Board (IAB) Meeting was recently organized on 20-21 Feb 1996 by the Engineering Research Center (ERC) on Particle Science & Technology, established by the National Science Foundation (NSF) at UF. The ERC is now in its second year of operation. Every year, the ERC hosts two IAB Meetings, and an NSF Review Meeting. Present at the IAB Meeting were many industry participants, ranging from large companies (e.g., Dupont, Shell, Rohm & Haas, Betz PaperChem, etc.) to small companies (e.g., Aveka, Conveyor Dynamics, etc.).



Chang-Tsan Sun

Also present was the NSF program director of the Engineering Education and Centers Division. At the February IAB meeting, **Assoc. Prof. L. Vu-Quoc** gave an overview of the research progress made by the Simulation, Modeling and Visualization Thrust Group—one of the six thrust groups in the ERC. The works in this group span from nanoscopic level (polymer coating), microscopic level (colloidal suspension), to macroscopic level (granular flow). **Dr. O. Cazacu** (see "Department news"), a member of the Dispersion and Consolidation Thrust Group, presented the research progress on work the development of a constitutive law for alumina powder.

Other AeMES faculty, graduate and undergraduate students who are involved in the ERC and who participated in this IAB Meeting were: Prof. N. Cristescu, Prof. B. Sankar, Assoc. Prof. R. Mei; Mr. M. Gundepudi, Mr. C. Hu, Mr. J. Jin, Mr. L. Lesburg, Ms. H. Shang, Mr. Xiang Zhang, Mr. Xueliang Zhang; Mr. B. Fuller, and Ms. H. Lobsinger. All students showcased their works in a poster presentation.

Pressure, Temperature and Shear Sensitive Coatings

The AeMES department hosted the Third Workshop on Pressure, Temperature and Shear Sensitive Coatings on May 8-10, 1995. The previous two workshops were held at McDonnell Douglas and at NASA Langley Research Center. The meeting focused on the latest developments in the use of pressure, temperature and shear sensitive coatings as a diagnostic technique. The workshop fostered interaction among governmental, industrial and academic researchers in this new instrumentation method. These optical diagnostic techniques are capable of obtaining full-field measurements on three dimensional objects with spatial resolutions and data rates that are unobtainable with conventional instrumentation. The University of Florida is one of the premier centers for the development of these technologies with the AeMES department playing a pivotal role.

The organizing committee for the workshop consisted of a multidisciplinary group of researchers: **Assist. Prof. J. Abbott**, **Assoc. Prof. B. Carroll**, and **Assist. Prof. P. Ifju** from the AeMES department, Dr. K. Schanze from the department of Chemistry at UF, and Dr. M. Morris from McDonnell Douglas in St. Louis. There were approximately 50 participants from a variety of locations including Automated Analysis Corp., Boeing, Canadian National Research Council, Carnegie Mellon, De Havilland (Canada), Georgia Tech, Lockheed, McDonnell Douglas, Micro Craft Technologies, NASA, Naval Air Warfare Center, Old Dominion University, Wright-Patterson Air Force Base, University of Toronto, University of Washington, and ViGYAN.

Stanford Linear Accelerator Center

Mr. Vinay Srinivas, a doctoral student working on electromagnetics and electronic materials under the guidance of Assoc. Prof. L. Vu-Quoc, spent an internship during the Summer 1995 at the Stanford Linear Accelerator Center (SLAC). There he worked on the development of finite element (FE) code for electromagnetic computation for analysis of particle wakes that will help the design of waveguides for linear accelerators in high-energy physics research.

Vinay successfully implemented an "edge" FE for accurate computation of the magnetic field and the electric field in the large FE code MODULEF. The results obtained from using his code proved to be more accurate, and corroborate experimental results better, than a previously developed code employed at SLAC. This success led the management of SLAC to offer Vinay an employment almost a year before his graduation, which is scheduled for May 1996. Vinay's doctoral thesis is on the development of accurate phenomenological models for ferroelectric materials, and on the development of electromagnetic computational formulation for advanced multilayer capacitors having a novel geometry.

