



Experimentally Speaking...

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MESSAGE FROM THE PRESIDENT



Kathryn Dannemann, SEM President, 2017-2018

Happy Anniversary to the Society for Experimental Mechanics (SEM! This year marks the 75th year since our founding in 1943. Some special activities are planned at the Annual Conference in June to celebrate this special occasion. I would be remiss if this message did not provide some highlights from our history. Hence, the following "top ten" list is presented to summarize some important events in SEM's history. For new members, this provides an introduction to how SEM became the "friendly" society we are today. Long-time members will recall how their involvement and influence helped to shape our current identity. To put things in perspective, initial patents for the electrical strain gage were issued in 1943.

- 1935 First meeting of New England Photoelasticity Conference at MIT on June 8, 1935. Attendees were exclusively academics.
- 1943 17th New England Photoelasticity Conference and Symposium on Experimental Stress Analysis, Detroit MI, May, 1943. Authors distributed copies of their papers to attendees. 90% of attendees were from industry.
- 1943 Transition of the Photoelasticity Conference to the Society for Experimental Stress Analysis (SESA). Founding members: Prof. William M. Murray (MIT), Prof. Raymond D. Mindlin (Columbia), Prof. Miklos Hetenyi (Stanford), Charles Lipson (Chrysler Institute of Engineering) with Prof. Murray as the first President.
- 1961 Journal of Experimental Mechanics first published as SESA's main publication, Jan. 1961. This initiated the transition from SESA to SEM. Benjamin

Lazan and Bonney Rossi, Executive Secretary of SEM, were the most active in creating the new journal.

- 1961 First international Congress on Experimental Mechanics, New York, NY, Nov. 1961.
- 1976 Experimental Techniques first published. D.R. Harting was one of the primary founders.
- 1982 SESA transforms into SEM and its current governance structure
- 1985 First Spring Meeting of the Society for Experimental Mechanics, Las Vegas, NV,
- 1991 SEM assumes total responsibility and management for IMAC (International Modal Analysis Conference). IMAC was created by Dick DeMichele and Peter Juhl; the first conference was held in 1981.
- 2015 First edition of the Journal of Dynamic Behavior of Materials; Editor, Dr. Eric Brown.

Many of the traditions initiated by our predecessors are still in effect today (e.g., dues-paying society, documentation and publication of conference papers, technical journals, member-driven focus). Our roots were established by a small group of founders who gathered to discuss technical problems and challenges relevant to photoelasticity, stress analysis and, ultimately, experimental mechanics. I believe the same drive and passion exists among current SEM members. This commitment of dedicated engineers and scientists to solve challenging experimental mechanics problems is what has sustained the society for seventy-five years.

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A review of SEM's current activities and future plans show the society is well-positioned to serve the technical community for at least another century. SEM boasts stable membership counts with active, committed members and a dedicated headquarters' staff. We are financially healthy, an enviable position following some tough times, in the early 2000's. Our financial health is largely due to the success of our conferences (IMAC and Annual) and our three flagship journals: Experimental Mechanics (EM), Experimental Techniques (ET) and the Journal of Dynamic Behavior of Materials (JDBM). Financial performance is now easier to predict owing to recent contract modifications, thanks to Executive Director, Kristin Zimmerman, with Springer - publisher of our conference proceedings and journals. SEM has added new technical focus areas based on member-driven interests in new and emerging technologies. We have embraced technological improvements and are applying them to further improve and streamline our operations. The new website has resulted in a more efficient registration and manuscript submission process. It will also aid our SEM headquarters staff as they assume conference management tasks for the next US conference of the International Digital Image Correlation Society (iDICS) in Fall 2019.

The passion and commitment of dedicated engineers and scientists was evident at the IMAC XXXVI Conference and Exposition on Structural Dynamics, held February 12th through 15th at the Rosen Plaza Hotel in Orlando, FL. IMAC's new byline is: "It's Not Just Modal Anymore". The theme of this year's conference was: "Engineering Extremes: Unifying Concepts in Shock, Vibration and Nonlinear Mechanics". This was my first opportunity to attend an IMAC conference. I had the pleasure of meeting many passionate SEM members from the Structural Dynamics community, as well as new SEM Executive Board members, members of the IMAC Advisory Board and very engaged vendors participating in the exposition. The IMAC exposition is larger than the Annual Conference.

