



ANNUAL REPORT TO THE EMI MEMBERSHIP FOR FY 2020

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

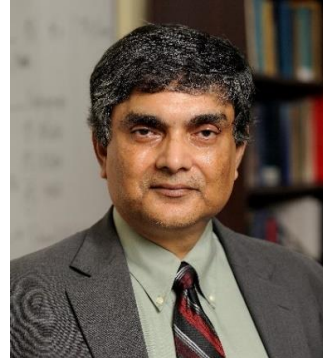
Over the spring and summer 2019, EMI conducted an election for one open position on the EMI Board of Governors, starting on October 1, 2019. Christian Hellmich, Ph.D., F.EMI, M.ASCE (Vienna University of Technology) and Ertugrul Taciroglu, Ph.D., F.EMI, M.ASCE (UCLA) were elected by the EMI membership to serve a three-year term. Pol Spanos, Ph.D., P.E., NAE, F.EMI, Dist.M.ASCE (Rice University) and George Deodatis, Ph.D., F.EMI, M.ASCE (Columbia University) served as FY 2020 EMI President and Past President, respectively. Somnath Ghosh, Ph.D., F.EMI, M.ASCE (The Johns Hopkins University) served as the FY 2020 Vice-President. Panneer Selvam, Ph.D., F.ASCE served as the ASCE-appointed Governor. Elisabeth Malsch, Ph.D., P.E., M.ASCE (Thornton-Tomasetti) was a second ASCE-appointed EMI Governor and served as the FY 2020 Treasurer. Gianluca Cusatis, Ph.D., F.EMI, M.ASCE and Somnath Ghosh, Ph.D., F.EMI, M.ASCE (The Johns Hopkins University) served the last year of their term on the EMI Board of Governors. Welcome to the new EMI Governors, and many thanks to Gianluca Cusatis and Somnath Ghosh for their many years of service on the EMI Board of Governors.



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



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



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



Christian Hellmich, 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, President



R. Panneer Selvam, Ph.D., P.E., F.ASCE



Ertugrul Taciroglu, Ph.D., F.EMI, M.ASCE

EMI Board of Governors (FY 2020)

