NEWSLETTER FOR ALUMNI, FRIENDS & STUDENTS

FALL 1999

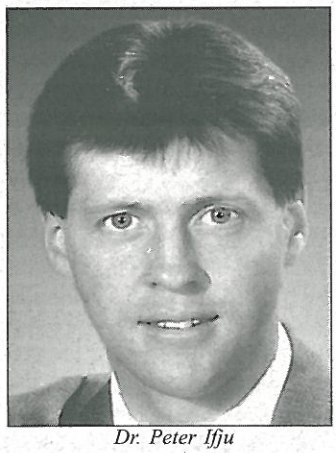
# THE STREAMLINE

AEROSPACE ENGINEERING, MECHANICS & ENGINEERING SCIENCE

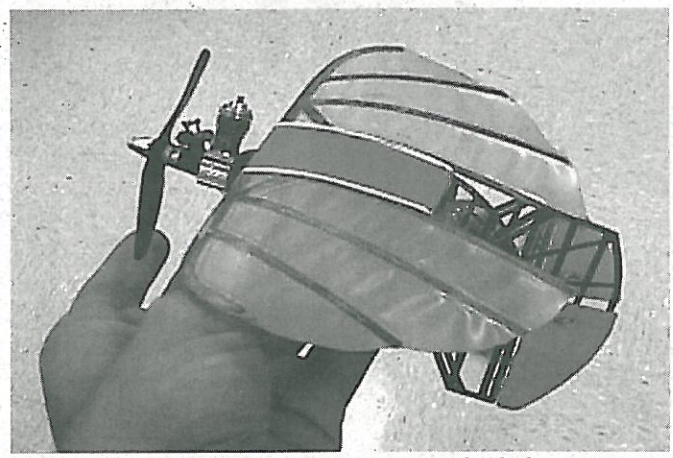
## UF Team Dominates Micro Aerial Vehicle Competition

After three years of research on Micro Aerial Vehicles (MAVs), the AeMES Department has made its first major technological breakthrough. The resulting MAVs are based on a new paradigm using flexible wings made with a carbon fiber skeleton and latex rubber skin. A novel construction method, using a carbon fiber framework, was also developed to enhance durability while decreasing weight. The combination of the construction method and flexible wing has resulted in a fleet of MAVs that have favorable flight characteristics including superior stability, dampened/smooth flight, and increased durability. MAVs with a maximum dimension as small as six inches have been flight tested using only off-the-shelf servo and radio control components.

This year at the Third Annual International Micro Aerial Vehicle Competition on May 8, 1999, hosted by the University of Florida, the AeMES Department dominated all of the competition categories. The UF team included students Scott Ettinger, Luis Martinez, Domenico Ruggerio, and Craig Yates along with faculty advisors Peter Ifju, David Jenkins, Raphael Haftka and Edward Walsh. In the surveillance competition, which required the team to capture a video image of a target 600 meters away from the launch zone, the UF team won with the smallest plane ever to complete the mission at 12 inches. The 12 inch airplane was equipped with a small color video camera and transmitter. Last year's winner Steve Morris from MLB Inc. won the competition with a MAV having a maximum dimension of 15 inches. Two years ago, the winning airplane had a maximum dimension of 30 inches. Next year, far smaller planes can be expected. "We have made some real progress since the competition. We currently have an airplane with a maximum dimension of 8 inches capable of completing the mission" said Ifju and Jenkins.



*Dr. Peter Ifju*



*Six-inch wing-span Micro Aerial Vehicle*

In the payload competition, the entrants were required to carry a 2-ounce block of aluminum for 2 minutes and land within the take-off and landing zone. The UF team won the payload competition with a plane with a maximum dimension of slightly less than 12 inches. The next smallest airplane had a maximum dimension of 15 inches.

The competition was sponsored by AIAA, Sanders Corporation, Boeing Corporation and the UF AeMES Department. The UF team members split the prize money, totaling $1500.

Over a year ago Dr. Ifju proposed using flexible wings, based on his windsurfing sails, for small aircraft. In windsurfing, one of Ifju's hobbies, the sail is an adaptive airfoil which produces near constant lift over a wide wind range, even in gusty wind conditions. This is possible because the

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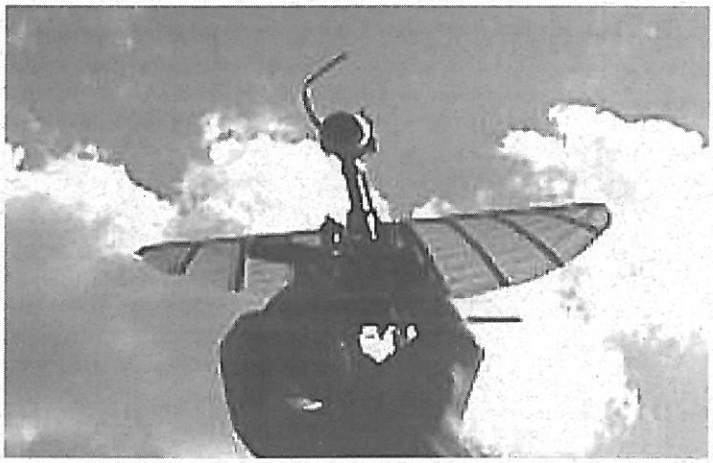
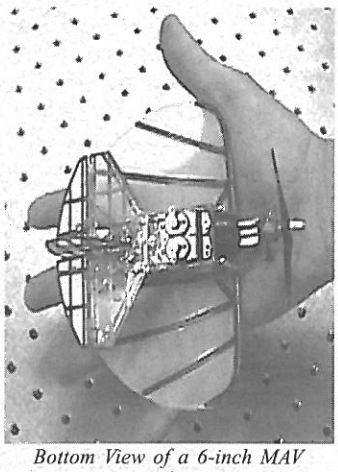
**Millsaps-Taylor Memorial Lecture in Feb 2000 by Prof. S. Nemat-Nasser, University of California, San Diego (see page 2).**

UNIVERSITY OF FLORIDA



*AeMES' MAV entry with mounted video camera for the competion*

airfoil changes shape by twisting. "This behavior, if tuned properly, can significantly reduce the erratic behavior of lightweight aircraft in gusty wind conditions. Over the last half year we have built numerous prototypes before settling on our current design" said Ifju.