In August 1995, Vinay gave an invited seminar on "An accurate methodology to obtain accurate phenomenological models for ferroelectric-ferroelastic materials" at the University of Singapore.

Introduction to Space: A New Course

Prof. M. Shuster, who has been with the AeMES department for a little more than a year, is teaching in Spring '96 a new 1000-level course titled *Introduction to Space*. The course is targeted toward lower-division students to satisfy the general education requirement in the physical sciences. Besides the obvious material on the history of space flight, the American and Russian space programs, space communications, and the like, the course will also treat such topics as the search for extraterrestrial intelligence, space colonization, astrology, UFO's and science fiction. Dr. Shuster, who was at the Applied Physics Laboratory of

the Johns Hopkins University before joining the AeMES faculty, began his career as a theoretical nuclear physicist, holding positions in France, Germany, and Israel as well as in the U.S. before turning his attention to Astronautics nearly twenty years ago. His most important contributions to Astronautics have been on spacecraft attitude determination. In the AeMES department he is working closely with Assist. Prof. N. Fitz-Coy to organize degree concentrations in Astronautics at all levels.

DEPARTMENT SEMINAR HIGHLIGHTS

Drift Mass, Energy, and Momentum

Graduate Research Prof. Emeritus C.S. Yih, who spends half a year (winter) in Gainesville, and the other half in Ann Arbor, Michigan, is back with us. Dr. Yih has been working on a nonlinear problem on long water waves. He gave a departmental seminar on his work titled "Kinetic energy and momentum in water waves," on Friday, 26 Jan '96.

We learned that Dr. Yih has successfully solved this difficult problem. In most textbooks on wave mechanics, particles underneath the waves are incorrectly considered to have circular motion, with decreasing amplitude with depth. Dr. Yih pointed out that particles under the waves are not moving in circles, but in spirals, in the direction of the waves, and thus the existence of drift mass. For example, the Nike shoes that were lost, in an accident some years ago from one of the cargo ship in the Pacific, and drifted ashore along the beaches of the northern West coast, is a result of the drift mass.

Formulating the nonlinear wave problem, Dr. Yih introduced a mathematical definition of drift mass. For deep water waves, the drift mass is equal to the mass of water in the circle with radius equal to the wave amplitude. With an ingenious, but simple, nonlinear transformation of variables, he was able to show that the kinetic energy of waves is equal to half the drift mass times the square of the phase velocity (celerity) of the waves, while the momentum is equal to the drift mass times the phase velocity. The results are simple and elegant; yet, it is surprising that

no one had ever thought about this problem before. Two years ago, Dr. Yih was already interested in a different type of drift mass, also known as the added mass of an object moving in an infinite and compressible fluid. Dr. Yih's result then was a generalization of Darwin's theorem, which focused on the same problem, but for incompressible fluid. We learned from Dr. Yih that the late Darwin, a physicist and author of the added mass theorem for incompressible fluid, was actually the grand son of the great Charles Darwin, the originator of evolution theory in biology.

The knowledge of the kinetic energy and momentum of waves will be helpful in the design of sea walls and devices to dissipate the momentum of waves. Understanding the effects of drift mass will be useful for recovering oil spillage at sea.

We are inspired by the continued scholarship of Dr. Yih, who still produces good works many years into his retirement. Congratulations, Dr. Yih, for a job well done, and for serving as a model scholar who inspires all of us.

Editor's note: *Dr. Yih is a member of the National Academy of Engineering.*

Research at Alcoa

We welcome back Dr. Ming Li, an alumnus and a former doctoral student of Graduate Research Prof. Emeritus D. Drucker. Ming came back to UF to visit and gave a seminar. He is currently working at the Material Mechanics & Microstructure Center of the Aluminum Company of America (Alcoa) in Pittsburgh, as a research engineer. There, he works on a number of topics of interest to industry having applications involving aluminum, e.g., aerospace industry, beverage industry (beer/Coca-Cola cans, etc.), and the automotive industry (aluminum car body). Ming spent one year doing postdoctoral work at the Institute for Mechanics and Materials at the University of California at San Diego, prior to joining Alcoa. During his visit on Friday, 16 Feb 95, he met with a number of faculty members and graduate students. Ming gave a seminar, on his works at Alcoa, titled "Micromechanics in metal forming." In particular, he discussed a practical procedure to determine the Fracture Limit Diagrams, serrated flow and

surface markings on aluminum sheets, and tool configurations for efficient cutting of aluminum sheets. Ming spent the following Saturday visiting the Druckers.

