

mechanics

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(references in the form "M26(1)" indicate the last time the Journal was cited in *mechanics*: v. 26, n. 1, in this case.)

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mechanics

mechanics provides its readers with news in the field of theoretical and applied mechanics, and serves as a forum for the presentation and discussion of issues related to the development of the science and profession of mechanics. Opinions expressed are those of the authors and do not necessarily reflect official points of views of AAM or the institutions with which the authors are affiliated.

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AWARDS

Guillermo C. Gaunard, PhD., a resident of Rockville, MD and a Senior Scientist at the Naval Surface Warfare Center, Carderock Division, in Bethesda, Maryland, has been recently named a **Fellow** of the I.E.E.E. (Institute of Electrical and Electronic Engineers).

The **Fellow** grade is conferred upon an I.E.E.E. member with at least ten years of active engineering practice at the Senior member grade, who has made significant contributions to the field. Dr. Gaunard earned his doctorate in 1972 from Catholic University in Washington DC. He is also a **Fellow** of the A.S.M.E. International (The American Society of Mechanical Engineers), of the Acoustical Society of America, and of the Washington Academy of Sciences. He is also a member of the American Institute of Aeronautics and Astronautics (A.I.A.A.), the Washington Society of Engineers (W.S.E.), the Optical Society of America (O.S.A.), the American Academy of Mechanics (A.A.M.), as well as Sigma Xi and Tau Beta Pi. His professional biography is listed in "American Men and Women of Science", Marquis' "Who's Who in America", and a dozen other such books. Dr. Gaunard has authored/co-authored over four hundred publications in scientific journals and various Conference Proceedings, and has been an Associate Editor of the I.E.E.E. Transactions on Ultrasonics, Ferroelectrics and Frequency Control since 1990. The citation chosen for his I.E.E.E. Fellow Award was: "For contributions to the direct and inverse scattering interaction of Acoustic, Elastic, and Electromagnetic waves with matter".

NEWS

A Worldwide Listing of Mechanics meetings is available through the Applied Mechanics division of ASME. The listing is maintained by **Nick Salomon** at Penn State (NS1@psuvm.psu.edu). Meeting organizers are encouraged to refer to this list when selecting meeting dates and also to inform Nick as soon as dates for future meetings have been selected so that overlapping meetings can be minimized if not eliminated. Persons interested in making the list interactive on the web are encouraged to contact Nick.

Engineering Mechanics and Materials Research in the Information Technology Age

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Division of Civil and Mechanical Systems

Directorate for Engineering

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Introduction

The National Science Foundation (NSF) has supported basic research in engineering and the sciences in the United States for a half century and it is expected to continue this mandate through the next century. As a consequence the United States is likely to continue to dominate vital markets because diligent funding of basic research does confer a preferential economic advantage (Wong, 1996). Concurrently over this past half century, technologies have been the major drivers of the U. S. economy, and as well, NSF has been a major supporter of these technological developments. According to the NSF Assistant for Engineering, Eugene Wong, there are three transcendental technologies (Wong, 1999):

- Microelectronics - Moore's Law: doubling the capabilities every two years for the last 30 years; unlimited scalability; nanotechnology is essential to continue the miniaturization process.
- Information Technology - NSF and DARPA started the Internet revolution about three decades ago; confluence of computing and communications.
- Biotechnology - molecular secrets of life with advanced computational tools as well as advances in biological engineering, biology, chemistry, physics including mechanics and materials.

By promoting research and development at critical points where these technological areas intersect, NSF can foster major developments in engineering. The solid mechanics and materials engineering (M&M) communities will be well served if some specific linkages or alignments are made toward these technologies. Some thoughtful examples for the M&M communities are:

- | | |
|---------------------------------|---|
| • Bio-mechanics/materials | • Simulations/modeling |
| • Thin-film mechanics/materials | • Micro-electro-mechanical systems (MEMS) |
| • Wave Propagation | • Smart materials/structures |
| • Nano-mechanics/materials | • Designer materials |

Considerable NSF resources and funding will be available to support basic research related to these technologies. These opportunities will be available for the individual investigator, teams, small groups and larger interdisciplinary groups of investigators. However, most of the funding at NSF will continue to support unsolicited individual investigator proposals on innovative “blue sky” ideas.