*Bottom View of a 6-inch MAV*

The wings on the University of Florida's MAVs bear an uncanny resemblance to those of a bat or large insect. "It was our intention to mimic nature when we designed the wings" Dr. Ifju says. During flight the wings flutter, which Dr Ifju and Dr. Jenkins think actually improves the flight characteristics by adding unsteadiness to energize the flow field. "While structures in nature are generally highly optimized, there are some structures which simply cannot be produced in biological systems" explains graduate student Scott Ettinger. "We try to combine the best of both". The team's novel construction method both greatly enhances durability and reduces development time by allowing rigorous flight testing. "We haven't busted up a single plane in the last three months" says undergraduate student Luis Martinez.

Recently the MAV effort has received a great deal of attention due to a press release on the AP with reports in many local and national newspapers, radio spots, TV news stories, and articles in nationwide magazines such as Business Week Magazine. For more information, visit our Web site at www.aero.ufl.edu.

*Student Scott Ettinger and Dr. Ifju at the competition*

## Knox Millsaps Memorial Endowment Fund

Our department's first endowment fund was established ten years ago by family, friends and colleagues of Knox Millsaps. Its purpose is to provide long-term support to encourage and reward excellence in performance by undergraduate and graduate students and to enhance the intellectual environment of our Department by supporting visits from distinguished colleagues.

After transfers to an account from which awards are made, the endowment principal grew about 11% through new gifts and investment earnings during the fiscal year ending June 30. Awards made during the past fiscal year in the three major categories were:

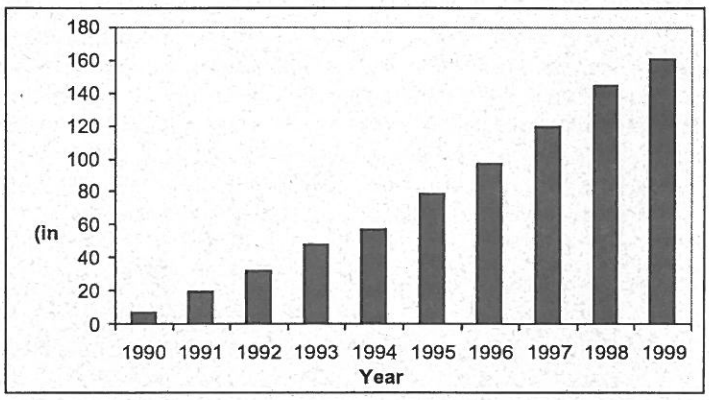
Awards to Undergraduate Students $2,078

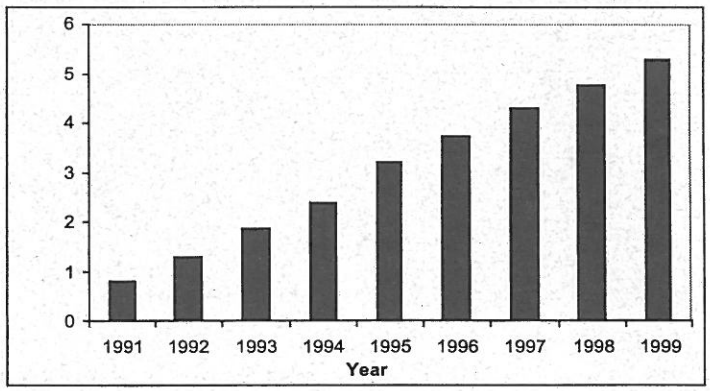
Awards to Graduate Students $ 895

Taylor & Millsaps Lecture Series $2,225

Total $5,198

The growth of the fund during the past ten years is shown in the two bar charts below. We thank our donors who have enabled us to endow this collection of student awards and lecture series. Dr. R. Fearn has stepped down as Chairman of the Advisory Committee of the Fund. This position is now assumed by **Dr. D. Mikolaitis** (dwm@aero.ufl.edu), who can be contacted for more information on the Fund. We thank Dr. Fearn for his excellent and dedicated service to the department.




## 4th Knox Millsaps Memorial Lecture, Fall '99: Sia Nemat-Nasser

### Millsaps-Taylor Lecture

We remind the readers that in Feb 2000, the Millsaps-Taylor lecturer will be **Dr. Siavouche Nemat-Nasser**, John Dove Isaacs Chair in Natural Philosophy and Professor of Applied Mechanics and Engineering Science at the University of California at San Diego. Dr. Nemat-Nasser is also the current Director of the Institute for Mechanics and Materials and the Editor-in-Chief of the international journal *Mechanics of Materials*. Dr. Nemat-Nasser's research covers a wide area, including the dynamic behavior of ductile materials; environmental effects and aging of polymeric composites; physically-based computational modeling of saturated soils; a new ap-

proach to structural reliability in fatigue failure; dynamic response, residual strength, and failure modes of rock, concrete, ceramic, ceramic/metal composites, and ceramics-metals-polymeric composite hybrids. His Millsaps-Taylor lecture will present new results on dislocation-based dynamic flowstress of metals over a temperature range extending from 77 K to 1300 K.

## DEPT NEWS

### Honors and awards

**Dr. R. Haftka** has been promoted to Distinguished Professor, and **Dr. L. Vu-Quoc** to Professor, effective August 1999.

**Prof. R. Tran-Son-Tay** was elected Secretary General of the International Society of Biorheology during the 10th International Congress of Biorheology in Pecs, Hungary, Jul '99.