STUDENT ACTIVITIES

National Aerospace Engineering Honor Society

Sigma Gamma Tau (SGT) is the National Aerospace Engineering Honor Society. The University of Florida Chapter has 11 members (7 undergraduate and 4 graduate) and the faculty advisor is Dr. Norman Fitz-Coy.

This year Sigma Gamma Tau became involved in one service project, and plans to become involved in another. The first service project is the Top Twenty Tutors Program run by the College of Engineering's Student Support Services Center. In this program, SGT provides free Dynamics tutoring for two hours each week, while other honor societies within the College of Engineering provide free tutoring for other core engineering subjects. The other service project will be high school outreach with Santa Fe High School through the Southeastern Consortium for Minorities in Engineering (SECME.) This project will largely involve tutoring high school students and encouraging them to maintain an engineering track course load in high school.

On December 3, 1995, SGT hosted a departmental picnic at Lake Wauburg. Another picnic is being planned for the Spring 1996 Term as well.

On February 21-23, 1996, the Benton Engineering Council of the College of Engineering hosted its annual Engineering Fair at the O'Connell Center. This year's theme was "Engineering the World Around Us" and SGT set up a booth which featured information about Aerospace spin-offs. The booth also featured four paper airplane contests (two on Thursday and two on Friday). Our hard work and preparation were rewarded since we won the 3rd Place Award for Visual Presentation for Service Societies.

Biomedical Engineering Society

The Biomedical Engineering Society (BMES) is a gathering of under-

graduate and graduate students from various departments around campus but primarily from AeMES. Currently, the society has members from engineering (AeMES, mechanical, materials, electrical), neuroscience, and dentistry. Dr. R. Tran-Son-Tay and Dr. R. Hirko are the faculty advisors for the BMES. This spring the BMES chapter won a total of four awards, including 1st place theme integration and 3rd place overall, at the annual Engineering-fair where more than 40 engineering societies competed. We are doubly proud of our accomplishments considering our local chapter is only two years old!

CURRENT AEMES FACULTY

To acquaint alumni who graduated several years ago with the current constitution of our faculty, we provide below the complete listing of our faculty members, their degree date, their alma mater, the year they entered service at UF (in parentheses), their current rank, and their research interests. In the future, we will provide highlights of our faculty members in the newsletter, whenever appropriate occasions arise. For example, in this issue, we highlight the career and contributions of Dr. N. Cristescu on the occasion of his receiving the Nadai Award (See the article "Nadai Award"). We also have articles on the lectures of two distinguished colleagues, Dr. D. Drucker and Dr. C.S. Yih, who are two of the three members of the National Academy of Engineering (NAE) on our faculty. The third member is Dr. C. Taylor.

Wei Shyy

Ph.D., 1982, University of Michigan (88), Professor and Chairman, Computational fluid dynamics, combustion, propulsion, materials processing, microgravity sciences.

John D. Abbitt

Ph.D., 1990, University of Virginia (90), Assistant Professor, Aerodynamics, combustion.

Roland C. Anderson

Ph.D., 1965, University of Florida (66), Professor Emeritus, Optics, atmospheric science.

Bruce F. Carroll

Ph.D., 1988, University of Illinois at Urbana-Champaign (88), Associate Professor, Compressible fluid dynamics, experimental methods, shock wave/boundary layer interactions, pressure and temperature sensitive coatings.

Nicolae D. Cristescu

Ph.D., 1972, University of Florida (69), Graduate Research Professor, Theory of

plasticity, wave propagation, mechanics of continuous media.

