

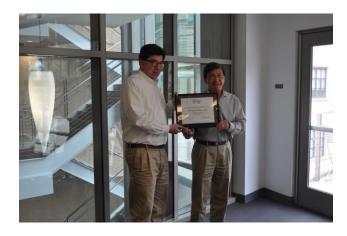
ANNUAL REPORT TO THE EMI MEMBERSHIP FOR FY 2019

The Engineering Mechanics Institute of ASCE, established on October 1, 2007, is organized under the American Society of Civil Engineers, a 501 (c) (3) non-profit association created in 1852. The purpose of this report is to present to the EMI membership a summary of the Institute's activities and progress during the period of October 1, 2018 to September 30, 2019 (FY 2019), as specified by article 9.3.1 of the EMI bylaws:

"Additional Duties of the President. The President, on behalf of the Board of Governors, shall prepare and distribute to the membership an Annual Report for the preceding fiscal year".

GOVERNANCE

Over the summer of 2018, EMI conducted an election for one open position on the EMI Board of Governors, starting on October 1, 2018. Sankaran Mahadevan, Ph.D., F.EMI, M.ASCE (Vanderbilt University) was elected by the EMI membership to serve a three-year term. George Deodatis, Ph.D., F.EMI, M.ASCE (Columbia University) and J.S. Chen, Ph.D., F.EMI, M.ASCE (University of California San Diego) served as FY 2019 EMI President and Past President, respectively. Pol Spanos Ph.D., F.EMI, NAE, Dist.M.ASCE (Rice University) served as the FY 2019 Vice-President. Somnath Ghosh, Ph.D., F.EMI, M.ASCE (The Johns Hopkins University) and Antoinette Tordesillas, Ph.D., Aff.M.ASCE (University of Melbourne, Australia) served the third year of their term on the EMI Board of Governors. Elisabeth Malsch, Ph.D., P.E., M.ASCE (Thornton-Tomasetti) was the ASCE-appointed EMI Governor and served as FY 2019 Treasurer. Welcome to the new EMI Governors, and many thanks to J.-S. Chen (University of California San Diego) for his many years as EMI Governor, President and Past President.



George Deodatis presents a certificate of appreciation to J.-S. Chen



J.S. Chen, Ph.D., F.EMI, M.ASCE, *Past President*



Gianluca Cusatis, Ph.D., F.EMI, M.ASCE



George Deodatis, Ph.D., F.EMI, M.ASCE, President



Somnath Ghosh, Ph.D., F.EMI, M.ASCE



Sankaran Mahadevan, Ph.D., F.EMI, M.ASCE



Elisabeth Malsch, Ph.D., P.E., M.ASCE, *Treasurer*



Pol Spanos, Ph.D., F.EMI, NAE, Dist.M.ASCE



Antoinette Tordesillas, Ph.D., Aff.M.ASCE

FY 2019 EMI Board of Governors

The EMI Board of Governors oversees the Institute's four Divisions:

Administrative Division

Awards Committee

Nominations Committee

Publications Division

Editorial Board of the Journal of Engineering Mechanics

Editorial Board of Lecture Notes in Mechanics

Technical Division

Architected Materials Committee (approved on June 18, 2019)