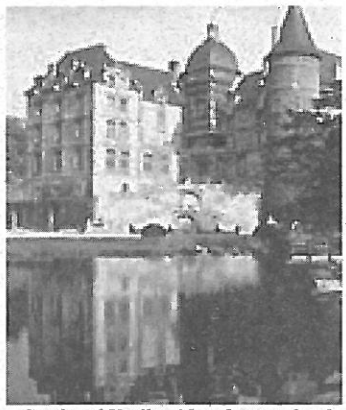
### Teaching activities

### Biomedical Engineering Graduate Program at UF

This recent degree-granting program was approved by the Florida Board of Regents in 1997, and is enrolling its first students this Fall. The program has four areas of specialization: (1) Biomaterials, (2) Biomechanics, (3) Molecular, cellular & Tissue engineering, and (4) Biomedical imaging and processing. The biomedical program recently received a $1 million Special Opportunity award from the Whitaker Foundation in Apr '98 to establish a Biomedical Engineering Departmental structure. The grant provides funds for faculty support, students fellowships, and seed money for research. Dr. Christopher Batich of Materials Science & Engineering is the program director, and **Dr. R. Tran-Son-Tay** of AeMES and Dr. Richard Melker of Anesthesiology are the co-directors. BioMedical Engineering (BME) is an area of growing interest. At present, the BME program has 34 enrolled graduate students.

### Student-exchange program between UF and INPG, France

Undergraduate UF engineering students can now spend one term studying at the INPG (Institut National polytechnique de Grenoble, or National Polytechnic Institute of Grenoble), France, with free tuition. Vice versa, French undergraduate students from INPG can come to study at UF for one term with free tuition.



*Castle of Vizille, 15 miles south of Grenoble, where the French Revolution started*

On 30 Sep '99, Dr. Yves Brunet, the Presendent of INPG, came to UF to sign an agreement on student exchange between UF and INPG, France. He also gave a presentation about INPG to UF engineering department chairs and representatives.

INPG is a consortium of nine engineering schools (or departments) that are part of the University of Grenoble, about one hour by road from Lyon (the second or third largest city in France). Grenoble, once hosted an Olympic game, also has several beautiful nearby ski resorts, with the closest about 20 min to half an hour from campus. The oldest department in INPG was established at about the beginning of the 20th century. Grenoble is a university town with about 400 thousand inhabitants, and with a student population of about 54 thousand (11% of the total population). The city has also many industrial companies, including branches of American companies such as HP, Rank Xerox, Bull, Carterpillar, etc. The university and its laboratories have about 8,500 researchers (5300 on fundamental research, and 3200 on applied research). INPG has overall more than 4000 students, which include about 1000 graduate and 200 PhD students. There are 32 laboratories managed by the engineering departments.

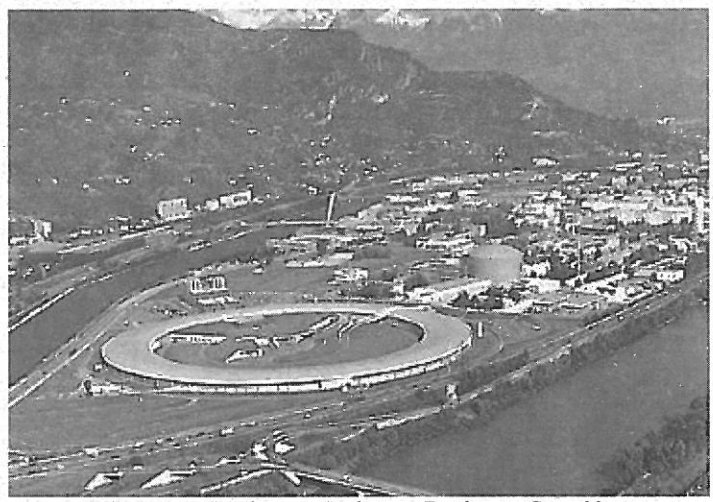
INPG has a goal of having 50% of their fifth-year students going abroad

*Mount Vercors, 1000m-2000m altitude, 30 min from Grenoble*

to study for three to six months. This study could also last for a year. They can either work on their fifth-year thesis, or take courses, with credits approved by their home depart-ments. The five-year engineering degree at INPG is equivalent to more than a BS, and less than a Master. Often, an equivalent to a Master's degree is given to these students, when they study at US institutions. It is also possible that fifth-year INPG students can study for a year at a US institution, and receive both a Master's degree from that US institution and an engineering degree from INPG. The format of the exchange is very flexible; many arrangements can be worked out. Currently, 30% of their fifth-year students went abroad to institutions from all over the world, including Asia (Japan, Singapore, Vietnam, etc.). Their goal is to bring this number up to 50%. Their motivation to work hard for such an exchange program is to train French engineers to work with other foreign engineers in the current global economy environment.

In return, undergraduate UF engineering students can spend three to six months studying at INPG. Issues regarding the transfer of credits can be worked out. Most French professors, researchers, and students can speak English. The issue of language will not be a problem.

For more information about INPG, you can visit the web site *www.inpg.fr*. For information about the student-exchange program, please contact **Dr. Vu-Quoc**, who was himself an undergraduate exchange-student from France to the US during the 1977-78 academic year.



*European Synchrotron Radiation Facility in Grenoble*

### Research Activities

**Assoc. Prof. Bruce Carroll** joined the AeMES faculty in August 1988. Coming to Florida was really coming home to Dr. Carroll, who has deep roots in the State. His great grandfather was a member of the Florida Legislature and his mother was raised in Volusia County near Daytona Beach. Many of his relatives still work together on the family farm in Seville, FL.

