

NEWSLETTER 52

Year 2022

EUROPEAN
MECHANICS
SOCIETY

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EUROMECH Conference Reports

18th European Mechanics of Materials Conference (EMMC18)

4 – 6 April 2022, University of Oxford, United Kingdom

Conference chairs: Laurence Brassart, Alan Cocks, Antoine Jérusalem

Introduction

The 18th edition of the European Mechanics of Materials Conference (EMMC18) was held in Oxford and brought together over 600 researchers from Europe and beyond to share and discuss recent developments in the mechanics of materials. The conference covered a wide spectrum of applications—from material science and mechanical engineering to biomechanics and geophysics—offering insights into the mechanical behavior of materials at all scales, from atomic to structural.

The event marked a return to in-person scientific exchange after pandemic-related disruptions, with around 480 delegates attending on site and the remaining participants joining virtually. Contributions included experimental, analytical, and computational modeling approaches, with particular encouragement for interdisciplinary work that combines methods.

Scientific program highlights

The scientific content of EMMC18 was organized around **18 thematic parallel symposia**, each coordinated by dedicated chairs and covering topics such as additive manufacturing, soft materials, interfaces, nanomechanics, and data-driven approaches. The conference hosted **three invited plenary lectures**, which served as key scientific highlights:

- **Prof. Chiara Daraio** (California Institute of Technology) – *Irregular Architected Materials with Programmable Properties*
- **Prof. Vicky Nguyen** (The Johns Hopkins University) – *Viscoelastic Behavior of Liquid Crystal Elastomers*
- **Prof. Samuel Forest** (MINES Paristech PSL University) – *Slip vs kink bands in metallic single and polycrystals and their impact on fatigue crack initiation and propagation*

Over the three days, participants could attend more than 600 presentations distributed across the following symposia:

- Additive manufacturing and materials processing (48 presentations)
- Data-driven mechanics of materials (25)
- Energy materials (15)
- Fatigue and fracture (46)
- Theoretical and computational mechanics (17)
- Architected materials (26)
- Biological materials (28)
- Composites (32)
- Interfaces and phase transformations (31)
- Metals and crystalline materials (28)
- Multifunctional materials (16)
- Polymers (41)
- Porous and granular materials (50)
- Soft materials and structures (28)
- Characterisation techniques (27)
- Nanomechanics (6)
- Scale bridging (29)
- Theoretical and computational mechanics II (35)

Organization

The event was hosted at the University of Oxford's Examination Schools and The Queen's College. The local organizing committee provided attendees with printed and digital versions of the program and abstracts, along with a welcome pack including a commemorative water bottle, notebook, pens, and a conference bag.

The registration included morning and afternoon coffee breaks, lunches, and social events. The welcome reception was held at the Ashmolean Museum, and the conference dinner took place at Keble College and Lady Margaret Hall. A dinner for the EMMC committee, local organizers, and EUROMECH President Marc Geers was held at The Alice Restaurant on the first evening.

A total of **622 participants** took part in the conference, including approximately 480 in-person and the rest virtually. Delegates represented a wide range of countries, with strong participation from France, the UK, Germany, and Switzerland.

Conclusion

EMMC18 offered a comprehensive overview of cutting-edge research in the mechanics of materials, promoting interdisciplinary collaboration and scientific excellence. The quality and breadth of the presentations reaffirmed the central role of this community in addressing challenges across traditional and emerging engineering domains. The next European Mechanics of Materials Conference (EMMC19) will be hosted at the Polytechnic University of Madrid, Spain, building on the plans for the postponed EMMC17.

Keynote or plenary speakers

The three plenary lectures by Chiara Daraio, Vicky Nguyen, and Samuel Forest set the tone for the conference, addressing critical topics in architected materials, soft matter mechanics, and crystal plasticity. These lectures provided cross-cutting insights relevant to multiple symposia.

Young scientist prizes

Two competitive awards were presented:

- **Best Student Presentation Award:**
 - *Filippo Masi*, for the paper *Multiscale modeling of inelastic microstructured materials with Thermodynamics-based Artificial Neural Networks (TANN)*
 - Jury composed of Laurent Delannay, Lorenzo Bardella, Laurence Brassart, and Samuel Forest
- **Best Poster Award:**
 - *Vincent Martin*, for the poster *316 L Steel MIM-like 3D Printing*
 - Evaluated by the local organizing committee

Each award was accompanied by a **€500 prize from EUROMECH**, a certificate, and a commemorative Oxford gift set.

11th European Solid Mechanics Conference (ESMC11)

4 – 8 July 2022, University of Galway, Ireland

Chairperson: Peter E. McHugh

Introduction

The 11th edition of the European Solid Mechanics Conference (ESMC2022) was held from 4 to 8 July 2022 at the University of Galway, formerly National University of Ireland Galway. The event, organized in a fully in-person format, brought together over 1,100 participants from 44 countries, consolidating ESMC's role as a central forum for the European solid mechanics community.

Chaired by Professor Peter McHugh and supported by a local organizing committee of 27 members, the conference included contributions from academia, industry, and research institutions. It featured 8 general themes, 54 mini-symposia, and 988 oral presentations. The organization received essential support from the ESMC Committee (chaired by Professor Gerhard Holzapfel) and from EUROMECH.

Scientific program highlights

The scientific program consisted entirely of oral presentations, with no poster sessions, to promote participant engagement in a post-pandemic context. A total of 19 rooms hosted 19 parallel sessions, running up to 13 two-hour slots per room during the week. The program included:

- **1 general lecture:** *Professor Thomas J.R. Hughes*
- **5 plenary lectures:** *Professors Vikram Deshpande, Ellen Kuhl, Gerard Ateshian, Alan Needleman, Javier Llorca*
- **1 EUROMECH Solid Mechanics Prize Lecture:** *Professor Jean-Jacques Marigo*

The thematic coverage included the latest developments in computational mechanics, biomechanics, fracture and damage, multiphysics coupling, material modeling, and more.

The event also featured innovative elements, such as:

- **A Women in STEM Conference Support Award**
- **A Postdoc and PhD student networking and mentorship session**

- A **Panel discussion** on the future of solid mechanics

Organization

ESMC2022 was hosted in the central buildings of the University of Galway, with plenary lectures held in the Bailey Allen Hall. An exhibition and catering marquee was set up beside the IT building, offering a picturesque riverside setting.