The 2018 IMAC conference was quite successful with attendance of over 500 attendees, more than 400 presentations and three pre-conference courses. Conference highlights included the keynote address on Monday morning, presented by Dr. Jason Foley, and the SAGE Publishing Young Engineer Lecture by Dr. Jacob Dodson. Jacob is a research engineer at AFRL-Eglin Air Force Base. Jason travelled from London where he is currently on assignment at the US Air Force European Office of Aerospace Research and Development. His keynote, entitled "Engineering Extremes: Experiments at the Edge of the Envelope", provided some ideas on how to develop robust test systems for extreme environments using the design of extreme shock-survivable defense systems as a backdrop. Jacob's lecture on "High-Rate Structural Dynamics under Mechanical Shock – Sensing, Characterizing and Making Microsecond Decisions" complemented the keynote.

Some similarities between IMAC and the Annual Conference were evident, including parallel sessions tracks, TD lunch meetings on Tuesday, an evening career panel. It was reassuring to observe the vibrancy of the SEM Structural Dynamics community discussing new technical program areas; at least one new TD is under consideration. The spirit of our founders lives on! One difference observed was the completion of the Wednesday Awards Luncheon in record time compared to the Awards Luncheon at the Annual Conference! Also, an IMAC Board, separate from the Executive Board, meets at the IMAC conference.


The IMAC XXXVII conference will return to the Rosen Plaza again in 2019. Attendees enjoy this venue, especially considering the sunshine and 80 temperatures we enjoyed this year. In the interim, we are finalizing preparations for the upcoming Annual Conference and 75th anniversary celebration scheduled for June 4-7 in Greenville, SC. The conference theme is fittingly: "Celebrating Past Accomplishments and Exploring New Frontiers in Experimental Mechanics". Special events will include an oral history session, organized by Prof. Ghatu Subhash, where longtime members will share memories and stories. Some commemorative mementos will be provided to all attendees. Photographic montages of our history will be displayed during the Welcome and President's Reception on Sunday and Tuesday evening, respectively. Correlated Solutions will also host a "Cocktails and Correlations" reception on Monday evening.

A robust technical program is planned, beginning with a special keynote on Monday morning by Prof. John Rogers (Northwestern University) on Mechanics of Biocompatible Microsystems. The Young Investigator Lecture and the Murray Lecture will shift to Tuesday and Wednesday morning, respectively, to accommodate this special addition to the program. Prof. Leslie Lamberson's (Drexel University) Young Investigator Lecture on "MAX Phases: A Ripple in Time" is sure to enlighten. Prof. Fu-Pen Chiang (SUNY Stony Brook) will present the prestigious Murray Lecture on Wednesday before the All Society Awards Luncheon. He will discuss "Evolution of Optical Stress Analysis Techniques and Their Impact on Other Fields". The current program includes 8 parallel conference tracks, 4 symposia, including a special symposium on the Role of DIC in Experimental Mechanics, as well as 3 pre-conference courses.

We will miss the presence of Chuck Taylor at the 75th anniversary celebration. Sadly, Chuck passed away in December. Chuck had a significant influence on SEM's history (see In Memoriam article in this issue), for more than 65 years. In addition to his many technical contributions, Chuck was President of SESA (1966-67) and served as SEM historian for many years until recently. Sincere condolences to Chuck's family and friends, and the many SEM members whose careers and lives he influenced.

Thanks to all SEM members who have continued the traditions of our founders. Our history has also been shaped by your technical contributions and involvement. Your ideas are always welcome for ways that we can better serve the technical needs and interests of the SEM family. Regional student conferences are a great way to introduce students to SEM. These are the folks who will build and continue the legacy. Please contact me or Kristin if you would like to lead or participate in a regional student conference. There are also opportunities to build shared programming between the IMAC and Annual Conferences.

I look forward to your suggestions and to seeing all of you in Greenville for the Annual Conference and 75th anniversary celebration.



Kathryn Dannemann
SEM President

FROM THE EXECUTIVE DIRECTOR

With this message, I would like to highlight the outcomes from our recent IMAC-XXXVI conference.

