# Program Book

# MATERIALS & ENERGY


## ICOME'23

ICOME'23: Int. Conf. On Materials and Energy
Caserta, Italy
May 30 –1 June, 2023
ICOME'23

# LOCATION OF THE ICOME23

# ICOME23 – INTERNATIONAL ATTENDEES

# CONTENTS

# WELCOME

*After the success of the International Conference on Materials & Energy (ICOME'15) in the nice Mediterranean city Martil - Tetouan in Morocco, followed by the edition of 2016 in the beautiful Atlantic city of La Rochelle in France, the edition 2017 in the amazing Eastern part of China at Tianjin, ICOME'18 in the sunny coastal city Donostia-San Sebastian located at the North of Spain, ICOME'19 in the sweet city of Hammamet in Tunisia, back to France ICOME'21 in a very successful online edition and the edition 2022 of last year in the magnificent port city of Baku in Azerbaijan.*

*This edition 2023 is scheduled in Italy, in the extraordinary elegant city of Caserta. It was chosen thanks to its perfect location which is 36 kilometers north of Naples on the edge of the Campanian plain. The city is best known for the 18th-century Bourbon Royal Palace of Caserta. This year 2023 is the 250th anniversary of the death of the architect Luigi Vanvitelli, who designed and realized the Royal Palace.*

*The ICOME'23 Conference is an excellent meeting devoted to cutting-edge research that meets the scientific needs of university researchers, industrials and professionals in order to explore new horizons of knowledge on various subjects related to the fields of interconnection between materials and energy. This edition is honorably chaired by the presidents of the ICOME series and prof. Biagio MORRONE, from University of Campania "L. Vanvitelli" Italy.*

*The presidents of the ICOME series: Prof. Rachid BENNACER (Univ. Paris Saclay / ENS-Paris-Saclay) and Prof. Mohammed El GANAOUI (University of Lorraine / IUT Longwy), thanks warmly Prof Biagio MORRONE for this collaboration with University of Campania "L. Vanvitelli" Italy, and they welcome the participants and hope that everyone will find in this event subjects of interest and great pleasure in exchanging with the materials, thermal and energy communities.*

# BENVENUTI

*Dopo il successo della Conferenza Internazionale sui Materiali e l'Energia (ICOME'15) nella bella città mediterranea di Martil - Tetouan in Marocco, seguita dall'edizione del 2016 nella bella città atlantica di La Rochelle in Francia, l'edizione 2017 nella sorprendente parte orientale della Cina a Tianjin, ICOME'18 nella soleggiata città costiera di Donostia-San Sebastian situata nel nord della Spagna, ICOME'19 nella dolce città di Hammamet in Tunisia, di nuovo in Francia ICOME'21 in un'edizione online di grande successo e l'edizione 2022 dello scorso anno nella magnifica città portuale di Baku in Azerbaigian.*

*L'edizione 2023 è in programma in Italia, nell'elegantissima città di Caserta. La scelta è stata fatta grazie alla sua perfetta posizione, a 36 chilometri a nord di Napoli, ai margini della pianura campana. La città è nota soprattutto per la settecentesca Reggia borbonica di Caserta e quest'anno ricorre il 250imo anniversario della morte del suo architetto Luigi Vanvitelli, che l'ha progettata e realizzata.*

*La Conferenza ICOME'23 è un incontro d'eccellenza dedicato alla ricerca d'avanguardia che risponde alle esigenze scientifiche di ricercatori universitari, industriali e professionisti al fine di esplorare nuovi orizzonti della conoscenza su argomenti legati all'interconnessione tra i campi dei materiali e dell'energia. Questa edizione è presieduta dai presidenti della serie ICOME e dal prof. Biagio MORRONE dell'Università della Campania "L. Vanvitelli" dall'Italia.*

*I presidenti della serie ICOME: Prof. R. Bennacer (Univ. Paris Saclay / ENS-Paris-Saclay) e Prof. M. El-Ganaoui (Università della Lorena / IUT Longwy), ringraziano calorosamente il Prof. Biagio MORRONE per questa collaborazione con l'Università della Campania "L. Vanvitelli". Diamo il benvenuto ai partecipanti e ci auguriamo che tutti trovino in questo evento argomenti di interesse, e un grande piacere nello scambio con le comunità scientifiche dei materiali, della trasmissione del calore e dell'energia..*

# FOREWORD

*The global health crisis of COVID 19 has shown more than ever that the eyes of the citizens are turned towards science in order to bring very quickly palliative and then decisive solutions to the pandemic. In such situation threatening the human species, the prerogative of Science would like researchers to work together in a spirit of sharing information, methods and discoveries, simply working for the sustainability of Man and life in general when it is threatened. Although the situation prevented any face-to-face meeting, the exchanges continued.*

*Indeed, the evolution of knowledge during the last two centuries allows today, thanks to the development of virtual interfaces and to the progress of the algorithmic, to transport sound and visual information which tend to generalize to the sensory. No one knows the limit of this exercise. In an increasingly reliable, stable and fast way, this connection made possible the continuity of pedagogical transmission and scientific research. This is another demonstration that the knowledge produced, accumulated and preserved is today a kind of lifeline-saving arch for doctors and patients, litigators and judges, teachers and students, professors and doctoral students, to continue to advise, assist, dialogue, transmit and create the knowledge of tomorrow. In this sense, the high places of knowledge that are the Universities, the Academies of Sciences, the Schools have largely fulfilled their saving missions towards the whole humanity.*

*In mathematics, if the extraction of the square root of a number became a child's play with the advent of calculators, its extraction with a sheet of paper, a pencil and the four elementary operations was previously, an exercise that could be long. Similarly, for prehistoric man, bringing a quantity of water to boil without having a metal container despite the domination of fire was in the same order of challenge as extracting the root of a number without a calculator.*

*At first, computers worked with lamps, today's computers (for all purposes) are based on the use of transistors industrialized since 1950 and their design is closely linked to the advent of rare earths and soon quantum. By chance, Moore's law (doubling every eighteen months of the density of transistors in processors) sees its predictions come true in the challenge of materials. This law is accompanied in a global context by another law called Dennard's law (increase in computing power at constant energy), which opens the challenge of energy efficiency. Without these two competitions between materials and energy (involving many scientific disciplines), the reader is free to imagine what his daily, life would have been like during the lockdowns that have disrupted the existence of the world's citizens since the end of 2019.*

*In this spirit, the ICOME (International Conference of Materials & Energy) aims to bring annually an updated and balanced picture of advances in the fields of materials and energy and to address significant progress in both fundamental and applied research as well as in societal areas.*

*This virtuous circle has punctuated the history of humanity by taking advantage of all the advances in knowledge as a natural laboratory or as a crucible providing innovations allowing experimental physics and numerical mathematics to continue their breakthroughs. Among these breakthroughs, we will particularly note those in optoelectronics, laser physics or high-performance computing.*

*The ICOME 2020 edition was supposed to take place in Metz, in Lorraine, and address advances in the fields of materials and energy. This edition was to take place under the auspices and legacy of the mathematician Henri Poincaré (Nancy) and the poet Paul Verlaine (Metz), symbolizing science and society. This conference returns after an international tour in Africa and Asia, especially after the success of the 2019 edition in Tunisia. ICOME is also a bridge between the two shores of the Mediterranean, the crucible of a civilization that has largely influenced in its own way the course of the history of materials and energy.*

*The edition of ICOME was postponed to June 2021 and again pandemic did not allow a face-to-face event, the committee opted to maintain an online edition as a new postponement would be unfavorable to the various strong links created during all the past years.*

*The 2022 edition pursued the spirit of regaining a face-to-face exchange and was hold in the City of Baku, Azarbaijan.*

