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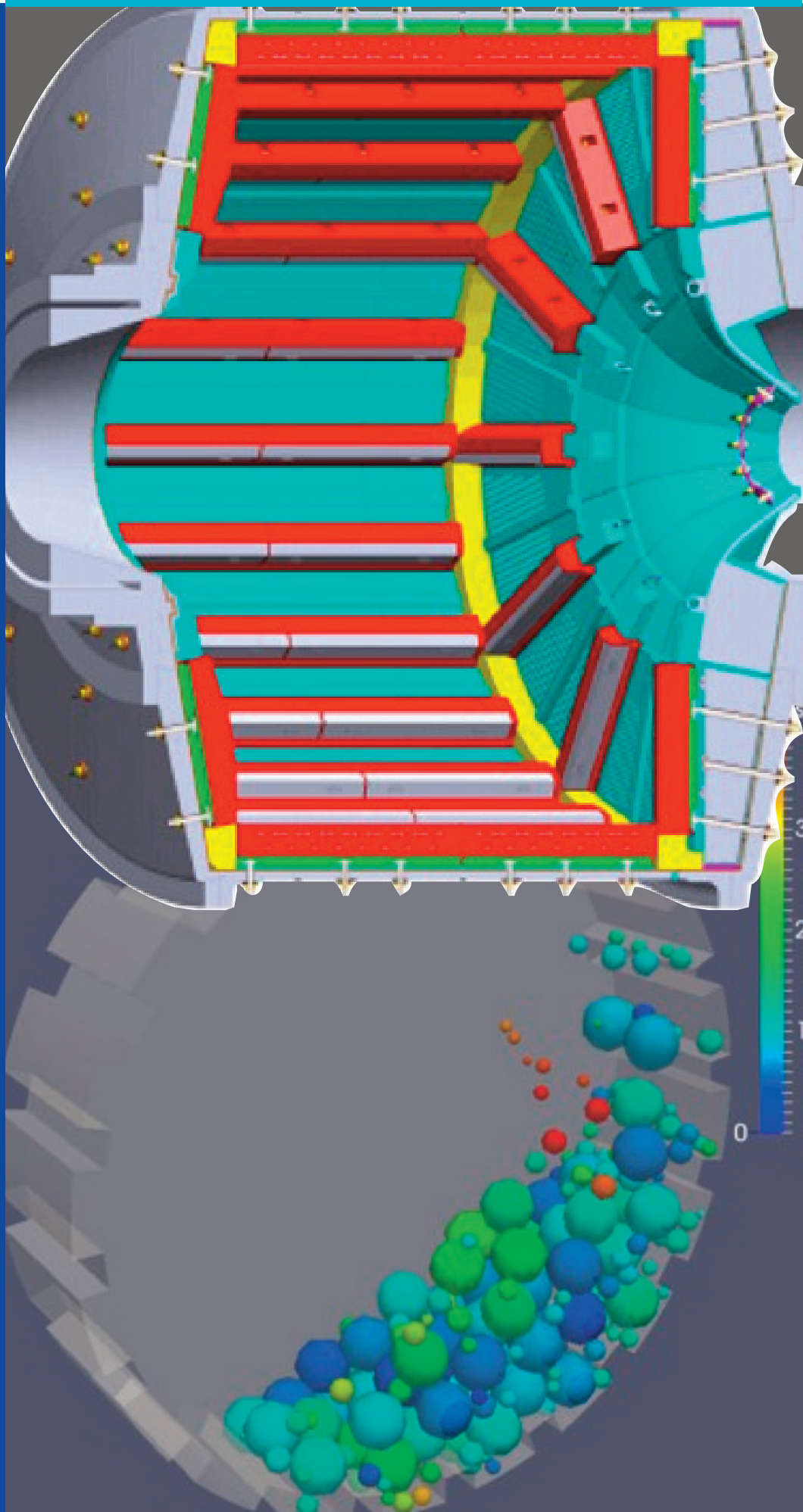

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contents

editorial

Dear Members of IACM,

I am honoured to assume the role of President of the International Association for Computational Mechanics (IACM). My appointment, which took effect in the summer of 2022, comes at a pivotal time for our organization and our field as a whole. I extend my sincere gratitude to all of you for your trust and support.

The past few years have been a testament to the resilience and adaptability of our global community. The Covid-19 pandemic disrupted life as we knew it and has made us reevaluate the way we operate. In response, we took the difficult but necessary step of transitioning not one, but two editions of our flagship event, the World Congress on Computational Mechanics (WCCM), into the online realm. While this presented challenges, it also showcased our resilience and adaptability. Here we came together virtually to share knowledge, engage in meaningful discussions, and fortify our bonds.

As we step into 2023, I am thrilled to report in-person conferences are making a return. These gatherings underscore the pivotal role IACM plays in shaping the future of computational mechanics.

In this dynamic landscape, we are witnessing the convergence of transformative technologies, including AI (Artificial Intelligence), DX (Digital Transformation), and IoT (Internet of Things). These tools are no longer isolated concepts but have become the common threads uniting us all in the pursuit of shared objectives. SDGs (Sustainable Development Goals) and DEI (Diversity, Equity, and Inclusion) are guiding our path, as we collectively march towards a new era of societal and technological advancement. As computational mechanics experts, we hold the key to harnessing these tools for the betterment of our field, fostering inclusivity, and contributing to sustainable development.

Furthermore, it is imperative that we recognize other important areas within our community. Promoting the active participation of female researchers through initiatives like the Female Research Chapter (FRC) as well as the nurturing and mentorship of emerging talent, ensuring that the next generation of computational mechanics professionals receives the support and opportunities they deserve. Additionally, the need for practical CAE (Computer-Aided Engineering) education for industry practitioners must be address.

In conclusion, I want to express my appreciation for your commitment to the IACM community. Let us embrace this evolving landscape with enthusiasm and determination, knowing that our collective efforts will shape the future of computational mechanics.

With warm regards,
Kenjiro Terada

Modelling Abrasive Wear via DEM & Phenomenological Models

by
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Discrete element method (DEM) is a computational technique used to describe the movement of many particles of different sizes and geometries, whose interaction between them and the medium is represented by a contact model [1, 2, 3, 4, 5]. In most simulations using DEM, particles with sizes in the order of millimeters and quantities on the order of a few thousand achieve results in reasonable computation times [6]. However, in industrial applications with wear, it is often necessary to simulate millions of particles to represent the process. With advances in computer processing power and optimization of algorithms, now it is possible to simulate millions of particles with complex geometries, using GPU (graphics processor unit) and parallel processing [7]. Despite this great advance in computing power, there is still a great challenge. Abrasive wear is usually a phenomenon that develops slowly over time. For example, in the mining industry, the lifters in a SAG mill are typically replaced after four to five months of use, about three thousand hours of mill operation, see *Figure 1*. How can be simulated three thousand hours of real time to remove about 100 millimeters in the lifter by wear?

To date, DEM has been used as an effective way to address engineering problems to model the behavior of granular and discontinuous materials, such as concrete [8], sand [9], ceramics [10], among others. Many engineering processes involve loading, transport, crushing, smelting and abrasion of materials must be considered discontinuous at the engineering scale of interest. In the field of mining, DEM has been used to predict the trajectory of the material inside a comminution device and in the mineral transfer hoppers [11, 12, 13, 14].

Another interest application in this area is the modeling of wear. Wear diminishes the life of equipment, affecting its productivity and operating costs. The use of a numerical tool to predict wear allows reducing the costs of experimental prototypes when trying to maximize the life of equipment. A simple way to estimate the rate of abrasive-erosive

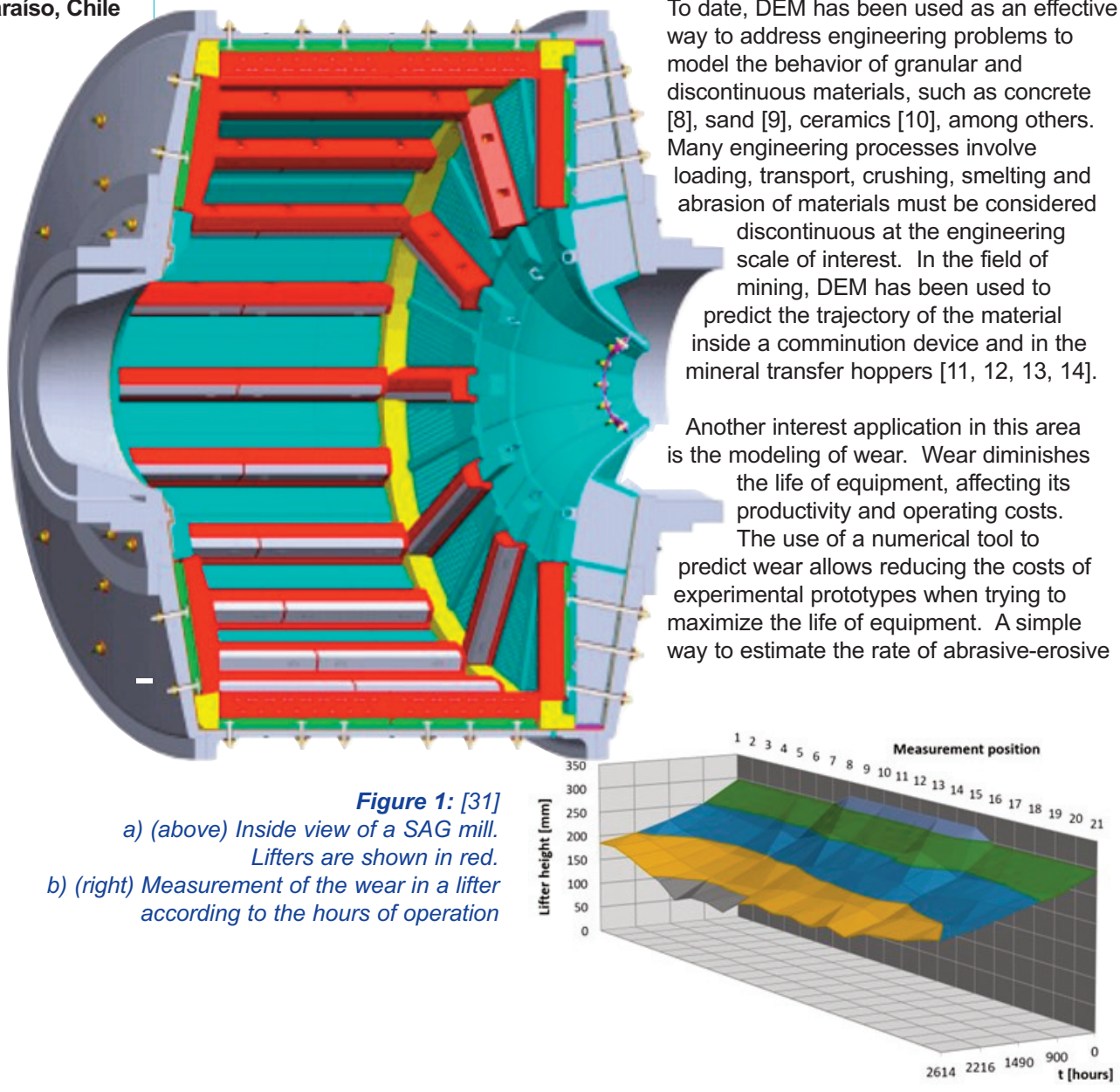

Figure 1: *[31]*
a) (above) Inside view of a SAG mill. Lifters are shown in red.
b) (right) Measurement of the wear in a lifter according to the hours of operation

wear using DEM code, is using the Archard or Finnie equations [15, 16]. In the context of comminution devices, one the first works where this methodology was applied was Cleary [17]. Here the Finnie equation was used to predict the wear rate in a ball mill lifter, using a 2D model for different conditions of rotational velocity. A modified form of the Archard equation has also been used and experimentally validated to predict the wear in the jaw crushers [18]. Subsequently, new research work has been carried out to predict wear using DEM [19, 20, 21, 22, 23]. In all these works the effort to carry out experimental tests that allow comparing the numerical results obtained is highlighted.