Key social events included:

- **Welcome reception** (Monday, 4 July, sponsored by Perfuze)
- **Speaker and committee dinner** (Tuesday, 5 July, in the historical Aula Maxima)
- **Conference dinner** (Wednesday, 6 July, at the Galmont Hotel, with over 660 attendees and traditional Irish music and dance)

The conference was officially opened by University President Professor Ciarán Ó hÓgartaigh and Minister Hildegard Naughton, TD. The closing ceremony was held on Friday, 8 July, where the location of ESMC2025 was announced: Lyon, France, chaired by Professor Eric Maire.

A team of 30 student helpers contributed significantly to the success of the event by providing assistance throughout the venue.

Conclusion

ESMC2022 was widely recognized as a successful and memorable event. It attracted strong participation from young researchers (36.2% student registrations), with an emphasis on mentorship and career development. Numerous messages of appreciation were received, and the event was estimated to have generated approximately €2 million in local economic impact.

Thanks are extended to all organizers, participants, sponsors, and the University of Galway. Special recognition is given to Abbey Conference & Events for their professional management as conference secretariat.

Keynote or plenary speakers

- **General lecture:** Thomas J.R. Hughes
- **Plenary lecturers:** Vikram Deshpande, Ellen Kuhl, Gerard Ateshian, Alan Needleman, Javier Llorca
- **EUROMECH Solid Mechanics Prize Lecture:** Jean-Jacques Marigo

EUROMECH fellowships and prize

At the EUROMECH Fellows ceremony (Thursday, 7 July), the following awards were presented by Professors Marc Geers and Stefanie Reese:

- **EUROMECH Fellows:** Vikram Deshpande, Laura De Lorenzis, Umberto Perego
- **EUROMECH Solid Mechanics Prize:** Jean-Jacques Marigo

Young researcher awards

Four awards were presented following two dedicated Young Researcher Award (YRA) sessions on Monday, 4 July:

- **EUROMECH Young Researcher Awards:**
 - Tianlu Wang (Max Planck Institute for Intelligent Systems, Germany)
 - Sarah Gayot (UCLouvain, Belgium)
- **Springer Nature Young Researcher Awards:**
 - Sara Bridio (Politecnico di Milano, Italy)
 - Alireza Golahmar (Technical University of Denmark)

472 eligible YRA applications were received, and 12 finalists were selected after abstract review by a panel of 16 experts.

Women in STEM awards

Thanks to support from **Cerenovus**, 30 Women in STEM Conference Support Awards were offered based on 99 applications. 27 awards were confirmed and availed across 12 countries.

Mentorship session

The postdoc and PhD student **mentorship session**, held on Wednesday, 6 July, attracted 230 young researchers who engaged in informal discussions with 30 senior mentors across all themes and nationalities. The event was hosted in the University's College Bar (SULT).

Sponsorship

In addition to the institutional support provided by EUROMECH, ESMC2022 was generously supported by a number of academic, public, and industrial partners. These included the University of Galway (Office of the Vice-President for Research and Innovation), the CÚRAM SFI Centre for Medical Devices, Fáilte Ireland, Cerenovus, Medtronic, Stryker, Alemmis, Medscan 3D, Aran Biomedical, I-Form Advanced Manufacturing Research Centre, Instron, Zeiss, 3DS Dassault Systèmes, Springer Nature, and Perfuzo. Their contributions played a significant role in the successful delivery of the event.

Panel discussion

A dedicated panel discussion was held on Thursday, 7 July, focusing on the future of solid mechanics and the evolution of the research community. The panel featured distinguished experts—Gerhard Holzapfel, Laura De Lorenzis, Marc Geers, Laoise McNamara, Vikram Deshpande, and Kerstin Weinberg—and was moderated by Peter McHugh. The session provided valuable perspectives on emerging challenges, research directions, and the opportunities ahead for the field.

EUROMECH Colloquium (ENOC10)

10th European Nonlinear Dynamics Conference

17 – 22 July 2022, Lyon, France

Chairperson: Claude-Henri Lamarque

Co-Chairpersons: Régis Dufour, Fabrice Thouverez

Introduction

The 10th edition of the European Nonlinear Dynamics Conference (ENOC 2022) was held in Lyon, France, from 17 to 22 July 2022. Originally scheduled for 2020, and then postponed due to the pandemic, ENOC 2022 was finally realized as a fully in-person international gathering of the nonlinear dynamics community.

Organized by the University of Lyon and supported by EUROMECH through the European Nonlinear Oscillations Conference Committee (ENOCC), the event brought together researchers from over 40 countries. ENOC has become the leading European conference covering the broad field of nonlinear dynamics, including multibody and stochastic systems, as well as their coupling with stability, control, identification, and structural optimization.

Scope of the conference

ENOC aims to bridge theory and applications in nonlinear dynamics, promoting cross-disciplinary interactions between mechanics, mathematics, physics, and engineering. The conference reflects recent trends in the field, characterized by:

- the move beyond simplified low-dimensional models towards high-fidelity modeling of real systems;
- the growing use of nonlinear dynamics for the design and control of advanced physical and engineering systems;
- the importance of nonlinear methods in addressing societal and environmental challenges.

ENOC 2022 provided a forum to explore reduced-order modeling, experimental validation, the characterization of complex behaviors, and the influence of nonlinear phenomena—

such as bifurcations, chaos, and quasi-periodicity—on the design and operation of modern technologies.

Scientific program highlights

The scientific program was structured around **22 mini-symposia**, chaired by internationally recognized researchers. Each session focused on a key topic in nonlinear dynamics, including a new session on **Nonlinear Dynamics in Acoustics** (MS-21). A special session (MS-22) was also dedicated to the memory of **Lev I. Manevich**.

The conference featured **9 parallel sessions**, with each oral presentation allocated a 20-minute time slot including discussion. A total of **417 contributions** were presented, selected from over 480 accepted abstracts. Proceedings were made available online via the conference website and included both extended abstracts and full papers (6–10 pages) reviewed by a panel of 66 experts.

Keynote lectures

Five keynote lectures were delivered in the Auditorium Lumière during the morning sessions:

- **Ivana Kovačić** (University of Novi Sad, Serbia): *Exact analytical solutions for nonlinear oscillators*
- **Andrei Metrikine** (TU Delft, Netherlands): *Nonlinear dynamics in offshore wind turbines*
- **Oleg Gendelman** (Technion, Israel): *Engineering nonlinearity*
- **Walter Lacarbonara** (Sapienza University of Rome, Italy): *High damping metamaterials with hysteretic resonators*
- **Bruno Cochelin** (École Centrale de Marseille, France): *Nonlinear modes in continuum mechanics*

Organization

ENOC 2022 gathered **384 participants** from more than 40 countries. The program was coordinated by the Local Organizing Committee under the leadership of Claude-Henri

Lamarque. Despite challenges related to the pandemic, international travel, and global events, the organizing team succeeded in hosting a dynamic and interactive conference.