IMAC was held in sunny Florida at the Rosen Plaza Orlando from February 12-15. The conference was a huge success in attendance, revenues and energy. Attendance was well over 500 with 220 individuals attending for the first time. Al Wicks, our IMAC Conference Director, wrote thank you emails to all attendees, especially the first timers, inviting them to continue their participation in the IMAC community and IMAC 2019.

I'm still trying to figure out what was different this year to create such participation and attendance in IMAC. I always go back first to the technical program. We have our IMAC Advisory Board, our Program Planning Committee, our session organizers and Technical Division chairs to thank for putting together an outstanding program. They clearly hit the mark. Next, I look to the hotel venue as an important variable in the success of a conference. The Rosen Plaza fits our SEM/IMAC technical program, trade show and reception requirements very well and the staff are great to work with. I then look to the dates that we selected three years ago when negotiating the Rosen Plaza contract. We were two weeks later this year...could that have been a key reason? There was another difference this year. We had 388 programmed papers but over 500 attendees. Typically, folks come to conferences to present a paper, but this year, people came to the conference to listen and learn without the requirement for a paper presentation. This is a very good sign and one that I will watch closely going forward. It is a sign that suggests that SEM/IMAC is staying very true to its mission.

We published nine Volumes in our IMAC Conference Proceedings, which will be available in mid-April. We are clearly doing some things right in terms of our conferences and we want to continue to enable emerging Technical Divisions (TDs) to blossom and grow, while pruning back those emergent TDs that are no longer as relevant as they used to be. To this point, this year we launched our two new IMAC Technical Divisions. They are, Nonlinear Structures & Systems chaired by Gaetan Kerschen and Dynamic Substructures chaired by Andreas Linderholt. There was also much discussion about the potential formation of new focus groups representing emerging growth

areas and a more formalized best student paper per program track and/or technical division. The work done by our Technical Program organizers, TD Chairs, Track Chairs, and Session Chairs, coordinated by the tireless work by our SEM staff, is responsible for creating outstanding programs that continue to bring in large numbers of conference attendees. We, however, need to stay agile and very aware of the emerging areas that we should include in our programs. Our Conference success rests in large part on the success of the Technical Program.

Our three Journals also met at IMAC. We take the opportunity at both IMAC and Annual to engage in face to face and conference call discussions with Springer our publisher. We were able to talk through some changes needed with the Springer website (transfer desk) that should enable our Editors-in-Chief the ability to learn where the submissions that they are receiving are actually coming from. For example, EM wants to be sure that when it transfers a paper to ET, that ET is actually receiving it. I believe that this single issue may assist a great deal in managing the submission to actual papers reviewed in the Springer Editorial Manager online process.

Another item that we discussed was the lack of interest in IMAC attendees to publish in SEM's journals. The journal that looks to be the best fit for the IMAC community is ET. However, the aims, scope and even title tagline of ET were not written in a way that recruited IMAC papers. Therefore, Paul Reynolds, Editor-in-Chief of ET, worked closely with IMAC leadership to tweak the aims and scope and update the tagline for the Journal. Please visit the website to learn more. We need to provide our SEM/IMAC members a journal to publish their work. I think we made significant progress in enabling our IMAC community to publish in SEM.

We are also working on the completion of the SEM Handbook of Structural Mechanics. We took the opportunity to meet with many of the contributing authors at IMAC. We have Pete Avitabile and Randy Allemang to thank as our co-editors. They have worked very hard to ensure that each contributor is fully aware of SEM's ownership of the copyright.

Our Annual Conference and 75th Anniversary

is ramping up nicely. We have over 500 papers programmed into eight parallel sessions over four days including many special sessions, panels, and receptions that are sure to make our 75th Anniversary a special one. Please visit the SEM website to learn more.

SEM will be working closely with the International Digital Image Correlation Society (iDICS) leadership on the 2019 Conference. Stay tuned as more information becomes available on the SEM website.