Harold W. Doddington

Ph.D., 1972, University of Florida (66), Engineer, Instrumentation and control, electronic circuit and system design, human physiology.

Daniel C. Drucker

Ph.D., 1940, Columbia University (84), Member NAE, Graduate Research Professor Emeritus, Photoelasticity, plasticity, mechanics of metal cutting and deformation processing, stress analysis, soil mechanics, materials engineering.

Ibrahim K. Ebcioğlu

Ph.D., 1958, University of Minnesota (61), Professor, Mechanics of continua, layered plates and shells.

Martin A. Eisenberg

D.E., 1967, Yale University (66), Professor, Mechanics of solids, theory of plasticity, inelastic wave propagation, computer methods of structural analysis.

Richard L. Fearn

Ph.D., 1965, University of Florida (65), Professor Emeritus, Fluid dynamics, aerodynamics.

Norman G. Fitz-Coy

Ph.D., 1990, Auburn University (91), Assistant Professor, Dynamics and control of multibody systems, game theory, orbital dynamics, flight mechanics.

Raphael T. Haftka

Ph.D., 1971, University of California-San Diego (94), Professor, Structural and multidisciplinary design optimization, genetic algorithms, reliability-based optimization, sensitivity of structural response to problem parameters.

Gene W. Hemp

Ph.D., 1967, University of Minnesota (67), Vice Provost and Professor, Non-linear oscillations, applied mathematics, biomechanics, dynamic material properties.

Robert J. Hirko

Ph.D., 1974, Carnegie-Mellon University (80), Associate Engineer, Electronics, instrumentation.

Chen-Chi Hsu

Ph.D., 1965, University of Michigan (78), Professor, Computational fluid dynamics, engineering mechanics, applied mathematics.

Peter G. Ifju

Ph.D., 1992, Virginia Polytechnic Institute & State University (93), Assistant Professor, Experimental mechanics, moiré interferometry and composite materials

David A. Jenkins, P.E.

Ph.D., 1973, University of Florida (77), Associate Engineer, Materials, structures, design, experimental stress analysis, instrumentation, failure analysis.

Dolores S. Krausche

Ph.D., 1975, University of Florida (90), Assistant Engineer, Infrared engineering, including signature and detectability assessment, design and development of countermeasures for military systems; magneto-astronomy.

Ulrich H. Kurzweg

Ph.D., 1961, Princeton University (68), Professor, Fluid mechanics, magneto-hydro-

dynamics, applied mathematics, heat transfer by high-frequency oscillations.

Bernard M. Leadon, Jr.

Ph.D., 1955, University of Minnesota (64), Professor Emeritus, Fluid mechanics, heat transfer, gas dynamics, micrometeorology, applied mathematics.

E. Rune Lindgren

Tekn. Dr., 1957, Royal Institute of Technology, Sweden (65), Professor, Mechanics, fluid mechanics, magneto-hydrodynamics, physicochemical hydrodynamics.

Sung Y. Lu

Ph.D., 1959, Carnegie Institute of Technology (59), Professor Emeritus, Stress analysis, mechanics of structures.

Lawrence E. Malvern

Ph.D., 1949, Brown University (69), Professor Emeritus, Continuum mechanics, elasticity, plasticity, dynamic material properties, inelastic stress wave propagation.

William H. McClure, Jr.

M.B.A., 1970, Georgia State University (89), Coordinator, Research Programs/Services; Department Administrator Finance, contract and grant administration, planning and budgeting, management, administration, management analysis, special studies.

Renwei Mei

Ph.D., 1990, University of Illinois at Urbana-Champaign (90), Associate Professor, Two-phase flow, turbulence, computational fluid dynamics.

David W. Mikolaitis

Ph.D., 1981, University of Illinois (82), Associate Professor, Fluid mechanics, combustion theory, applied mathematics.

James E. Milton

Ph.D., 1966, University of Florida (66), Engineer and Resident Director (Eglin APB), Aerodynamics, terradynamics, flight dynamics.

Gale E. Nevill, Jr., P.E.