In addition to NSF, there is also a sense that U. S. Federal agency research support is increasingly being driven by broad systemic initiatives. One of these initiative is Information Technology (IT), listed above as one of the transcendental technologies. The President’s Information Technology Advisory Committee (PITAC) advises that an “immediate and vigorous information technology research and development (R&D) effort in Information Technology be initiated. IT is essential for the United States to have economic growth and prosperity in the 21st Century.” PITAC (www.ccic.gov) concluded that current U. S. Federal support for research in IT is inadequate and these current efforts also take “a short-term focus for immediate returns.” PITAC recommends IT R&D with long term priorities focusing on “software development that is far more usable, reliable, and powerful, scalable information infrastructures that satisfy the demands of large numbers of users, high-end computing systems with both rapid calculation and rapid data movement, and IT education and training for the citizenry.” Achieving these ends requires diversified modes of research support to foster projects of broader scope, longer duration and emphasis on projects involving multiple investigators over several years. Of most importance is using these new information technologies to advance critical application domains for the benefit of our nation.

Discussion

Consistent with this theme, the National Science Foundation Directorate for Engineering in collaboration with other NSF Directorates and Federal agencies recently announced several IT-related initiatives. The NSF Directorate for Computer and Information Science and Engineering (CISE) and the Directorate for Engineering in cooperation with the Division of International Programs jointly announced the Wireless Information Technology and Networks initiative (Program Announcement NSF 99-68) in early 1999. “The great demand for Internet services, wireless cable television distribution, and information technology, makes the development of broadband wireless mobile communication systems a national imperative in the 21st Century.” Researchers face many technical challenges, but “data rates of tens of megabits per second (enabling broadband Internet access, for example) are apparently realizable in the near future.”

The Engineering Directorate research initiative on Engineering Microsystems: “XYZ on a Chip” (Program Announcement NSF 99-31) focuses on non-electronic applications of micro-electronic technologies and exploration of non-electrical processes at the micro-scale. Here XYZ refers to any non-electrical phenomena such as “biology, genomics, chemistry, optics, mechanics, materials, sensors, actuators, and software.” Examples of solid mechanics and materials engineering XYZ related phenomena could include MEMS, nanomechanics, etc.

The initiative Engineering Sciences for Modeling and Simulation-Based Life-Cycle Engineering (Program Announcement NSF 99-56) is a collaborative research program by NSF and the Sandia National Laboratories (Sandia) focusing on advancing the fundamental knowledge needed to support advanced computer simulations. This collaborative initiative capitalizes

on the missions of both organizations. NSF's mission is to advance the fundamental science and engineering base of the United States. Sandia has the responsibility to provide solutions to a wide range of engineering problems pertinent to national security and other national issues. It is moving toward engineering processes in which decisions are based heavily on computational simulations; thus, capitalizing on the available high performance computing platforms. This FY 99 initiative has sought modeling and simulation advances in key engineering focus areas such as thermal sciences, mechanics and design. This initiative will continue for one more year and the authors of this paper should be contact for updates on status.

The NSF-wide research initiative, Biocomplexity: Research on the Functional Interrelationships between Microorganisms and Biological, Chemical, Geological, Physical and Social Systems, is a long-term effort to support "integrated research on the functional interrelationships between microorganisms and the biological, chemical, geological, physical, and/or social systems that jointly comprise complex systems." Understanding biological complexity requires sophisticated approaches of integrating scientists from a range of disciplines. These include: "biology, physics, chemistry, geology, hydrology, social sciences, statistics, mathematics, computer science and engineering (including mechanics and materials)." These collaborations cannot be constrained by institutional, departmental or disciplinary boundaries.