SEM is defined by its ability to remain agile, focused and open to all experimental mechanicians who have an insatiable need to learn and grow as experts in their field of study. Our relatively small conference size enables our agility...allowing us to keep our finger on the pulse of what is next, create a conference track to represent an emerging area of interest, and carve out our niche in that new area... A niche that sends the message to our meeting participants that SEM's IMAC, Annual and Fall conferences are the ones to attend. This, I believe is one of the keys to what defines us and gives strength to the meaning of the "friendly society."

SEM is working on a new member survey. Our last survey was in 2008. We will need your input by participating in the survey. We need to learn what membership in SEM means to you and where we need to improve communication of the value of an SEM membership. Stay tuned for further updates.

To those of you that attended IMAC, I want to personally thank you for a successful conference. And I look forward to seeing you in Orlando, Florida in 2019. We guarantee another exciting conference as we celebrate IMAC 37.

To those planning on attending the Annual Conference in Greenville, SC in June, I look forward to seeing you, engaging with you and I invite you as you register for the conference to either renew your membership, or become a new member of SEM!



Kristin Zimmerman,
Executive Director

SEM'S DIC CHALLENGE NEWS: PAST WORK AND FUTURE DIRECTIONS

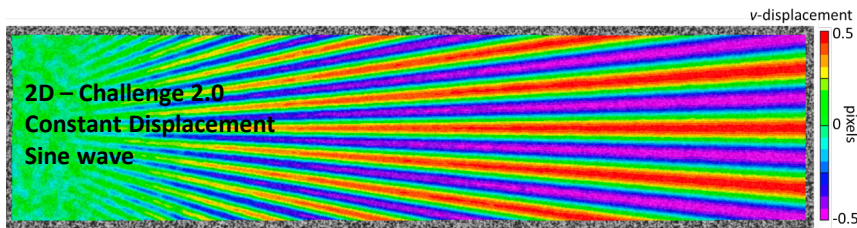
The DIC Challenge is an international organization operated under the auspices of the Society for Experimental Mechanics (SEM) and the International Digital Image Correlation Society (iDICs) whose goal is to provide trusted synthetic and experimental images for DIC code verification and validation.

2D - DIC CHALLENGE RESULTS

The first round of the 2D Challenge is completed and the results are published in Experimental Mechanics†. The paper describes 18 image sets available for download and use in future journal publications – particularly when claiming improvements in the DIC algorithm. In the paper, eleven different DIC codes were compared for two image sets. An example difference map from the paper for 4 of the 11 codes is shown to the right. Link to challenge images is shown below.

2D CHALLENGE 2.0

The first analysis revealed that the sample images were not “challenging” enough for the codes. Therefore, a new 2D Challenge 2.0, led by Benoît Blaysat, has been initiated to create new image sets designed specifically to study DIC spatial resolution. Images are available for download using the link below.



STEREO-DIC CHALLENGE

The stereo-DIC Challenge is in the image evaluation phase with a number of synthetic and experimental image sets available for download (see link below). We are in the process of determining the best methods of comparing results between codes and with secondary experimental data. An example figure to the right shows the full-field difference in the w-displacement between two different DIC systems.

DIGITAL VOLUME CORRELATION (DVC) CHALLENGE

The DVC Challenge, led by Helena Jin, has just started a round robin experiment to gather data from a range of different CT machines to look at error sources in volumetric correlation. Contact Helena for more details.

SCANNING ELECTRON MICROSCOPE (SEM) CHALLENGE

The SEM Challenge, led by Will LePage, seeks to create a broad set of standardized experimental SEM images for testing DIC image correction schemes. Contact Will for more details.

INFORMATION

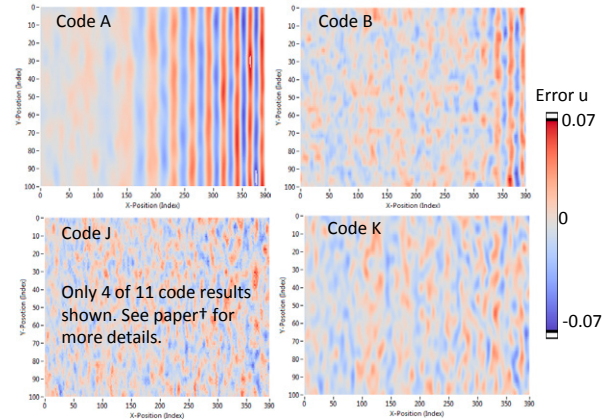
There will be an open DIC Challenge meeting at 6 p.m., June 4th at the SEM Annual Conference. See SEM program for room.