Different types of tests can be implemented to measure the rate of abrasive wear on elements of machines used in the grinding of minerals [24]. One of them, with the ability to control some of the variables that influence abrasive wear, such as the force applied and the speed, is the standard test of the wear wheel ASTM G65 [25]. This test represents a good opportunity to validate experimentally the results of the abrasive wear rate calculated with DEM, as well as the methodology used to correctly represent the wear pattern. It also allows correctly calibrate the granular material and its properties when using DEM, thus improving the reliability of numerical predictions. In this paper, a numerical methodology based on a DEM code to model the abrasive wear is presented. The Archard law is used to calculate the loss of material in the zone of the steel plate subjected to the wear. A finite element surface mesh, which is deformed according to the volume removed from the worn material, is used for the representation of the pattern of wear in the plate. An important step in the implementation of the methodology to calculate the wear is the calibration of the material. Specific tests are implemented for this, which allow obtaining the coefficients of rebound and friction between particles, as well as between particles and the steel plate [26]. The numerical results obtained from the rate and the wear pattern are in good agreement with those of the experimental test of the wear wheel.

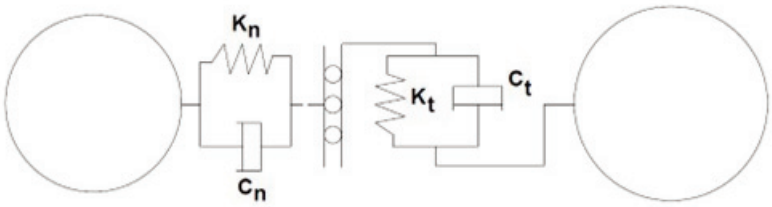

Figure 2:
Dashpot model used for contact forces

Discrete Element Model. Basic Equations

The equations describing the motion of the discrete elements are the well-known Newton-Euler equations for the balance of forces and moments [27]. The forces and moments are given by the usual body forces (gravity, magnetic) and most importantly from computational considerations contact forces with other discrete elements/objects or walls. Equations are integrated in time using an explicit low-storage 4-stage (1/6, 1/3, 1/3, 1/6) Runge-Kutta scheme [28]. For the contact, linear and nonlinear (Hertz) dashpot models are used to estimate the forces between particles (see *Figure 2*). The forces are separated into normal and tangential, in both case, spring stiffness and viscous damping coefficient are used.

DEM-DEM and DEM/WALL Contact Detection Algorithms

As in most DEM techniques, the overwhelming computational cost is due to contact search (the actual contact force calculation is insignificant). Therefore, care must be taken in the design of fast contact detection algorithms. In the present case, lists of possible contacts are built every so often. These pairs are tested at the beginning of each timestep to see if an actual contact exists. Given that this test is cheap, a compromise must be reached between the extent of possible contacts (memory, tests if contacting) and the cost of rebuilding the possible contact pairs. The larger the list of possible contacts, the less often the list needs to be rebuilt. Efficient spatial data storage and search techniques are crucial in obtaining fast-running, scalable DEM codes. In the present case, a simple bin data structure is employed for the DEM-DEM contact search, while a hierarchical bin data structure (a series of bins with increasing bin size) is used for the boundary triangulation [29, 30].

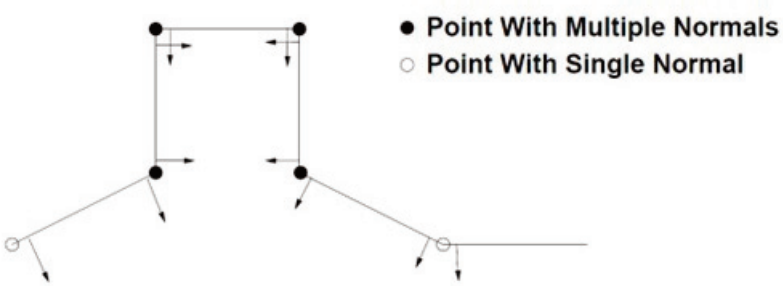

Figure 3:
Surface recession with multiple normal

Wear Model

The wear of surface walls is computed using the model of Archard as $dV = K \cdot fn \cdot ds = K \cdot fn \cdot |vt| dt$, where dV, K, fn, ds, vt and dt denote the change in volume, wear coefficient, normal force, relative displacement tangential to the wall, relative tangential velocity and time increment. Given that the wear occurs in a matter of days or weeks, and that a run of even a minute can consume copious amounts of computer resources, a separation of timescales was implemented. The present configuration is run for a relatively small amount of physical time to get the statistics of wear. For example, in a mill this could be a few rotations. For all the faces on the boundaries, the change in volume is updated every timestep. As the faces in contact are known, as well as all other quantities required for Archard's model, this step is simple. At the end of the run, the total change in volume is used to compute a 'recession speed' for each face. Denoting by dV the accumulated change in volume, and by $T0, T1$ the beginning and ending (physical) times of the simulation, the recession speed is given by: $Vr = dV/(A \cdot (T1 - T0))$ with A the area of each face. The recession speed is then used to extrapolate the recession distance dr (i.e. the wear) from ti to $T2 >> T1$ by $dr = Vr \cdot (T2 - T0)$. Once the surface is moved via the recession distance, the run is restarted and the cycle repeats.

Surface Movement

Given the recession distance for each face, the next step is to move the surface. This is simple if the surface is smooth. However, care has to be taken for cases where corners are present (see *Figure 3*). To handle such cases, multiple normals are allowed at points. The average recession from all the faces with similar normals is then used to obtain the final movement of the boundary points. Before movement, the surface mesh is checked to avoid post-movement face folding, change in normals, and vanishing areas. If any such anomalies appear, the recession distance is reduced until a valid configuration is obtained. One should remark that this happens very seldomly and is not considered a problem.

Example

The proposed concept is exemplified for the mini-mill shown in *Figure 4*. The mill has only 248 spheres that follow a size distribution as shown in *Figure 5*. The larger spheres are made of steel, the smaller ones of copper. The geometry, as well as the spheres after 60 sec (i.e. 6 rotations of the mill) are shown in *Figure 4*.

The sequence of runs outlined above was performed for 5 integration and surface recession cycles. After each integration to $T = 60$ sec, the wear was extrapolated to $T = 3600$ sec(1 hour), the surface recession computed and the new surface used to continue the integration from the previous run. A typical 'wear map' obtained after 6 rotations of the mill ($T = 60$ sec) is shown in *Figure 6*. Note the higher wear at the corners, as well as the impact of the larger spheres close to the side walls of the mill. *Figures 7 and 8* show the actual wear obtained. The surface triangulation is clearly visible.

"... the methodology can compute realistic wear patterns with CPU requirements that are acceptable in an engineering design environment."

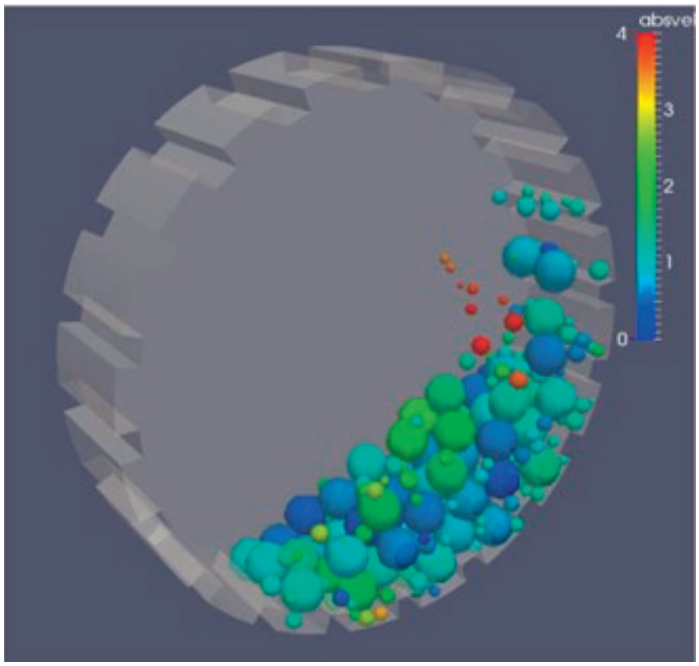

Figure 4:
Mill and spheres at T = 60 sec

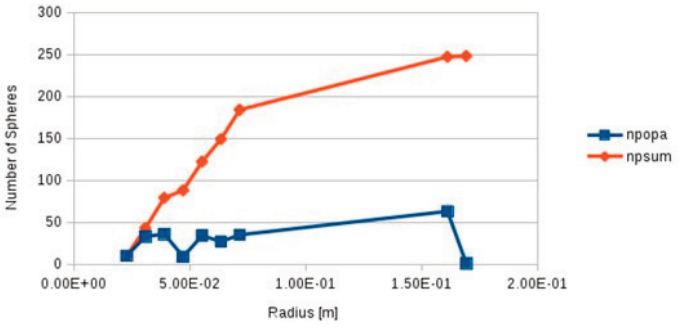

Figure 5:
Size distribution of spheres (npopa=number of spheres by size, npsum=cumulative spheres count). The Archard wear coefficient was set to K = 10-10

Conclusion and Outlook

A methodology to predict wear via Discrete Element Method (DEM) and phenomenological wear models has been developed. The results obtained to date show that the methodology can compute realistic wear patterns with CPU requirements that are acceptable in an engineering design environment. As with so many technologies, many improvements are possible. Among the most obvious ones, we mention:

- Use of non-spherical elements to characterize the materials being crushed
- Extension of the DEM code to distributed memory environments
- Link with flow solvers to account for the 'mushy phase' at the bottom of mills
- Extensive validation and verification. ●

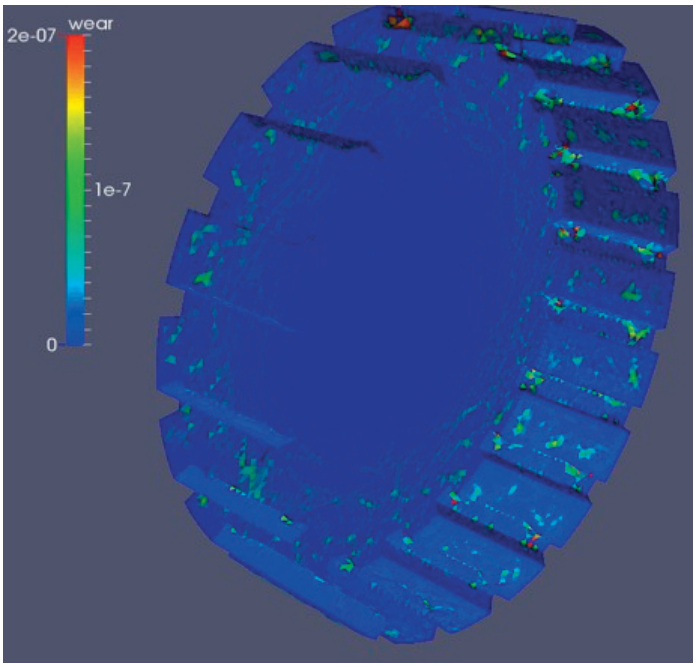

Figure 6:
Typical 'wear map' at T = 60 sec

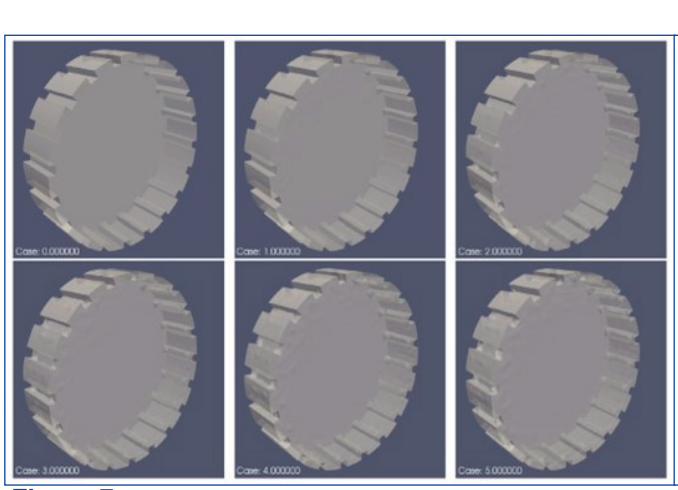

Figure 7:
Wear after each cycle

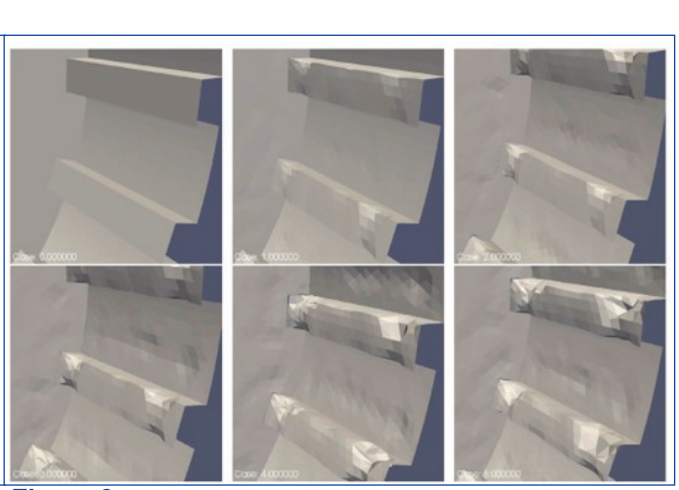

Figure 8:
Wear after each cycle (zoom)