Conclusion

ENOC 2022 reaffirmed its status as a key event for the international nonlinear dynamics community. The conference provided a platform for sharing the latest scientific advancements, fostering collaborations, and discussing future directions. In the spirit of unity and exchange, the conference reminded participants of the value of meeting in person, even in difficult times, and closed with a reflection on the importance of science in building bridges across nations and disciplines.

Keynote or plenary speakers

- Ivana Kovačić
- Andrei Metrikine
- Oleg Gendelman
- Walter Lacarbonara
- Bruno Cochelin

Each keynote addressed contemporary challenges and applications of nonlinear dynamics, bridging analytical techniques and experimental investigations.

Young scientist prizes

The EUROMECH Nonlinear Oscillations Conference Committee awarded **two Young Scientist Prizes** (€300 each) to:

- **Audrey Couineaux** (LAUM – CNRS UMR 6613, Le Mans, France)
- **Dennis Heyser** (Institute of Applied Dynamics, TU Darmstadt, Germany)

Awards recognized the best oral presentations delivered by scientists under 35.

Poster awards

Two **Best Poster Awards** were presented to:

- **Rima Saadaoui** (ICube, University of Strasbourg, France)
- **Pauline Kolb** (University of São Paulo, Brazil and TU Darmstadt, Germany)

Mini-symposium prize

In recognition of his outstanding commitment and scientific contribution over four consecutive editions (2019–2022), **Prof. Yuri Mikhlin** received the award for best organization of a mini-symposium, for MS-09 *Nonlinear Dynamics in Engineering Systems*. His co-organizers—Prof. Konstantin Avramov, Prof. Francesco Pellicano, and Prof. Matthew Cartmell—were also warmly acknowledged.

EUROMECH Conference (EFMC14)

14th European Fluid Mechanics Conference

13 – 16 September 2022, Megaron Athens International Conference Center, Greece

Chairperson: Professor John Tsamopoulos

Introduction

The 14th European Fluid Mechanics Conference (EFMC14) was held from 13 to 16 September 2022 in Athens, Greece, at the Megaron Athens International Conference Center. Organized by the University of Patras and chaired by Professor John Tsamopoulos, the event welcomed 890 participants from 39 countries. Scientific coordination was provided by the European Fluid Mechanics Conference Committee (EFMCC), chaired by Professor Matthias Heil (University of Manchester, UK).

EFMC14 resumed in-person gatherings after the disruption caused by the pandemic and reaffirmed its position as a leading forum for fundamental and applied research in fluid mechanics across Europe and beyond.

Scientific program highlights

The conference featured a comprehensive scientific program spanning a wide range of fluid dynamics topics. Out of more than 1,020 submitted abstracts, 880 were accepted, with 814 presentations ultimately delivered. A total of 101 sessions, including 11 held in parallel, were conducted at the conference venue.

The program was structured around key thematic areas including turbulence (94 contributions), instability (53), multiphase flows (48), convection (41), fluid-structure interaction (37), drops and bubbles (68), and many others. In addition, three focused mini-symposia addressed: shear flows over complex surfaces (MS1), complex and non-Newtonian fluids (MS2), and unsteady aerodynamics interactions and interference (MS3).

Keynote or plenary speakers

The EFMC13 Prize Lecture, postponed due to the pandemic, was delivered by **Uriel Frisch**, while the EFMC14 Prize Lecture was given by **Patrick Huerre**, assisted by **Lutz Lesshaft**.

Seven invited keynote lectures were presented by:

- **Lydia Bourouiba**
- **Maurizio Quadrio**
- **Markus Uhlmann**
- **Ann Juel**
- **Juan Lopez**
- **Stéphane Popinet**
- **Robert Moser**

All prize lectures and invited talks were held in single plenary sessions in the Banquet Hall.

Organization

EFMC14 was organized as a single-venue event, ensuring that all sessions, keynote talks, and discussions took place within the Megaron Athens International Conference Center. The conference opened with a guided visit to the Acropolis Museum and a welcome reception at the Athens Tennis Club.

The Opening Ceremony featured addresses by the conference chair, Professor Tsamopoulos; EUROMECH Secretary General, Professor Jacques Magnaudet; the Vice Rector of the University of Patras, Dionysios Mantzavinos; and the Mayor of Athens, Dr. Kostas Bakoyannis.

The Conference Dinner, held on Thursday 15 September at BLE AZURE on the Athens Riviera, featured live music and dancing and was well attended by participants, providing an informal atmosphere for networking and socializing.

Conclusion

EFMC14 offered a vibrant and wide-reaching forum for the fluid mechanics community to exchange ideas, present research, and foster collaboration. The high number of quality

presentations and the diverse range of topics underlined the continuing vitality of the field and the importance of EFMC as a key event in the EUROMECH calendar.

Young scientist prizes

During the closing session, two **Young Scientist Awards** were presented for outstanding oral contributions:

- **Bianca Viggiano** (Portland State University, USA) for the presentation *Building up a turbulent jet from homogeneous turbulence*
- **Jeremy Parker** (EPFL, Switzerland) for the presentation *Variational methods for finding periodic orbits in turbulence*

EUROMECH Colloquia Reports 2022

EUROMECH Colloquium 610

Emerging Topics in Acoustic and Mechanical Metamaterials

25 – 27 April 2022, Castellón de la Plana, Spain

Chairperson: Daniel Torrent

Co-Chairperson: Anastasiia Krushynska

Introduction

The EUROMECH Colloquium 610 brought together researchers working on acoustic and mechanical metamaterials to discuss the most recent developments and emerging trends in the field. Hosted in Castellón de la Plana, Spain, from 25 to 27 April 2022, the event aimed to create a multidisciplinary environment involving experts from physics, materials science, mechanical and aerospace engineering, and acoustics. In total, 41 participants engaged in 34 oral presentations and a poster session, promoting knowledge exchange and collaboration.

Scientific program highlights

The scientific program was divided into seven thematic sessions and a poster session.

Phononics and nano-phononics

This session focused on the control of elastic wave propagation at the micro- and nano-scale, particularly through thin structures such as metasurfaces. Several talks emphasized the challenges associated with optomechanics, which remains an open and complex field. The topic of open resonant structures with finite mode lifetimes was also discussed, highlighting the need for more advanced theoretical and computational tools. Unlike photonics, nanophononics is still relatively underdeveloped, and more attention is needed to fully understand these systems.