Contact Email: Phillip Reu: preu@sandia.gov; Helena Jin: hjin@sandia.gov; Will LePage: wlepage@umich.edu; Benoît Blaysat: benoit.blaysat@uca.fr

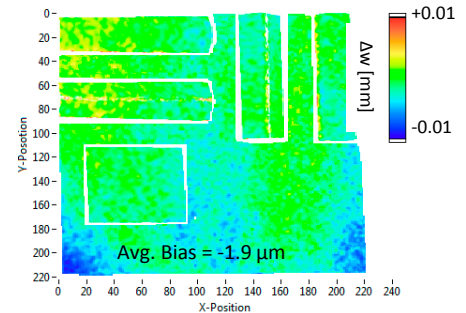
2D Challenge 1.0 Download link: <http://sem.org/dic-challenge>

2D Challenge 2.0 Download link: https://drive.google.com/open?id=1ELWo0GMxxRBjG9KSQ8PlyMk1CL__GtLB

Stereo-DIC Download link: <https://drive.google.com/open?id=1uLZdQscdt3pWVwNZU7HBaCxNIUx7ByJb>



Sample 14 difference between command and DIC response



Stereo-DIC Challenge w difference map example for Step 4: W = -10 mm, U = 0 mm

DIC BOARD MEMBERS

Chair: Phillip Reu–Sandia

Co-chair: Mark Iadicola–NIST

DVC Challenge Lead: Helena Jin–Sandia

SEM Lead: Will LePage–University of Michigan

Lead 2D Challenge 2.0: Benoît Blaysat–

Univ. Clermont Auvergne

Elizabeth Jones–Sandia

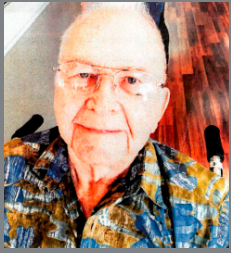
Evelyne Toussaint–Univ. Clermont Auvergne

Hugh Bruck–University of Maryland

†Reu, P. L., et al. (2017). "DIC Challenge: Developing Images and Guidelines for Evaluating Accuracy and Resolution of 2D Analyses." Experimental Mechanics.

MEMBER NEWS

CHARLES E. TAYLOR



Charles E. 'Chuck' Taylor, age 93, passed away at his home in Gainesville, surrounded by family on Monday, December 18, 2017. He was born on March 24, 1924 in West Lafayette, Indiana to Alvin Lee and Ruby Hamilton Taylor.

Chuck Taylor was very close to his older brother Bill. At a young age they took music lessons together, Chuck on trombone, Bill on trumpet. They were in the same grade at school, even though they were 15 months apart. Because they were always together, and their father owned a monument business, they were called the 'Tombstone Twins'. They graduated from Monticello High School in 1941, and then planned to study music at Indiana University. At the last minute they got a job offer from an excellent dance band in Lafayette, so they enrolled at Purdue. At Purdue Chuck had a choice between agriculture and engineering. This was the beginning of a five-decade career in engineering.

There were, however, a few interruptions in his education. It took WWII to split the brothers up with Bill serving in the Army Airborne in Europe, and Chuck serving in the Army in the Philippines. Later, during the Korean War, Chuck worked for the navy as a civilian engineer at the David Taylor Model Basin (nuclear submarines) near Washington DC. In 1954 Chuck returned to academic life, completed his PhD, and became an Engineering Professor. He taught 30 years at the University of Illinois, and 10 years at The University of Florida.

On August 28, 1946 Chuck married Lucile 'Nikki' Nitsche. Together they had two sons, four grand children, three great grand children, two chihuahuas and one black Cocker Spaniel. Chuck loved his family, and he also loved his graduate students as if they were family. Their many successes were a source of enormous pride to him.

Finally in 2006, to honor his forty-nine year career, Chuck received a second, honorary Phd. from his alma mater Purdue University. He was addressed thereafter as Doctor-Doctor Taylor.