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

Administrative Division

Awards Committee
Nominating Committee

Publications Division

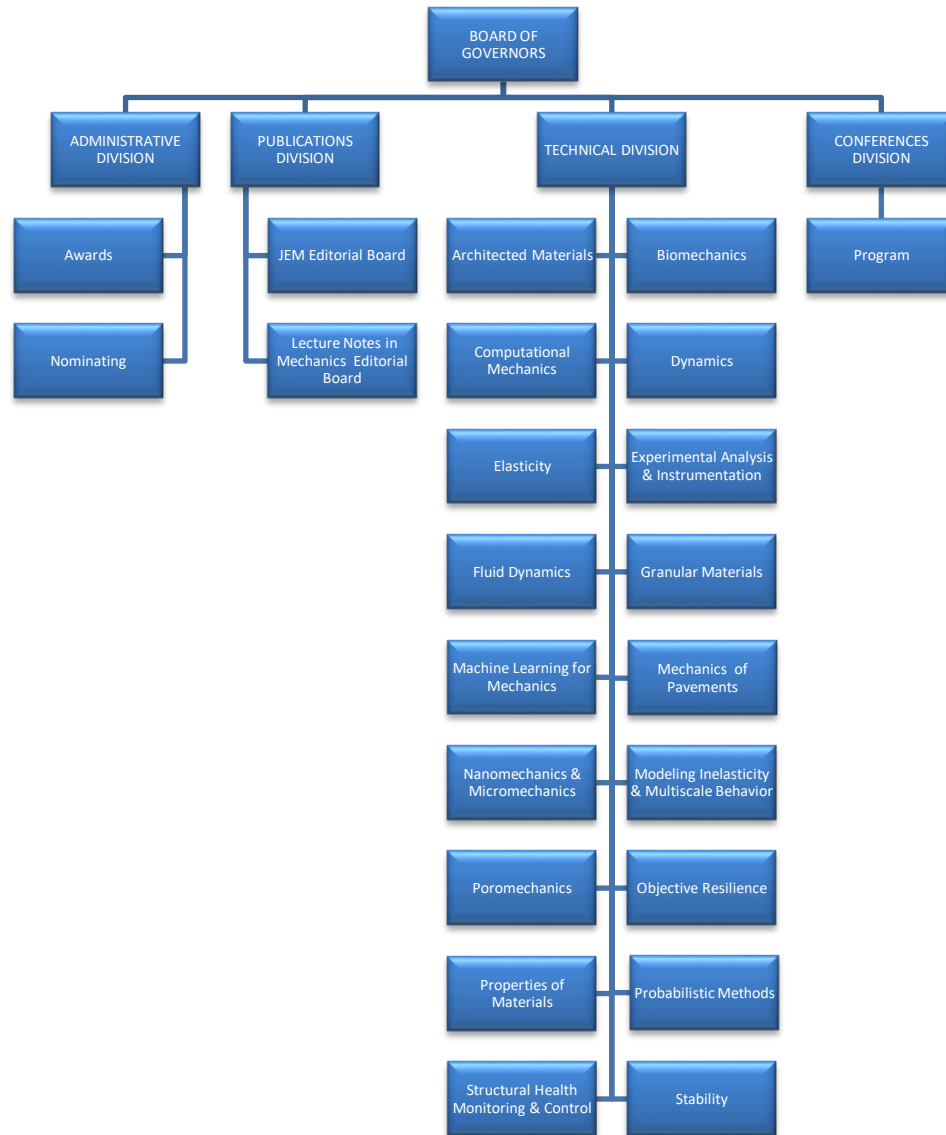
Editorial Board of the *Journal of Engineering Mechanics*
Editorial Board of *Lecture Notes in Mechanics*

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
Machine Learning for Mechanics
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 [annual dues discount](#) based upon the yearly World Bank World Development Indicators is provided to members residing in certain countries. On-line membership applications are available for [ASCE/EMI membership](#) and for [EMI-only membership](#). 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 [Journal of Engineering Mechanics](#) (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 from 0.787 in 2007 when EMI was established to 2.003 in 2019, 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. Several Special Collections have been published in JEM:

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

Another special collection on “Recent advances on the mechanics of masonry structures” (Guest Editor: Vasilis Sarhosis) is under preparation.

EMI is also preparing a *Manual of Practice on Objective Resilience* edited by Mohammed Ettouney, to be published in 2021 by ASCE.



CONFERENCES

EMI 2020 Conference

EMI had planned to hold its EMI 2020 Conference and its 2020 Probabilistic Mechanics and Reliability Conference on the campus of Columbia University in New York City from May 26 to May 29. The event was to be chaired by Shiho Kawashima, Ioannis Kougioumtzoglou, Steve Waiching Sun, Haim Waisman, Haim Waisman (all of Columbia University), Elisabeth Malsch (Thornton Tomasetti), and George Deodatis (Columbia University).

Due to the COVID-19 pandemic which made travel and large gatherings impossible, the event was postponed to 2021 and will be held as the EMI PMC 2021 conference, a [virtual event](#), on May 25-28, 2021.

The EMI PMC 2021 conference will feature [six plenary lectures](#) by leading researchers:

Katia Bertoldi, Ph.D., Wyss Institute, Harvard University: Multistable Structures – From Energy Trapping to Morphing

Ronaldo I. Borja, Ph.D., Stanford University, The Poromechanics of Shale

Jie Li, Ph.D., Tongji University, Physical Stochastic System: A New Perspective on Objective World

Elisa E. Konofagou, Ph.D., Columbia University: Imaging Cardiovascular Mechanics for Disease Diagnosis

Arif Masud, Ph.D., F.EMI, University of Illinois at Urbana-Champaign: Hierarchical Variational Methods for Coupled-Field Problems, Data Driven Modeling, and Error Estimation