Elastic and acoustic metamaterials

This session illustrated the ongoing innovation in the field of acoustic and elastic metamaterials, enabled by improvements in fabrication techniques. Presentations addressed various emerging concepts and applications: from materials capable of attenuating noise in railway tracks, to seismic isolators, to the analysis of soft metamaterials and their mechanical stability. One presentation discussed the emergence of roton-like dispersion relations in elastic metamaterials, and another highlighted analogies between quantum materials and metamaterials, underlining how such cross-disciplinary comparisons remain a fertile area of research.

DYNAMO project session

This session was dedicated to the EU EIC Pathfinder project “DYNAMO,” which had only recently started in March 2022. As no official results were available yet, the session served as an introduction to the work of the various partners. Sebastien Guenneau presented a concept for the active cloaking of thermal waves, while Pawel Packo discussed multiple scattering theory for nonlinear resonators connected to elastic beams. Agustin Mihi showed fabrication methods developed for photonic crystals and their upcoming adaptation to phononic systems. Bernard Bonello shared recent results on the localization of elastic waves by random scatterers in the GHz range. Vincent Tournat, the only speaker not affiliated with the project, gave a talk on nonlinear waves in metamaterials. The session confirmed that nonlinear metamaterials are an emerging and high-potential topic requiring new theoretical tools.

Nonlinear, time-dependent, and tunable metamaterials

One of the major limitations of metamaterials is that their extraordinary properties typically arise under resonant conditions, where energy dissipation can be high and performance reduced. Achieving tunability and real-time reconfigurability remains a central challenge. Several talks in this session presented mechanisms based on nonlinear and time-dependent responses that can introduce gain and adjustability. Although these materials are still difficult to realize, important advances were presented from both theoretical and experimental perspectives, reinforcing their potential in overcoming current limitations.

Acoustic metamaterials and metasurfaces

This session featured contributions describing increasingly exotic and sophisticated phenomena in acoustic metamaterials. These included particle trapping using metamaterial structures, non-Hermitian whispering gallery modes, and techniques for enhancing

tunability via multiple scattering between Helmholtz resonators. Talks also explored wave diffraction by doubly periodic gratings and the emergence of Willis coupling through thermal interactions. Overall, the session demonstrated the continuing expansion of new effects and mechanisms in acoustic metamaterials, suggesting that many new applications may be developed in the near future.

applications of phononics, acoustic and mechanical metamaterials

Although most applications of metamaterials remain at the proof-of-concept stage, this session illustrated several promising directions. Energy harvesting was discussed as a major area of interest, particularly due to the ability of metamaterials to concentrate and dissipate energy. One talk described the use of acoustic holograms for medical and therapeutic applications. Others addressed the creation of tunable metamaterials through the integration of magnetic components and bio-inspired structures that improve dissipation. The session showed that while challenges remain, the practical potential of metamaterials is steadily increasing.

Theoretical aspects of designing metamaterials and phononic crystals

The final session was dedicated to theoretical approaches to the design of novel metamaterials. Several talks proposed moving beyond traditional intuition-based design, favoring optimization algorithms and computational methods capable of navigating complex design spaces. Other contributions presented methodologies for defining unit cells and IBZ (irreducible Brillouin zone) paths for accurate band gap analyses in periodic structures. Innovative designs based on octet lattices and shell-like plates were also introduced, demonstrating the ability to block or focus wave energy efficiently. One especially novel talk explored the use of mechanical metamaterials in speech recognition applications, which led to active and enthusiastic discussions.

In addition to these sessions, a poster session provided a dedicated space for PhD students and early-career researchers to present their projects and engage with senior scientists. The informal format of the event fostered lively discussion throughout the coffee breaks, lunches, and social activities.

Organization

The colloquium was co-chaired by Daniel Torrent and Anastasiia Krushynska and benefited from financial support by the EIC Pathfinder project “DYNAMO.” The event was attended by 50 participants from 11 countries, with Spain, France, the Netherlands, and Italy being the most represented. In addition to the scientific sessions, the program

included various informal moments for social interaction, which contributed significantly to the engaging and collaborative atmosphere of the meeting.

Conclusion

EUROMECH Colloquium 610 successfully promoted discussion on the state of the art and future directions in the field of metamaterials, emphasizing both fundamental studies and potential applications. The diversity of topics and the high level of participation confirmed the dynamism and interdisciplinary nature of this research area. The event stimulated new collaborations and helped shape a shared vision for future research in phononics and architected materials.

EUROMECH Colloquium 611**Bridging the Gap: From Brain Mechanics to Brain Dynamics**

26 – 30 September 2022, Lorentz Center@Oort, Leiden, Netherlands

Chairperson: Daniele Avitabile

Co-Chairpersons: Cristian Bick, Alain Goriely, Sylvie Lorthois, Susanne van Veluw

Introduction

The human brain is one of the most complex and fascinating systems in the living world. It not only regulates vital physiological functions such as respiration, heartbeat, and sleep, but also underpins cognition, emotion, decision-making, and creativity. Understanding the interplay between the brain's mechanical environment—including both fluid and solid processes—and the dynamics of its neuronal networks is essential for advancing both fundamental neuroscience and clinical approaches. However, the interactions between brain mechanics and brain dynamics remain poorly understood. This colloquium aimed to bridge disciplinary gaps by bringing together researchers from neuroscience, mechanics, mathematics, and physics, with expertise ranging from experimental and clinical studies to theoretical and computational models.

Scientific program highlights

This colloquium encouraged participants to move beyond disciplinary boundaries and engage in deep discussions at the interface between brain mechanics and dynamics. Although no single scientific breakthrough was identified, the environment fostered the emergence of original ideas and conceptual shifts. For instance, participants addressed the dual interpretation of the term “brain dynamics”—as it can refer either to mechanical processes (such as deformations and flows) or to neural activity viewed through the lens of dynamical systems theory. This ambiguity led to insightful discussions and helped identify common ground between different perspectives.

Numerous participants reported “aha” moments throughout the event. One such moment was the shared realization of the challenges posed by limited experimental techniques when investigating the coupled behavior of mechanical and neural processes. These challenges were balanced by the creativity and openness of the group, who used this occasion to lay the groundwork for future collaborative work.

Among the tangible scientific outcomes was the plan to write a perspective paper that captures the main insights of the workshop. This paper, currently in preparation, is structured into three thematic sections—Genesis, Zoe, and Ptois—reflecting different conceptual phases in the integration of brain mechanics and dynamics. The structure emerged directly from group discussions, where early-career researchers played an active role by summarizing sessions and helping to coordinate subgroup dialogues.