Ph.D., 1961, Stanford University (64), Professor, Expert systems for conceptual design, computer-aided decision analysis, robot touch sensing.

Emmanuel Partheniades

Ph.D., 1962, University of California (68), Professor, Tidal hydrodynamics, stratified flow, salinity intrusion, erosion and sedimentation dynamics of turbulent flows.

C. Allen Ross, P.E.

Ph.D., 1971, University of Florida (58), Professor Emeritus, Aerospace structures and materials, composite materials, experimental stress analysis.

Bhavani V. Sankar

Ph.D., 1984, Purdue University (86), Professor, Composite materials and structure, impact-fracture and micro-mechanics, textile composites, layered materials and structures.

Corin Segal

Ph.D., 1991, University of Virginia (91), Assistant Professor, Fluid mechanics, combustion, fluid diagnostics, aircraft design.

Malcolm D. Shuster

Ph.D., 1971, University of Maryland (94), Professor, Spacecraft navigation, parameter estimation and system identification, spacecraft attitude determination dynamics and control.

Chang-Tsan Sun

D.Eng., 1964, Yale University (79), Professor, Mechanics of composite materials, fiber-reinforced plastics, fracture mechanics, damping damage tolerance, non-destructive testing of polymer matrix composites.

Charles E. Taylor

Ph.D., 1953, University of Illinois (80), Member NAE, Professor Emeritus, Photoelasticity, composites, holography.

Roger Tran-Son-Tay

D.Sc., 1983, Washington University (93), Associate Professor, Biomedical engineering, rheology, fluid mechanics.

Loc Vu-Quoc

Ph.D., 1986, University of California-Berkeley (88), Associate Professor, Computational mechanics (finite elements, boundary elements, dynamics of flexible structures formulation and computation), optimization and control.

Edward K. Walsh

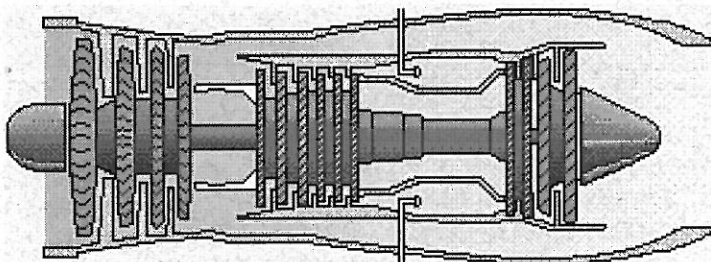
Ph.D., 1967, Brown University (70), Professor, Continuum mechanics, visco-elasticity, wave propagation, bioengineering.

Deborah Weissman-Berman

D.S., 1989, Eurotechnical Research University (90), Scientist, Courtesy, Sandwich composite materials, elastic and inelastic response.

Chia-Shun Yih

Ph.D., 1948, State University of Iowa (88), Member NAE, Graduate Research Professor Emeritus, Fluid mechanics, stratified flow, history of mechanics.



AeMES on the World Wide Web

The department has established a site on the World Wide Web at the URL <http://www.aero.ufl.edu>. The site is an on-going project, mostly under the direction of Assoc. Prof. D.W. Mikolaitis. A special feature for alumni is our *Alumni News Page* (<http://grumpy.aero.ufl.edu/alumpost.htm>), where you can read the postings of other alumni. You can also post your own message by following the links to the Alumni Add-A-Post Page. You can either learn about, or convey to graduating students, information on job opportunities through the department Web page. Other information about the department activities that does not fit in the newsletter can also be found in the Web page, e.g., the recent G.I. Taylor Memorial Lecture of Prof. D. Drucker, etc. If your news can also be disseminated through the newsletter, please send an e-mail to the editorial board as well.

The newsletter will be on-line in the future. If you post to our Alumni News Page, we will automatically add your name to our Alumni News Mailing List and we will send you an e-mail announcement when the next newsletter is on-line (unless, of course, you don't want to be included in our e-mailing list). Come visit our site, post a note, and let us know how our Web presence can be improved to serve you better.