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IACM Medal Acceptance Speech Delivered by J.N. Reddy

I want to express my sincere appreciation and gratitude to the International Association for Computational Mechanics for bestowing this honor. I consider it to be one of the most significant professional honors of my life.

I will do my best to live up to the high standard exemplified by the past recipients of the Gauss-Newton Medal – some of whom are present here tonight. My sincere and deepest respects to them; I feel deeply honored to be included among them. I have been fortunate over the years to have met and be inspired by the works of several previous recipients of the IACM Medal.

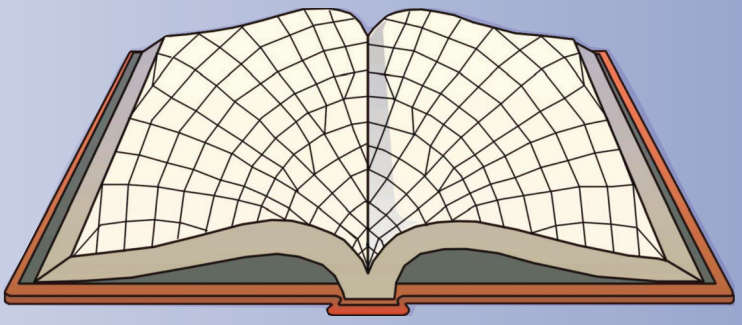
In the way of remarks and advice to younger colleagues in the audience, I have few thoughts to share. Some of the thoughts expressed here have already been included in my Timoshenko Medal acceptance speech published in the Journal of Applied Mechanics in 2019.

Computational mechanics has emerged as the "third scientific methodology," in addition to the traditional two pillars of scientific inquiry, namely, mathematical and experimentation studies. Computational mechanics has contributed to unifying ideas and bringing together diverse fields. It provides an important link between materials, design, and manufacturing. Therefore, funding agencies must see this important mechanics link in going from the creation of novel materials to analysis, design, and manufacturing and support the computational mechanics research that evaluates and certifies materials selection in the design. Lastly, we must take pride in whatever little we do to advance our field.

Once again, I thank the Major Awards Committee of the IACM for this prestigious award. No matter how much one deserves, it is not possible for someone to receive an award without the thoughtful consideration of the colleagues on the award committee and those who provide the support letters. I give my most sincere thanks to these unnamed colleagues. I also want to take this moment to thank my teacher and mentor, Professor J. T. Oden, and all my students and collaborators all over the world who have contributed to my professional success that enabled me to receive the IACM (Gauss-Newton) Medal. I thank my wife for her love, support, and sacrifice throughout our married life. Finally, I thank you all for your presence tonight, and I wish you and your families the best in life. ●

Numerical Linear Algebra:
25th Anniversary Edition

Lloyd N. Trefethen & David Bau, III
SIAM, Philadelphia, 2022



BOOK REVIEW

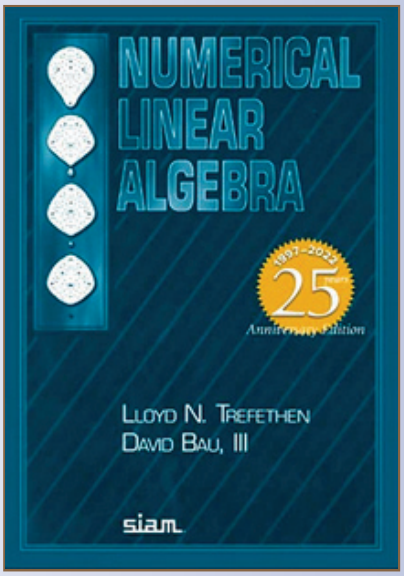
ISBN: *0-89871-361-7, 361 pages, soft cover, $79 (List Price)*

Contents: *Preface; 1: Fundamentals; 2: QR Factorization and Least Squares; 3: Conditioning and Stability; 4: Systems of Equations; 5: Eigenvalues; 6: Iterative Methods; Appendix: The Definition of Numerical Analysis; Notes; Bibliography; Index.*

This is the 25th edition of the book originally published in 1997. The first author is a well-known applied mathematician from Oxford University. The second author worked in Microsoft Corp. when the book was written, and today is a faculty member of Northeastern University. This edition is identical to the original one except for new forward and afterword.

This is a superb book, which I read years ago from cover to cover with great interest. It covers standard material in numerical linear algebra, but does so in a very non-standard and fresh way. A few examples that demonstrate this are given below. In addition, the structure of the book is extremely appealing. It is divided into 40 short lectures, each one dedicated to a certain subject. It is thus easy to read and to study and can easily serve as a textbook for a graduate course in applied mathematics or engineering. Each lecture ends with helpful exercises, and at the end of the book there are enrichment notes that relate to each lecture. The book contains examples for MATLAB codes, and algorithms written in boxes, whose complexities are always indicated. It is inviting to read.

The Singular Value Decomposition (SVD) appears at the beginning of the book (lectures 4 and 5). Eigenvalues appear for the first time only in lecture 24. As far as I am aware, this is the only treatment of linear algebra discussing singular values before eigenvalues. The use of SVD for the low-rank approximation of a matrix is very useful for information (e.g., image) compression, although this application, as well as others, are not explained in the book. The computation of the SVD appears in lecture 31, since it is a variant of the computation of eigenvalues. Another manifestation of the very special order of presenting the subjects is that Gauss elimination appears only in lecture 20, after the lectures on SVD, QR, least squares and conditioning.



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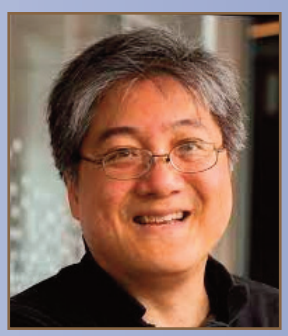
L.N. Trefethen


D. Bau, III

The topic discussed at length after SVD is QR factorization, decomposing any matrix into a unitary matrix times an upper triangular matrix (possibly with a lower zero block). QR factorization appears in various applications, such as the direct solution of a linear system, least squares and iterative methods. An unstable way to calculate QR (Algorithm 7.1) and later the stable way (Algorithm 8.1) are presented. QR appears also in the lectures on eigenvalues. The space given to this topic here is significantly larger than in most standard treatments. In fact, the authors state that QR is the most important algorithm in numerical linear algebra. Least squares and the pseudo inverse are introduced in lecture 11.

Eight lectures discuss conditioning and stability. Backward error analysis is presented in this context. Several examples for ill-conditioning are given, including Wilkinson's classic example of determining the roots of a high-order polynomial; see *Figure 1*.

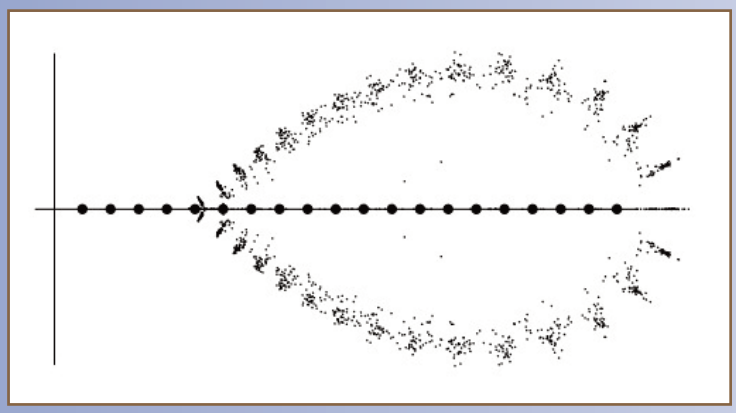


Figure 1:
Wilkinson's example of ill-conditioning. This is Fig. 12.1 in the book.

The lectures on eigenvalues are very nicely presented. Only the standard eigenvalue problem is discussed, not a word on the generalized eigenvalue problem that is very important in computational mechanics (the latter is covered in books by Gilbert Strang). Among the algorithms for calculating eigenvalues, the Arnoldi algorithm is presented and analyzed in lecture 34. See *Figure 2*. Incidentally, sparse matrices are mentioned in the book, but there is no emphasis on algorithms tailored for them.

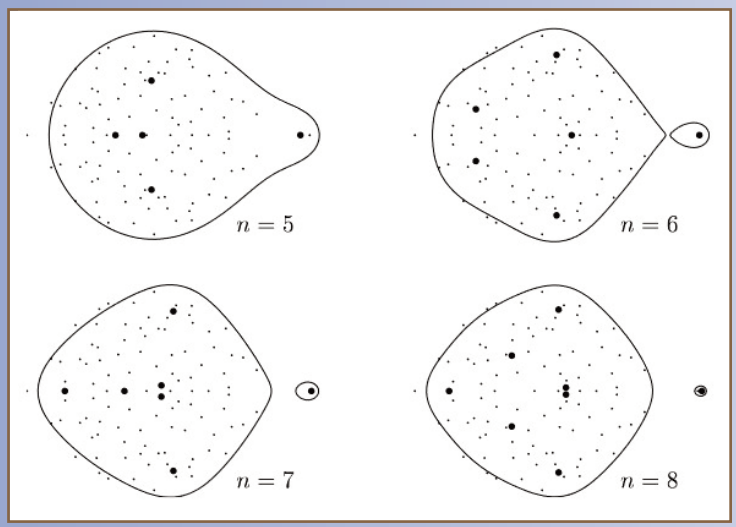


Figure 2:
Illustration of the Arnoldi process of locating eigenvalues. The small dots are the eigenvalues, and the large dots are the Ritz values. This is Fig. 34.3 in the book.

The Appendix includes some thought-provoking statements on numerical linear algebra. For example, on page 324 the authors explain their objection to symbolic calculations, and on page 326 they write "large-scale matrix eigenvalue problems are about as easy to solve in practice as linear systems of equations." I would be surprised if the reader of this review is not surprised to read this.