Prior to moving to UF, Dr. Carroll lived in his birthplace, Urbana, Illinois,

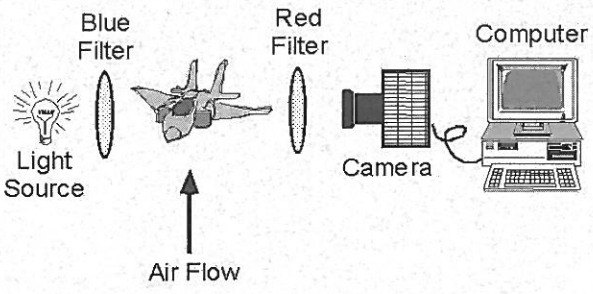
where he was earning a PhD in Mechanical Engineering from the University of Illinois. Before that he obtained a BS and an MS in Mechanical Engineering from Texas A&M University. While working on his graduate degree's, Dr. Carroll received an Office of Naval Research graduate fellowship which enabled him to spend time during the summer at the supersonic wind tunnel facilities of the Naval Surface Warfare Center in Silver Spring, MD. This association continued with Dr. Carroll spending a summer at NSWC as a part of the Navy Summer Faculty Program.

*Dr. B.Carroll*

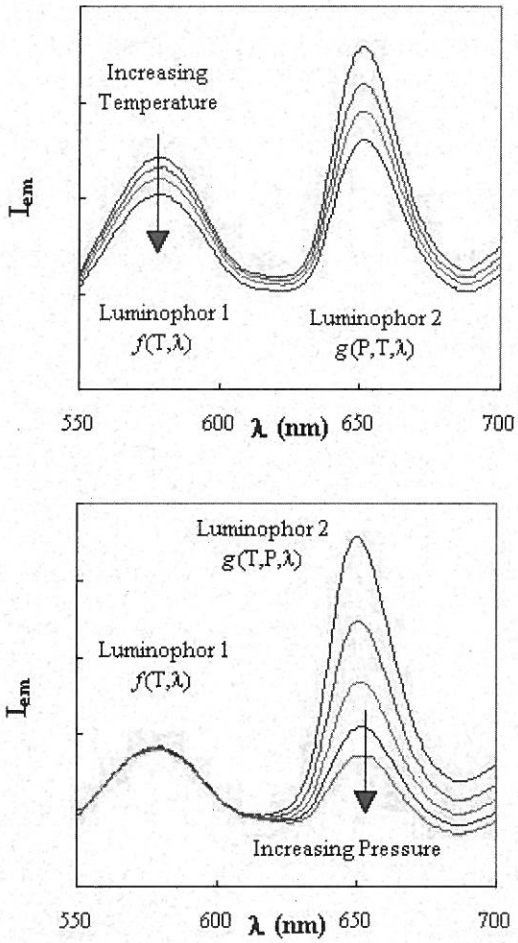
One of Dr. Carroll's current research activities grew out of his earlier work at NSWC with shock wave/turbulent boundary layer interactions. A need to measure pressure distributions over a porous plate in a supersonic inlet led him to begin studying a new full-field pressure measuring technique called Pressure Sensitive Paints or PSP. The big advantage of PSP is that it eliminates the need for traditional pressure taps. The optical technique uses a low noise scientific grade CCD camera to quantitatively determine the luminescence output of the PSP coating. The PSP coating is composed of oxygen sensitive luminophores dispersed in an oxygen permeable binder. The luminescence intensity is proportional to the oxygen concentration within the coating, which in turn is proportional to the surface pressure through mass diffusion and sorption processes.

The PSP technique has great potential to provide early pressure and loads information during the development of new aircraft. One of the difficulties with the technique is that the time response of typical PSP coatings is relatively slow, with time constants on the order of one second. In collaboration with Dr. Kirk Schanze in the Department of chemistry at UF, new PSP formulations have been developed for use in short duration hypersonic shock tunnels with run times of only 5 or 10 milliseconds. Dr. Carroll and his students have developed detailed models of the PSP behavior and corresponding dynamic correction schemes. They can now confidently make full-field unsteady measurements.

A second difficulty with PSP is that the coatings also exhibit a temperature dependence. In fact, temperature sensitive paints or TSP have also been developed, and are finding use in boundary-layer transition studies on transonic and hypersonic vehicles. One of the areas that Dr. Carroll has pursued, again in collaboration with the Department of Chemistry, is the development of multi-luminophore coatings capable of measuring both pressure and temperature. The luminescence output must be spectrally resolved to separate the pressure and temperature information. Dr. Carroll's team is applying techniques common to hyperspectral imaging to decouple the spectral data. These techniques, commonly called factor analysis in




*Schematic of a Pressure Sensitive (PSP) system. Blue light excites the PSP coated model. Intensity of the red shifted luminescence is digitized and converted to pressure*



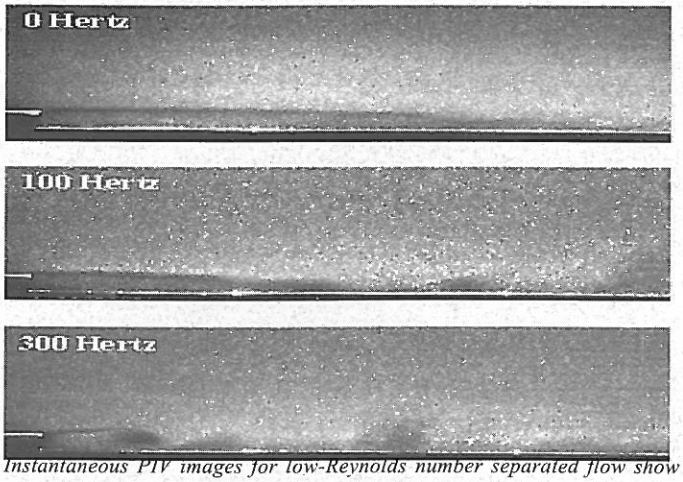

*Spectroscopic data for a dual-luminophor temperature/pressure sensitive paint: (Top figure) Constant pressurewith changing temperature; (Bottom Figure) Constant temperature with changing pressure*

analytical chemistry, are similar to Proper Orthogonal Decomposition or POD often used in fluid mechanics and control theory. The POD analysis is yielding valuable information on the molecular interactions between the pressure and temperature sensing luminophores, which is being used as a guide by the organic chemists in developing improved coatings. The POD is also being explored as the basis of a general purpose calibration algorithm for aerospace applications of PSP and TSP.