Biomechanics Committee

Computational Mechanics Committee

Dynamics Committee

Elasticity Committee

Experimental Analysis & Instrumentation Committee

Fluid Dynamics Committee

Granular Materials Committee

Mechanics of Pavements Committee

Modeling Inelasticity & Multiscale Behavior Committee

Nanomechanics and Micromechanics Committee

Objective Resilience Committee

Poromechanics Committee

Probabilistic Methods Committee

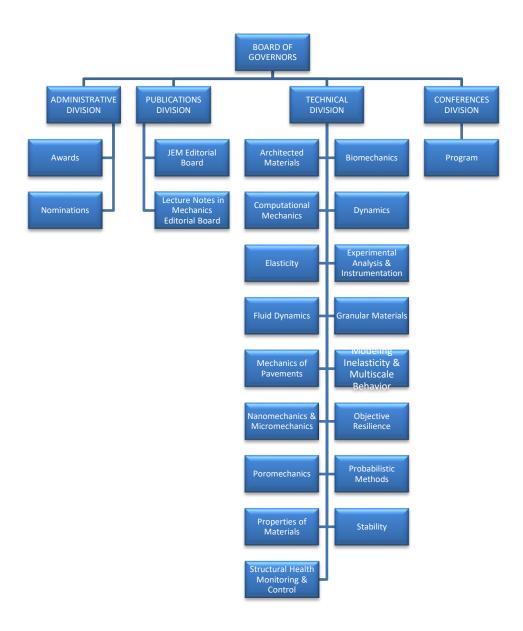
Properties of Materials Committee

Stability Committee

Structural Health Monitoring & Control Committee

Conferences Division

Program Committee



EMI Organizational Chart

MEMBERSHIP

There are two ways of becoming an EMI member: members can join ASCE and select EMI as one of their Institutes (ASCE/EMI membership), or they may choose to be members of EMI only (EMI-only membership). EMI membership provides: member discounts on EMI publications (25%), EMI journals subscriptions (75%), and EMI conference and webinar registrations; the ability to nominate members for elected positions on the EMI Board of Governors, to be a candidate and to vote in EMI elections, and to apply to join EMI technical committees; a subscription to the EMI newsletter; and access to valuable resources and information on the EMI website.

Membership dues had been kept at the same level since the start of EMI in FY 2008. Following approval by the EMI Board of Governors, EMI-only membership dues were increased in FY 2018 to \$100 per calendar year. EMI-only membership for full-time graduate student members is no longer offered, as students can join ASCE and select an Institute such as EMI for free. Membership in EMI is free for ASCE members choosing EMI as their first Institute and \$30 after the first Institute.

An <u>annual dues discount</u> based upon the yearly World Bank World Development Indicators is provided to members residing in certain countries. On-line membership applications are available for <u>ASCE/EMI membership</u> and for <u>EMI-only membership</u>. On-line membership renewal is now available for both types of membership.

EMI pursued its efforts to attract and retain younger members through free membership for students, student competitions, and the prestigious EMI Leonardo da Vinci award. EMI membership has grown to over 2,500. About 34% of the EMI members reside outside the U.S. (64 countries). Over 90% of the EMI members are in academia or research, and about 24% are students. EMI counts 16 Distinguished/Honorary Members of ASCE and 21 NAE members among its members.

PUBLICATIONS

EMI is proud of its publications which help disseminate important emerging knowledge and engage the membership of the Institute.

Prof. Roberto Ballarini, Ph.D., P.E., F.EMI, F.ASCE (University of Houston) has served as the Editor of the monthly <u>Journal of Engineering Mechanics</u> (JEM), the flagship journal of EMI, since the fall of 2012. JEM continues to demonstrate extraordinary progress as one of the premier mechanics journals. All the journal statistics show a marked improvement over the past five years. There has been an increase in submissions and in papers published annually, a reduction in acceptance rate, and a strong increase in impact factor with an all-time high of 2.264 for 2018, and a decrease in the time to first decision time (3 months). With these substantial improvements in the journal performance measures, JEM has become one of the most prestigious mechanics journals.

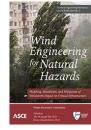
Two Special Collections were published in JEM:

Engineering Mechanics

ASCE IS

- 1. <u>Advanced Modeling and Characterization of Civil Infrastructure Materials</u> (Guest Editors: Hao Wang and Yong-Rak Kim)
- 2. <u>Recent Advances in Computational Methods in Engineering Mechanics</u> (Guest Editors: Haim Waisman and Ertugrul Taciroglu)

EMI also published the third new volume in the Trends in Engineering in Engineering Mechanics Special Publications series, <u>Wind Engineering for Natural Hazard</u>, edited by Aly Mousaad Aly and Elena Dragomirescu.



CONFERENCES

EMI 2019 Conference

EMI held its 2019 conference on the campus of the California Institute of Technology in Pasadena, CA from June 18 to June 21. The EMI 2019 conference was chaired by José E. Andrade (California Institute of Technology), Giuseppe Buscarnera (Northwestern University), Marika Santagata (Purdue University) and Matt Evans (Oregon State University). The total number of registrations (906) came close to the previous record, and the conference program included over 900 presentations in 10 parallel streams. There were participants from 40 countries. A particular feature of the EMI 2019 conference was the participation of the Geo Institute which resulted in a very strong "stream" on Computational Geotechnics, a topic of interest to both Institutes, the inclusion of three truly outstanding plenary lectures in that area, and the G-I Soil Properties and Modeling student poster competition.

The conference featured six plenary lectures given in the Beckman Auditorium by leading researchers:

Prof. Gioacchino Viggiani (Université Grenoble Alpes, France): 3D Experimental Micromechanics at the Grain Scale: What For?