*We are particularly grateful to the chairs of sessions and round tables. All authors and contributors have coped and maintained their interest in the event, we hope to live up to their expectations.*

*Usually, the conference is coupled with a thematic school for PhD students and newly-qualified doctors. It is a privileged place of exchange between juniors and seniors who take advantage of the event's atmosphere to benefit from the seniors' advice and experience. Only face-to-face exchanges can ensure and fully consolidate the benefits of the seniors' values.*

*The committee has chosen to reschedule the theme school for a more important face-to-face event during the fall of 2023/24 to guarantee the benefits for the community of PhD Students.*

*During this edition of ICOME'23, participants are invited to three days of intense activity, through several plenary lectures given by renowned scientists.*

*The series of lectures on materials and energy promotes initiatives and values aiming at the accumulation of human progress, cultural exchange, economy of mind, sharing and investment in intelligence, strength of argument, guarantee of respect for opinions, starting of creativity, support for the quest for truth. In this sense, the reference to the universal scientist Averroès born in Cordoba, Spain in 1126 and died in Marrakech, Morocco in 1198, through the prize bearing his name reinforces this vision of a man who places truth beyond the beliefs and allegiances of his time, intelligence beyond temporal interest and societal use.*

*"Knowledge acquired in a foreign country can be a homeland and ignorance can be an exile lived in one's own country"*
***Averroès (1126-1198).***

*The organizers of the ICOME 23 edition wish everyone a fruitful event where young researchers can deepen their knowledge both onsite and online.*

*The organizers would like to thank the entities that supported the event and in particular the laboratories and institutes of the University of Lorraine that encouraged and supported the holding of this edition in Lorraine and accompanied the ICOME series since its creation.*

*Prof. M. EL GANAOUI, Chair ICOME Serie's, University of Lorraine.*

*Prof. R. BENNACER, Honorary Chair ICOME Serie's, Université Paris-Saclay.*

# ICOME SERIES CHAIRS


***Prof. Mohammed El GANAOUI:*** *is a full professor at the University of Lorraine and researcher in the Jacques Villermaux Federation for mechanics, energy and processes (FR 28 63/LERMAB). He is heading the research in energy in the Henri Poincaré Institute of Technology in Longwy. Previously, he was an associate professor in the University of Limoges and the SPCTS UMR 6638 CNRS laboratory where he was responsible for the Physics Department (2004-2010) and the international cooperation service (2006-2010) in the Faculty of science and technology. His research aims to understand heat and mass transfers through modeling and numerical simulation with a specific activity in the field of the solid -liquid-vapor phase change. Applications concern materials and energy and benefit to energy systems including phenomena for sustainable building (Eco-materials). He teaches the mechanics of continuous media, heat transfers, and numerical methods. He was advisor of more than 25 Phd Thesis with strong international interaction noticeably in the Euro-Mediterranean context. He participated/managed the PAI Australia, Canada, Maghreb (Tassili, Utique, Volubilis), China (Xugangqi). El Ganaoui has participated in the Edition of more than 10 special issues and conference proceedings, co-authored over than 200 publications in journals (rank A) and participated in more than 100 international conferences including ten he co-organized. He is member of many international scientific societies in mechanics and heat transfers.*

***Prof. Dr. Ing. Rachid BENNACER:*** *is an Engineer in Mechanical field (1989), and he got his PhD thesis at Pierre et Marie Curie University (Paris 6) in 1993. He worked as lecturer in the University Paris XI (1993/94), became an associate professor at Cergy Pontoise University in 1994 and full Professor in 2008. He moved as senior Professor to the prestigious school Ecole Normale Superieure (Paris-Saclay) since 2010. He becomes in 2017 an Exceptional National Class Professor. He is also adjunced professor at Tianjin Uni. Of comm. (China) and UMB Univ. He assumed several responsibilities, director of the LEEVAM research team (2003-2007), Licence degrees (2008-2010), Aggregation title (2010-2011), Master research degree (2011 2013), Transfer and Environmental Research Unit (CNRS LMT-Lab) (since July 2012), dean of Civil/Environmental department (Oct. 2012/Sep. 2016) and since 2019 Coordinate International Affairs Related To Ph.D Univ. Paris-Saclay. His present research activity is within the LMPS laboratory where he managed Transfer and Environmental Research Unit. His Research field covers wide spectrum and several domains. It covers the building material for energy applications or on durability aspect, renewable and energy system. The expertise covers the direct numerical simulation including CFD coupling on multi-scales. The previous approach is consolidated by analytical or reduction approach in order to identify the instabilities and global behavior bifurcation and similarity controlling parameters in multiphysics situations. He published around 10 book chapters and more than 250 referenced international journals (Rank A).*

# *ICOME 2023 CHAIR*


***Prof. Biagio MORRONE:*** *Associate Professor,received his Master Degree in Mechanical Engineering in 1992, University of Naples Federico II, and earned his Ph.D. in 1995, University of Naples Federico II, with a thesis on numerical and experimental natural convection in channels. 1994, visiting Ph.D. student at Idaho State University, USA, on numerical analysis of the electronic components cooling and analytical solutions of heat transfer in solid. 1998-2002 junior researcher and 2002-today associate professor of Applied Thermodynamics and Energy Management at the University of Campania. Member of the College of Doctorate in "Mathematics, Physics and Engineering applications" teaching courses on "Numerical Methods in Physics and Engineering" at the University of Campania. Visiting researcher in India in 2018, visiting professor in France Cergy-ICAM EPMI 2019 and 2023 at the University of Lorraine – France, leading researcher of scientific projects to produce bio-hydrogen and bio-methane from animal manure and organic fraction of municipal solid waste; leading researcher of scientific projects on Ground Energy Pile Heat Pumps; researcher for several projects in Energy recovery from Biomass; Invited speaker at several conferences on the use of bio-hydrogen in Internal Combustion Engines and Biomass to Energy conversion; co-author of more than 80 scientific publications on international journals, many others presented at international and national conferences and several book chapters; main research topics are: biomass-to-energy conversion, recovery of materials from biomass treatments, alternative fuels for internal combustion engines, heat exchangers, Organic Rankine Cycles, ground-coupled heat pumps, numerical methods for heat transfer.*

# INT. SCIENTIFIC COMMITTEE

| | | |
|---|---|---|
| *Abrudeanu M.* | *Acad. Sciences University* | *Romania* |
| *Alexander J.I.D.* | *Case Western Reserve University* | *USA* |
| *Allia K.* | *USTHB University* | *Algeria* |
| *Bayazitoglu Y.* | *Rice University* | *USA* |
| *Benim A.C.* | *Düsseldorf University* | *Germany* |
| *Benyoussef A.* | *Hassan II Academy* | *Morocco* |
| *Bontoux P.* | *Aix Marseille University* | *France* |
| *Bouali M.* | *Mondragon University* | *Spain* |
| *Boulet P.* | *Lorraine University* | *France* |
| *Bsaies B.* | *CRTEn, Tunis* | *Tunisia* |
| *Cambra J.* | *The Basque Country University* | *Spain* |
| *Chai J.* | *School of Comtruting & Eng.* | *UK* |
| *Coronas A.* | *Rovira I Virgili University* | *Spain* |
| *Costa V.* | *Aveiro University* | *Portugal* |
| *Cotta R.* | *Me Cotrtre UFRJ* | *Brazil* |
| *De Lemos M.* | *Inst. Tecno. De Aeronautica* | *Brazil* |
| *Dombrovsky L.* | *Inst. High Temtreratures* | *Russia* |
| *Duan F.* | *Nanyang Technological University* | *Singapore* |
| *El Abbassi I.* | *ECAM-EPMI* | *France* |
| *Garcia A. M.* | *The Basque country University* | *Spain* |
| *Lappa M.* | *Strathclyde University* | *UK* |
| *Mataoui A.* | *USTHB University* | *Algeria* |
| *Merzoud M.* | *Annaba University* | *Algeria* |
| *Meyer J.* | *Pretoria University* | *South Africa* |
| *Meziani B.* | *Bejaia University* | *Algeria* |
| *Mimet A.* | *Abd. Essaadi (UAE) University* | *Morocco* |
| *Morrone B.* | *Campania L. Vanvitelli University* | *Italy* |
| *Nandakumar K.* | *Louisiana State University* | *USA* |
| *Nouari M.* | *Lorraine University* | *France* |
| *Nunzi J. M.* | *Queen's University* | *Canada* |
| *Seddiki A.* | *Tunis Al Manar University* | *Tunisia* |
| *Saghir Z.* | *Ryerson University* | *Canada* |
| *Takorabet N.* | *Lorraine University* | *France* |
| *Timchenko V.* | *NSW University* | *Australia* |
| *Uzunova M.* | *ECAM-EPMI University* | *France* |
| *Vieira G.M.R.* | *CEFET/RJ* | *Brazil* |
| *Yuen R.* | *City University of Hong Kong* | *China* |
| *Zhu Ji-Hong* | *Northwestern Polytech. University* | *China* |