Much of Dr. Carroll's work with PSP and TSP has been in supersonic and hypersonic flows. However, Dr. Carroll is also working on the other end of the aerospace vehicle speed range. He is the principal investigator on a project exploring the use of Micro Electro-Mechanical Systems (MEMS) on Micro Air Vehicles (MAV's). MAV's are small airplanes with characteristic lengths on the order of six inches and flight speeds of only 20 or 30 mph.


*Test geometry of low-Reynolds-number separation/reattachment control experiments. The piezo actuated flap is driven at frequencies up to 500 Hz and the MEMS based sensor array detects the reattaching shear stress*

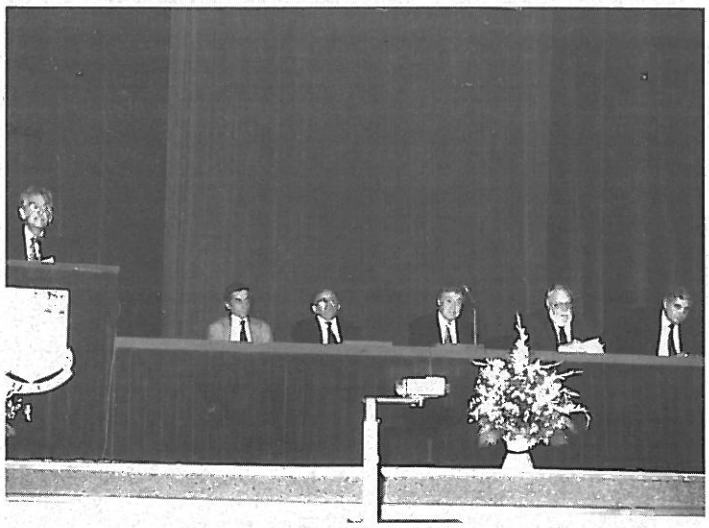
The flow on these low-Reynolds-number vehicles is prone to laminar separation on the upper wing surface. Small scale actuation at the separa-




*Instantaneous PIV images for low-Reynolds number separated flow show formation of large-scale structures with increasing actuation frequency*

tion point can have a substantial impact on the flow through the stimulation of natural instabilities in the separated shear layer. Particle Image Velocimetry (PIV) measurements show that this type of actuation can effectively manipulate the size of the separation region. MEMS sensors are being used to provide a feedback signal to control the size of the separated region as free stream velocity and angle of attack are varied. Two types of feedback control are being considered. The first, a fuzzy controller, is currently being implemented in the AeMES low speed wind tunnel. Preliminary results indicate that the fuzzy controller will provide a robust control scheme. The second type of controller is a model-based controller. Inspired in part by his use of POD for pressure and temperature sensitive paints, Dr. Carroll is using POD to identify large-scale structures in the transitioning shear layer. This identification is then being used as the basis of a reduced order model of the complicated flow field. Dr. Carroll is collaborating with numerous faculty members on this exciting project, including Drs. Cattafesta, Kurdila, Fitz-Coy, Sheplak, and Shyy in the AeMES department and Dr. Nishida in the Department of Electrical and Computer Engineering.

In addition to his research activities, Dr. Carroll puts substantial effort into teaching and service. He has been recognized by his students on three separate occasions with the AeMES Teacher of the Year Award. His teaching efforts were also recognized by a Teaching Improvement Program award. Over the years, Dr. Carroll has been involved in several outreach programs to improve science education in K-12 programs. He received an Exemplary Math, Science and Technology Program Award from the Florida Postsecondary Education Planning Commision. This award recognized Dr. Carroll's program as one of the top three university-based K-12 outreach programs in the State of Florida.



*Dr. N.D. Cristescu giving a welcoming address at MECASALT5, with Dean Win Phillips sitting at the center (third from right)*


*Group photo of the participants at MECASALT5*

## Service to profession

**Grad. Res. Prof. N. D. Cristescu** delivered an invited plenary one hour lecture at the Fourth International Conference on Constitutive Laws in Engineering Materials, the Rensselaer Polytechnic Institute, in Troy, New York, 27-30 Jul 1999, where 124 papers were presented.

Dr. Cristescu was also Chairman of the 5th Conference on the Mechanical Behavior of Salt (MECASALT5) held in August 9-11, 1999, at the University of Bucharest, Romania. The Conference was sponsored by the Sandia National Lab, University of Bucharest, University of Florida, Romanian Academy, Pennsylvania State University and SALROM (Autonomous Administration of Salt-Romania). These periodic conferences are bringing together scientists from many countries, interested in rock salt mechanics.

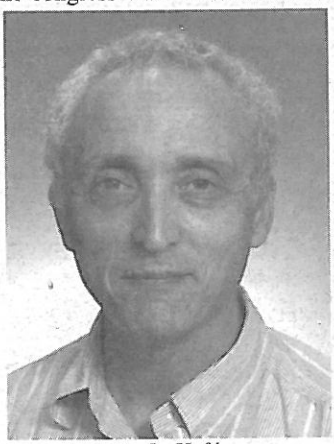
*Salt "mountain" at Slanic, Romania*

Speaking at the opening ceremony were Prof. I. Mihailescu, Rector of the University of Bucharest, Prof. I. Barbu, Vice President of the Romanian Academy, Dr. W. M. Phillips, UF Dean of the Graduate School, Dr. F. Hansen, Sandia National Lab, Prof. H. Reginald Hardy, Jr., University of Pennsylvania, and Dr. N.D. Cristescu.

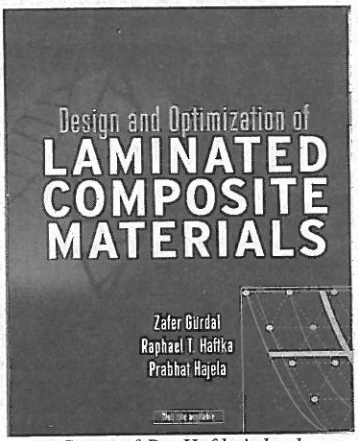
There were 47 papers, organized in 9 technical sessions, from the USA, Germany, England, Canada, France, Russia, Ukraina, Bulgaria, Spain and Romania. The main problem discussed was the safe storage in rock salt of radioactive wastes and of other dangerous materials, and that of storage of petroleum products and gases in huge underground caverns. That is why the mechanical properties of rock salt are to be carefully studied. Rock salt has very peculiar mechanical properties. The mining problems concerning rock salt are also of interest.