Prof. Kenichi Soga (University of California, Berkeley): Large Deformation Modeling of Soil-Fluid Mixture - Macro and Micro Scales

Prof. Haeyoung Noh (Carnegie Mellon University): Structures as Sensors: Using Structures to Indirectly Monitor Humans and Surroundings

Prof. Ken Kamrin (Massachusetts Institute of Technology): Some New Directions in Modeling Granular Flows

Prof. Chiara Daraio (California Institute of Technology): Morphing materials in freeform objects, at the micro- and macro-scales

Prof. Davide Bigoni (University of Trento, Italy): Nonconservative Loads of the Follower Type and Related Hopf Bifurcations in Elastic Structures



Conference Opening and Welcome - Some of the Plenary Lecture Speakers

The EMI Board of Governors met on the occasion of the conference, as did all the EMI Technical Committees and the Editorial Board of the Journal of Engineering Mechanics. Ten committees organized a <u>student paper competitions</u>:

EMI Dynamics Committee Student Paper Competition

EMI Fluid Dynamics Committee Student Paper Competition

EMI Modeling Inelasticity & Multiscale Behavior Committee Student Competition

EMI Objective Resilience Committee Student Competition

EMI Poromechanics Student Poster Competition

G-I Soil Properties and Modeling student poster competition

EMI Probabilistic Methods Committee Student Paper Competition

EMI Structural Health Monitoring and Control Committee Student Paper Competition

EMI Stability Student Paper Competition

EMI Computational Mechanics Committee Student Poster Competition.

The EMI Computational Mechanics Committee organized a <u>Student Poster Competition</u> where students had to submit a poster, a three-page paper supplemental to the poster, and one summary slide for the "blitz" presentation of their research. The competition was held in two stages: 1) a "blitz" slide presentation of the research where each participant had 2 minutes to introduce his/her research to the audience; and 2) discussion and Q &A by the posters with a panel of three judges.

The social events included: An Ice Breaker reception on June 18 at the Dabney Garden, a Welcome reception on June 19 under a huge tent on the Beckman Mall which was also used for the breakfasts, morning and afternoon breaks and lunch, and for the June 20 reception and awards banquet.

Certificates and medals were presented at the awards banquet to the winners of ASCE and EMI awards:



MAURICE A. BIOT MEDAL

Younane N. Abousleiman, Ph.D., F.EMI, Larry W. Brummett/ONEOK Chair, Professor at the University of Oklahoma.

"For his pioneering recognition of the value of poromechanics for industrial applications; his ground-breaking closed-form poromechanical solutions and corresponding relevant experiments, that have irreversibly transformed the oil and gas industry; and his decade-long commitment to nurture the poromechanics community honoring Maurice A. Biot."



GEORGE W. HOUSNER STRUCTURAL CONTROL AND MONITORING MEDAL

Dan M. Frangopol, Sc.D., P.E., F. EMI, F. SEI, Dist.M.ASCE, Fazlur R. Khan Endowed Chair, Professor of Structural Engineering and Architecture at Lehigh University.

"For pioneering contributions to the integration of structural health monitoring and control in life-cycle reliability-based assessment, design and optimization of civil and marine infrastructure.





RAYMOND D. MINDLIN MEDAL

Roberto Ballarini, Ph.D., P.E., F.EMI, F.ASCE, Thomas and Laura Hsu Professor and Chair, Department of Civil and Environmental Engineering, at the University of Houston.

"For the application of elasticity and fracture mechanics to problems in numerous disciplines and at multiple length scales, and for seminal contributions to experiments for measuring the mechanical properties of materials and structures at the micro- and nano-scales."



MASANOBU SHINOZUKA MEDAL

James Leslie Beck, Ph.D., F.EMI, M.ASCE, George W. Housner Professor of Engineering and Applied Science, Emeritus at the California Institute of Technology.

"For his original contributions to subset simulation in reliability analysis of stochastic systems, a powerful technique that allows probabilistic estimation of rare events; for his pioneering work in developing technologies for machine learning in earthquake engineering applications.



NATHAN M. NEWMARK MEDAL

Bojan Guzina, Ph.D., A.M.ASCE, Shimizu Professor, Department of Civil, Environmental & Geo- Engineering, University of Minnesota. For " seminal work on theoretical and computational methods related to wave propagation and inverse scattering problems, with applications to the imaging of biological and engineered systems."