Mircea D. Grigoriu, Ph.D., F.EMI, Cornell University: Data-based estimates of extreme rare events in dynamical systems

On the occasion of the EMI PMC 2021 Conference, nine EMI Technical Committees are organizing [student paper competitions](#) which will be held on-line:

EMI Dynamics Committee Student Paper Competition

EMI Modeling Inelasticity & Multiscale Behavior Committee Student Competition

EMI Objective Resilience Committee Student Competition
EMI Poromechanics Student Poster Competition
EMI Probabilistic Methods Committee Student Paper Competition
EMI Structural Health Monitoring and Control Committee Student Paper Competition
EMI Structural Stability Student Paper Competition
EMI Computational Mechanics Committee Student Poster Competition.

Although the EMI PMC conference had to be postponed, the EMI Board of Governors, all the EMI Technical Committees, and the Editorial Board of the Journal of Engineering Mechanics met via Zoom in May and June 2020. Six student competitions were organized by the EMI Technical Committees and were also held on-line.

The winners of the six **student competitions** received certificates:

1. [The Dynamics Committee Student Paper Competition](#)
(Chair: Dr. Hamed Ebrahimian, University of Nevada, Reno)
1st Place - Jonathon Fagert, Carnegie Mellon University / Stanford University
2nd Place - Shaopeng Li, University at Buffalo
3rd Place - Mariyam Amir, The Pennsylvania State University
2. [The Modeling Inelasticity & Multiscale Behavior Committee Student Paper Competition](#)
(Chair: Prof. Yong-Rak Kim, Texas A&M University)
1st Place - Deepak Kumar, National University of Singapore
2nd Place - Santosh Reddy Kommidi, Texas A&M University, Gabriel Nsengiyumva, Texas A&M University
3rd Place (tied) - Kuangguidong Wang, Youcheng Hong, Columbia University; Kunhao Yu, University of Southern California; Zimu Su, Vanderbilt University
3. [The Objective Resilience Committee Student Paper Competition](#)
(Chair: Dr. Mohammed Ettouney)
1st Place - Mohamadreza Sheibani, University of Utah
2nd Place - Ahmed U. Abdelhady, University of Michigan
3rd Place - Nariman Laal Dehghani, Ohio State University
4. [The Probabilistic Methods Committee Student Paper Competition](#)
(Chair: Prof. Seymour MJ Spence, University of Michigan)
Winner - Aikaterini Kyprioti, University of Notre Dame
Winner - Jungho Kim, Seoul National University
5. [The Structural Health Monitoring & Control Committee Student Paper Competition](#)
(Chair: Prof. Jian Li, The University of Kansas)
1st Place - Seyed Omid Sajedi, University at Buffalo
2nd Place - Roya Nasimi, University of New Mexico
3rd Place - Pu Ren, Northeastern University

6. [The Elasticity Committee Student Paper Competition](#)

(Chair: Prof. Evgueni Filipov, University of Michigan)

Winner: Siva P. Vasudevan, IIT Madras

At the awards ceremony of the EMI PMC 2021 conference, certificates and medals will be presented to the winners of the 2020 (and 2021) ASCE and EMI awards:

2020 Awards

[Zdeněk P. Bažant Medal for Failure and Damage Prevention](#)



Prof. Ares J. Rosakis Ph.D., NAS, NAE, M.ASCE (Caltech) has been selected for "*groundbreaking contributions to earthquake mechanics, specifically for inventing laboratory earthquakes which have transformed our understanding of failure and damage processes in the earth, that have proven central to infrastructure damage prevention.*"

[Maurice A. Biot Medal](#)



Prof. Colin Atkinson Ph.D., FRS (Imperial College) has been selected "*for outstanding contributions to the development of fundamental mathematical solutions to problems in fracture mechanics of fluid-saturated porous media and linking these contributions to the successful applications in energy resources recovery sectors worldwide.*"

[Jack E. Cermak Medal](#) (*Joint with the Structural Engineering Institute of ASCE*)