In summary, this is a highly original and eye-opening treatment of numerical linear algebra, and is highly recommended for anyone interested in scientific computing. ●

Newsletter of Int. Conf. on DACOMA 2022
by CACM
International Conference on Data-Driven Computing and Engineering Machine Learning 2022

by
Zhanli Liu, Zhuo Zhuang
School of Aerospace Engineering
Tsinghua University
Beijing, China

The International Conference on Data-Driven Computing and Engineering Machine Learning 2022 (DACOMA 2022) was successfully held in Beijing, China, on September 25-27, 2022. The conference is organized by Tsinghua University, and co-organized by Tongji University, Leibniz Universität Hannover, Bauhaus-Universität Weimar, Beijing Institute of Technology, Beijing Society of Theoretical and Applied Mechanics from China, and Marie Sklodowska-Curie Actions. The chairmen of the conference are Prof. Zhanli Liu from Tsinghua University and Prof. Xiaoying Zhuang from Tongji University. Along with the conference chairmen, Prof. Timon Rabczuk from Bauhaus-Universität Weimar, Prof. Xiang Li from Hainan Normal University, and Prof. Jing Xie from Beijing Institute of Technology serve on the conference organizing committee. The conference is supported by Beijing International Science and Technology Exchange Center and Chinese Association for Computational Mechanics (CACM).

Aiming to promote the data-driven computing and artificial intelligence in engineering, as well as scientific exchange among researchers, scientists, practitioners, and engineers in affiliated disciplines, the series of DACOMA conferences have been held since 2019. The first DACOMA conference was organized by Tongji University, China, and the chairman was Prof. Timon Rabczuk. The main topics of the DACOMA 2022 include (but not limited to) image reconstruction of materials, data-driven based constitutive modeling, machine learning based solutions of PDEs, big data for design and optimization, uncertainty analysis of geomechanics model, machine learning for materials characterization, data-driven simulation techniques, high-performance data-processing, data-driven techniques in multi-scale and multi-field simulations of materials, visualization and visual analytics of multi-source data, data-driven techniques for continuous and discrete methods, and data-driven computing in dynamics. The conference is set as a hybrid onsite-online pattern. The conference is broadcast on the Koushare Platform and Tencent Meeting. Over 6000 people joined the online conference and discussion, and over 40 people participated in the onsite conference in Beijing.

Figure 1:
Prof. Zhanli Liu hosts the opening ceremony

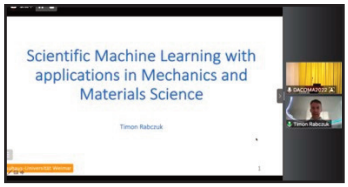
Figure 2:
The Vice President of IACM, Prof. Zhuo Zhuang delivers the opening speech at the opening ceremony.

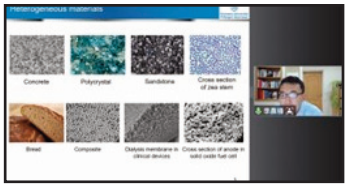
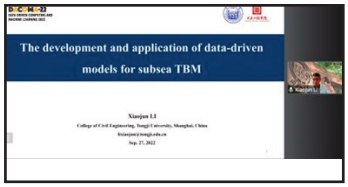
At the opening ceremony, the conference chairman Prof. Zhanli Liu, on behalf of the organizing committee, introduces the guests who come to the conference onsite, including the vice president of the International Association for Computational Mechanics, Prof. Zhuo Zhuang from Tsinghua University, the director of Bejing Society of Theoretical and Applied Mechanics, Prof. Yuesheng Wang from Beijing Jiaotong University, Prof. Shaoqiang Tang from Peking University, Prof. Dongping Chen from Beijing Institute of technology, as well as Ms. Yushan Li and Ms. Yanxiang Jia from Beijing International Science and Technology Exchange Center.

There are 6 plenary presentations and another 12 invited presentations at the conference. The presentations are divided into 8 sessions. The chairmen of each session are Prof. Yuesheng Wang, Prof. Shaoqiang Tang, Prof. Xiaoying Zhuang, Prof. Leiting Dong, Prof. Xiaozhi Tang, Prof. Xia Liu, Prof. Zhanli Liu, and Prof. Jing Xie.


Figures 3:
Prof. Zhuo Zhuang, Prof. Shaoqiang Tang, and Prof. Dongping Chen are invited to give plenary presentations

In the plenary presentation session, Prof. Zhuo Zhuang from Tsinghua University presents "Combination data-driving with mechanics model for defect bone reconstruction" and discusses some key mechanics problems in bone reconstruction. Prof. Shaoqiang Tang from Peking University presents "Some recent progresses on clustering analysis for numerical homogenization," in which he shows the computational acceleration with the clustering method and its application to some specific problems, including crack propagation and elastodynamics. Prof. Dongping Chen from Beijing Institute of Technology presents "Reaction kinetics of energetic materials: applications of data-driven models", and introduces his recent work based on the chemical reaction neural network.



Figures 4:
Prof. Timon Rabczuk, Prof. Chenfeng Li, and Prof. Xiaojun Li are presenting plenary speeches online

There are also three plenary speeches given online. Prof. Timon Rabczuk from Bauhaus-Universität Weimar presents "Scientific machine learning: application to engineering and materials science." Prof. Chenfeng Li from Swansea University presents "Machine learning for heterogeneous microstructure characterization, reconstruction and analysis." Prof. Xiaojun Li from Tongji University presents "The development and application of data-driven models for subsea TBM tunnel in complex geological condition."




Figures 5:
The invited presentation speakers receive certificates from the session chairmen

The invited presentation speakers receive certificates from the session chairmen
The 12 invited presentation speakers are Prof. Shan Tang, Prof. Qian Zhang, Prof. Leiting Dong, Prof. Heng Hu, Prof. Zhuojia Fu, Prof. Jianjun Chen, Prof. Kai Zhang, Prof. Xiaolei Yang, Prof. Weixi Huang, Prof. Hongling Ye, Prof. Xiang Li, and Prof. Haowen Dong. After each presentation, a certificate of the DACOMA conference presentation is granted to the speaker.

In the closing ceremony of DACOMA 2022, Prof. Zhanli Liu introduces six Best Paper Award recipients, who are selected by the conference committee from all the papers submitted to the DACOMA 2022 conference but cannot be presented in person. After appreciating the conference committee and the organizing team, he wishes great success to the DACOMA conference in the next year. On behalf of the DACOMA 2023 organization committee, Prof. Jing Xie welcomes people to participate in the next conference in October 2023, which will be organized by Beijing Institute of Technology.

Figure 1:
Prof. Jing Xie sends the invitation for DACOMA 2023

UK acm
UK Association for Computational Mechanics

UKACM 2023 Conference

The 2023 conference took place on 19th-21st of April 2023. Organised by **Dr Mohaddeseh Mousavi Nezhad** and **Dr Mohammad Rezania** (*University of Warwick*) with 70 contributed talks, 5 plenary speakers and a total of 95 participants from 30 institutions.

UKACM School

As it is tradition in UKACM, a School was organised before the start of the conference. This year the following topics were covered in the UKACM School:

- The interface between rigorous mathematical modelling, analysis, and high-performance computing in fluid mechanics. (**Dr Radu Cimpeanu**, *University of Warwick*)
- Modelling of coupled chemo-mechanical phenomena in solids (**Prof Laurence Brassart**, *University of Oxford*)

UKACM Plenary Speakers

Four plenary lectures at the conference were delivered by the following distinguished researchers:

Prof. Chris Pearce, *University of Glasgow*

Prof. James Sprittles, *University of Warwick*

Prof. Alberto Guadagnini, *Politecnico di Milano*

Prof. Stephane Bordas, *University of Luxembourg*

In addition, **Dr Jinlong Fu** delivered the closing lecture, entitled as winner of the 2021 Roger Owen PhD Thesis Award.

UKACM Conference Awards

The following delegates received the three UKACM conference awards:

- **Agustina Felipe** from *Swansea University* received the Mike Crisfield Prize for the paper “A coupled HDG-FV method for incompressible flows simulations”.

- **Robert Bird** from *Durham University* received the Nina Cameron Graham prize for the paper "Cone Penetration Tests (CPTs) in bi-phase soils: a material point approach with rigid body interaction".
- **Ted O'Hare** from *Durham University* and **Nima Sarmadi** from the *University of Warwick* received Laura Annie Willson prize for the papers "A geometrically exact finite element method for micropolar continua with finite deformations" and "The effects of bedding orientation on the hydraulic fracture trajectories in layered heterogeneous rocks", respectively.

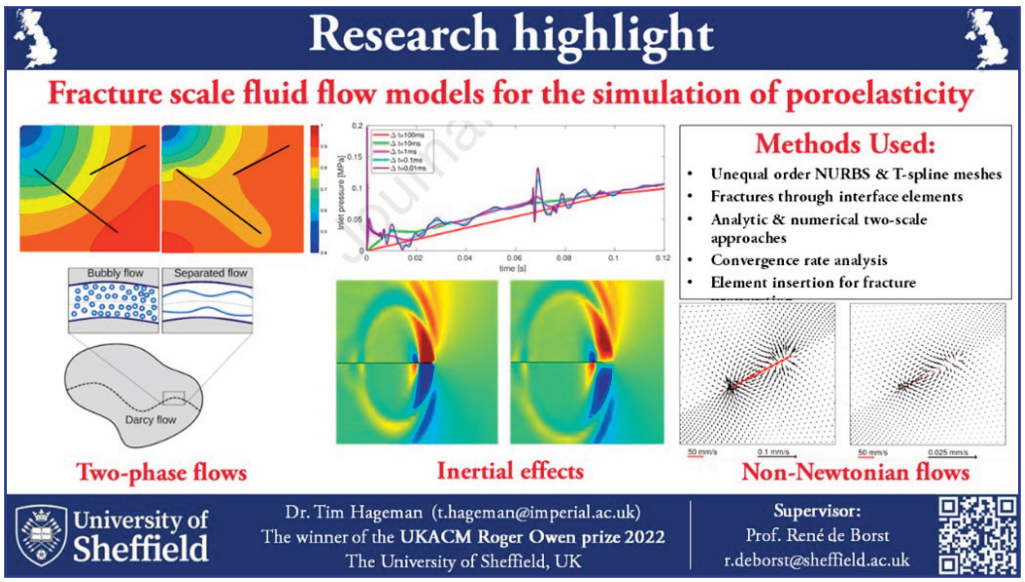
Special issues in the European Journal of Computational Mechanics

Attendees to the 2023 UKACM conference have been invited to submit a paper to a special issue in Engineering with Computers entitled "Advances in Computational Mechanics". The issue is expected to be published in 2024.

In addition, three UKACM board members are organising the special issues:
- "Computational Mechanics Applications in Aerospace Engineering", guess-edited by **Dr Jose Luis Curiel Sosa**.
- "Advanced Computational Modelling of Composite Materials", guess-edited by **Dr Wei Tan**
- "Advances in computational modelling of fluid-structure interaction with flexible and multibody structures", guess-edited by *Dr Chennakesava Kadapa*.

2022 Roger Owen PhD Thesis Award

The winner of the 2022 Roger Owen PhD Thesis Award was **Dr Tim Hageman** (*University of Sheffield*).



UKACM 2023 Autumn School

The first UKACM Autumn School will be organised by *Glasgow University*. The school will take place online on 6-8th September 2023 and will focus on ***Mixed Finite Element Formulations in Solid Mechanics***.

UKACM 2024 Conference

The 2024 UKACM conference will be organised by **Prof Will Coombs**, from *Durham University*. The Conference and School will take place in April 2024.

The Workshop on Establishing Benchmarks for Data-Driven Modeling of Physical Systems

Held April 6-7, 2023 at the University of Southern California in Los Angeles, the Workshop on Establishing Benchmarks for Data-Driven Modeling of Physical Systems was sponsored by the Data-Driven Modeling TTA of USACM. The organizers were Professors Assad Oberai (University of Southern California), Alireza Doostan (University of Colorado, Boulder), Paris Perdikaris, (University of Pennsylvania) and Jian-Xun Wang (Notre Dame University)

Over the last decade the field of data-driven modeling for physical systems has sparked tremendous interest and undergone rapid growth. This has led to the development of many new algorithms that have shown initial promise. This rapid growth has made it imperative that a set of benchmarks be established so that developers of models can quickly access FAIR data for training and testing their algorithms, new models can be consistently compared against existing algorithms, and users/adopters of these algorithms can easily determine which algorithms are best suited for their needs.