AeMES: 50 Years of Service to the State and to the Nation

1996 marks the 50th year of continued dedicated service of the AeMES department to the State and to the Nation in the formation of engineers who can take on new challenges at the forefront of technology. The department has evolved over the years through departmental mergers and name changes. A complete history of the department can be found in the Spring '96 issue of the Florida Engineer, which is distributed to all alumni. Below is the history of the changes in our department's name, and the list of all Chairmen from the founding time up to today.

1946 Aeronautical Engineering department founded; Robert A. Thompson, Chair 1948 Engineering Mechanics department founded; 1948 H.J. Hansen, Chair. First graduating undergraduate class in Aeronautical Engineering.

1949 William L. Sawyer, Chair - Engineering Mechanics department

1956 John W. Hoover, Interim Chair; Capt. Raymond E. Doll, Chair - Aeronautical Engineering department

1957 John W. Hoover, Interim Chair - Aeronautical Engineering department

1960 First Engineering Mechanics Ph.D. degree

1961 Aeronautical Engineering department changed name to Aerospace Engineering; Mark H. Clarkson, Chair

1962 First graduating undergraduate class in Engineering Science

1964 William A. Nash, Chair - Engineering Mechanics department

1965 First Aerospace Engineering Ph.D. degree

1967 Gale E. Nevill, Jr., Chair - Engineering Mechanics department

1972 Aerospace Engineering and Engineering Science and Mechanics departments merged to form Engineering Science, Mechanics & Aerospace Engineering department; Lawrence E. Malvern, Interim Chair

1973 Knox T. Millsaps, Chair - Engineering Science, Mechanics & Aerospace Engineering department

1974 (Engineering Science, Mechanics & Aerospace Engineering) and (Coastal and Oceanographic Engineering) merge to form Engineering Sciences department

1986 Martin A. Eisenberg, Chair - Engineering Sciences department

1987 Engineering Sciences department changed name to Aerospace Engineering, Mechanics & Engineering Science department

1996 Wei Shyy, Chair - Aerospace Engineering, Mechanics & Engineering Science department

Mark your calendar: The AeMES department wants to welcome its alumni "home" for a celebration of the 50th Anniversary of the founding of the AeMES department. On September 7, 1996, the faculty and students of the department will host an open house and BBQ to showcase 50 years of department history. Tours will be available and demonstrations provided. All alumni and friends are invited to attend the celebration which will be held prior to the home football game between the Gators and Georgia Southern University. Watch your mail for an invitation and more details this summer. This event will be held in conjunction with the UF National Alumni Association's 35, 40, and 45 Year Reunion.

Letter to AeMES Alumni

Dear AeMES alumni, we would like to receive your news, which could fall into one of, but not necessarily limited to, the categories listed below:

- ☐ Profile of successful alumni
- ☐ Awards received by alumni
- ☐ Career move: Promotion, joining another company, etc.
- ☐ Professional accomplishments
- ☐ Updated addresses of alumni (including e-mail)

In addition, we would like to know if

- ☐ You would like to come "home" to AeMES to give a seminar on your works for AeMES faculty and students
- ☐ You know of opportunities for summer jobs or internships for AeMES students
- ☐ You have any tips on job opportunities for graduating AeMES students
- ☐ You have any idea on how to improve the AeMES newsletter (contents, design, layout, etc.).

In return, please let us know what we can do for you, in addition to the newsletter, e.g.,

- ☐ AeMES faculty/students to give presentations at your institution
- ☐ List of research publications by AeMES faculty/students
- ☐ List of graduating undergraduate and graduate students looking for jobs

You could give us your news via the department Web site (see "AeMES on the World Wide Web"). For news items that are to be printed in the newsletter, it is much easier, however, if you also send your news via e-mail, or via "snail" (postal) mail, to the editorial board.

Also, please don't forget to mark your calendar the day when you would come "home" to UF and to Gainesville—the "Number one city in the USA" (as ranked by the *Money Magazine* in 1995)—for the 50th Anniversary Celebration of the AeMES department. This celebration is promised to be memorable and fun (See "AeMES: 50 years of service to the State and to the Nation").



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