Peter J. Vickery, Ph.D., P.E., F. SEI, F. ASCE (Applied Research Associates, Inc.) has been selected " *for his contributions in the development of hurricane hazard models for risk analysis and for his major impact on the development of building codes and standards in North America.* "

[Alfred M. Freudenthal Medal](#)



Prof. Dan M. Frangopol, Sc.D., P.E., F. SEI, F. EMI, Dist. M.ASCE (Lehigh University) has been selected " *for outstanding contributions to the advancement of probabilistic, reliability and risk methods in civil engineering, particularly in developing probabilistic models for life-cycle performance assessment, maintenance and optimum management of civil infrastructure systems in diverse loading environments .*"

[George W. Housner Structural Control and Monitoring Medal](#)



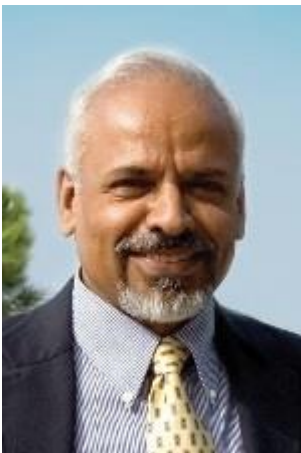
Prof. Yozo Fujino Ph.D., M.ASCE (Yokohama National University) has been selected "*for pioneering research in the development and implementation of structural monitoring and control systems in large-scale structures, as well as for his commitment to developing innovative education programs for students .*"

[Raymond D. Mindlin Medal](#)



Prof. Glaucio H. Paulino, Ph.D., F.EMI, M.ASCE (Georgia Tech) has been selected "*for pioneering contributions to the field of mechanics, including geometric mechanics associated to origami and tensegrity engineering, which led to the creation of multifunctional structures and configurational metamaterials with unprecedented properties .*"

[Theodore von Kármán Medal](#)



Prof. Katepalli R. Sreenivasan, Ph.D., NAS, NAE (New York University) has been selected "*for lasting*

scientific contributions to diverse fluid dynamical topics from cryogenics to solar convection, especially the dynamics and mixing of turbulence in laboratory, computational and terrestrial flows, and vast impact on scholarship, scientific development and education in many countries ."

[Nathan M. Newmark Medal](#) (Joint with the Structural Engineering Institute of ASCE)



Prof. Satish Nagarajaiah, Ph.D., P.E., F. SEI, F. ASCE (Rice University) has been selected " *for the development of nonlinear dynamic analysis techniques for base isolated structures, development of adaptive stiffness systems, negative stiffness systems, smart tuned mass dampers, and for sparse structural system identification techniques and laser based non-contact strain sensing using nanomaterials ."*

[Robert H. Scanlan Medal](#)



Prof. Qiu-Sheng Li, Ph.D., P.E., M.ASCE (City University of Hong Kong) has been selected " *for outstanding contributions to wind engineering and structural mechanics from fundamental research to engineering applications ."*

[EMI Leonardo da Vinci Award](#)



Prof. Mija Hubler, Ph.D., M.ASCE, M.EMI (University of Colorado Boulder) has been selected" *for pioneering breakthroughs in the understanding of toughness of materials due to microstructure feature arrangement, and innovations in experimental methods to study concrete fragmentation, surface characterization, and aging ."*

EMI also elected in 2020 **six new EMI Fellows** who will be recognized at the award ceremony of the EMI PMC 2021 Conference:

Sanjay Raja Arwade, Ph.D., F.EMI

Jiann-Wen "Woody" Ju, Ph.D., P.E., F.EMI, F.ASCE

Loukas F Kallivokas, Ph.D., P.E., F.EMI, M.ASCE

Jie Li, Ph.D., F.EMI, Aff.M.ASCE

Antonina Pirrotta, Ph.D., F.EMI, A.M.ASCE

Linbing Wang, Ph.D., P.E., F.EMI, M.ASCE.