# ICOME 23 SCIENTIFIC SECRETARY & WEBMASTER

***Dr. Souad MORSLI:*** *Assistant Professor at University of Lorraine, UL-ENIM -Metz Previously Associate Professor in Sciences and Technology of Oran Mohamed Boudiaf / USTOMB. Department of Marine Engineering. Her research interests focus on the field of heat & mass transfer, aeration dynamics, and energy optimizations.*

***Mrs. Amira M'HADBI:*** *A PhD student at University of Lorraine and University of Tunis. Her research focuses on the area of fluid mechanics and heat transfer.*

***Dr. Hichem Ahmed MAHBOUBI:*** *Is a self-taught software engineer with 5 years of experience. He has worked on a variety of high-profile projects, from mobile apps to web-based software solutions, and is known for his technical expertise and problem-solving abilities.*

***Dr. Karim RAGUI:*** *After being Associate Professor at USTHB (Algeria) he joined the Academy of Science University (China). His research interests focus on the field of heat & mass transfer, Supercritical fluids, porous matrix, nanotechnology, pollutants spreading, energy optimizations. He is an Editor-in-Board and Guess Editor in several international journals.*

***Mrs. Annalinda CAPONE**, Ph.D. student in Mathematics, Physics, and Engineering Applications. After graduating in Energy and Environmental Engineering, she is involved in the optimization of thermochemical and biological processes for energy and material recovery from waste and different types of biomass.*

***Mrs. Raffaella GRIFFO** graduated in Energy and Environmental Engineering in 2021, Ph.D. student in Mathematics, Physics and Applications to Engineering at the University of Campania "Luigi Vanvitelli", she is currently working, in collaboration with Federico II University of Naples, on the production and wettability characterization of carbon nanofilms.*

***Dr. Giovanna Marta FUSCO** obtained her PhD in April 2023 from University of Campania, where she still works in the Plant Crop Physiology Lab. Her research interests focus on the effects of plant biostimulants on the yield and metabolism of horticultural crops.*

# ICOME 23 TECHNICAL SC.COMMITTEE

*Warm thanks to the reviewers, the administration staff, and the students, as well, for their devotion, allowing the organization success of the present event.*

| | | |
|---|---|---|
| *Biagio Morrone* | *University of Campania "L. Vanvitelli"* | *Italy* |
| *Raffaella Griffo* | *University of Campania "L. Vanvitelli"* | *Italy* |
| *Annalinda Capone* | *University of Campania "L. Vanvitelli"* | *Italy* |
| *Lucio Zaccariello* | *University of Campania "L. Vanvitelli"* | *Italy* |
| *Petronia Carillo* | *University of Campania "L. Vanvitelli"* | *Italy* |
| *Giovanna Marta Fusco* | *University of Campania "L. Vanvitelli"* | *Italy* |
| *Aldo Amirante* | *University of Campania "L. Vanvitelli"* | *Italy* |
| *Morsli Souad* | *University of Lorraine, ENIM* | *France* |

# KEYNOTE/ SYMPOSIUM/ INVITED LECTURER

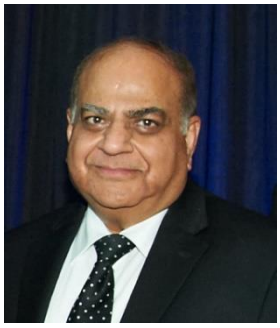
## *Keynote Speakers*

### *Keynote 1: Convective Transport in Channels due to the Combined Effect of Shear and Imposed Pressure*

***By: Dr. Yogesh JALURIA, Rutgers University, Piscataway, USA***

*The flow and convective heat transfer in channels are generally due to an imposed pressure difference. Flows in mini- and microchannels for thermal management of electronic systems and in heat exchangers are examples of such flows. However, in many important cases, the shear due to a moving surface may also act in conjunction with the pressure, resulting in both aiding and opposing circumstances. Examples of such flows are seen in lubrication and in manufacturing processes like extrusion, coating, and wire drawing. In optical fiber drawing and coating processes, for instance, the moving fiber imparts shear along with the imposed pressure. The transport in the channels strongly influences the thermal processing of the material and the final product. Similarly, cooling of optical fibers after the furnace drawing process is another important step in the overall fiber fabrication process. The shear is imparted by the moving fiber and inert gases like Helium and Nitrogen are driven by pressure into the cooling channel. In extrusion processes as well, shear and pressure driven flows arise and affect the transport mechanisms that influence the thermal processing of the extruded material. This paper is focused on such processes, where the flow and the convective heat transfer in channels are induced by both shear and pressure. Of particular interest are mini- and microchannels, though larger channels are also considered. The transport processes at the inlet and outlet regions of the channels are of special intertest and are discussed in detail. Experimental and numerical results are presented to describe the flow in the channel and the resulting convective heat transfer. The increase in pressure in channels with reducing diameter or width is determined. This is of interest in dies and extrusion processes. It is seen that, in several practical circumstances, high velocities and fluid viscosity result in greater shear-induced pressures than the imposed pressure. The flow is then dominated by the shear effects due to the moving surface. The flow in narrow channels often develops very rapidly, resulting in largely developed flow regions. Thus, the transport rates are relatively small over much of the flow region. Methods to enhance the heat transfer under these circumstances by disturbing the flow are outlined. Comparisons between experimental and numerical results show good agreement. Therefore, the validity of the numerical models for these processes is established. The results obtained can also*

*be used for the design of the thermal systems, particularly in lubrication, materials processing, and manufacturing.*



***Dr. Yogesh JALURIA:*** *is Board of Governors Professor and Distinguished Professor at Rutgers, the State University of New Jersey. His research work is in the field of thermal science and engineering, covering areas like convection, fires, materials processing, thermal management of electronics, energy, and environment. He is the author/co-author of 10 books, including 4 extensively expanded revised versions. He is also the editor/coeditor of 15 conference proceedings, 14 books, and 16 special issues of archival journals. He has contributed over 600 technical articles, including over 230 in archival journals and 22 book chapters. He has 3 patents and 7 copyrighted software. He has received several awards and honors for his work, such as the prestigious 2020 Holley Medal from ASME for pioneering achievements in optical fiber drawing, 2010 A.V. Luikov Award from the International Center for Heat and Mass Transfer (ICHMT) in recognition of outstanding work done over his career, the 2007 Kern Award from AIChE, the 2003 Robert Henry Thurston Lecture Award from ASME, and the 2002 Max Jakob Memorial Award, the highest international recognition in heat transfer, from ASME and the AIChE. He received the 2000 Freeman Scholar Award and the 1995 Heat Transfer Memorial Award from ASME. He has served as Department Chairman and as Interim Dean of Engineering. He served as Editor-in-Chief of the Journal of Heat Transfer, as Editor of Computational Mechanics and as Editor of Annual Review of Heat Transfer. He served as the Chair of the Executive Committee of the ASME Heat Transfer Division and that of ICHMT. He has served as conference Chair/co-Chair for several international conferences. He is an Honorary Member of ASME, and a Fellow of AAAS, ASTFE and APS. He served as the founding President of the American Society of Thermal and Fluids Engineers (ASTFE) from 2014 to 2019.*