Finally, a subgroup of participants expressed their willingness to organize a follow-up meeting within the next two years, demonstrating the long-term impact of the event.

Organization

The workshop was held entirely in person at the Lorentz Center@Oort, with only a few remote presentations from participants unable to attend due to last-minute constraints. The format was intentionally transdisciplinary, with talk titles not announced in advance to encourage attendance at all sessions. In line with recommendations from the Lorentz team, the schedule included ample time for structured discussion sessions—some in smaller groups and others in plenary format. Early-career researchers were invited to co-chair these sessions and present summaries of the discussions. These collaborative and inclusive dynamics were key to initiating the writing of the collective perspective paper.

The relaxed and welcoming atmosphere, supported by the Lorentz Center's environment, greatly contributed to the success of the meeting. Participants appreciated both the scientific richness and the informal moments of exchange, including a memorable workshop dinner on the beach—made even more unforgettable by unexpected rain and strong winds.

Conclusion

The EUROMECH Colloquium 611 succeeded in catalyzing new ideas and fostering a community interested in the interdisciplinary challenges at the crossroads of brain mechanics and brain dynamics. While the event did not aim at providing definitive answers, it laid the foundations for future collaborations, initiated a collective publication effort, and offered a rare opportunity for researchers from distinct fields to engage in meaningful dialogue.

EUROMECH Colloquium 616 Unification of Microsystems and Metamaterials for New Generation Engineering Solutions

10 – 12 October 2022, Milan, Italy

Chairperson: Valentina Zega

Co-Chairpersons: Varvara Kouznetsova, Slava Krylov

Introduction

EUROMECH Colloquium 616 aimed to create a bridge between the micro/nanoelectromechanical systems (MEMS/NEMS) community and the field of mechanical and elasto-acoustic metamaterials. Although both communities often approach problems from different perspectives, they share a strong interest in nonlinear dynamics, static and dynamic modeling, multiphysics interactions, and optimization strategies. This colloquium provided a platform to explore common ground, discuss emerging applications, and stimulate new collaborations.

Scientific program highlights

The colloquium emphasized the integration of MEMS/NEMS and metamaterials, both from modeling and experimental perspectives. Discussions covered full-order and reduced-order modeling, emergent nonlinear phenomena, and optimization-based design. A recurring theme was the exploration of novel functionalities such as negative effective material properties, gyroscopic and rainbow effects, tunable stiffness, and subharmonic energy exchange.

Predictive tools—ranging from nonlinear normal modes to multiple scales methods and homogenization—were discussed as crucial in designing next-generation micro and metamaterials systems. Attention was also given to topology and shape optimization, as well as to experimental strategies to validate designs in both fields.

A total of 39 participants attended the colloquium, including representatives from academia and industry (e.g., STMicroelectronics, TDK Invensense, Phononic Vibes). The program featured 30 invited talks organized across nine oral sessions, and a poster session with six presentations.

First oral session

The session focused on the design of innovative metamaterials that exhibit peculiar properties not available in nature. In particular, geometry, combinatorics and topology of personalized mechanical metamaterials have been discussed together with metamaterials with controllable macroscopic stiffness and nonreciprocal gyroscopic microstructured media.

Second oral session

The session focused on nonlinearities in the microsystems community. In particular, numerical, classical and quantum non equilibrium dynamics of nonlinear nanomechanical systems have been discussed together with the influence of combined thermal and radiation stresses on the bifurcation structure of a nonlinear optomechanical micro-resonator. A model order reduction technique for nonlinear MEMS structures based on the invariant manifold approach has been proposed together with nonlinear normal modes and bifurcation tracking to guide the design of resonant MEMS sensors/actuators..

Third oral session

The session focused on nonlinearities in the metamaterials community. In particular, breathers in strongly nonlinear oscillator chains have been discussed together with the study of localized modes in continuous elastic media under evolving boundary conditions. Interest has been also addressed to the softening of shear wave modes in nonlinear composites on the edge of elastic instability as well as to the instability-driven microstructure transformations in soft (meta-) materials. The session ended with the investigation of emergent phenomena in locally resonant acoustic metamaterials due to subharmonic energy exchange.

Fourth oral session

The session focused on the integration of metamaterials and MEMS in particular on the role of metamaterials in MEMS. The session started with the keynote presentation of Carlo Valzasina from STMicroelectronics, entitled ‘MEMS: the ingredients for success’. The keynote speaker proposed an overview on the MEMS future trends and underlined the crucial role that metamaterials can play in this field. The session continued with the informal moments for social interaction, which contributed significantly to the engaging

discussion of zero-power speech processing in passive elastic metastructures and with the discussion of the role of acoustic metamaterials in standard Integrated Circuit platforms.

Fifth oral session

The session focused on innovative MEMS solutions for both the readout and the integration of metamaterials in microsystems. In particular, the feedthrough capacitance issues in metamaterial-based MEMS has been discussed in details since these strongly affect the performances of integrated MEMS and metamaterials. A new method for driving electrostatic double-sided comb drives and a new method for characterizing their response based in zero-power consumption has been proposed as a promising solution for microsystems and possibly integrated microsystems and metamaterials. Finally, a CMOS-compatible piezoelectric microacoustic metamaterials for Radio Frequency Applications has been proposed together with a resonant micro-arrays for frequency signal amplification.

Sixth oral session

The session focused on innovative solutions in the field of metamaterials. In particular, a whirling string actuator has been proposed as a promising solution toward dynamically amplified active mechanical metamaterials. Some insights on the non-intuitive behavior of bistable lattices have been also provided during the session. The session ended with the presentation of a multi-material metastructure for vibration isolation.

Seventh oral session

The session focused on MetaMEMS which are microsystems exploiting metamaterials for achieving better performances. In particular, an overview of the new trend of metaMEMS in Microsystems technology has been proposed together with the design and experimental characterization of electrically-tunable MEMS periodic auxetic structures and energy harvesters. Homogenization in microsystems and metamaterials is finally proposed as a promising simulation tool to reduce computational costs for periodic media.

Eighth oral session

The session focused on acoustic metamaterials. In particular, advanced modelling and design of vibro-acoustic metamaterials has been proposed together with the design and

modeling of a Periodic Single-Phase Sandwich Panel for Acoustic Insulation Applications and electroacoustic reconfigurable topological insulators.