Since 70% of the U.S. economy is service oriented, Engineering the Service Industry (Wong, 1999) is a major challenge in terms of "scaleable enterprises, manufacturing/construction processes, transportation systems, healthcare delivery systems, process modeling and simulation, government services and others." In spite of its importance, the service industry lacks a true science base. The objectives of software engineering are also applicable for the service industry as a whole (Wong, 1999). These include "quality control, graceful recovery from failure (forging systems), scalability and performance." An initiative on Scalable Enterprise Systems is being developed.

The NSF Civil and Mechanical Systems (CMS) Division is planning an initiative on Model-based Simulation (MBS) (Sack, 1999). Model-based simulation is a process that integrates physical test equipment with system simulation software in a virtual test environment aimed at dramatically reducing product development time and cost. This initiative will impact many civil/mechanical areas: "structural, geotechnical, materials, mechanics, surface science, and natural hazards (e.g., earthquake, wind, tsunami, flooding and land-slides)." MBS would involve "combining numerical methods such as finite element and finite difference methods, together with statistical methods and reliability, heuristics, stochastic processes, etc., all combined using super-computer systems to enable simulations, visualizations, and virtual testing." Expected results could be fewer physical testing, or at best, better strategically planned physical testing in the conduct of R&D. Examples of the use of MBS in research, design and development exist in the atmospheric sciences, biological sciences, and the aerospace, automotive and defense industries. The manufacturing of the prototype Boeing 777 aircraft, for example, was based on computer-aided design and simulation. This initiative should be announced in the future and the authors of this paper should be contact for updates on status.

In the future one should expect the continued introduction of bold innovative research ini-

tiatives related to important national agenda such as the environment, civil and mechanical infrastructure, the service industry and the business enterprises.

The Challenge to M&M

The challenge to the mechanics and materials research communities is, “How can we contribute to these broad-base and diverse research agenda?” Although the mainstay of research funding will support the traditional programs for the foreseeable future, considerable research funding will be directed toward addressing these research initiatives of national focuses.

Mechanics and materials engineering are really two sides of a coin, closely integrated and related. For the last decade this cooperative effort of the M&M Program has resulted in better understanding and designed of materials and structures across all physical scales, even though the seamless and realistic modeling of different scales from nano-level to system integration-level (Fig. 1) is not yet attainable. In the past, engineers and material scientists have been involved extensively with the characterization of given materials. With the availability of advanced computing, and new developments in material sciences, researchers can now characterize processes, design and manufacture materials with desirable performance and properties. One of the challenges is to model short-term micro-scale material behavior, through meso-scale and macro-scale behavior into long term structural systems performance. Accelerated tests to simulate various environmental forces and impacts are needed. Super-computers and/or workstations used in parallel are useful tools to solve this scaling problem by taking into account the large number of variables and unknowns to project micro-behavior into infrastructure systems performance, and to model or extrapolate short term test results into long term life-cycle behavior (Chong, 1999).

<u>MATERIALS</u>	<u>STRUCTURES</u>		<u>INFRASTRUCTURE</u>	
nano-level (10 ⁻⁹)	micro-level (10 ⁻⁶)	meso-level (10 ⁻³)	macro-level (10 ⁺⁰)	systems-level (10 ⁺³) m
Molecular Scale	Microns	Meters		Up to Km Scale
•nano-mechanics	•micro-mechanics	•meso-mechanics	•beams	•bridge systems
•self-assembly	•micro-structures	•interfacial-structures	•columns	•lifelines
•nanofabrication	•smart materials	•composites	•plates	•airplanes

Fig. 1. Physical scales in materials and structural systems

Acknowledgments and Feedback

The authors would like to thank their colleagues and many members of the research communities for their comments and inputs during the writing of this opinion paper. We would appreciate further feedback from the research communities at large. We can be reached by e-mail at: [kchong@nsf.gov] and [dcdavis@nsf.gov]. Information on NSF initiatives, announcements and awards can be found in the NSF website:[www.nsf.gov].