With this as motivation, this workshop brought together experts in this field to establish a set of benchmarks in operator learning, inference of dynamical systems and modeling in high-dimensional data space. Participants and speakers included experts from universities, national labs and industries. The workshop included around 30 technical talks and three discussion sessions. The outcome of the discussion was a clear delineation of the path forward for developing, advertising and curating these benchmarks. These ideas will be written up as a white paper in the next couple of months. Stay tuned!

Figure 1:
Prof. Oberai addressing a speaker at the Workshop

New Technical Thrust Area on Environment and Energy Modeling

The new USACM Energy & Earth Systems TTA encompasses a broad range of topics involving the modeling and analysis of earth systems and energy applications. Topics relevant to the TTA include: climate and earth system modeling; climate couplings; geomechanics; wind, solar and nuclear energy; carbon sequestration, capture and storage; oil/gas recovery. The TTA will promote advancements in both traditional first principles-based modeling and simulation, as well as the development of innovative data-driven model reduction and analysis methods, applied to the aforementioned domains.

The inaugural committee is composed of Irina Tezaur from Sandia National Laboratories, Steve WaiChing Sun from Columbia University, Yuri Bazilevs from Brown University and Clint Dawson from The University of Texas at Austin.

USACM Announces New Award

In recognition of her outstanding accomplishments in the field of computational mechanics, USACM is pleased to announce the establishment of the **Mary F. Wheeler Medal**. The first award will be made in 2025.

Description of the award is as follows:
The Mary F. Wheeler Medal is given in recognition of outstanding and sustained contributions to interdisciplinary and emerging areas including earth, environmental and energy sciences (EEES). These contributions shall generally be in the form of important research results that significantly advance the understanding of theories and methods impacting EEES and other emerging areas. Industrial applications and computational analysis that advance EEES shall also represent accomplishments worthy of recognition.

Figure 2:
Mary F. Wheeler

Her biography may be found at
https://oden.utexas.edu/people/directory/Mary-F.-Wheeler/.

Workshop on Data-Driven and Computational Modeling of Materials Across Scales

The USACM TTA on Nanotechnology and Lower Scale Phenomena hosted the Workshop on Data-Driven and Computational Modeling of Materials Across Scales on the UCLA campus, May 10-12, 2023.

The Workshop covered various aspects of multiscale modeling, including data-driven and computational approaches. Specific thrust areas of the workshop included:

- machine learning approaches to problems in the mechanics of materials,
- mechanics and physics of low-dimensional materials (nanomaterials – 0D, 1D and 2D materials),
- multiscale physics/mechanics of coarse-graining,
- multiscale design of materials and inverse problems, and
- defects and interfaces.

The Workshop featured 22 invited speakers (**https://sites.google.com/usacm.org/home/speakers**), 14 poster presentations preceded by lightning talks, and panel discussions on each of the five topics to review current trends and issues facing each area. Participants represented a wide spectrum of demographics and diverse institutions. Animated discussions on questions such as how machine learning models can best be used in computational materials modeling across scales, how reliable experimental and computational data may be generated, standardized and shared, and how latest advancements in artificial intelligence may be harnessed for materials design, were held.

The Workshop was organized by Professors Amartya Banerjee (UCLA), Nikhil Admal (University of Illinois at Urbana-Champaign), Alejandro Strachan (Purdue University), and Surya Kalidindi (Georgia Institute of Technology).

USACM TTA Virtual Seminars

Several TTAs of the USACM continued holding monthly virtual seminars which have featured guest speakers and discussions on various topics of importance to their field. Videos of the talks may be found at **usacm.org/ttas** under the TTA of interest. The following talks have taken place during the Spring 2023:

TTA on Large Scale Structural Systems and Optimal Design:

Early Career Colloquium

- April 5: *Prof. Ju Liu*, Southern University of Science and Technology
  Recent Advancements in Structure-Preserving Integration for Nonlinear and Inelastic Problems
- March 1: *Prof. Subhayan De*, Northern Arizona University
  Design Optimization Under Uncertainty Using Stochastic Gradients
- February 1: *Prof. Sid Kumar*, Delft University of Technology
  What Machine Learning Can Do for High-Dimensional Design of Metamaterials

TTA on Uncertainty Quantification and Probabilistic Modeling

- May 25: *Laura Swiler*, Sandia National Laboratories
  Uncertainty Quantification and Sensitivity Analysis Supporting Performance Assessment of Nuclear Waste Repositories
- April 20: *John D. Jakeman*, Sandia National Laboratories
  Recent Advances in Multi-Fidelity Uncertainty Quantification
- March 23: *Somdatta Goswami*, Brown University
  Integration of Numerical Modeling and Machine Learning in Mechanics
- March 9: *Bruno Sudret*, ETH Zürich
  Recent Developments on Surrogate Models for Stochastic Simulators ●

USACM Upcoming Events

- **17th U.S. National Congress on Computational Mechanics,**
  July 23-27, 2023, Albuquerque, New Mexico**;**
  17.usnccm.org
- **Advances in Computational Mechanics;**
  A Conference Celebrating the 80th Birthday of Thomas J.R. Hughes with Special Track:
  Computational Fluid-Structure Interaction – Frontiers in Methods and Applications (CFSI 2023) **,**
  October 22-25, 2023, Austin, Texas.
  Write to ***admin@usacm.org*** for details. ●

*For all inclusions under **JACM***
please contact:
Hiroshi Okada **jacm@ja-cm.org**

Report from
the Japan Association for Computational Mechanics

The Japan Association for Computational Mechanics (JACM) is a union of researchers and engineers working in the field of computational mechanics mainly in Japan. The JACM is a loosely coupled umbrella organization covering 29 computational mechanics related societies in Japan through communication with e-mail and web page (**https://ja-cm.org/index-e.html**). The number of individual members is about 330. JACM members actively participate in the IACM activities.

On March 4th, 2023, the third JACM awardee seminar was held in an in-person/online hybrid format. The purpose of this seminar series is to have researchers who received the JACM awards recently give lectures on their latest research activities. The first and second seminars in December 2021 and March 2022 were held fully online due to the COVID-19, and this was the first seminar held as a partial face-to-face event.

Figure 1:
Professor Kazuki Shibanuma

Figure 2:
Professor Daigoro Isobe

Two lectures were given in the seminar. The first one entitled "*development of a numerical model for simulating brittle crack propagation and arrest behavior in steel plate based on the s-version FEM*" was presented by **Professor Kazuki Shibanuma** (University of Tokyo, *Figure 1*), who is the JACM Young Investigator Award winner of year 2020. The second one was "*solving structural dynamics using beam elements –from collapse analysis of buildings to control of robotic architectures–*" given by **Professor Daigoro Isobe** (Tsukuba University, *Figure 2*), received the JACM Computational Mechanics Award of year 2020. The speakers and in-person participants attended the seminar at Waseda University, which was broadcast to remote participants (Figure 3).

The JACM plans to hold this seminar series twice or three times a year in the future ●

Figure 3:
Group Photo of third JACM awardee seminar held on March 4th, 2023

The JSCES General Assembly Meeting and Special Symposium

The 2023 general assembly meeting of JSCES was held at the Ito International Research Center, the University of Tokyo, Japan, on May 23, 2023. Both the operating and financial review for the previous fiscal year and operation and financial plan for this fiscal year were reported in this meeting (*Figure 1*).
The general assembly meeting was followed by the JSCES special symposium, in which a lecture was given by Dr. Keizo Ishii, Founder & Chairman of Quint Corporation. He delivered a talk entitled "Creating Markets with Computational Engineering Software" (*Figure 2*). He gave a very valuable lecture on the history of the finite element method and optimal design, their pioneers, and interesting episodes he himself experienced in computational engineering. In explaining how he established Quint Corporation, he conveyed his high aspirations and sincere attitude toward manufacturing, which greatly impressed the audience.

Figure 1: (left) The 2023 general assembly meeting of JSCES

Figure 2: (right) Dr. Keizo Ishii

Award Ceremony for JSCES Prizes

On the same day, JSCES prizes were presented to those researchers and practitioners who have marked outstanding achievements and contributions. This year's recipients were Prof. Takahiro Yamada and Prof. Naoki Takano (The JSCES Achievements Award), Prof. Tomohiro Takaki (Kawai Medal), Mr. Tomoharu Saruwatari (Shoji Medal), Central Research Institute of Electric Power Industry (Technology Prize), Mr. Makoto Onodera and Mr. Takashi Hamaguchi (Technology Prize) and Dr. Yasutomo Kanetsuki (Young Technical Researcher Award).
Paper awards associated with the Transaction of the JSCES (see, https://www.jstage.jst.go.jp/browse/jsces) were also given to the following researchers: Dr. Takeki Yamamoto, Dr. Takahiro Yamada and Dr. Kazumi Matsui (Outstanding Paper Award), Mr. Riichi Sugai (Young Researcher Paper Award) and Dr. Reika Nomura (Young Researcher Paper Award). Dr. Tokimasa Shimada and Dr. Daniel Shigueo Morikawa were awarded for their outstanding Ph.D. dissertation (*Figure 3*).

Figure 3: Award Ceremony for JSCES Prizes

Conference on Computational Engineering and Science

The 28th Conference on Computational Engineering and Science, chaired by Dr. J. Matsumoto (AIST), was held during May 31 – June 2, 2023, at Tsukuba International Congress Center (Tsukuba, Japan). The conference was attended by about 591 participants, and 370 papers with full lectures were presented by researchers, graduate students, and practitioners. Fruitful discussions were exchanged in 30 organized sessions associated with a plenary lecture, graphic awards and 8 luncheon seminars. Special seminars were also organized at lunch times to inspire graduate students in the field of computational mechanics by offering small talks from four speakers. The participants were informed on the images and excitements of career paths after their graduation. The JSCES scholarship award, also aimed to promote young researchers, was presented to Mr. Yasutoshi Taniguchi (Waseda Univ.). The banquet of the conference was held at Hotel Nikko Tsukuba with almost 300 attendees (*Figure 4*).

Figure 4:
The conference banquet

The JSCES Grand Prize 2022

On the second day of the conference, a plenary lecture entitled “Computational autonomous synthesis of robot mechanisms – challenge and response” was delivered by Dr. Yoon Young Kim, the distinguished Professor of Seoul National University, Korea (*Figure 5*). In his lecture, he presented the design of rigid-body mechanisms applicable to the design problem of wearable exoskeletons and transformable wheel robots, where large motion and high-force transmission are considered. For these difficult design problems, Dr. Kim developed a new approach, the autonomous mechanisms synthesis, and introduced several successful research projects, including the process of devising the method and some of the difficulties encountered at the time.

Prof. Yoon Young Kim received “The JSCES Grand Prize 2022”, for his outstanding contributions in the field of computational engineering and sciences, at the following ceremony (*Figure 6*). ●

Figure 5: (left)
Dr. Yoon Young Kim
Professor of
Seoul National University

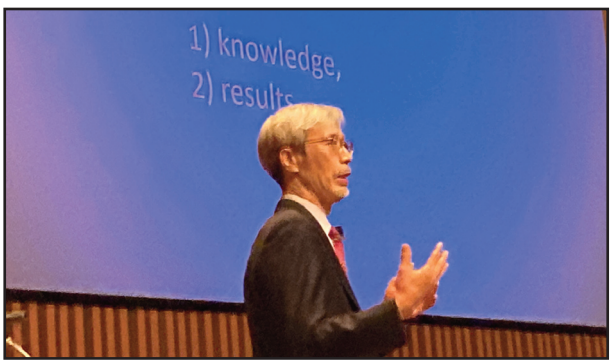


Figure 6: (right)
Prof. Yoon Young Kim
receiver of the
JSCES Grand Prize 2022

GACM Best Ph.D. Award 2022

We are very pleased that the outstanding doctoral thesis of Dr.-Ing. Ivo Steinbrecher is honored with the GACM Best Phd Award 2022.