THEODORE VON KARMAN MEDAL

Yonggang Huang, Ph.D., NAE, M.ASCE, Walter P. Murphy Professor, Dept. of Civil and Environmental Engineering at Northwestern University. "For his seminal work on the mechanics theories for micro-indentation hardness, deterministic 3D assembly, and stretchable electronics."



WALTER L. HUBER CIVIL ENGINEERING RESEARCH PRIZES

Sinan Keten, Ph.D., M.ASCE, Associate Professor of Civil & Environmental Engineering, Mechanical Engineering at Northwestern University. "For his contributions to the understanding of the mechanical behavior of structural materials, and for establishing novel molecular simulation techniques for characterizing the nanomechanics of polymer nanocomposites."



EMI LEONARDO DA VINCI AWARD

Dominik Schillinger, Ph.D., A.M.ASCE, Assistant Professor, Department of Civil, Environmental, and Geo- Engineering at the University of Minnesota. "For seminal contributions in computational mechanics, ranging from the application of the finite cell method in iso-geometric analysis, to work on medical imaging and its use in patient-specific simulations, to advances in variational multiscale methods and discontinuous Galerkin methods."

The winners of the ten **student competitions** also received certificates:

1. The Computational Mechanics Committee Student Poster Competition

(Chair: Prof. Haim Waisman)

Winner - Adrian Egger, ETH Zürich

Runner Up - Xiaohui Tu, Johns Hopkins University

Runner Up - Xiaoshu Zeng, University of Southern California

2. The Dynamics Committee Student Paper Competition

(Chair: Dr. Hamed Ebrahimian)

Winner - Mostafa Mirshekari, Carnegie Mellon University

Runner Up - Maria Katsidoniotaki, Columbia University

Runner Up - Herta Montoya, Purdue University

3. The Fluid Dynamics Committee Student Paper Competition

(Chair: Prof. Ning Zhang)

Winner - Reda Snaiki, The State University of New York at Buffalo

4. The Geo-Institute Soil Properties and Modeling Student Poster Competition

(Chair: Prof. Brina Montoya)

1st - Shashank Agarwal, Massachusetts Institute of Technology

1st - Yanni Chen, Northwestern University

Runner Up - Keshab Thapa, North Dakota State University

5. The Modeling Inelasticity & Multiscale Behavior Committee Student Paper Competition

(Chair: Prof. Chung Song)

1st Place - Y. C. Zhang, Columbia University

Runner Up - M. Zadshir, Columbia University

Runner Up - Tingtao Zhou, Massachusetts Institute of Technology Runner Up - Mohmad Mohsin Thakur, The University of Tennessee

6. The Objective Resilience Committee Student Paper Competition

(Chair: Dr. Mohammed Ettouney)

1st Place - May Haggag, McMaster University

2nd Place - Mostafa Naiem, McMaster University

3rd Place - Ahmed Gondia, McMaster University

7. The Poromechanics Student Poster Competition

(Chair: Prof. Giuseppe Buscarnera)

1st - Hoang Nguyen, Northwestern University

Runner Up - Alexandre Guevel, Duke University

Runner Up - Wei Zhang, The Pennsylvania State University

8. The Probabilistic Methods Committee Student Paper Competition

(Chair: Prof. Michael Shields)

Winner - Arthriya Suksuwan, University of Michigan

Winner - Ioannis Petromichelakis, Columbia University

Winner - Charalampos Andriotis, The Pennsylvania State University

9. The Stability Student Paper Competition

(Chair: Prof. Ahmer Wadee)

Winner - Luke Lapira, Imperial College London

10. The Structural Health Monitoring & Control Committee Student Paper Competition

(Chair: Prof. Nicholas Wierschem)

1st Place - Rih-Teng Wu, Purdue University

2nd Place - Charalampos Andriotis, The Pennsylvania State University

3rd Place - Yuguang Fu, The University of Illinois at Urbana-Champaign

The awards banquet was also the venue for recognizing several of the six newly elected EMI Fellows:



Michele Barbato, Ph.D., P.E., F.EMI, M.ASCE
Professor, Department of Civil and Environmental Engineering
UC Davis



Yuri Bazilevs, Ph.D., F.EMI, A.M.ASCE

E. Paul Sorensen Chair in the School of Engineering
Brown University

Matthew R. Kuhn, Ph.D., F.EMI, M.ASCE Professor, Shiley School of Engineering University of Portland



Ramesh B. Malla, Ph.D.,F.EMI, F.ASCE
Professor, Civil & Environmental Engineering
University of Connecticut

Marc P. Mignolet, Ph.D., F.EMI, M.ASCE
Professor and Program Chair
School for the Engineering of Matter, Transport and Energy
Arizona State University

Caglar Oskay, Ph.D., F.EMI, M.ASCE
Professor of Civil and Environmental Engineering, Mechanical Engineering
Director of Graduate Studies in Civil Engineering
Vanderbilt University

At the end of the banquet, Prof. John Brigham (Durham University) and Prof. Ioannis Kougioumtzoglou (Columbia University) gave a preview of the upcoming EMI conferences at their respective institutions.