## *Keynote 2: Rheology of a Fluid of Energy and Environmental Interest: Response to Oscillatory Shear of Dense Suspensions*

***By: Prof. Mario MINALE, University of Campania "L. Vanvitelli", Aversa (CE), ITALY***

*Suspensions are ubiquitous both in the environment and in energy applications. The thermal and rheological properties of the suspending fluid are significantly modified by the suspended particles whose microstructure primarily affects the suspension behavior. The microstructure can be altered by the flow, and we here investigate the response of a very simple Newtonian, non-Brownian, inertialess, dense suspension of rigid hollow glass spheres to oscillatory shear, both after the very first oscillatory cycles and after a long time sweep oscillatory experiment.*
*We first focus on the first two or three cycles of oscillations. Experimental and numerical results agree and allow to prove that at very small strain amplitudes the oscillatory shear only induces the rotation of few couples of touching particles and the complex viscosity results slightly smaller than the steady one, at intermediate amplitudes the oscillatory shear induces the breakage of particle clusters and the microstructure modifies so to minimize particle collisions, while for very large strains the oscillatory flow reshuffles the particles inducing a microstructure as clustered as the steady state one but with a different angular distribution function. We showed that most of the microstructure rearrangement occurs soon after the flow inversion of the first cycle.*
*In long time sweep oscillatory experiments the suspension response resulted dependent on the amplitude of the applied strain, and, unexpectedly, on the angular frequency. Two different regimes were individuated depending on the applied strain. For values smaller than 1 the complex viscosity depends on the frequency, for values larger than 1, it is rate independent. In the first regime, the dependence on the applied strain amplitude and the angular frequency can be lumped into a single parameter: The maximum shear rate. The presence of non-hydrodynamic force, so small to be neglected in simple shear, can explain the observed behavior. Using a minimal hydrodynamic model, we show that van der Waals attraction gives rise to this behavior showing also that the rate dependence is accompanied by diverging particle diffusivities and pronounced cluster formations after repeated oscillations. We also showed that in the presence of weak attractions a new transition to irreversibility occurs below an ω-dependent critical amplitude.*

***Prof. Mario MINALE:*** *is Professor of Chemical Engineering at University of Campania "Luigi Vanvitelli".*
*He got the Ph.D in Chemical Engineering at University of Naples "Federico II". He was the recipient of 3 undergraduate awards and 2 laurea dissertation prizes. In 1998 he was the recipient of the young researcher award for the best presentation at GRICU Conference.*
*In 2008 he was nominated for the American Chemical Society award: "Langmuir Lectureship".*
*Editorial activity: 2022 : Associate Editor of "Frontiers in Soft Matter"; 2021 : Editorial Board of "Processes" ; 2021 – 2022: Review Editor of "Frontiers in Soft Matter"; 2008 – 2015: Co-editor Panta Rei: Bulletin of SIR; 2007 Co-guest Editor Special Issue, International Journal of Environmental Technology and Management, vol. 7, issues 1/2*
*Scientific societies: 2021-2023: President of the European Society of Rheology; 2020 : Vice-president of the Italian society of Rheology – SIR; 2019-2023: Vice-president of the European Society of Rheology; 2016- : Member of The International Committee of Rheology – ICR; 2016 - : Member of The European Society of Rheology Committee ; 2016 - : Member of the executive board and International delegate of the Italian Society of Rheology – SIR. He is member of the Society of Rheology (USA), the European Society of Rheology, the Italian Society of Rheology-SIR, GRICU.*
*Invited Lectures: 2009 keynote lecture at the 5th Annual European Rheology Conference AERC 2009, Cardiff; 2011 invited lecture at the opening ceremony of the Universiteti Metropolitani Tiranes; 2019 Plenary Lecturer at ic-rmm4 conference, 4th International Conference on Rheology and Modeling of Materials, Lillafured; 2019 Invited Keynote Lecturer at: VII Escuela de Verano 2019: Nuevas Tecnologías en Productividad y Recobro Mejorado de Petróleo y Gas", Medellin (Colombia); 2021 – Invited Keynote Lecturer at VIII Escuela de Verano 2021: the role of conventional resources in Energy Transition", Virtual, 02-04 June 2021*
*International Conferences Organization: 2022 Chairman of a Session of AERC 2022 Seville, Spain – 2021 - Chairman a the Session AERC 2021, Cyberspace – 2018 Chairman of AERC 2018 of the European Society of Rheology 17-20 April 2018, Sorrento (Naples) – 2016 Member of the International Advisory Board of the XVII International Congress on Rheology, Kyoto, Japan – 2012 Member of the International Advisory Board of the XVI International Congress on Rheology ICR2012 Lisbon, Portugal – 2007 Member of the organising committee of AERC2007 Naples, Italy.*
*Mario Minale is author of more than 160 publications on international Journals, books and on proceedings or books of abstracts of scientific conferences. Many of these papers are the result of collaboration with leading international groups and most of his activity has been focused on the rheology of heterogeneous systems.*
*Prof. Minale studied the non-Brownian suspensions and he was able to numerically demonstrate the existence of a single steady state in simple shear flow for suspensions in the*

*semidilute regime. Moreover, he investigated numerically and experimentally the mechanisms at the basis of the failure of the Cox-Merz rule even for Newtonian suspensions. He also investigated the flow through a porous medium with a new technique based on rheological measurement. The approach allowed to define a correct way to use rough geometries in rheometrical measurements. Crude oils attracted his attention in particular their rheological behaviour under the action of solvents, additives and nanoparticles.*

### *Keynote 3: Mini/micro channels and metal foams for enhanced heat exchangers*

***By: Prof. Gian Luca MORINI, Alma Mater Studiorum Università di Bologna, ITALY***

*In the last twenty years, many research works were focused on the optimization of heat transfer in heat exchangers. Tubes are scaled down from macro-metric sizes to micrometric dimensions in order to improve their performances. Finned surfaces are replaced with porous metallic media to maximize the heat transfer surface per unit of volume.*

*However, the reduction of the inner dimensions of the channels implies a series of negative effects which cannot be ignored during the design of a new micro heat exchanger. In many heat exchangers the adopted number of parallel microchannels is very large and this aspect introduces a new problem related to the distribution of the working fluid among the channels. During the talk it will be shown, by means of numerical and experimental results, in which way the non-uniform distribution among the channels can be controlled by optimizing the shape of the inlet and outlet manifolds, or by introducing an additional pressure loss at the entrance of each channel. In addition, when the thickness of the solid region among the channels can become of the same order of magnitude of the hydraulic diameters of the channels the conjugate heat transfer between the solid walls and the fluids cannot be ignored both along the axial and transverse direction. The presence of a non-negligible axial and transverse heat conduction changes the behavior of the heat exchanger in terms of overall performances and the impact is different if the adopted flow configuration changes from counter-current flow to co-current flow or to cross flow configuration.*