He is preceded in death by Nikki his loving wife of 56 years, his brother Bill Taylor, and his sister-in-law Babe Taylor. He is survived by his two sons Gary and Glenn; daughter-in-laws Amy Taylor and Donna Taylor; sister-in-law Arlys Gale; favorite brother-in-law Jack Gale; granddaughter Lauren Taylor; grandson Michael Taylor; Nieces Susan Rankert, Laurel Mendivil, and Allison Marioni; Nephews John Taylor and Greg Gale; step grandchildren Lisa Richards and Tom Swain, and three step great grandchildren.

He loved music and played his trombone well into his 80s. He was an avid fisherman. From the Puget Sound to the Gulf of Mexico, from the streams of Colorado to the icy waters of Alaska fish trembled at the mention of his name. He will always be remembered for the twinkle in his eye, and his appreciation of joy, fun, and a great joke, especially if he was telling it! He will be missed by all who loved him.

GENE MADDUX



Gene Maddux, 85, of Tipp City passed away Wednesday, Jan. 10, 2018.

He was born, February 7, 1932 in Dayton to John and Bernice (Caudy) Maddux, who preceded him in death. He is survived by his wife of 60 years, Alice (Puterbaugh) Maddux of Tipp City, and children Cheryl (Kent) Hamon of Powell, Ohio, and David (Erica)

Maddux of Bay Village, and grandchildren Erica and Alicia Hamon and Cole, Giana and Lane Maddux.

Gene was a 1950 graduate of Tipp City High School and designed some of the early Tipp City Red Devil mascots. He attended Purdue University and graduated from The Ohio State University with degrees in Aeronautical Engineering and Nuclear Physics.

He worked for Aeroproducts in Dayton and then spent the next 40 years at Wright Patterson AFB as a civilian engineer.

He was elected in 1973, as a Charter Member of The Aviation Hall of Fame and was awarded the William Murray Medal, Society of Experimental Mechanics.

He was very active in The First Baptist Church of Tipp City as a deacon and Sunday school teacher and an active contributor to the Tippecanoe Historical Society.

CLYDE EVERETTE WORK



Clyde Everette Work of Guilford was born in Nebraska in 1924. He died on Nov. 4 of Legionnaire's pneumonia after a train trip to visit his daughter in Edmonds, Washington.

Clyde served as a naval officer during WWII. He was head of the Department of Engineering Mechanics at MTU in Houghton, Michigan, and dean of engineering at WNEC (now WNU) in Springfield, Massachusetts.

He is survived by his wife of almost 70 years, Betsy; daughter Cathy (Washington); sons Richard (Ohio), and Steve (California).

2018 IMAC-XXXVI CONFERENCE AND EXPOSITION ON STRUCTURAL DYNAMICS

FEBRUARY 12–15, 2018 AT THE ROSEN PLAZA HOTEL, ORLANDO, FLORIDA USA

HIGHLIGHTS AND AWARDS OF IMAC-XXXVI IN ORLANDO, FLORIDA

IMAC Conference Co-Director, Raj Singhal, conducted the Awards Luncheon ceremony, presenting various awards in recognition of outstanding achievements in structural dynamics and service to SEM/IMAC.

Our sincerest congratulations to all those who received awards and to the attendees for making this a successful IMAC conference.

With a theme of *Engineering Extremes: Unifying Concepts in Shock, Vibration and Nonlinear Mechanics*, the conference attracted over 500 attendees and more than 35 exhibitors.



Jason Foley—IMAC keynote speaker with Al Wicks—IMAC Conference Director



Jacob Dodson—SAGE Publishing Young Engineer Lecturer with Raj Singhal—IMAC Conference Co-Director



*Charles Farrar—SEM Fellow awardee
with Raj Singhal—IMAC Conference Co-Director*



*Carlos Ventura—SEM Fellow awardee
with Raj Singhal—IMAC Conference Co-Director*



*Raj Singhal—IMAC Conference Co-Director with
Gary Foss—G.A. Brewer awardee*



*Charles D. Van Karsen—D.J. DeMichele awardee
with Raj Singhal—IMAC Conference Co-Director*



*Raj Singhal—IMAC Conference Co-Director with
Alfredo Fantetti—D.J. DeMichele Scholarship awardee*