His dissertation *"Mixed-Dimensional Finite Element Formulations for Beam-to-Solid Interaction"* was written at the University of the Bundeswehr Munich under the scientific supervision of Prof. Alexander Popp. The official award ceremony will take place during the next GACM colloquium in Vienna.

Dr.-Ing. Ivo Steinbrecher

Ivo Steinbrecher's dissertation deals with the mathematical modeling and high-fidelity numerical simulation of mixed-dimensional systems in nonlinear structural and solid mechanics, and in particular with the embedding of dimensionally reduced, 1-dimensional beams into 3-dimensional computational domains. Such mixed-dimensional formulations have a high practical importance for numerous applications and problems in computational mechanics and beyond: one thinks exemplarily of fiber-reinforced materials such as reinforced concrete, CFRP or biological tissue material.

For all new methodological developments proposed in the work, the finite element method (FEM) is used, in the context of which Ivo Steinbrecher makes use of particularly powerful element formulations both for the 1-dimensional embeddings (implemented by geometrically exact beam elements) and for the 3-dimensional solids. The major scientific novelty value of his work lies on the formulation of suitable coupling conditions for the underlying degrees of freedom of 1D beams and 3D solids as well as on their numerical implementation. Standard solutions in commercially available FEM software packages today mostly rely on simplified 1D rebar elements, homogenized 3D models or fully resolved 3D models, while the 1D-3D models favored by Ivo Steinbrecher can so far only be analyzed with considerable limitations (e.g., no coupling of the rotational degrees of freedom of the beams, restrictions in the positioning of the embeddings, etc.).

In the context of his work, Ivo Steinbrecher considers mixed-dimensional coupling problems with increasing degrees of complexity. Beginning with the "simple" coupling of the displacement degrees of freedom of 1D-beams and 3D-solids, essential new scientific contributions lie above all in the coupling of the rotational degrees of freedom, in the coupling of 1D beams and curved 2D surfaces as well as in unilateral 1D-3D-contact conditions with tangential sliding. The dissertation also deals in detail with expected limits of the scope of his methods, which are formulated in advance based on analytical considerations of singularities in displacement and stress fields. The validity limits finally actually observed during the convergence studies confirm his assumptions with remarkable accuracy.

Figure 1:
Dr.-Ing. Ivo Steinbrecher

Ivo Steinbrecher has already published the results of his scientific work in three journal articles as first author and another three journal articles as

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co-author in high-ranking international peer-reviewed journals. This underlines the impact that his research work is already achieving in the scientific community. In this context, it is also worth mentioning that Ivo Steinbrecher was awarded the prestigious Robert J. Melosh Medal 2021 by Duke University (USA) and was chosen as a winner of the 13th ECCOMAS PhD Olympiad at the 7th ECCOMAS Young Investigators Conference 2023 in Porto. !

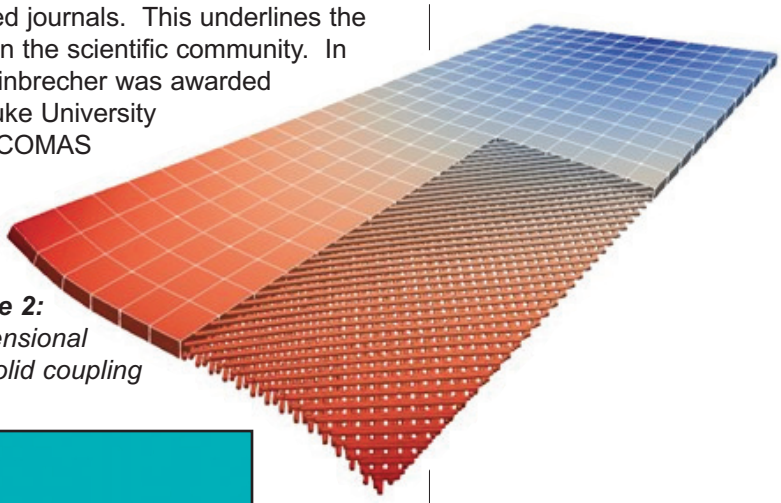


Figure 2:
Fiber-reinforced plate modeled wit mixed-dimensional beam-to-solid coupling

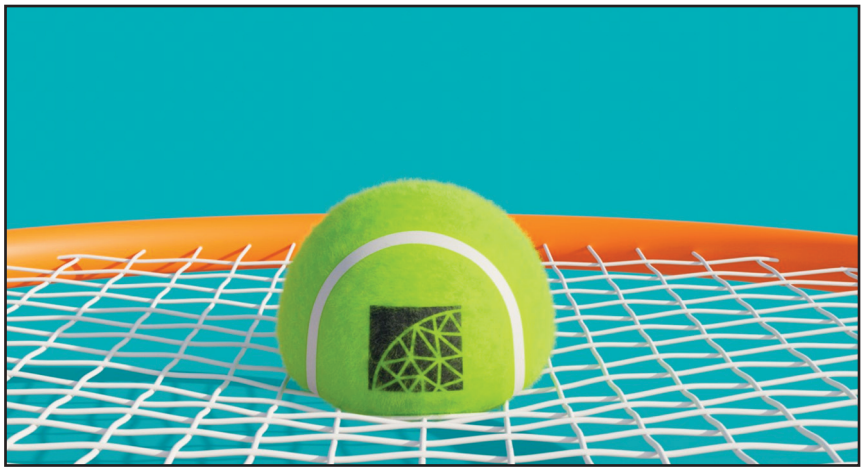


Figure 3:
Photorealistic rendering of the impact of a tennis ball on a tennis racket simulated using mixed-dimensional beam-to-solid contact

10th GACM Colloquium on Computational Mechanics for Young Scientists from Academia and Industry

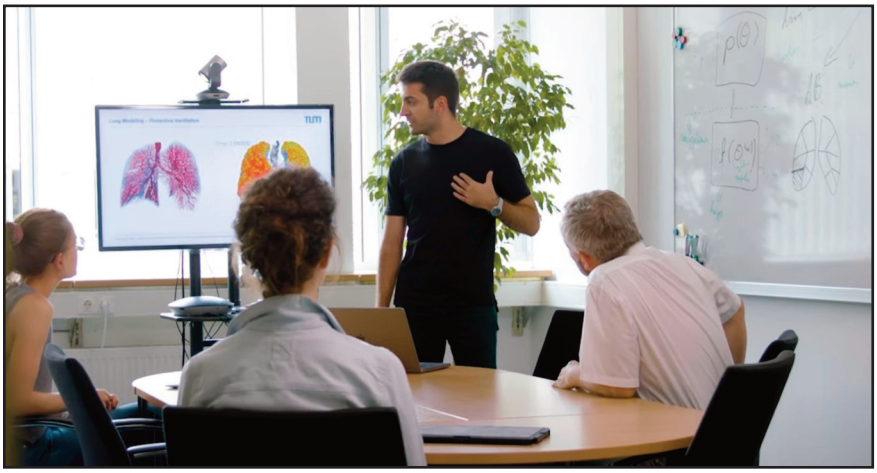
Colloquium Chairpersons
Fabian Key, Marco De Paoli, Antonia Wagner, Merten Stender

"GACM meets sustainability" -- this is the motto of the 10th GACM Colloquium on Computational Mechanics for Young Scientists from Academia and Industry. It will take place from September 10 to 13, 2023 in Vienna, Austria. Designed as a certified sustainable event (» EcoEvent), the colloquium will be hosted at TU Wien. In addition to the 10th anniversary of the GACM Colloquium itself, it also invites to celebrate the 30th anniversary of the GACM.

We are pleased to announce the plenary lectures by Prof. Liesbet Geris (University of Liège and KU Leuven), Dr. Dirk Hartmann (Siemens Digital Industries Software), Prof. Jelena Ninic (University of Birmingham), Prof. Alexander Popp (UniBW München), Prof. Sebastian Schöps (TU Darmstadt), and GACM Best PhD Award Winner Dr. Ivo Steinbrecher (UniBW München).

We cordially invite you to participate in the GACM Colloquium 2023 and are looking forward to meeting you in Vienna.

Detailed information can be found here: **https://colloquia.gacm.de/**



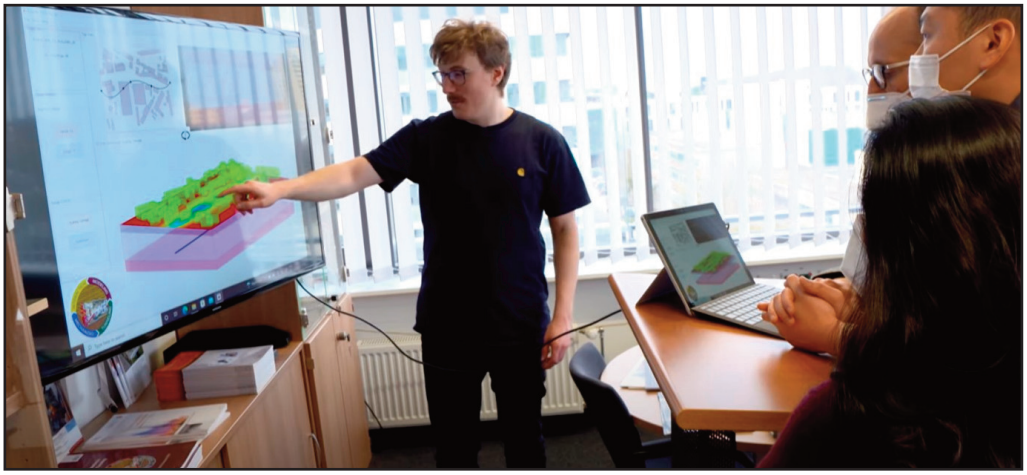
GACM Movie

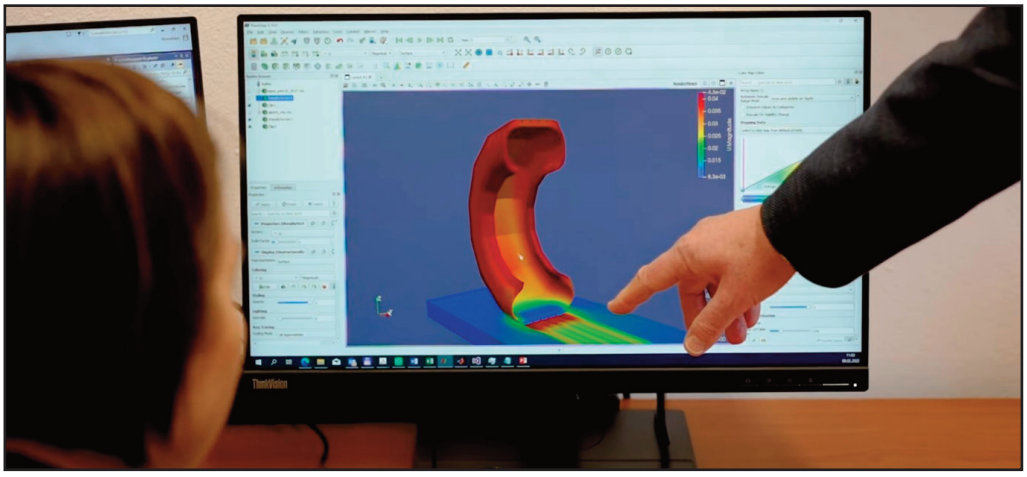
As a new initiative, GACM recently published an image film on our YouTube channel **https://www.youtube.com/@gacmev.**

The film highlights all the significant facets of computational engineering. It is not only meant to showcase the work in this exciting field at the intersection of engineering, mathematics, and computer science. It is especially meant to get excited about our shared passion those future talents who may not have encountered it before.