*On the other hand, the replacement of conventional finned surfaces with metal foam surfaces is not always convenient. In this talk, it is shown how the adoption of metal foams with high porosity might guarantee similar pressure drops with respect to the conventional finned heat exchangers but, in terms of overall heat transfer coefficients, high values of porosity are responsible for a lower surface-to-volume ratio of the foam-based extended surfaces, yielding a strong penalization on the heat transfer rate. Moreover, the small contact area between metal fibers and tubes proved to strongly increase the contact thermal resistance between metal foams and tubes and, consequently, the overall thermal performance of the heat exchanger are reduced. The total thermal resistance is also influenced by the bonding technique adopted to build the foam-based heat exchangers. The experimental results underline that the replacement of the fins*

*conventionally used in water-to-air heat exchangers with metal foam surfaces can be suitable only in presence of low specific air flow rates and a reduced contact thermal resistance between foam and tubes.*

***Prof. Gian Luca MORINI:*** *is Full Professor of Applied Thermal Engineering at the University of Bologna since 2012. He is Head of the Applied Thermal Engineering Laboratory of the Department of Industrial Engineering (DIN). From 2021 he is Deputy Rector for buildings of the University of Bologna. From 2008 to 2023 he was Local Scientific leader of 3 European Projects (FP7-GASMEMS, H2020-MIGRATE, H2020-Hybrid BioVGE). He is Member of AICARR (Association of Italian Air Conditioning Systems and Refrigeration), UIT (Italian Union of Thermal Fluid-dynamics), Italian delegate of EUROTHERM Committee and of the Scientific Council of International Center of Heat and Mass Transfer (ICHMT). His main research interests deal with microfluidics, heat exchangers, heat pumps and HVAC systems. He is author of more than 200 technical papers appeared on the most important International Journal and Conferences related to the Thermal Engineering and Heat Transfer.*

## *Keynote 4: CFD, AI and Machine Learning*

***By: Dr. Akshai RUNCHAL, CFD Virtual Reality Institute Analytic & Computational Research, Inc - USA***

*Artificial Intelligence (AI) in the form of Machine Learning through Neural Networks is rapidly transforming the practice of scientific simulation in general, and Computational Fluid Dynamics (CFD) in particular. Of special importance to CFD is the subset known as Physics Informed Machine Learning (PIML). Since the first known use of neural networks to solve partial differential equations by Lagaris in 1998, there has been an exponential increase in applying neural networks to solve otherwise intractable partial differential equations.*

*The simplest approach is to use a meshless collocation method and determine the unknown coefficients of the neural network by minimizing the residual of the governing equations at the collocation points. However, this has many limitations. the preferred option now is that of Physics Informed Neural Network (PINN), also called Physics Informed Machine Learning (PIML). The first use of this technique was by Raissi et.al.(2017) and involved the joint use of data driven techniques and the governing equations. Now it appears more than likely that, for scientific computing, the PINN may take its place alongside the well-known methods such as the Finite Difference Method (FDM), the Finite Volume Method (FVM) and the Finite Element Method (FEM).*

*One major advantage of Neural Network is that, once trained, the neural network is quick to evaluate and is more compact in terms of storage than a typical numerical method. Another major advantage is that PINN predictions can be easily integrated with data generated from experimental studies and real time data obtained from actual operations of a prototype or a target system. Further, the neural network can be trained to modify its predictions based on real time data received, say, through IoT. This makes PINN very useful in solving inverse problems, uncertainty predictions and development of fast Surrogates or Digital Twins for a real system.*

*The PINN, applied to CFD, does have some shortcomings. The training process is usually very slow and computationally intensive. Further it is often sensitive to the network architecture. Also, currently PINN only takes the spatial coordinates of the collocation points and time as inputs. This implies that the PINN is trained for a specific boundary and initial condition, which restricts its use in practical systems. On the other hand, the field of research is extremely active and it is expected that these shortcomings can be overcome or minimized so as to provide a real alternative to established numerical methods.*

*The talk concludes with a case study to illustrate the use of PINN to solve a CFD application for a real life system.*

***Dr. Akshai K. RUNCHAL:*** *Has over 50 years of experience in CFD and simulation of flow, heat and mass transport processes in engineering and environmental sciences, He obtained his Ph.D. in 1969 from Imperial College (London) under the guidance of Prof. D, B. Spalding. He was a key member of the 3-person team led by Spalding that invented the Finite Volume Method (FVM) of Fluid Dynamics (CFD) in mid 1960's. He started his professional career as a faculty at IIT Kanpur in 1969 and has taught as regular or adjunct faculty at IIT(Kanpur), Imperial College (London), University of California (Los Angeles), Cal Tech (Pasadena), and Cal State (Northridge). In 1979, Dr. Runchal established the ACRi group of companies (www.acricfd.com) that now has offices in Los Angeles (USA), Nice (France) and Bangalore (India). Core expertise of ACRi is Engineering, Environmental and Space Sciences. Over the past 40 years. ACRi has provided advanced technology and CFD Simulation services to over 200 clients that include major corporations, R&D organizations, and governments in over 20 countries.*

*For the past 50 years, Dr Runchal, has consulted extensively on projects related to flow, heat and mass transfer, combustion, environmental impact, management of air, surface and ground water resources, safe disposal of hazardous and nuclear waste, and, policy and decision analysis. He is the principal author of the ANSWER®, PORFLOW®, TIDAL®, and RADM™ CFD Software Tools that are widely employed by commercial, academic and R&D organizations. He obtained a Bachelor's in Engineering with Honors from Punjab Engineering College (Chandigarh) in 1964. He is the author or co-author of 12 books and over 200 technical publications. Dr. Runchal has received professional honors and awards and has delivered keynote and invited talks at more than 100 international conferences and seminars. He is a Fellow of the ASME, a member of ASTFE and has served as Chairman of the IIT Kanpur Foundation Board. He was a member of the IIT Gandhinagar Advisory Board from 2012 to 2019. He has acted as an Advisor to Government of India and the Indian Army and, a number of educational institutes in their R&D and Industrial Relations Programs.*

*Dr. Runchal grew up in the scenic hill town of McLeod Ganj, Dharamsala that is now on the world map as the hometown of His Holiness the Dalai Lama. Since 2006 he has been deeply engaged in reviving the lost heritage of Kangra Miniature Paintings through Kangra Arts Promotion Society based in McLeod Ganj. In 2011, Dr. Runchal founded a non-profit CFD Virtual Reality Institute (www.CFDVRi.org) to further the cause of CFD education, training and R&D. He divides his time between Los Angeles and McLeod Ganj and is actively engaged in promoting education, training and R&D in CFD and related disciplines.*

## *Keynote 5: Solid Particle Self-assembly in Time-Periodic Flows: new Concepts to Manipulate Matter on Small Scales*

***By: Prof. Marcello LAPPA, University of Strathclyde, Glasgow, UK.***

*Application-driven technological demands require vastly superior control of particles and other inclusions dispersed in many inorganic and organic materials when they are in the liquid state. We present a survey of recently discovered mechanisms for solid particle self-assembly, ordering and accumulation in non-isothermal laminar time-periodic fluid flows, potentially inherent to exerting such a control. Assuming surface-tension gradients and vibrational effects as the main mechanisms driving fluid flow, an attempt is made to disentangle the complex hierarchy of relationships existing between the multiplicity of the loci of particle aggregation, the geometry of the physical domain hosting the considered fluid-particle mixture, the physical properties of the particles per se and the applied thermal boundary conditions. We show that the particle self-organization processes in time-periodic thermal flows obey a complex logic, which makes the arrangement of particles different from realization to realization. As some influential conditions or parameters are varied, particles can be gradually transferred from the region of influence of an attractor to another. Moreover, ranges exist where these "attractee" compete resulting in overlapping or intertwined particle structures. The final objective is the integration of new physics in already existing theories and forge a new unified concept for the (contactless) manipulation of solid matter dispersed in a fluid, which may lead in the future to alloys with improved properties or perhaps completely new materials.*