*S. Shekhar—2018 MVUQ Best Paper awardee
with Raj Singhal—IMAC Conference Co-Director*

SUBMIT A NOMINATION

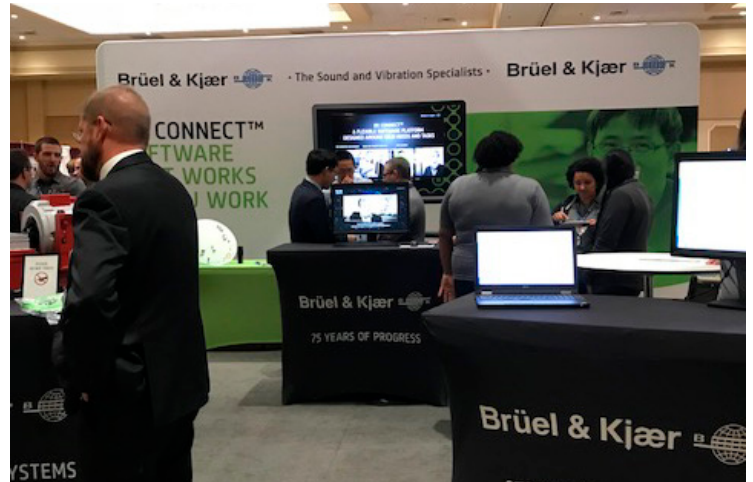
Do you have a colleague you'd like to nominate? The Honors Committee meets each year at the SEM Annual Conference (generally held the first week in June) to determine award recipients for the following year.

The committee will consider all Nominations received by April 15 of that year. A nomination received is kept for active consideration for three years

Go to sem.org/awards to submit a nomination!

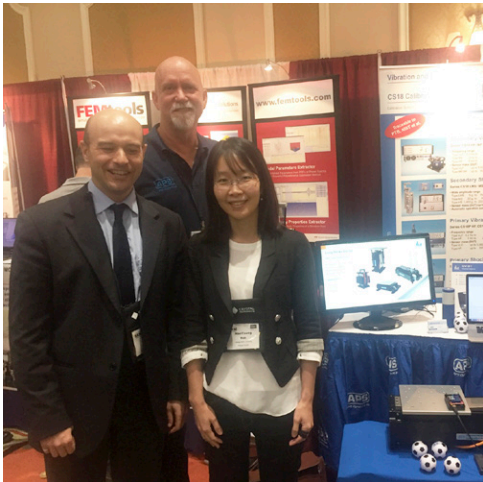
IMAC-XXXVI PEOPLE AND EVENTS

Attendees mingling and interacting with exhibitors during receptions and show hours.



IMAC-XXXVI





500+

Number of attendees at IMAC-XXXVI.



UPCOMING EVENTS

2018

2018 SEM ANNUAL



75TH ANNIVERSARY OF SEM:
CELEBRATING PAST ACCOMPLISHMENTS
AND EXPLORING NEW FRONTIERS IN
EXPERIMENTAL MECHANICS

JUNE 4-7, 2018

HYATT REGENCY GREENVILLE

220 North Main Street, Greenville, SC USA

18TH U.S. NATIONAL CONGRESS FOR THEORETICAL AND APPLIED MECHANICS

JUNE 4-9, 2018

HYATT REGENCY O'HARE

Rosemont, IL USA

13TH INTERNATIONAL CONFERENCE ON ADVANCES IN EXPERIMENTAL MECHANICS

AUGUST 29-31, 2018

DEVERE GRAND HARBOUR HOTEL

Southampton, United Kingdom

IDICS 2018

OCTOBER 15-18, 2018

LAKEVIEW HOTEL

Hangzhou, China

2019

IMAC-XXXVII

JANUARY 28-31, 2019

ROSEN PLAZA HOTEL

Orlando, FL USA

2019 SEM ANNUAL

JUNE 3-6, 2019

PEPPERMILL RESORT SPA CASINO

Reno, NV USA

2020

IMAC-XXXVIII

FEBRUARY 10-13, 2020

HYATT REGENCY HOUSTON

Houston, TX USA

To explore these events and others SEM and its partners are planning, please go to sem.org for more information.