The entire <u>program</u> of the conference, including the schedule of meetings, sessions, plenary lectures, student competitions and social events and the <u>book of abstracts</u> were posted on the conference website. This very successful event is documented in a <u>photo gallery</u>. Congratulations and many thanks to José E. Andrade (California Institute of Technology), Giuseppe Buscarnera (Northwestern University), Marika Santagata (Purdue University) and Matt Evans (Oregon State University) and their team for organizing and hosting a memorable conference!



George Deodatis and Younane Abousleiman (Biot Medal)



George Deodatis and James Beck (Shinozuka Medal)



George Deodatis and Bojan Guzina (Newmark Medal)





George Deodatis and Michele Barbato (EMI Fellow)



George Deodatis and Ramesh Malla (EMI Fellow)



Giuseppe Buscarnera, Matt Evans, George Deodatis, José Andrade, and Marika Santagata



Prof. Chung Song and the winners of the Modeling Inelasticity & Multiscale Behavior Committee Student Paper Competition



Prof. Michael Shields and the winners of the Probabilistic Methods Committee Student Paper Competition



Prof. Fariborz Tehrani and the winners of the Objective Resilience Committee Student Paper Competition



Prof. Giuseppe Buscarnera and the winners of the Poromechanics Student Poster Competition



Prof. Brina Montoya, the winners the Geo-Institute Soil Properties and Modeling Student Poster Competition, and Marika Santagata



Adrian Egger, winner of the Computational Mechanics Committee Student Poster Competition



The Computational Mechanics Committee Student Poster Competition



Prof. Ahmer Wadee and the winner of the Stability Student Paper Competition



Prof. Hamed Ebrahimian and the winners of the Dynamics Committee Student Paper Competition





Views of the Awards Banquet

Reception and Awards Banquet

Upcoming Conferences

The EMI/PMC 2020 conference will be held on May 26-29, 2020 at Columbia University. It is planned that the EMI 2021 annual conference will be organized in Baltimore by The Johns Hopkins University. The 2020 EMI International Conference will be held on April 5-8, 2020 at Durham University in Durham, U.K. The 2021 EMI International Conference will be held at Tsinghua University in Beijing, China. The 2022 EMI International Conference will be held at Ghent University in Ghent, Belgium.

LOCAL ACTIVITIES

EMI helped establish the <u>Engineering Mechanics Committee within the ASCE Met Section</u> in 2011. The Engineering Mechanics Committee of the ASCE Met Section organizes two major events at Columbia University: the <u>Biot Lecture</u> in the fall and the <u>Mindlin Lecture</u> in the spring. The videos of these and other prestigious lectures have been posted on the "<u>EMI Lecture Series</u>" page of the EMI website.

COMMUNICATIONS

The monthly EMI newsletter continues to provide timely information to the membership regarding activities of the Institute, upcoming events and deadlines, and other useful information such as the table of contents of the current issues of the EMI journals. The newsletter also features a Research Group Profile that highlights the work of research team. Each RGP presents the problem the team is addressing, its approach, its findings, their impact, a list of selected publications, current research team members, industry partners, and research collaborations.

The EMI website includes:

- The searchable database of a growing number of Research Group Profiles that present a snapshot of the research undertaken by EMI members.
- EMI-specific areas on <u>books</u> and <u>journals</u>, <u>conferences and events</u>, <u>continuing education and jobs</u>, <u>membership</u>, and <u>awards</u>.
- A searchable section on EMI committees providing automatically updated committee.
- An <u>EMI Lectures Series</u> page which featuring the videos of the most recent Biot and Mindlin Lectures, the newly established EMI Annual Lecture on Objective Resilience and the Mechanics Research Communications Elsevier Distinguished Lectures.

The site also includes an <u>on-line EMI membership application</u> and an <u>on-line technical committee</u> <u>membership application</u>. In addition to these EMI-specific areas, the integration with the ASCE site provides immediate access to other areas of general interest.