***Prof. Marcello LAPPA:*** *is the Director (main Programme Advisor) of the MSc course in Mechanical Engineering at the University of Strathclyde (public British University located in the center of Glasgow, UK). He is listed in the "World Ranking of Top 2% Scientists in 2022" Stanford University database in the subfield Fluids & Plasmas. Over the last 25 years, he has authored 3 international books (2004, Elsevier Science, Cambridge; 2009, John Wiley & Sons, Chichester; 2012, John Wiley & Sons, Chichester), more than 130 publications in high impact-factor peer reviewed journals or as book chapters (most of which as single author, http://www.researchgate.net/profile/Marcello_Lappa/publications) and 60 other conference and technical papers. His research focuses on fluid motion and stability behaviour, computational fluid dynamics, incompressible and compressible fluid flows, organic and inorganic materials sciences and crystal growth, multiphase flows, solidification, high-temperature gas-dynamics, particle dynamics and microgravity science. On September 2013 he attained a qualification (habilitation) to the rank of Full Professor in Italy. He joined the Department of Aerospace and Mechanical Engineering of the University of Strathclyde as an Associate Professor in 2015 (Academic grade 9). On Oct 2017 he took on the role of Director of the MSc course in Mechanical Engineering (Programme Advisor of Studies) and later he*

*was given the highest UK Academic title (Full Professor). Over recent years he has secured (in a position of PI) over £ 2 million of external funding. He seats in the Steering Committees of several conferences (ICTEA, ICCES, ICFVM, ParCFD, ICOME, ICCMREA, AMT, ICMAPH) and acts as a Reviewer for several funding bodies (EPSRC-UK, DFG-Germany, FNRS-Belgium, GIF-Israel, ANVUR-Italy, NSERC-Canada, NVSTE-Kazakhstan and ESA). Since 2005 he serves as the Editor-in-Chief of the international scientific Journal "Fluid Dynamics and Materials Processing" (ISSN 1555-256X), currently being indexed in Scopus and the ESCI index of Clarivate Analytics' Web of Science.*

## *Keynote 6: The Balbi model, a simplified physical propagation model for surface fires, development and applications*

***By: Dr. François Joseph CHATELON, University of Corsica, France***

*The Balbi model is a simplified physical surface fire behaviour model which takes into account both radiation and convection as heat transfer modes. The model, developed at the University of Corsica, is faster than real time and then it could be used in operational tools for firefighters or people involved in fire management. The model has no model parameters and only depends on fuel characteristics, the topography and meteorological conditions. The last version of the model is as simple as empirical models found in the literature. Because of its simplicity and its quickness, it represents a good candidate for an incorporation into a coupled fire/atmosphere simulator. The model has known several developments: definition of non-propagation criteria, prediction of fire eruption's triggering and definition of safety zones widths when it was coupled to the acceptable safety distance analytical model developed at the University of Corsica.*

***Dr. François Joseph CHATELON:*** *is an associate professor in applied mathematics at the University of Corsica, France, where he got his PhD (1996). Prior to entering the field of wildland fire he worked in the areas of fluid mechanics and physical oceanography, solving the Navier-Stokes and shallow water equations. His three main areas of research interests are: 1) Development of a physical simplified surface fire spread model called 'the Balbi Model'.*
*2) Development of sub-models which take the convective flow induced by the fire into account.*
*3) Investigations on fire eruption's occurring.*

## *Keynote 7: Emerging technologies & innovations for a sustainable energy industry*

***By: Dr. Mohamed TABAA, R&D and LPRI Laboratory Director, EMSI Casablanca, Morocco***

*The industry of the future comes to accelerate the modernization of the industrial tool, in the context of the deployment of new technologies. IoT, Artificial Intelligence, Big Data Analytics, Digital Twins, virtual & augmented reality, and advanced technological tools must collaborate for the foundation of the new industrial model. They constitute an opportunity to improve the attractiveness of different industrial applications. Buildings, charging stations, factories and industrial zones are considered the main consumer of energy sources in urban areas. Over the decades, electricity generation has undergone several evolutions, moving from decentralized to centralized energy and arriving at distributed energy with the integration of renewable sources. The integration of renewable energy sources has been considered as an alternative option used by governments instead of upgrading traditional power stations. This is due to the availability of renewable energy sources and their advantages, including cost effectiveness, inexhaustibility, and reduced greenhouse gas emissions. As for modernization, it is indeed about integrating new technologies to improve energy production and consumption. In this talk, we will present the evolution of industrial sectors using new technologies impacting both the production and consumption of energy.*

***Dr. Mohamed TABAA:*** *is IEEE and ACM Member. Received the degree of engineer in telecommunication and networking from the EMSI Casablanca, Morocco, and master in radiocommunication, and embedded electronic systems form university of Paul Verlaine of Metz, France. He received his Ph.D degree and HDR (Habilité à Diriger des Recherches) diploma in electronics systems from university of Lorraine Metz, France. Since 2015, he has been the director and founder of the LPRI private Laboratory attached to the EMSI Casablanca, Morocco. His research interests include array of digital signal processing for wireless communications, embedded systems, Energy and IA. He has served on the Organizing Committees and Technical Program Committees of several international conferences, including IEEE ICM, IEEE REPS&GIE, IEEE Systol, TMREES, POWER AFIRCA, INTIS, ASD, JDSI, FIoE. He is the editor of several special issues: Elseiver AEU - International Journal of Electronics and Communications, Sustainability and Energies.*

# *Symposium Speakers*

## *Topic 1: Waste derived biomaterials and biostimulants for sustainable agriculture*

***By: Prof. Petronia CARILLO, University of Campania "L. Vanvitelli" ITALY***

***Prof. Petronia CARILLO:*** *is a Full Professor of Agronomy at the Department of Environmental, Biological and Pharmaceutical Sciences and Technologies of University of Campania "Luigi Vanvitelli" Caserta Italy since 2020. She was Associate Professor of Plant Physiology (2010-2020) and permanent Researcher of Plant Physiology (1999-2010) at the Department of Life Sciences, Second University of Naples, Italy. She received her Ph.D. in Plant Physiology from the University Federico II of Naples in 1996, studying the relationship between nitrogen and carbon metabolism in plant cells. She received her degree with distinction in Biology from the University Federico II of Naples in 1992. She was Visiting Scientist in September 2017 and June 2018 at the INRA (UMR 1332 - Biologie du Fruit et Pathologie) Bordeaux Aquitaine France; Visiting Professor (Erasmus+ program) at the Plant and Agrobiosciences Center (PABC) of the National University of Ireland Galway in June 2015; Visiting Scientist in 2001-2020 (2-4 months per year until 2010 and shorter visits in 2011-2020) at the Max Planck Institute of Molecular Plant Physiology of Golm-Potsdam Germany, and in in 2001 (4 months) at the Botanical Institute, Ruprecht-Karls-University of Heidelberg Germany. She teaches Agronomy, Plant physiology and Post-harvest physiology. She is member of editorial board for international journals (Frontiers in Plant Science, Agronomy, Plants), and has been reviewer of research projects for international programs (FP7-KBBE 2008, 2009, 2010; ANR, France 2010, 2014; ERA-CAPS 2012, 2013; BMBF 2010, 2013, 2015, 2017). She has thirty years of research experience in laboratory and a strong background and knowledge in crop physiology, enzymology and metabolic profiling. She has studied the metabolic and physiological responses of species of agronomic interest to nutrient deficiency, salt stress, type of cultivation. Recently, she has focused her studies on the effects of biostimulants on the resource efficiency, growth yield quality and stress tolerance of crop plants. She has authored more than 100 scientific publications and has been ranked in the Stanford University list of top 2% scientists worldwide published by PLOS Biology.*