If you like the movie, please help expand its reach. Please like or comment on the video and related posts to increase its weight in the algorithms or link to the film in other social media channels. And feel free to link to the video on YouTube in your own channels. This way, we can bring the field's appeal to a broader audience and expand our community with great new members!

Figure 4, 5, 6 & 7: *Screenshots from GACM Movie*





GIMC Best PhD Thesis Award

The GIMC Best PhD Thesis Awards committee, composed by **Elio Sacco** (Università di Napoli, Federico II), **Giovanni Castellazzi** (Università di Bologna), **Mauro Corrado** (Politecnico di Torino), **Flavio Giannetti** (Università di Salerno) and **Francesco Picano** (Università di Padova), selected the following theses, defended in 2022, as the best Theses in Computational Solid and Fluid Mechanics:

- **Dr. Andrea Opreni**, Politecnico di Milano "*The direct parametrisation method for invariant manifolds: developments and application to large dimensional finite element models of MEMS structures*". This thesis was also selected as candidate to the ECCOMAS PhD Award

- **Dr. Davide Ninni**, Politecnico di Bari "*Development of a multi-GPU solver for atmospheric entry flows with gas-surface interactions*"

GIMC GMA GBMA 2023

Reggio Calabria
July 12-14, 2023

The AIMETA Groups of Computational Mechanics (GIMC), of Materials (GMA) and of Biomechanics (GBMA) are organizing a congress "GIMC GMA GBMA 2023" that will take place in Reggio Calabria on July 12-14, 2023.

A special session will be devoted to the presentation of the PhD theses in Computational Mechanics winner of the GIMC award 2022.

A special session will be organized for young researchers in which the best presentation will be awarded. All the details can be found at the web site:
https://www.gimc-gma-gbma-2023.unirc.it/

http://www.gf.unsa.ba/web/

The Central European Association for Computational Mechanics (CEACM), has attributed newly created CEACM Awards to honor active researchers from CEACM partner countries, regrouping (in alphabetical order): Austria, Bosnia and Herzegovina, Croatia, Czech Republic, Hungary, Slovakia and Slovenia. This year, the meeting was held in early March 2023. Three different types of awards are given by CEACM. In particular, the senior scientists are honored by CEACM Prof. Mang Award, the established scientists by CEACM Computational Mechanics Award and young researchers by CEACM Best Thesis Award.

Figure 1:
Josef Eberhardsteiner
CEACM Prof. Mang Award

The CEACM Prof. Mang Award is the highest honor attributed by CEACM. It is named after the association founding father Herbert Mang, Professor at TU Wien, and its first President 1992-99. The CEACM Prof. Mang Award is bestowed each year to honor an outstanding individual who has demonstrated sustained efforts in advancing either theoretical or practical aspects of computational mechanics and who provided strong leadership either in academic environment or in different industrial applications. This award was given for the first time in 2022 to two CEACM members: Prof. Vladimír Kompis, one of the CEACM founding fathers, and Prof. Adnan Ibrahimbegovic, the current CEACM president. The CEACM scientific board again decided this year to attribute two Prof. Mang Awards to distinguished colleagues who have contributed to a large extent to many CEACM activities and served as its representatives in either IACM or ECCOMAS associations. The first award is given to Josef Eberhardsteiner *(Figure 1)*, Professor of Civil Engineering at TU Wien, who has provided a long time CEACM representation in ECCOMAS, and who currently serves as CEACM representative in ECCOMAS Management Board. The second award is given to Jurica Soric *(Figure 2)*, Professor of Mechanical Engineering at University of Zagreb, who served as CEACM president, and has been a driving force in Croatia and organizer of many international conferences for CEACM members.

Figure 2:
Jurica Soric
CEACM Prof. Mang Award

The board also decided the CEACM Computational Mechanics award for the established scientists, which is attributed for the first time this year. The CEACM Computational Mechanics Award is bestowed to honor exceptional individual contributions not only to traditional but also to broader fields of interest to Computational Mechanics that reached notoriety within the region and internationally. The winner is Jože Korelc *(Figure 3)*, Professor of Structural Engineering at Department of Civil Engineering, University of Ljubljana, Slovenia. Jože is recognized for his numerous scientific contributions, and most importantly the development of a scientific software AceFEM, which is distributed as a part of Mathematica software package (https://www.wolfram.com/products/applications/acefem/) and currently used by many research groups world-wide for efficient developments of new formulations in Computational Mechanics.

Figure 3:
Joze Korelc
CEACM Computational Mechanics Award

The CEACM scientific board finally attributed a Young Researcher Award, which was created by CEACM to honor an exceptional contribution of a young scientist, who has completed his/her doctoral thesis in the broad field of Computational Mechanics within the year of the award call. The award winner is Richard Schussnig *(Figure 4)*, who completed his thesis supervised by Prof. Thomas-Peter Fries at TU Graz in the domain of fluid-flow computations in application to hemodynamics. This thesis is nominated by CEACM for the ECCOMAS Best Thesis Award 2022 competition and the winner is awarded with a stipend to cover the participation cost in ECCOMAS MSF 2023, which is this year's CEACM special interest conference.

Figure 4:
Richard Schussnig
CEACM Best Thesis Award

ECCOMAS MSF 2023 (which stands for: International Conference on Computational Methods for Solids and Fluids 2023) is already 6th in a long series of meeting, which is this year jointly organized by University of Sarajevo, Academy of Sciences and Arts of Bosnia and Herzegovina and UT Compiegne. The ECCOMAS MSF 2023 meeting will take place in June 25-27, 2023, in Bosnia capital, Sarajevo. It is featuring a number of distinguished lectures (by Professors Ladeveze, Mang, Matthies, Ohayon, Pimenta, Damjanovic, Stergiopulos, Trovaluschi, Hellmich, Chamoin, Ibrahimbegovic) and 17 organized Mini-Symposia on many different topics in the domain. More information is given at the meeting website: **https://eccomas.gf.unsa.ba/msf-2023/**.

CACSE ACCSG

The Canadian Association for Computational Science and Engineering
Association Canadienne pour le Calcul en Sciences et Génie

for all inclusions under ***CACSE*** *please contact*
Reza Vaziri
reza.vaziri@ubc.ca

1st CACSE Conference on Recent Trends and Developments in Computational Science & Engineering

Banff, Alberta, Canada
January 14-16, 2023

The First Conference of the Canadian Association for Computational Science and Engineering, CACSE/ACCSG 2023, was held in person on January 14-17, 2023, at the Fairmont Banff Springs Hotel in the Canadian Rockies.

The inaugural conference brought together about thirty experts from academic institutions across Canada to discuss recent advances, novel applications, and emerging research directions in the field of Computational Science and Engineering. The technical program consisted of twenty-nine talks in various fields of CSE and several panel sessions to discuss future activities and directions of the Association. The social program also included a welcoming reception and a banquet in one of the beautiful rooms of the venue. The event was organized by Profs. Artem Korobenko (University of Calgary), Reza Vaziri (University of British Columbia), Serge Prudhomme and Marc Laforest (Polytechnique Montréal), and Robert Gracie (University of Waterloo).

The scientific event was a frank success and received such enthusiasm from the participants that it was decided that the second CACSE will be held next year at the same venue in Banff on January 13-17, 2024. The objectives of the Association (see website at https://www.cacse-accsg.ca) are to promote and foster education, research, and industrial practice in Computational Science and Engineering, to organize and coordinate activities in Canada such as periodic national and regional conferences. CACSE/ACCSG is proud to host the 16th WCCM and 4th PANACM Congress on July 21-26, 2024, in Vancouver, BC, the first time it will be held in Canada (**https://www.wccm2024.org**).

By:
Serge Prudhomme
(founding CACSE President)
Reza Vaziri
(CACSE President)
& Artem Korobenko
(CACSE Vice-President)

Welcome from the new ABMEC President

The ABMEC (Brazilian Association for Computational Methods in Engineering), founded in 1997, is a non-profit scientific society dedicated to advancing the knowledge and use of computation in all areas of engineering and related sciences. It serves as a high-level scientific and academic forum for the promotion and dissemination of knowledge in these fields, bringing together researchers, professors, engineers, physicists, mathematicians, and graduate and undergraduate students from across the country who are at the forefront of knowledge in these areas.

Figure 1:
ABMEC board for the biennium 2023-2024

It is an honor and privilege for me to serve ABMEC as the association's first female president. The current board, which took office on January 1, 2023, includes also Felicio Bruzzi Barros as vice president, Marcus Vinicius G. de Morais as treasurer, and Darlan Carvalho and Marcos Arndt as first and second secretaries.

I am deeply grateful to the previous board, including former president Felicio Bruzzi Barros, vice president Roque Pitangueira, treasurer Lapo Gori, and secretaries Darlan Carvalho and Marcos Arndt.

I am excited to continue supporting the younger generation of Brazilian researchers. Our goal is to ensure that ABMEC helps them achieve their objectives. ●

The organization of **CILAMCE 2022** in Foz do Iguaçu by the Brazilian Association for Computational Mechanics (ABMEC) was a milestone in the dissemination of research, exchange of ideas, networking, and human resources development in the field.

The event brought together researchers, students, professors, and professionals from various areas of Computational Mechanics, providing a unique opportunity for knowledge sharing and experiences. Papers were presented on relevant topics in the field, such as numerical modeling, simulation and analysis of structures, software development, among others.

Figure 2:
Iguasu Falls

In addition, CILAMCE 2022 featured lectures by national and international experts discussing important and current issues related to Computational Mechanics. These moments were crucial for exchanging ideas and establishing new partnerships among researchers and institutions.

The networking opportunities provided by CILAMCE 2022 were also of great importance for human resources development in research. Participants had the opportunity to meet others in the field, establish professional and academic contacts, and even seek internship or job opportunities. Furthermore, hosting the event in Foz do Iguaçu allowed participants to experience the natural beauty of the region, providing a unique cultural exchange. ●

ABMEC Awards

To recognize outstanding contributions in computational mechanics, ABMEC has established three annual awards:

i. ABMEC Award:

The ABMEC Award is the highest honor bestowed by ABMEC. It recognizes individuals who have made exceptional and sustained contributions to the field of computational mechanics throughout substantial portions of their professional careers. Recipients of this award have also demonstrated their support for ABMEC through membership and active participation in the Association, its meetings, and activities. The ABMEC Award is conferred every year, with a maximum of one award presented.

ii. ABMEC Award for Young Scientists:
The ABMEC Award for Young Scientists is presented to young researchers who have made significant contributions to the field of computational mechanics. Eligible candidates for this award must be 40 years of age or younger at the time of nomination. The ABMEC Award for Young Scientists is conferred annually, with a maximum of one award given.
iii. ABMEC Award for the Year's Best Doctorate Thesis:
The ABMEC Award for the Year's Best Doctorate Thesis recognizes outstanding doctoral theses in the field of computational mechanics. This award has been conferred every year since 2022.
Each year, a maximum of one award is granted.

These awards serve to acknowledge and celebrate the remarkable achievements and advancements made by individuals in the field of computational mechanics, while also promoting excellence and innovation within the ABMEC community.

Activities in 2023

For the year 2023, ABMEC aims to continue the methods used to disseminate and promote the work of our researcher members, as established in our bylaws. One of the main initiatives in this regard is the organization of the CILAMCE conference, which is an important space for idea exchange, research dissemination, and human resources development in the field of Computational Mechanics.

In this regard, ABMEC is pleased to announce that CILAMCE will be held in Porto, Portugal, from 13 to 16 November 2023, organized by our colleagues Renatl Natal Jorge and Rui Calçada from the Faculty of Engineering of the University of Porto (FEUP) and Diogo Ribeiro and Jorge Belinha from the Superior Institute of Engineering of Porto (ISEP). This is a great opportunity for our researchers and members to participate in an internationally relevant event, with the presence of important figures in the field, and present their work to a qualified audience. Additional information about the conference can be found at **www.cilamceporto2023.com**.