At the end of the conference (11 Aug) the participants had a chance to see a Total Solar Eclipse, which was observed in Bucharest with a duration of more than 2 minutes. In the following days, a trip to several salt mines in Romania was organized. Due to the generous support of SALROM, the welcome cocktail, the banquet and the tourist trip at the salt mines were free for all participants. Dr. Cristescu is also the editor of the conference proceedings, which will be published by Trans Tech Publ, Germany.

Dr. Cristescu also participated at the 9th International Congress on Rock Mechanics, held during the period of 25-28 Aug 1999, at the Congress Palace (Palais des Congres), Paris, France. The papers presented were selected in each country by the International Society of Rock Mechanics and the National Committee. Among the 15 papers from the US, two were from UF (one by Dr. Cristescu and A. Matei, and the other by [Dr. Oana Cazacu] with Dr. Cristescu). There were 471 participants. The theme of the congress was "Lessons from the 20th century and challenges for the 21st century".



*Dr. R. Haftka*

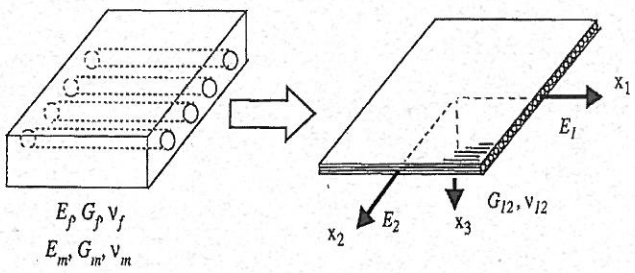



*Cover of Dr. Haftka's book*

**New Textbook**: *Design and Optimization of Laminated Composite Materials*, by Zafer Gürdal, **Raphael T. Haftka**, and Prabhat Hajela, Wiley, 1999, 329 pages.

AeMES **Distinguished Prof. R. Haftka** has recently co-authored a new textbook on composite structures. Below is a description of the book.

With the rapid growth in the use of composite materials in many commercial products ranging from sports equipment to high-performance aircraft, the teaching of the topic has reached the undergraduate curriculum. There are many textbooks on the analysis of laminated composite materials and many on design optimization of engineering systems, directed at two different courses often offered as electives in the undergraduate engineering curriculum. As this curriculum is getting crowded, fewer and fewer students have the chance to take both courses. Furthermore, optimization capabilities are now readily available in popular software packages such as spreadsheets Excel, Lotus 1-2-3, Quatro Pro), Matlab, and Mathematica. This new textbook is intended to allow students to learn simultaneously about composite laminate analysis and design by taking advantage of readily available optimization software.

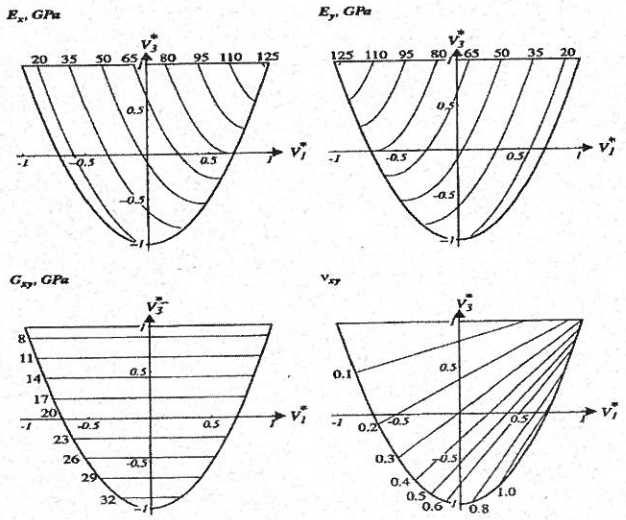



*Elastic properties of a unidirectional fiber-reinforced composite layer.*

The design of composite laminate often leads to difficult combinatorial or discrete optimization problem. This is because in industry there is preference for laminates that use a small number of fiber directions, typically zero, plus and minus 45 and 90 degrees. The laminate design problem then becomes a matter of deciding what direction to choose for each ply of the laminate, as well as the total number of plies needed. Fortunately, even spreadsheet optimization routines can deal with small problems of this type, allowing students to solve such problems in the course. For larger problems, specialized algorithms such as genetic algorithms are useful. For this reason, genetic algorithms get substantial coverage in the textbook.

The textbook is the outgrowth of course notes for courses taught by the three authors at Virginia Tech, University of Florida, and Rensselaer Polytechnic Institute. It was used at UF for the first time in the Spring Semester of 1999 in EAS 4240 - Aerospace Structural Composites. The students employed Matlab and Excel for the analysis and optimization tasks. A project of designing a laminate using genetic algorithms was also given. In the course evaluation, most students felt that the course was very useful for their professional development.

The first chapter of the textbook reviews the types of composite materials in use and the terminology established for their description. The types of composites considered in the book are then identified and their properties discussed in the context of mechanics. A brief review of the design issuesrelevant to composite materials is included. The chapter concludes with an introduction to the terminology and formulation of mathematical optimization problems, with special emphasis on laminate design problems.




*Contours of constant effective engineering elastic properties.*

The second and third chapters introduce the basic equations and assumptions used in the analysis of laminated composites under mechanical and thermal loads. They emphasize the computation of elastic properties as functions of variables that can be changed during the design process and the effects of such changes on response quantities such as stresses and strains.

Chapter 4 formulates the in-plane stiffness design as an optimization problem and introduces a simple graphical technique for its solution. Also provided is a technique to handle the discrete nature of the thickness and orientation design variables.