Ninth oral session

The last session focused on the design, simulation and testing of innovative metamaterials. In particular, the laboratory experiments with multi-resonant metamaterials for broad band frequency piezoelectric energy harvesting has been discussed in details together with bioinspired tonotopic micro-resonators. The dynamics of quasiperiodic elastic metasurfaces has been finally investigated using a multiple scattering formulation. In addition to the scientific sessions, participants engaged in informal discussions during social activities and breaks. A shared online folder and interactive jamboard were created to continue the exchange of ideas after the event, with the goal of fostering future collaboration.

Organization

The colloquium was organized by Valentina Zega, with support from co-chairpersons Varvara Kouznetsova and Slava Krylov. Held in Milan, the event offered participants access to all scientific sessions and a rich program of social and networking activities, including guided tours, local dining experiences, and a gala concert of Italian opera arias. The setting facilitated relaxed yet productive interactions among participants from academia and industry alike.

Conclusion

EUROMECH Colloquium 616 successfully brought together researchers from the MEMS/NEMS and metamaterials communities to explore synergies, discuss challenges, and identify future research directions. The quality of the presentations, the diversity of perspectives, and the collaborative spirit of the event helped lay the foundations for a new interdisciplinary network and sparked ideas for joint research efforts.

Keynote or plenary speakers

The colloquium featured a keynote presentation by Carlo Valzasina (STMicroelectronics), who offered a comprehensive overview of MEMS technologies and highlighted the strategic relevance of metamaterials in next-generation devices.

EUROMECH Colloquium 617 Multiscale Mechanics, Multiphysics Modeling and Simulations for Energy Storage

29 – 31 August 2022, Lake of Garda, Italy

Chairperson: Alberto Salvadori

Co-Chairpersons: Robert McMeeking Edwin Knobbe

Introduction

The EUROMECH Colloquium 617 brought together leading experts from academia and industry to address critical issues in the modeling, design, and optimization of energy storage systems. With a particular focus on the mechanics and multiphysics aspects of next-generation batteries, the event emphasized solid-state lithium and sodium ion technologies. The conference was held at the Congress Center in Sirmione, on Lake Garda, and included both in-person and remote contributions, fostering a broad and interdisciplinary dialogue on challenges and innovations in the field.

Scientific program highlights

The scientific sessions featured 30 oral presentations and 11 posters, delivered by participants from across Europe, North America, and Asia. The talks spanned a wide range of topics, including multiscale modeling, mechanical degradation, thermal management, electrochemical performance, and materials innovation for battery systems. Presenters addressed the coupling between electrochemical, thermal, and mechanical processes, and explored how these interactions affect the efficiency, durability, and safety of modern energy storage technologies.

A defining characteristic of the colloquium was its interdisciplinarity. Mathematicians, mechanics, chemists, and engineers engaged in vibrant exchanges, with active contributions from both academic and industrial researchers. Industrial participants represented major stakeholders in battery development and applications, including BMW, Dassault Systèmes, Sabic, Ferrari Automotive, and Fincantieri.

Particular attention was devoted to solid-state batteries, where safety and reliability are paramount but complex to model due to intricate mechanical behavior. Talks explored advanced computational methods, including multiphysics simulations, model order

reduction, and failure prediction. Experimental studies provided validation benchmarks and insights into material performance under realistic operating conditions.

Round-table discussions complemented the presentations and helped deepen the exchange among participants. These conversations laid the foundation for new collaborations, reinforcing the relevance and timeliness of the colloquium's themes.

Organization

The colloquium was organized in a hybrid format to ensure broad participation despite travel limitations. A total of 52 participants contributed to the scientific program, including in-person and online presenters. The event was supported by the University of Brescia, BMW Group, Dassault Systèmes, Comsol, and Sabic, as well as EUROMECH, which provided financial support.

The social and institutional components of the event also played an important role. The opening featured a welcome from the Rector of the University of Brescia and the Mayor of Sirmione. The program included a colloquium dinner at the "Borgo la Caccia" winery, accompanied by a live music performance, offering participants a chance to continue their discussions in a relaxed setting.

A shared online platform was made available for all attendees to access presentations, posters, and other materials, further promoting interaction and continuity beyond the colloquium.

Conclusion

EUROMECH Colloquium 617 successfully addressed key scientific and technological challenges in energy storage through a multidisciplinary lens. The hybrid format and strong industrial presence enhanced the dialogue between research and application, and the event stood out for its scientific depth, organizational quality, and collaborative spirit. The exchanges fostered during the meeting are expected to lead to new projects and advances in the understanding and engineering of battery systems.

EUROMECH Colloquium 619 Oberbeck–Boussinesq Hypothesis and Beyond in Stratified Turbulence

4 – 8 July 2022, Vienna, Austria

Chairperson: Francesco Zonta

Co-Chairpersons: Sergio Pirozzoli, Francesca Chillà

Introduction

EUROMECH Colloquium 619 focused on stratified turbulence, with a particular emphasis on the role and limitations of the Oberbeck–Boussinesq (OB) approximation. Stratified turbulent flows—where density gradients introduce buoyancy forces—are central to numerous industrial and geophysical applications, such as atmospheric and oceanic boundary layers, nuclear reactors, and heat exchangers. Despite significant progress through experimental, computational, and theoretical methods, the field presents many unresolved challenges, particularly in regimes with high Reynolds and Rayleigh numbers.

One of the central issues addressed during the colloquium was the relevance of the OB hypothesis, especially in flows with large temperature gradients or vertical scales, where its simplifying assumptions may no longer hold. The need for advanced modeling techniques that go beyond OB assumptions was highlighted as essential to accurately describe real-world turbulent stratified flows.

Scientific program highlights

The colloquium brought together approximately 45 international participants and was organized in hybrid format, combining in-person and online contributions. The program was divided into six thematic blocks, each introduced by a keynote lecture, and featured lively discussions throughout the presentations, breaks, and social activities.

Stably stratified turbulence and buoyancy in porous media

The first morning was dedicated to stably stratified flows, introduced by a keynote from Prof. Caulfield on the role of stratified turbulence in climate prediction. Topics included internal wave dynamics, flow layering, and boundary effects. In the afternoon, the focus shifted to buoyancy-driven flows in porous media and high-Prandtl-number regimes. Prof. Hansen’s keynote addressed thermal and double-diffusive convection in Earth’s

mantle, followed by talks on Rayleigh–Darcy flows, Rayleigh–Taylor convection, and fingering phenomena—crucial for environmental modeling.