Disclosure and Copyright Policy

The opinions expressed in this article are the authors only, not necessarily those of the National Science Foundation nor representative of their positions at NSF. This paper was written by U.S. Government employees. It may not be copyrighted and is intended for wide dissemination.

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OBITUARIES

Behrouz Tabarrok, D. Phil., P. Eng.

Behrouz Tabarrok died unexpectedly on April 20, 1999, at the age of 60 years. Bez - as he was affectionately known - had been serving as the Canadian Director of the American Academy of Mechanics. He had previously served as the Chair of the Canadian National Committee of IUTAM (1980-93), and as a member of the IUTAM Congress Committee (1988-1996). He was also involved with numerous other professional organizations. He was on the editorial boards of at least 7 journals, a member of several professional organizations and often served on their executive committees. Notably, he was President of the Canadian Society for Mechanical Engineering (1993-94), Chair of the Natural Sciences and Engineering Research Council (NSERC) Grant Selection Committee for Mechanical Engineering (1994-95), and Chair of the Canadian Congress of Applied Mechanics (CANCAM) Central Committee. The 1999 CANCAM Award was presented to him in recognition of his achievements.

Bez was born in Teheran, but he left his home and country for boarding school in England at age 13. He never lived in Iran again, but over the years, he returned as a visiting scholar and to see his family.

On April 20, 1963, Bez married Carolyn Croft. Two years later he was awarded a D. Phil. from Oxford University. The couple had the opportunity to come to Canada in 1965, when Bez became an Assistant Professor of Mechanical Engineering at the University of Toronto.

He is survived by three children. His son Alex was born in 1966, followed by Nicholas in 1968. Jeremy was born in 1970 in Hanover, Germany, where Bez was visiting on an Alexander von Humboldt Fellowship.

Through the 1970s and 80s, Bez was an active teacher, scholar and consultant, rose to Full Professor, and received many fellowships and other honors. When the University of Victoria in British Columbia decided to create a Faculty of Engineering, Bez was selected to become the founding Chair of the Department of Mechanical Engineering in 1987.

Moving to Victoria from Toronto was a major change for him and his family, but they quickly made this community home and began building many cherished friendships.

Bez remained Department Chair for a decade, during which he devoted his tremendous energy, good will and sense of humor to building an excellent department. One of the things that impressed many was how he would put his own career needs second so that younger faculty members would have greater opportunities. In 1993, he was pleased to have co-authored a book with his good friend Fred Rimrott, called *Variational Methods and Complementary Formulations in Dynamics*. His research contributions covered a wide span of topics, ranging from his early interest in variational methods to his more recent applications to logging truck dynamics and the modeling of crystal growth. He produced excellent fundamental research while simultaneously promoting the practical applications of mechanics to industrial problems.

Just in the last year, Bez took on a new position as Executive Director of the Institute for Integrated Energy Systems. Typically, he described this job (a major career shift that might have frightened others), as "great fun."

Bez was a great socializer. He loved entertaining, get-togethers, cookouts and dinner parties. Over the years, many thousands of students and friends enjoyed his and Carolyn's hospitality.

Bez Tabarrok has left a strong legacy; many former students from around the world attest to his teaching and dedication. Bez expected from other people the traits that he himself exhibited: good will, fairness, modesty, maturity, principled courage, and a sense of the ridiculous. He will be greatly missed by all who knew him.

Second Annual Joint Cost Management Societies Symposium

to be held at *McCormick Place*, Chicago, IL, Nov. 8-10, 1999.