Two formal procedures, namely integer linear programming and genetic algorithms, suitable for handling discrete optimization problems specific to composite laminate design, are introduced in Chapter 5. In particular, the formulation and solution of in-plane stiffness design problems are demonstrated.

Chapters 6 and 7 address strength analysis and design, respectively. Commonly used failure criteria for laminated composite materials are introduced in Chapter 6. Chapter 7 describes the implementation of strength constraints in design optimization based on graphical and numerical opti-

mization procedures.

Finally, Chapter 8 introduces analysis and design for bending requirements. These include the transverse displacements of a simply supported laminate loaded by transverse loads, its natural vibration frequencies, and the buckling response of a simply supported laminate under in-plane loads.

**Dr. W. Shyy**, AeMES Prof. and Chair, co-edited with Chemical Engineering professor R. Narayanan, a book titled *Fluid Dynamics at Interfaces*, which is a collection of papers presented at a symposium in memory of Prof. Chia-Shun Yih at the 13th US National Congress on Applied Mechanics, in Gainesville, FL, in Jun '98. The authors of these papers are internationally recognized experts in both theory and experimentation. The book was published by Cambridge University Press.

**Prof. R. Tran-Son-Tay** organized in July 1999, a Symposium on Mechanotransducer in Biorheology at the 10th International Congress of Biorheology and 3rd International Conference on Clinical Hemorheology, in Pecs, Hungary. He also chaired the session on "Rheology of Cell Adhesion and Migration", and another session on the "Effects of Shear Stress on Cells".

**Prof. L. Vu-Quoc** co-chaired with UC Berkeley's Prof. R.L. Taylor the opening session of the symposium on Computational Dynamics at the 5th US National Congress on Computational Mechanics, University of Colorado, Boulder, 4-6 Aug 1999, where he also presented a paper on a new elastoplastic normal force-displacement model for granular-flow simulations. About 700 papers by international authors were presented.

## Student society activities

### AIAA Student Chapter News

This year the UF Student Chapter of AIAA has had a great start. At the first meeting in September, Dr. Wei Shyy was the guest speaker. On 30 Sep '99, members traveled to Orlando for the September meeting of the Central Florida Professional Section of AIAA, which featured a talk on the Airborne Laser System. In October, a joint meeting with the Biomedical Engineering Society (BMES) featured Dr. Mark Sheplak as the guest speaker who presented a seminar on Micro Electro Mechanical Systems (MEMS). On 13 Oct '99, Dr. Bruce Carroll gave a tour of the wind tunnels to AIAA members. AIAA has been informing students about scholarships, awards, conferences, industry, and recruiting events through emails, posters, and our new website. Two socials with BMES have increased inner-department activity, and we will also be helping Sigma Gamma Tau with the Annual Picnic November 13th. Our display for E-Fair, which will be during February 22-24 in the O'Connell Center, is currently being planned. AIAA members also act as mentors to a group of freshman engineers.

## BMES Activities

This semester the **Biomedical Engineering Society** is proud to announce its *Second Annual National Biomedical Engineering Design Competition*. The competition is open to undergraduate students from around the nation who are pursuing the field of biomedical engineering or a related discipline. For information about entering or sponsoring the event, please visit their newly designed website at *http://aemes.aero.ufl.edu/~ufbmes*.

The Biomedical Engineering Society is actively involved in holding lectures from speakers from industry (e.g., Cordis, O&P Technologies, and Exactech) and from UF faculty. Please let them know if you are interested in giving a talk.

To form closer ties with their peers, the Biomedical Engineering Society has formed a closer association with AIAA nd the Society for Biomaterials by organizing together a variety of social activities and community service projects. BMES members themselves have found time to get to know each other through intramurals and homecoming activites.

## Congratulations

**Mr. Ali I. Abdel-Hadi**, an AeMES doctoral Student working with Graduate Research Prof. N.D. Cristescu, won second place in the student poster competition at the biannual Industrial Advisory Board (IAB) meeting of the Engineering Research Center on Particle Science and Technology. Twice each year, representatives from over 35 Industrial Partners visit the UF campus for a two-day meeting that highlights research progress at the Center. There were 53 posters for display and competition during the meeting on 13-14 Oct '99. The presentation were judged by IAB members based on organization, oral presentation, creativity, and scientific understanding of the area. Ali's poster was titled "Development of a New Technique for Measuring volume change of Particulate Systems Under Very Low confining Pressures", co-authored with Drs. N.D. Cristescu, O.R. Walton, O. Cazacu and R.A.Bucklin.

## Awards Presented at Spring Banquet

**Prof. U. Kurzweg** received the AeMES Department Teacher of the Year Award for the 1998-1999 academic year. The students of the department voted for Prof Kurzweg based on his excellence in the classroom. He can add this award to his numerous other teaching awards.

Graduate student **Samit Pethe** received the *Outstanding Teaching Assistant Award* as voted by the AeMES undergraduate students. **Andy Winslow** received the runner-up award. They both received a cash prize that was sponsored by the Knox Milsaps Fund.

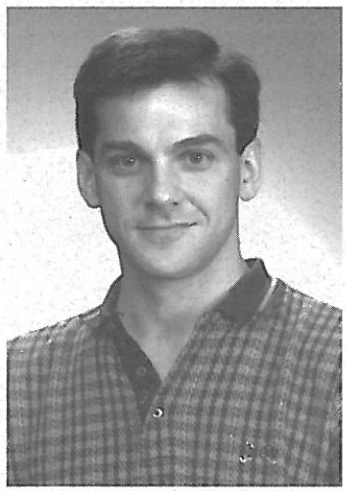
## Faculty Search

The AeMES Department is advertising for two faculty positions, one in area of biomechanics and one in the area of spacecraft engineering. Applications are due by March 1, 2000. Further information can be found at http:/www.aero.ufl.edu. Queries may also be directed to search@aero.ufl.edu.