Thermal convection and Non-Oberbeck–Boussinesq effects

Prof. Schumacher opened the second day with a lecture on mesoscale structure in turbulent convection. The morning sessions explored extreme events and thermal plumes, with attention to measurement and simulation methods, including the effects of rotation and magnetism. The afternoon was devoted to Non-Oberbeck–Boussinesq (NOB) effects. Prof. Pecnik presented scaling laws for density- and viscosity-stratified turbulence, followed by contributions on NOB behaviors in liquids and gases, especially at high Rayleigh numbers.

Multiphase flows and particle dispersion

The third day introduced multiphase flow into the discussion. Prof. Verzicco delivered the keynote on multiphase Rayleigh–Bénard convection, followed by talks on moist convection, liquid–liquid flows, and buoyancy-influenced turbulence near rough or smooth walls. The afternoon turned to ecological and environmental applications, such as mixing and dispersion of organisms in stratified environments. Prof. Dijkstra’s keynote on intermittent mixing in deep lakes was followed by presentations on the transport of inertial, neutrally buoyant, and gyrotactic particles—mimicking planktonic motion—in stratified flows.

Across all sessions, the colloquium stood out for its in-depth scientific dialogue. In particular, the discussions on Oberbeck and Non-Oberbeck–Boussinesq models were so intense and constructive that, for the first time, a shared understanding emerged among participants who had debated the subject for years. These exchanges were supported by extended discussions during breaks and meals, enhancing both the scientific and social aspects of the event.

Organization

The colloquium was hosted in Vienna and organized over five days, combining on-site presentations with virtual participation. Participants were provided with a complete colloquium package, including the book of abstracts, stationery, access to a fully equipped venue, three lunches, six coffee breaks, a welcome dinner, and a social dinner. The event

did not rely on external funding aside from participant registration fees and the support from EUROMECH.

The hybrid format allowed for flexibility while maintaining a high level of engagement. The venue and logistics created a comfortable setting for discussion and networking, which significantly contributed to the success of the event.

Conclusion

EUROMECH Colloquium 619 successfully brought together the international community working on stratified turbulence. The focus on both Oberbeck–Boussinesq and beyond–Oberbeck–Boussinesq regimes was timely and essential for advancing understanding of buoyancy-driven flows. The interdisciplinary approach and the quality of the discussions set the stage for future collaborative research, especially in modeling and simulation of complex stratified systems across environmental and industrial applications.

Keynote or plenary speakers

Each of the six scientific sessions began with a keynote lecture by a leading expert in the field. These talks provided context and depth, guiding the following discussions and setting a high standard for the scientific program. The invited keynote speakers were:

- Prof. Caulfield
- Prof. Hansen
- Prof. Schumacher
- Prof. Pecnik
- Prof. Verzicco
- Prof. Dijkstra

EUROMECH Colloquium 623

Architected Media: Recent Developments and Scientific Challenges

2 – 6 May 2022, Nancy, France

Chairperson: Jean-François Ganghoffer

Co-Chairperson: Francesco Dell’Isola

Introduction

The development of architected materials—engineered structures whose effective mechanical behavior arises from their designed internal architecture rather than solely their composition—has opened new frontiers in material science and engineering. These materials, often referred to as metamaterials, are characterized by exceptional static and dynamic properties, enabling innovative solutions for applications where conventional materials fall short.

Driven by requirements for lightweight yet stiff structures, these artificial materials are particularly relevant in morphing technologies, aerospace, biomechanics, and civil engineering. Their design involves achieving prescribed mechanical responses, including non-standard Poisson’s ratios and tailored anisotropy, which are unattainable with isotropic or homogeneous materials. Additive manufacturing has further accelerated the practical realization of such materials by enabling precise control of internal architectures.

Scientific program highlights

The scientific program was structured into four thematic sessions:

Fibrous materials, biomaterials, composites

This session explored architected systems inspired by biological structures and advanced composite designs. Applications included lightweight reinforcements and biomimetic substitutes, such as tendon- and ligament-like constructs, showcasing anti-auxetic behavior.

Homogenization, material design

Talks in this session focused on multiscale approaches and homogenization techniques to link microstructure with macroscopic behavior. These models are essential to translate complex architectures into continuum-scale properties for design purposes.

Waves

This session addressed wave propagation in architected materials, with emphasis on phononic and elastic metamaterials. Presentations highlighted how geometry and periodicity can be tuned to control wave dispersion, attenuation, and localization.

Multiphysical couplings

Discussions in this session examined the interaction between mechanical behavior and other physical fields such as thermal, electrical, or magnetic responses. Such multiphysical couplings are critical in the development of smart materials and sensors.

Throughout the event, participants shared recent advances and state-of-the-art findings in the field. The one-session format fostered a unified environment, encouraging extensive and informal discussions. This setup was particularly appreciated for enhancing scientific exchange across sub-disciplines and experience levels.

Organization

The colloquium was hosted in Nancy and organized by Jean-François Ganghoffer with co-chair Francesco Dell'Isola. It welcomed 28 participants from across Europe, with a majority from France, Italy, and other EU countries. Participants benefited from a comprehensive program, which included access to the booklet of abstracts, participation in scientific sessions, coffee breaks, a welcome cocktail, and a banquet. Support was provided by Université de Lorraine, and colleagues from the host institution contributed to the organization without paying registration fees.

Conclusion

EUROMECH Colloquium 623 successfully created a space for dialogue and collaboration among researchers working on architected materials. The range of topics and the quality of presentations underscored the vitality and maturity of this research area. Discussions on mechanical performance, microstructural control, and multiphysics.

interactions demonstrated both the current achievements and the challenges that remain open. The event confirmed the need for continued investigation in this domain and suggested the organization of a follow-up colloquium in 2024 or 2025.

EUROMECH Colloquium 624**Mechanics of Soft Active Polymers**

24 – 26 August 2022, Southampton, United Kingdom

Chairperson: Daniil Yurchenko

Co-Chairpersons: Mikael Lallart, Kostia Volokh

Introduction

The mechanics of soft active polymers remains one of the most compelling challenges in modern material mechanics. Soft materials play a central role in the development of flexible electronics, soft robotics, biomedical devices, and other emerging technologies. However, their inherently nonlinear behavior and strong coupling with multiple physical domains make them complex to model and optimize.

EUROMECH Colloquium 624 brought together researchers from various disciplines to discuss the theoretical, computational, and experimental aspects of soft active polymers. The meeting emphasized transdisciplinary approaches to address energy conversion processes and to develop more efficient actuation and energy harvesting systems based on soft materials.