The meeting, *Cost Management and Value Analysis for Project Success*, will offer technical presentations, workshops, and seminars from each of the JCMS member societies: AACE International; the American Society of Professional Estimators (ASPE); the International Society of Parametric Analysts (ISPA); the Professional Construction Estimating Association (PCEA); SAVE International; and the Society of Cost Estimating and Analysis (SCEA). The technical program will include topics such as Practical Dispute Management; Can Past History Affect Future Project Success?; Overcoming "Gotcha" Clauses in Construction Contracts; Conceptual Cost Estimating for Building Construction; Increasing Construction Productivity by Utilizing Internet Technologies; Forensic Estimating of Project Owner Damages; Estimating General Conditions: How It Affects Cost and Profit; Fallacy of the Contract Schedule of Values; Technology Selection Techniques for the Design for Affordability of Future Aviation Concepts; Parametrics Via the Internet; Value Management for Design/Build Projects; Earned Value Management; Understanding Competitive Assessments; Value Engineering's Contribution to Capital Project Success; A New Approach to Conceptual Estimating and Early Planning; Methods and Databases; Cost and Schedule Risk Analysis; Bid Day-Foundation for Cost Control; and many more.

A JCMS Symposium brochure is now available. An electronic version is posted on the JCMS website <http://www.jcms2000.org>. Interested individuals also can contact AACE International at 800-858-COST. On site registration will be from 9:00 a.m. to 4:00 p.m. on Nov. 8, and from 9:00 a.m. to noon on Nov. 9.

For more information on the 2nd Annual JCMS Symposium, please contact: AACE International, 209 Prairie Avenue, Suite 100, Morgantown, West Virginia 26501 USA, phone: 800-858-COST or 304-296-8444 / fax: 304-291-5728, e-mail: info@aacei.org, or visit our website at <http://www.cost.org> or the JCMS website at <http://www.jcms2000.org>

Fourteenth Engineering Mechanics Conference (EM2000) of the American Society of Civil Engineers

to be held at the *Joe C. Thompson Conference Center*, University of Texas at Austin

The Technical Program of **EM2000** will be composed of keynote lectures and presentations on current research in engineering mechanics. Topics include: biomechanics, computational fluid dynamics, computational mechanics, damage mechanics, elasticity and elastodynamics, experimental techniques, fluid mechanics, fluid-structure interaction, fracture mechanics, geomechanics, hydrodynamics, inelasticity, micromechanics, mechanics of composite materials, nondestructive testing, nonlinear dynamics and chaos, nonlinear mechanics, offshore structural mechanics, smart materials, soil-structure interaction, solid mechanics, stability, stochastic mechanics, dynamics and control, damage assessment, structural reliability, system identification, turbulence and wave propagation.

If you are interested in presenting a paper, please submit a one-page abstract by September 30, 1999. The abstract should address the objectives of the work to be presented, outline the methods employed, and summarize the conclusions. Please state authors' affiliations and addresses clearly and identify a corresponding author. If at all possible, abstracts should be submitted as text or attachment by e-mail to: editor@em2000.ce.utexas.edu

Otherwise, you can submit a copy of the abstract by conventional mail to Professor John L. Tassoulas, EM2000, Department of Civil Engineering, The University of Texas at Austin, Austin, Texas 78712-1076, Telephone: (512) 471-4553, Fax: (512) 471-8477.

Please transmit inquiries or communications by e-mail to: info@em2000.ce.utexas.edu. Please Visit the Conference Web Site for More Details: <http://www.ce.utexas.edu/em2000/>

University of Illinois at Urbana-Champaign
Faculty Position (Open Rank)
Department of Mechanical and Industrial Engineering

The Department of Mechanical and Industrial Engineering, College of Engineering, University of Illinois at Urbana-Champaign invites applications for full-time tenure-track positions at the Assistant Professor level. Senior level appointments with tenure will be considered for a person of recognized national and international stature.

Candidates are sought in all areas of mechanical and industrial engineering including bioengineering; computational mechanics; controls; design methodology and optimization; dynamics; environmental engineering; fluid mechanics with an emphasis on experiments; human factors; and information technology.

Requirements include an earned doctorate and a background that enables the candidates to teach both undergraduate and graduate students. Successful candidates will be expected to establish and sustain an active research program. Salary is commensurate with education and experience.