## *Topic 2: Photonics for Energy*

***By: Prof. Jean-Michel NUNZI, Queen's University, Canada***

***Dr. Hassina DERBAL HABAK, Picardie J.V. University, France***

*Research on the applications of photonics for renewable energy is at the forefront of actual discoveries and innovation. All the light spectrum is concerned, from the UV down to the micro-wave range. Research encompasses light harvesting, conversion, storage, distribution, monitoring, consumption, and its efficient use. We expect that the symposium will stimulate new research and collaborations in the core of this new edition of ICOME 2023.*

***Prof. Jean-Michel NUNZI:*** *he is graduated from l'Ecole de Physique et Chime, Paris in 1982, he joined l'Ecole Polytechnique for a PhD on the nonlinear optics of surface plasma waves (plasmons). He was then hired as full-time Researcher in Organic Photonics at the Atomic Energy Commission (Saclay) in 1984. He joined the Department of Physics at the University of Angers as Professor in 2000, where he built the Plastic Solar Cells Technology Research Team. He moved to Queen's University as Tier 1 Canada Research Chair in Chiral Photonics in 2006, renamed Photonics for Life in 2013. He studies Organic Photonics, including the Chemistry, Processing and Physics of nanomaterials and devices. He continuous to innovate the news process for PV cells and match between*

***Dr. Hassina DERBAL HABAK:*** *she obtained her graduated on "Capteurs Optiques et Instrumentations from University of Angers and made her PhD thesis in same University in the same Laboratory PHIA. She worked on elaboration and characterization of structured organic solar cells. She demonstrated the relation between morphology, physico-chemical and electrical characteristics of the cells. She studied and used new materials as C60'derivatives and Carbon Nanotubes for improving solar cells' performance. She worked as professor associate in Ecole des Arts et Métiers d'Angers. She joined the Laboratoire Angevin de Mécanique, Procédés et innovation in the same structure. She Joined for her Post-Doc IM2NP and LPCIM-Ecole Polytechnique. She studied new solar cells based on CNT or Silicon amorphous as electrodes. She had interest into interface effects on I-V parameters and optical characteristics. She is Full Professor associate in University of Picardie Jules Verne-France from Laboratoire de Technologie Innovante LTI. She undertakes in several project concerning new generations of solar cells in terms of new materials in thin photoactive layers or to use a bio-sourced materials as substrates. She is working also on the coupling between Thermal cells and Solar PV cells.*

## *Topic 3: Fire physics and simulations*

***By:*** ***Dr. Sofiane MERADJI, University of Toulon, France***

***Dr. Jean-Louis ROSSI, University of Corsica, France***

***Dr. Thierry MARCELLI, University of Corsica, France***

*Over the last few decades, considerable efforts have been focused on developing and implementing statistical and physics-based models to account for the interactions between fire, vegetation, and the atmosphere. These models have led to a better understanding of the dynamics of fire spread in a landscape and are continuing to contribute to the state of art of wildfire science. However, despite considerable progress in modeling fire behavior, wildfires occur in complex environments where multiple parameters and physical processes interact to influence its behaviour at a variety of spatial and temporal scales. Despite the wide use of these models, many have experienced some limitations. The main problem today is the existence of high intensity fire events, that are very difficult to control and can overwhelm suppression capabilities. It was reported by scientists that only 5% of these past years forest fires caused the most important damages. These so-called extreme fires seem to become a new standard. Thus, wildfires can still create unexpected scenarios for emergency services during real situations and result in significant injury, even fatalities, in addition to the numerous socioeconomic and the irreversible ecological impacts. Wildfires in wildland-urban interface communities have also rapidly grown in occurrence and strength over the past few decades due to the growing pace of urbanization and landscape transformation. Recently, using data assimilation and deep learning techniques to better predict wildfire behavior has aroused considerable interest. These emerging approaches coupled to standard models seem very promising. This special event offers an opportunity for those involved in fire safety science and wildfire / wildland urban interface fire behavior to present their work. The target audiences for this program are graduate students, post-doctoral fellows, and researchers and engineers, engaged in fire science and fire safety research programs. The adopted viewpoint in the program is primarily (but not exclusively) engineering based. The objectives are to expose a broad range of advanced topics with a mix between fundamental aspects (underlying physical and chemical mechanisms) and the current challenges related to the mitigation of the negative impacts of these extreme fires. Submissions are encouraged on, but not limited to, the following topics: Fuel flammability, fire spreading, fire dynamics, fire suppression, wildland fires and large outdoor fires, enclosure fire dynamics, wildfire risk assessment and management, fire risk analysis and fire safety design, wildland Urban Interface, human evacuation and behavior, environmental impacts of fire, sustainability, CFD simulation and modeling, AI / Deep Learning and/or data assimilation.*

*Authors will be invited to submit the final version to the following MDPI Special Issue Journals:*

*https://www.mdpi.com/journal/atmosphere/special_issues/wildfires_modeling*
*https://www.mdpi.com/journal/fire/special_issues/35NV4A118M*
*Full waivers (100% discount of APC) will be provided for high quality papers.*
*We look forward to receiving your contributions.*

***Dr. Sofiane MERADJI:*** *holder of a PhD in Computational Fluid Mechanics, obtained at the University of Aix-Marseille II in 1999, I started my research activity around the theme of forest fires, in 2006, during the European project FIRE PARADOX. Since 2010, I am a Research Engineer in Scientific Computing at the University of Toulon, in a laboratory of Applied Mathematics and Computer Science. My research focuses on the fire physics and tools development on HPC architectures.*

***Dr. Jean-Louis ROSSI :*** *(h-index : 15 ; i10-index : 17) is an Associate Professor (HDR) at the University of Corsica, France, where he got his PhD (1996). Prior to entering the field of wildfires, he worked in the area of modeling underwater sound scattering phenomena. His three main research topics are: 1) Development of a physical simplified surface fire spread model. 2) Development of models of radiant heat from shrub. 3) Development of safety distance models to address firefighter safety zones. The motivation of his current work is to develop better tools for operational applications. For instance, these tools could be used when addressing fire management, such as defining fuel-break areas and firefighter safety zones at field scale. From 2018 is a part of the UNDRR international expert advisory group (E-STAG) as a Forest Fire expert.*

***Dr. Thierry MARCELLI:*** *is an assistant professor at the University of Corsica, France, where he got his PhD in 2002. He is teaching fluid mechanics and energetics at the University Institute of Technology in the Civil Engineering Department. Since 2002, he has been working on wildland fire behavior thanks to a simplified approach and a multiphase formulation. Since January 2020, he has been the co-manager of the GOLIAT project which is devoted to provide operational tools for fire-fighters and forest managers. This project is funded by the "Collectivité de Corse" and the French State (CPER: 40031).*

# *Invited Lecturers*

## *Topic 1: Integration of a photovoltaic device on nonconductive surfaces using thermal spray Coatings*

***By: Dr. Yamina MEBOUDA LAHMAR, Center for Dev. of Adv. Tech. (CDTA), Algeria***

*The supply of electricity is a key-requisite for all modern societies; its production has to be efficient and environmental friendly. Scenarios within the next 30 years [1] project that the development of renewable energy sources will increase significantly; renewable electricity generation meets incremental demand growth [1]. Which makes it essential to curry out development of materials and processing to improve efficiencies and performance of energy generation systems. Thermal spray coatings have high potential use for energy systems such as boilers, components of gas turbines and steam power plants, fusion reactors, solid oxide fuel cells, thermoelectric devices and other devices for the capture of renewable energy. The use this technology in renewable energy applications is of great interest, mainly due to their cost-benefit aspect and their flexibility. This coating technology is potentially industry-scalable. In this context, thermal spray technology was introduced in PV cell conception aiming to integrate photovoltaic device on nonconductive surfaces particularly on wood surface. A conductive layer is created on the wood surface, which can be used as a back electrode for a solar cell. The experimental work was combined to a numerical study predicting the characterizations of different types of PV devices. [1] U.S. Energy Information Administration (EIA) Annual Energy Outlook 2022.*