COMMITTEES

The EMI community was deeply saddened by the June 3, 2018 passing of Prof. Asad Esmaeily (Kansas State University), who served for many years as Chair of the EMI Committee on Experimental Analysis and Instrumentation.

The EMI committees continue their excellent work in supporting EMI activities, including reviewing papers submitted to the EMI journal; organizing sessions at the EMI annual conference, and organizing student paper or poster competitions at the annual conference. All the EMI committees met at the EMI 2019 conference. A new committee on Architected Materials chaired by Stavros Gaitanaros (The Johns Hopkins University) was established at the June meeting of the EMI Board of Governors. Many thanks to all our committee chairs and committee members for their continued support of EMI activities!

As they come to the end of their terms, several Committee Chairs are stepping down. EMI is grateful to the outgoing committee chairs for their dedication and hard work:

Asad Esmaeily (Experimental Analysis and Instrumentation) replaced by Bernhard Pichler Haim Waisman (Computational Mechanics) replaced by John Brigham Chung Rak Song (Modeling Inelasticity and Multiscale Behavior) replaced by Yong-Rak Kim Linbing Wang (Nanomechanics and Micromechanics) replaced by Nima Rahbar Giuseppe Buscarnera (Poromechanics) replaced by Chloe Arson

Lori Brady (Probabilistic Methods) replaced by Alex Taflanidis
Stefan Scheiner (Properties of Materials) replaced by Anil Misra
Ahmer Wadee (Stability) replaced by C.W. Lim
Babak Moaveni (Structural Health Monitoring and Control) replaced by Yang Wang.

Many thanks to the outgoing Committee Chairs, and welcome to the new Committee Chairs!

FINANCES

EMI is required to operate within the financial model of the ASCE Institutes. As such, its main sources of income are membership dues, publications and journal royalties, net income from conferences and continuing education activities, and donations. Its main areas of expenses are: Board and committee operations; Institute operations; and staff salary, fringes and travel. A positive net financial result is expected for FY 2019 and will be added to EMI's reserves which serve both as a "rainy day" fund and a source of funding for new promising initiatives. Overall, EMI's financial situation is satisfactory, but additional resources are needed to increase EMI staff (currently 1.5 FTE) to adequately address the substantial increase in activity of the Institute.

ASSESSING PROGRESS

Since its founding in the fall of 2007, EMI has significantly expanded its program of activities, made significant progress in several areas, enhanced its program of prestigious awards, and significantly increased its membership while keeping with the tradition of organizing excellent conferences and producing high-quality publications. EMI enhanced its stature among the many U.S.-based mechanics-related associations and increased its international visibility and influence.

In FY 2019 EMI held a very successful EMI 2019 conference at Caltech and two International Conferences at Tongji University in Shanghai, China and at INSA of Lyon, France. *JEM's* significantly increased its impact factor and decreased its time to publication. EMI continues to provide financial support to the student competitions. EMI regularly provides new content on its website and keeps its members informed through its newsletter. The EMI membership elects each year new members to its Board of Governors and can thus influence the governance of the Institute. EMI's considerable progress since its founding in the fall of 2007 is mostly due to the dedication and hard work of its volunteers and the effective support of its staff.

Despite these accomplishments, EMI still needs to improve its financial sustainability, establish stronger connections to industry, and enhance its continuing education program.

We encourage EMI members to actively engage into the Institute activities, including:

- Renewing their membership
- Giving a voluntary contribution (which may be tax deductible) to EMI when renewing their membership
- Encouraging their graduate students, post docs and colleagues to join EMI and to remain members of EMI
- Attending the EMI conferences and contributing to their technical program

- Getting involved in EMI technical committee activities
- Being responsive to requests for reviews of EMI journal articles
- Suggesting or offering webinars and short courses
- Encouraging organizations in industry and government that are users of advanced mechanics they are familiar with to become organizational members of EMI
- Contributing articles to the Journal of Engineering Mechanics
- Contributing volumes to the Lecture Notes in Mechanics series
- Publishing collections of papers based on presentations at sessions and mini symposia at EMI conferences in the Trends in Engineering Mechanics Special Publication series
- Submitting short articles, pictures, videos, and announcements to the EMI newsletter and the EMI website.

Thank you for all your support. Your continuous engagement and participation will allow EMI to grow and prosper. It has been my great honor to have the opportunity to serve as the President of EMI for the past year.

Respectfully submitted,

George Deodatis, Ph.D., F.EMI, M.ASCE

Peodatris Georgios

EMI President, FY 2019