## New Faculty

*Dr. Lou Cattafesta*

**Asst. Prof. Lou Cattafesta** joined AeMES in April '99 after spending seven years at High Technology Corporation in Hampton, VA. His wife, Carolyn, and their two children, Allison and Nicholas, accompany him to Gainesville. He received a BS degree in Mechanical Engineering in 1986 from Penn State University, a MS degree in Aeronautics from MIT in 1988, and a Ph.D. degree in Mechanical Engineering in 1992 from Penn State University. He then joined High Technology Corporation as a Research Scientist at NASA Langley Research Center, where he worked on supersonic laminar flow control and pressure- and temperature-sensitive paints. In 1996, he became Head of the Experimental and Instrumentation Group and Senior Research Scientist. His recent research has focused on active flow, noise, and vibration control, including the design of piezoelectric actuators and the development and implementation of adaptive control schemes.



*Dr. B.J. Fregly*

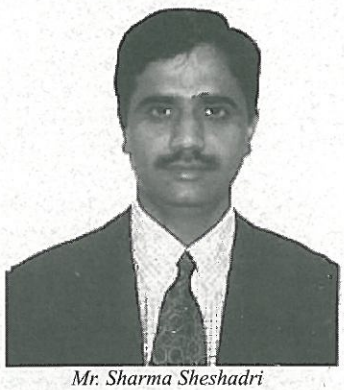
**Asst. Prof. B.J. Fregly** joined the AeMES Department in April '99, and was appointed to the faculty of the Biomedical Engineering Program. Dr. Fregly followed a rather circuitous route to becoming a Gator. He received his B.S. in Mechanical Engineering in 1986 from Princeton University and his Ph.D. in Mechanical Engineering in 1993 from Stanford University, where his research focused on the application of dynamics and controls principles to biomechanics problems. With the help of a Chateaubriand Post-Doctoral Fellowship from the French government, he spent the next year studying French and the kinematics of

human movement at the University of Lyon. Upon returning to the U.S., Dr. Fregly accepted a position with Rasna Corporation, a Silicon Valley start-up company that produced the Mechanical line of computer-aided engineering software. Six months later, he experienced a corporate acquisition from the inside as Rasna was purchased by Parametric Technology Corporation, the makers of Pro/ENGINEER CAD software. Dr. Fregly remained with PTC, researching elastic contact and flexible body modeling approaches for multibody dynamics applications, until accepting his position with the University of Florida.

Dr. Fregly was attracted to UF by the opportunity to combine his interests in dynamics and biomechanics, by the chance to work with students on a regular basis, and by the excellent work environment in the AeMES department. He is currently experimenting with an interactive computer instructional technique in his graduate Intermediate Dynamics class and is developing a new undergraduate biomechanics course for spring semester. He has already established research collaborations with radiologists and orthopedic surgeons at Shands Teaching Hospital and plans to pursue research related to computer modeling and simulation of the human knee joint during normal daily activities. Surprisingly, despite the high incidence of debilitating knee joint problems, our understanding of knee joint mechanics remains extremely limited. Dr. Fregly intends to apply his recent industrial knowledge in multibody dynamics to this important problem. His initial goals are to develop improved artificial knee joint designs and to deepen our understanding of how abnormal knee joint mechanics (e.g., after ligament injury) contribute to the development of osteoarthritis. Individuals interested in learning more about Dr. Fregly's research and teaching interests are invited to visit his faculty web page at *http://www.aero.ufl.edu/~fregly*.

## Alumni Corner

Warm congratulations to **Mr. Sharma Sheshadri**, for his recent promotion to Program Manager in the Metals & Mechanism group of Johnson Controls Inc. (JCI), a tier-one supplier of automotive seats (manual/power seat tracks, back frames, cushion and foam), automotive interiors (instrumentation panel, door panels and electronics), batteries and temperature control units. Sharma received an MS degree from the AeMES department in 1990, and continued on in our graduate program until he moved to Michigan in May 1992 to accept a job in the automotive industry. As a Program Manager, he manages the production and the launch of power tracks for the 2000 and 2001 Chrysler Jeep programs and for the 2000 Mercedes program. In Oct 1997, Sharma received an annual Innovation Award from JCI for having proposed a novel seat design. Below, Sharma gracefully shares his perspective on thejob market in the automotive industry.



*Mr. Sharma Sheshadri*

Sharma mentioned that "there are several areas in the automotive industry that a graduate student can pursue to find a job". These areas in general are in (i) Advanced Engineering and Product Development or (ii) in Product Engineering.

*Internal Structure of a car seat by Johnson Controls, Inc.*

Advanced Engineering and Product Development (AEPD) is given top priority by the automotive industry, since AEPD can significantly save in prototype costs and prototype testing. AEPD also helps anticipate design/tooling problems in the early stage of a product cycle. Such prediction reduces therefore the product development cycle time, and in turn helps industry bring a product to the market in a much shorter time. This type of work involves the modeling and analysis of automotive components for failure, crash, fatigue, noise and vibration, after a design has been conceptualized.It basically involves modeling a CAD design using standard packages and subsequent finite element analysis. Optimization is also often used in the preliminary design phase. Product engineering (PE), a stage that follows the AEPD stage, is another area in which fresh graduates may want to work. After the design is finalized in the AEPD stage, the PE stage is concerned with prototype building and testing, product launch and production validation. Here, engineers work closely with a customer to come up with a design that satisfies customer's needs. Engineers also work closely with assembly plants to assemble prototype components and to prepare the product for actual product launch. Typically, the work involves a very hands-on approach, with heavy emphasis on using Geometric Dimensioning and Tolerances fundamentals, design of experiments, tolerance stack up analysis and use of statistical analysis. Sharma said "one aspect of PE that demands very good analytical ability is in trouble shooting after the product is launched".

In parallel to his work at JCI, Sharma is pursuing an MBA degree at theUniversity of Michigan. Sharma also wants to inform current students and alumni that JCI is looking for engineers, and that he will help putting interested job applicants in contact with JCI managers. Sharma's e-mail address is *Sheshadri.Sharma@jci.com*.

**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.*

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