Furthermore, ABMEC will continue to seek publications in reputable and renowned outlets to disseminate the work of our researchers, in order to encourage and boost research in the field of Computational Mechanics. CILAMCE is an important platform for this dissemination, but other initiatives will also be considered to ensure that the research results of our members are widely recognized and shared.

To this end, in order to disseminate knowledge and bring the latest advancements in research, ABMEC proposes the organization of webinars on its YouTube channel throughout the year 2023. These webinars will be conducted by experts in Computational Mechanics, both national and international, who will present relevant topics for the academic and industrial community. Subjects such as numerical modeling, simulation and analysis of structures, software development, and practical applications of Computational Mechanics in various fields such as civil, mechanical, aerospace, automotive engineering, among others, will be addressed.

The idea is to provide a space for discussion and exchange of experiences among professionals, students, and researchers, as well as contribute to the dissemination of knowledge and the training of highly qualified professionals. The webinars will be broadcast live and made available on the ABMEC YouTube channel for later viewing.

It is worth noting that in March 2023, a general assembly was held in a remote format to present the financial accountability of the previous board and the financial and fiscal planning for the current year. ABMEC believes that this initiative will foster research and the development of Computational Mechanics in Brazil, as well as bring the academic and industrial community closer, expanding access to cutting-edge knowledge. Therefore, we invite all interested parties to follow the webinar schedule and participate in this important event that will contribute to the advancement of research in Computational Mechanics.

In summary, for the year 2023, ABMEC reaffirms its commitment to valuing and recognizing researchers in the field of Computational Mechanics through the organization of the CILAMCE event in Porto, Portugal. We believe that each year the community of researchers in computational methods grows, and it is our mission to offer opportunities for new researchers and interested individuals to explore new knowledge in this field and present the results of their work to society. Currently, we are proud to have 250 active members in our association.

The junior board of the French Computational Structural Mechanics Association

The French Computational Structural Mechanics Association (CSMA) encouraged and launched in 2016 its section of young researchers, called CSMA Juniors. The range of actions of this section is large but the main goals are

i) to facilitate exchanges and collaborations among the young generation (< 40 years old) of the CSMA;
ii) to propose scientific activities which are useful and unique for young researchers &
iii) to help CSMA in its activities (such as social networking) and to promote to young researchers. The section is driven by a committee comprising 9 young researchers, which is renewed by half every two years. The president of the bureau is automatically a co-opted member of the European Young Investigator Committee at ECCOMAS.

To this end, the junior office has gradually become an experimental group for testing new formats of scientific mediation and animation of a academic society of young researchers, conducive to the emergence of new practices in a context of extreme changes in recent years in the face of the climatic challenges of our time.

A major activity of the board is undoubtedly the organization of an annual two-day workshop dedicated to the young generation of CSMA (including PhD students, post-docs, and junior researchers with permanent position). It is worth noting that the participation of more experienced researchers to these events is also highly supported to foster the connection between juniors and seniors. Every year, several specific and original activities with unconventional formats are proposed, which make the workshop a privileged place for scientific exchanges between the young generation of CSMA.

For the past 6 years, this annual workshop has brought together between 60 and 80 people and definitely highlights the dynamism of the CSMA junior. Six workshops have been organized each year at different sites in France (Giens, Gif-sur-Yvette, Porquerolles, Paris,...) where some activities have now become a trademark of the junior bureau :

- the hackathon, where teams of young researchers have to solve a computation problem in just a few hours (the hackathon organized as part of the 2020 WCCM World Congress lasted 24 hours worldwide (*figure 1 left*). The final objective of the 2022 hackathon is to implement a triangular mesh capable of handling concave geometries (*figure 2 below*).

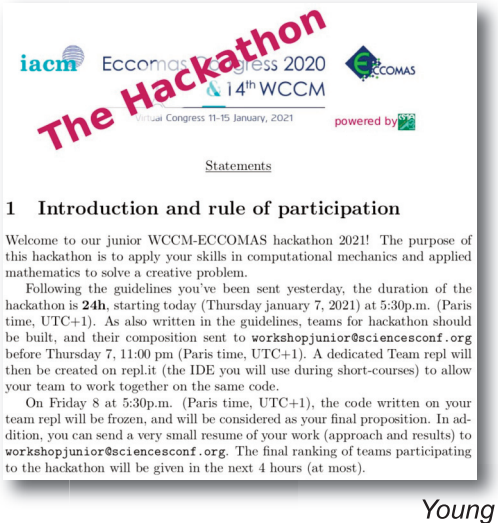


Figure 1: *The world scale hackathon at the 2020 WCCM organized by the junior CSMA*

Figure 2: *Young researchers team-working on the 2022 hackathon*

- collaborative work on scientific projects : for example in 2022, 18 scientific proposals were submitted and evaluated by three parallel juries, giving rise to new ideas and original research activities.

The last 2023 workshop brought us all together in Paris on the CNAM site (*figure 3*), and saw a number of new proposals for activities, including a team theatrical game to raise awareness and prepare future candidates for research and teaching positions

Figure 3:
Participants of the CSMA junior workshop in Paris in March 2023

and associated competitions. Participants were both candidates and members of a fictitious, yet realistic, jury, to raise awareness of the exercise, ans was great success ! (*figure 4*)

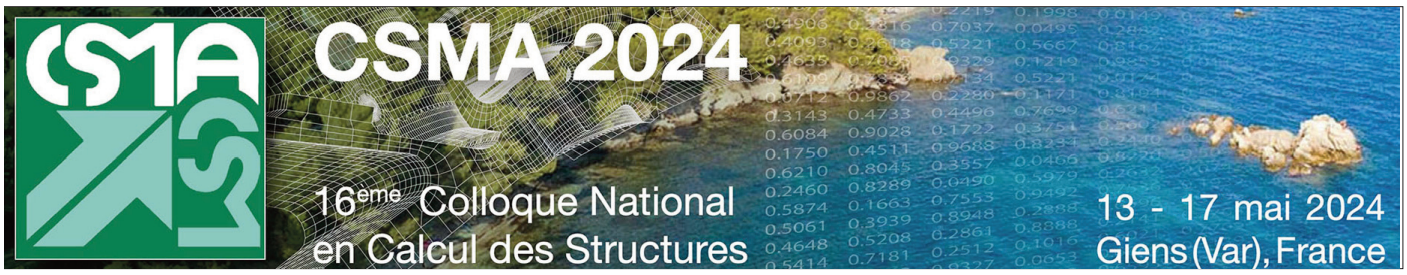
Figure 4:
Team theatrical game

Last but not least, discussions took place between the assembly and a round table of experts in the field of ecological transition, to discuss the evolution of the profession of researcher in engineering and scientific computing in the light of the fundamental transitions awaiting us due to climate deregulation: green engineering, de-growth, slowing down the pace of life, etc...

The Junior Board is now preparing for its next workshop, which will take place on the weekend of May 17, 2024, in Porquerolles, France, with a host of new ideas to ensure that our community can continue to meet and exchange ideas! See you soon!

follow us on our social media :

by
Jérémie GIRARDOT
President of the CSMA Juniors Committee



little focus on the next CSMA event :

The next French Congress on computational structural mechanics, organized by the CSMA association, will be held on 13-17 May 2024 in the beautiful Giens peninsula (on the French Riviera). This event is organized every two years, and it gathers both researchers and industrialists for discussions on key scientific topics in the field.
For more information, please visit: **https://csma2024.sciencesconf.org/.**

conference diary planner

20 - 23 Aug 2023	**M-FET 2023 - III Modern Finite Element Technologies – Mathematical & Mechanical Aspects**			
	Venue:	Mülheim, Germany	*Contact:*	https://www.eccomas.org/conferences/
28 - 30 Aug 2023	**CSAI 2023 - Computational Sciences and Artificial Intelligence in Industry**			
	Venue:	Trondheim, Norway	*Contact:*	https://www.eccomas.org/conferences/
4 - 7 Sept 2023	**PCM-CMM 2023 - 25th International Conference on Computer Methods in Mechanics**			
	Venue:	Gliwice, Poland	*Contact:*	http://cmm-solmech.ippt.pan.pl/.
5 - 7 Sept 2023	**COMPLAS 2023 - XVII Int. Conference on Computational Plasticity**			
	Venue:	Barcelona, Spain	*Contact:*	https://complas2023.cimne.com/
11 - 13 Sept 2023	**10th GACM Colloquium - 30th Anniversary of the German Association for Computational Mechanics**			
	Venue:	Vienna Austria	*Contact:*	https://www.gacm.de/news
12 - 14 Sept 2023	**COMPOSITES 2023 - IX Conference on Mechanical Response of Composites**			
	Venue:	Trapani, Italy	*Contact:*	https://www.eccomas.org/conferences/
24 - 27 Sept 2023	**2nd IACM Mechanistic Machine Learning & Digital Twins for Computational Science, Eng. & Technology**			
	Venue:	El Paso, TX, USA	*Contact:*	https://www.utep.edu/engineering/mmlde/index.html
25 - 29 Sept 2023	**HFSS 2023 International Conference on Highly Flexible Slender Structures**			
	Venue:	Rijeka, Croatia	*Contact:*	http://hfss.uniri.hr/
2 - 4 Oct 2023	**Structural Membranes 2023 - XI Int Conference on Textile Composites & Inflatable Structures**			
	Venue:	Valencia, Spain	*Contact:*	https://structuralmembranes2023.cimne.com/
9 - 11 Oct 2023	**PARTICLES 2023 - VII International Conference on Particle-based Methods**			
	Venue:	Milano, Italy	*Contact:*	https://congress.cimne.com/particles2023/
10 - 13 Oct 2023	**CMCS 2023 - II Int Conf on Computational Modeling of Complex Materials Across the Scales**			
	Venue:	Eindhoven, Netherlands	*Contact:*	https://www.eccomas.org/conferences/
22 - 25 Oct 2023	**ACM 2023 - Advances in Computational Mechanics Celebrating the 80th Birthday of T.J.R. Hughes and CFSI 2023 - Computational Fluid-Structure Interaction: Frontiers in Methods and Applications**			
	Venue:	Austin, Texas	*Contact:*	https://sites.google.com/usacm.org/acm2023/home
13 - 16 Nov 2023	**XLIV CILAMCE - Ibero-Latin American Congress on Computational Methods in Engineering**			
	Venue:	Porto, Portugal	*Contact:*	https://cilamce.com.br/
22 - 24 Nov 2023	**MORTech 2023 – 6th International Workshop on Model Reduction Techniques**			
	Venue:	Paris, France	*Contact:*	https://mortech2023.sciencesconf.org/
13 - 16 Jan 2024	**CACSE - 2nd Conference of the Canadian Association for Computational Science and Engineering**			
	Venue:	Banff, Canada	*Contact:*	https://www.wccm2024.org/
22 - 23 Jan 2024	**SACAM 13 – 13th South African Conference on Computational and Applied Mechanics**			
	Venue:	Stellenbosch, South Africa	*Contact:*	htthttp://saam.africa/
13 - 17 May 2024	**CSMA 2024 – 16th National Symposium on Structural Calculation**			
	Venue:	Giens, Franace	*Contact:*	https://csma2024.sciencesconf.org/
26 - 29 May 2024	**CSME International Congresses**			
	Venue:	Toronto, Canada	*Contact:*	http://www.csme-scgm.ca/conferences
3 - 7 June 2024	**9th European Congress on Computational Methods in Applied Sciences and Engineering**			
	Venue:	Lisbon, Portugal	*Contact:*	https://eccomas2024.org/,
21 - 26 July 2024	**WCCM/PANACM - 16th World Congress on Comp Mechanics & 4th PANACM Congress**			
	Venue:	Vancouver, Canada	*Contact:*	https://www.cacse-accsg.ca/
7 - 10 Dec 2025	**9th APCOM 2025 - Asia Pacific conference on Computational Mechanics**			
	Venue:	Brisbane, Australia	*Contact:*	https://web.aeromech.usyd.edu.au