Scientific program highlights

The scientific sessions addressed the multiple couplings that characterize the behavior of soft active polymers and their applications. Particular focus was placed on four main coupling mechanisms:

Electro-mechanical coupling

Presentations addressed the modeling and characterization of electroactive polymers, such as polyelectrolyte gels and hydraulically amplified self-healing electrostatic (HASEL) actuators. These systems are of particular interest for soft robotic actuators due to their responsiveness and compliance.

Thermo-mechanical coupling

Talks in this session explored experimental and modeling approaches for materials such as VHB (very high bond) elastomers. The influence of thermal gradients on deformation and failure was examined, with relevance to both actuation and sensing applications.

Magneto-mechanical coupling

This session included experimental studies and finite element modeling of magnetoactive polymers. Topics included magneto-deformations, viscoelasticity, elastodynamics, and instability-induced pattern formation—key aspects for the design of responsive magnetic actuators and sensors.

Multiphysical coupling beyond three domains

Some contributions addressed systems combining multiple physical effects, such as electromagnetic-dielectric hybrid energy harvesters. These systems require holistic optimization strategies due to the bidirectional nature of energy transfer across domains.

The need for an integrated perspective in the design process was a recurring theme throughout the colloquium. It was emphasized that optimizing individual components in isolation often results in suboptimal system performance. Instead, global optimization—accounting for the material, structure, electrical interface, and intended function—is essential. Several talks illustrated this principle in applications such as soft robotic grippers, energy harvesters, and adaptive optical components.

Notable contributions included:

- Design and modeling of soft electroactive robots
- Electromechanical models of biological tissues
- Thermo-viscous modeling in liquid crystal elastomers
- Hybrid energy harvesters and switched electrical interfaces

Organization

The colloquium was held in Southampton and organized by Daniil Yurchenko with the support of Mikael Lallart and Kostia Volokh. Participants benefited from access to the electronic book of abstracts, daily refreshments and lunches, and a conference dinner. In total, the event featured:

- 7 student participants
- 12 non-EUROMECH members
- 2 keynote lectures
- 2 invited lectures by the co-chairpersons

Registration categories included student, member, non-member, and online participant options. Keynote speakers were exempt from registration fees.

Conclusion

EUROMECH Colloquium 624 provided an engaging platform for advancing the scientific understanding of soft active polymers. The interdisciplinary nature of the event enabled fruitful discussions on both foundational principles and applied innovations. Presentations demonstrated the importance of considering full-system design for optimal energy conversion and mechanical performance. The colloquium highlighted both current advancements and future challenges, paving the way for collaborative research in this vibrant and rapidly evolving field..

EUROMECH Colloquium 625

Advances in LES of Turbulent Multiphase Flows

22 – 24 June 2022, Udine, Italy

Chairperson: Cristian Marchioli (University of Udine, Italy)

Co-Chairperson: Joern Sesterhenn (University of Bayreuth, Germany)

Introduction

Multiphase flows are pervasive in both natural systems and technological applications. When turbulence is involved, their complexity increases significantly due to the wide range of time and length scales involved. For many practical cases, direct numerical simulation remains computationally prohibitive, which is why large-eddy simulation (LES) has become a preferred strategy. LES offers a balance between resolution and computational cost, making it particularly suitable for shear-dominated or mixing-controlled multiphase flows.

The aim of EUROMECH Colloquium 625 was to bring together researchers from academia and industry to discuss recent advances in LES modeling for turbulent multiphase flows. The focus was on understanding the challenges in sub-grid scale (SGS) modeling for both dispersed and interface-dominated flows, and identifying future research directions with real-world impact.

Scientific program highlights

The colloquium was attended by around 50 participants (40 speakers and 10 non-speakers) and was held in hybrid format. The program was organized into five thematic blocks, each introduced by a keynote lecture.

Particle-laden flows and sub-grid modeling

The day opened with a keynote by Prof. Simon Schneiderbauer on interphase forces in turbulent dispersed flows. Discussions followed on the role of sub-grid structures in particle dispersion and small-scale turbulence, LES applications to erosion, sediment transport, bubble columns, and separated flows. The afternoon focused on modeling frameworks, introduced by Prof. Aymeric Vie, who presented statistically-consistent approaches for two-way coupled flows. Talks explored stochastic force models, wall modeling, and hybrid approaches for particle deposition and dispersion.

Practical applications and interface modeling

The morning began with Prof. Olivier Desjardins presenting a talk on sub-grid scale breakup modeling in liquid atomization. This was followed by case studies on fluidized solids in risers, autoclaves, lime dissolution, and cavitating hydrofoils. In the afternoon, Prof. Marcus Hermann introduced dual-scale modeling for immiscible interfaces. Sessions covered droplet resuspension, swirling flow-induced deposition, and airborne particle dispersion, including a special session launching the 2022 International CFD Challenge on violent expiratory events—an initiative that extended beyond the colloquium and is being considered for publication in *Physics of Fluids*.

Euler-Euler and Euler-Lagrange approaches

The final morning was dedicated to LES strategies for dispersed phase simulations. Prof. Antonino Ferrante presented a mixed artificial neural network (MANN)-based LES framework for droplet-laden turbulence. Presentations followed on LES applications to atmospheric clouds, sediment beds, submerged jets, and flows over heterogeneous surfaces.

Across all three days, sessions featured ample time for discussion, further supported by informal exchanges during breaks, lunches, and dinners. The event succeeded in fostering an open environment for critical assessment and the exchange of new ideas.

Organization

The colloquium was hosted at the University of Udine and organized by Cristian Marchioli and Joern Sesterhenn. Participants attending in person received printed programs, abstract booklets, and conference materials, along with coffee breaks, lunches, a welcome cocktail, and a gala dinner. Online participants were granted access to digital materials, live-streamed sessions, and post-conference recordings. Financial support was provided by the University of Udine and EUROMECH.

Conclusion

EUROMECH Colloquium 625 provided a valuable platform for sharing current developments in LES for turbulent multiphase flows. The diversity of topics—from dispersed particle modeling to interface dynamics and real-world applications—reflected

the maturity and growing significance of the field. The event stimulated discussion on the limitations of current modeling strategies and highlighted promising directions for future research, especially in the context of predictive modeling and industrial application.

Keynote or plenary speakers

Each of the five main thematic blocks began with a keynote lecture delivered by:

- Prof. Simon Schneiderbauer
- Prof. Aymeric Vie
- Prof. Olivier Desjardins
- Prof. Marcus Hermann
- Prof. Antonino Ferrante

These talks helped structure the discussions and provided crucial insights into emerging challenges and modeling strategies..