EMI 2020 International Conference

EMI had planned to hold its EMI 2020 International Conference on the campus of Durham University in Durham, UK on April 5-8, 2020. With travel and large gatherings prevented by the pandemic, the conference organizers had to postpone the conference. The hope was that by the same time in 2021, the restrictions created by the pandemic would no longer apply. Unfortunately, this was still not the case near the end of 2020, and the decision was made by the EMI Board of Governors to hold the conference as a virtual event on March 22-24, 2021 to provide to the authors of accepted presentations a venue to show their work, get feedback on their research, find out what others in the field are doing, and engage in stimulating discussions with like-minded colleagues. The conference was also intended to be an occasion to strengthen or initiate international collaborations.

The [virtual conference](#) followed the familiar format of EMI conferences, with [five live plenary lectures presented by leading researchers](#), and up to six concurrent technical presentation sessions for which all participants and speakers arrived in the meeting room at the designated time. Playback of the pre-recorded presentations took place in the session meeting room and everyone watched the content at the same time. At the end of the playback, the presenters participated in a live Q&A with the session attendees. Although only a fraction of the authors of presentations accepted for the in-person conference at Durham University registered for the virtual event, nearly all the [25 mini-symposia](#) initially

scheduled were held as shown in the [final program](#), and the event was successful. Frequently, the discussion, interaction, and networking among session attendees went past the allotted time and into the breaks.

EMI is pleased to have been able to hold its international conference as a successful virtual event. Congratulations to the members of the Local Organizing Committee, and to Prof. John Brigham who chaired the conference!

Upcoming Conferences

The EMI PMC 2021 conference will be held as a virtual event on hosted by Columbia University May 25-28, 2021. It is planned that the EMI 2022 annual conference will be organized in Baltimore by The Johns Hopkins University on May 31-June 3, 2022. It is planned that future EMI International Conference will be held at Tsinghua University in Beijing, China and at Ghent University in Ghent, Belgium, once travel and large gatherings are possible again.

LOCAL ACTIVITIES

EMI helped establish the [Engineering Mechanics Committee within the ASCE Met Section](#) in 2011. The Engineering Mechanics Committee of the ASCE Met Section organizes two major events at Columbia University: the [Biot Lecture](#) in the fall and the [Mindlin Lecture](#) in the spring. The videos of these and other prestigious lectures have been posted on the "[EMI Lecture Series](#)" 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 [books](#) and [journals](#), [conferences and events](#), [continuing education and jobs](#), [membership](#), and [awards](#).
- A searchable section on [EMI committees](#) providing automatically updated committee.
- An [EMI Lectures Series](#) 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 [on-line EMI membership application](#) and an [on-line technical committee membership application](#). 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 October 29, 2020 passing of Bill Iwan, Ph.D., F.EMI, NAE, Dist.M.ASCE, Professor Emeritus at Caltech, and Founding President of EMI. He received the Nathan M. Newmark Medal in 1997 and was elected to the National Academy of Engineering in 1999. He became a Professor Emeritus in 2004 and received the William H. Wisely Award in 2006. He received the EERI George W. Housner medal in 2007 and became a Distinguished Member of ASCE in 2009. He received the Theodore von Kármán Medal and was elected Fellow of EMI in 2013. He will be missed by the entire engineering mechanics community.

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. Although the EMI PMC 2020 conference had to be postponed, all the EMI committees met in May and June 2020 via Zoom. 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:

Michele Barbato (*Dynamics*) replaced by Eleni Chatzi

Anil Wijeyewickrema (*Elasticity*) replaced by Evgueni Filipov

Bernard Pichler (*Experimental Analysis & Instrumentation*) replaced by Mija Hubler

James Kaihatu (*Fluid Dynamics*) replaced by Ning Zhang.

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. The postponement of the two EMI conferences planned in 2020 had a severe impact on EMI's finances. It was necessary to use a substantial percentage of EMI's reserves to keep the Institute in operation. Overall, EMI's financial situation is satisfactory but fragile, and 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.

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.

Beyond 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.

Sincerely,

POL SPANOS

Pol Spanos, Ph.D., P.E., F.EMI, NAE, Dist.M.ASCE
EMI President, FY 2020