To ensure full consideration, applications must be received by December 1, 1999; applications will be considered until the positions are filled. The proposed starting dates for the positions are May 21 or August 21, 2000 or January 5, 2001. In your cover letter please reference position #6631. Interviews may take place before the closing date; however, no decision will be made until after that time. Send an up-to-date biography with names of four references to:

Professor Richard O. Buckius

Head, Department of Mechanical and Industrial Engineering
University of Illinois at Urbana-Champaign
140 Mechanical Engineering Building
1206 West Green Street
Urbana, IL 61801
tel: 217-333-1079
<http://www.mie.uiuc.edu>

The University of Illinois is an affirmative action/equal opportunity employer.



James R. Rice Professorship in Solid Mechanics

Applications are invited for a faculty position in the area of mechanics of solids within the Division of Engineering at Brown University. An appointment will be made at the level of Assistant Professor or Associate Professor within the tenurable ranks of the University; the level of appointment and tenure status will be consistent with the professional experience and qualifications of the appointee. The position may be filled at any time after January 1, 2000.

This faculty position has been created through the generosity of former graduate students in the program in the name of Professor James R. Rice of Harvard University who made many important contributions to solid mechanics during his years as a faculty member at Brown. The appointee will hold this distinguished position for an initial term of from three to five years. The goal in creating the position is to provide a young scholar of exceptional talent and potential an opportunity to establish a leadership position in the field through work in a diverse and active research group.

The Solid Mechanics Group at Brown University fosters a balanced program of research and instruction which integrates the perspectives of continuum mechanics and materials science. Applications are invited from individuals with interests in any of the promising sub-branches of the field. Representative areas of interest include but are not limited to: mechanics of material nanostructures, mechanics of novel materials, biomechanics, micro-electro-mechanical systems, microstructural evolution, and computational mechanics. Specific qualifications for the position are: (a) a Ph.D. degree or equivalent in mechanics of solids, materials science or a related applied science, (b) a record of significant scholarly research as demonstrated by publications in scientific or professional journals, and (c) effectiveness at communicating technical material, both verbally and in writing.

An application should include the following items:

- a complete professional resume, including education, experience, honors received and list of publications.
- names, full mailing addresses, telephone numbers and email addresses of at least five individuals who could provide letters of reference, if requested to do so.
- reprints or preprints of recent papers.
- a brief statement of research interests and objectives.

Applications should be addressed to:

Professor Rob Phillips
Mechanics Faculty Search Committee
Division of Engineering
Brown University
Providence, Rhode Island 02912-9104

Applications should be received by November 22, 1999; the position will remain open until filled. Brown University is an Affirmative Action/Equal Opportunity Employer.



VISIT the AAM Website at
<http://www.purdue.edu/AAM>

- 2313 Effect of growth parameters on dislocation generation in inp single crystal grown by the vertical gradient freeze process AN Gulluoglu, CT Tsai
- 2323 Uniaxial stress-strain behavior of aluminum alloy foams KYG Mccullough, NA Fleck, MF Ashby
- 2331 Toughness of aluminum alloy foams KYG Mccullough, NA Fleck, MF Ashby
- 2345 Evolution of the sidebranch structure in free dendritic growth Q Li, C Beckermann
- 2357 Equilibrium shape of prismatic dislocation loops under uniform stress RB Calhoun, A Mortensen
- 2367 The influence of transient strain-rate deformation conditions on the deformed microstructure of aluminum alloy al-1% mg GJ Baxter, T Furu, Q Zhu, JA Whiteman, CM Sellars
- 2377 The influence of transient deformation conditions on recrystallization during thermomechanical processing of an al-1% mg alloy T Furu, H Shercliff, GJ Baxter, CM Sellars
- 2391 Calorimetric and magnetic determination of the interfacial enthalpy and heat of mixing in ag(ni) alloys HG Zolla, F Spaepen
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