***Dr. Yamina MEBDOUA LAHMAR:*** *is working as a director of research, head of the thermal spraying technology platform at the Center for Development of Advanced Technologies (CDTA) in Algiers, Algeria and a member of the Scientific Council (CS) of this establishment.*

*Completed Magister of astrophysics from Saad DAHLAB University - Blida, Algeria. Awarded with Ph.D in Ceramic Processing and Surfaces Treatments in 2008 from Limoges University-France, followed by a university habilitation (HDR) from Saad DAHLAB University-Blida. She possesses several years of experience in research activity in the field of plasmas and thermal spraying at the CDTA. She trained a research team on thermal spraying and set up a technological platform for thermal spraying processes. She also headed a research division on ionized media and lasers (DMIL) at the CDTA during three years.*

*Her research activities have been organized into research projects whose involved members are multidisciplinary including students. She has led several research projects: on the design of a microwave plasma reactor for surface treatment application, on the applications of thermal spraying in surface treatment and on the development of thermal barrier coatings on industrial parts. She has numerous publications on these processes but also on transversal subjects through PhD supervision.*

## *Topic 2: Legal models for alternative energies: energy communities in European law*

***By : Prof. ALDO AMIRANTE, Uni. degli studi della Campania "L.Vanvitelli", Italy***

*The DIRECTIVE (EU) 2018/2001 on the promotion and use of renewable energy sources has set the production of renewable energy at 32% by 2030 for European countries. The need to reduce dependence on fossil fuels finds increasing space in European programs, through incentives for research and above all for the production of renewable energies, to the point of outlining forms of possible production in aggregate forms, such as the Renewable Energy Communities (REC) . The directive establishes a series of concessions and criteria for the development of energy communities, without determining a defined economic model. The implementation of the directive, in Italy, is quite complex, and, the creation of energy communities cannot find an adequate legal position, also due to the indeterminacy of the directive in this regard. We want to verify whether the creation of a new institution, apparently easy to implement, could lead to a universally valid system, which can be implemented regardless of the legal characteristics of the implementing country.*

***Prof. Aldo AMIRANTE:*** *Adjunct professor and full-time researcher of international law, Department of Political Sciences, University of Campania "L. Vanvitelli ".*
*Lawyer, member of the Bar Association of S. Maria C.V.*
*Professor of the course International Law and EU Law for Tourism from 2011 to date.*
*Subsequently professor of international and EU law for tourism.*
*Assigned to the European Union Law Course at the Department of Letters and Cultural Heritage of the University of Campania "L. Vanvitelli ".*
*Visiting professor at the National Politechnic University of Lviv, (Ukraine), July 2018.*
*Erasmus Program Visiting Professor at the Jagellonian University in Krakow, Poland, May 2019.*
*Lecturer in international law, international humanitarian law, navigation law at various military training centers.*
*Research in the field of war law, the protection of human rights for the mentally disabled, Studies in the field of energy and energy communities,*
*Member of numerous scientific research groups.*

*Member of the scientific committee of the ARTETETRA editions.*
*Member of the scientific committee of the European series Documents-monuments of identity, Sec. Right, culture, society, ICCU - Department of Political Sciences*
*Speaker at numerous scientific conferences, national and international.*
*Former legal consultant for municipalities, public bodies and businesses.*
*M.Sc. in Law.*
*PhD. in Law, Second University of Naples.*

## *Topic 3: Advances in modeling and experimentation of the thermal behavior of heating systems: from open foams to floor heating systems*

***By : Dr. Abdelatif MERABTINE, EPF Ecole D'Ingénieur-e-s, France***

*The analysis of the thermal behavior of systems, whatever their scales, is vital to better understand the thermo-mechanical aspects. Open foams, heat exchangers, radiant heat slab are all an illustration of what we call heat sinks and that systems among others are involed in mobility and energy transition concerns. In this presentation, I will show some recent numerical and experimental investigations on studying the thermal behavior of the thermal systems in order to estimate some critical operation parameters affecting the thermal management system. The sensitivity studies are depicted in order to identify the optimal design parameters and to derive a new simplified model for design purposes.*

***Dr. Abdelatif MERABTINE:*** *since 2013, he is Associate Professor at EPF School of Engineering (Troyes - France) attached to Laboratory of Mechanical & Material Engineering (LASMIS) at University of Technology of Troyes (France). He is in charge of an experimental platform BBC+ including a full-scale monitored test cell facility that he has designed and developed. Abdelatif Merabtine has obtained his PhD in Mechanical engineering at Lorraine University (France) in 2012. He then found a lecturer position at the Department of Civil Engineering at Ecole Normale Supérieure de Cachan where he has spent one year (2012-2013). Abdelatif Merabtine conducts his research on experimental analysis of the heat transfer at different scales of building's envelope as well as the energy performance of the Heating, Ventilation and Air Conditioning (HVAC) systems. He also does research on multi-optimisation of the energy efficiency of buildings including HVAC systems for thermal comfort purposes.*

## *Topic 4: Control and Optimization Opportunities in the Integration of Renewable Energy into the Complex Energy Systems*

***By: Dr. Bilal AMGHAR, ESTP Paris Engineering School, France***

*A substantial reduction of greenhouse gas emissions is necessary to maintain the balance of our ecosystem. The use of renewable energy sources (RES) recognized today as an appropriate response and durable solution. This is the main reason for the occurrence of smart grid, designed to provide a reliable electricity supply and better quality to consumers. 'Smart grids' or 'intelligent grids' are electricity grids that adjust electricity flows between suppliers and consumers, using IoT tools. They therefore match the production of electricity with its distribution and consumption. The goal? Reap economic and environmental benefits. On the other hand, the increase in the number of electric vehicles and the development of heat pumps will have a significant impact. If special measures not taken, these new needs, and in particular the recharging of electric vehicles, may considerably increase instantaneous energy consumption. However, smart grid can change this problem to a solution. The electric vehicles are not only consumer; they are also a valuable resource, thanks to the storage possibilities of their batteries. This system consists of using the battery of an electric vehicle as an extension of the distribution grid, energy stores from which the electricity supplier can draw from time to time. In this context at ESTP Paris, we have a 100 kW smart grid test bench that reproduces the same energy constraints as a 19-storey urban building with the aim of raising awareness among engineering students on the place of renewable energies in the future. This device designed to meet teaching, research and innovation objectives.*

***Dr. PhD. Eng Bilal AMGHAR:*** *is an Assistant Professor and Head of the Electricity Laboratory at ESTP Paris Engineering School 28 avenue du President Wilson-94234 Cachan Cedex Such: 01 49 08 5644, Email:bamghar@estp-paris.eu-www.estp.fr Engineer (2008), Master in Electrical Engineering (2009), PhD in electrical engineering (2013) University of Cergy, Mr AMGHAR Bilal is a specialist in energy and the smart city.*

*During his first professional experience, he was responsible for European projects in particular BCAPP qualified Business Check APPlication and participated in academic and industrial research projects (Hyro+, Seinergy Lab, SMART GRID, etc).He has also supervised several theses on energy mixes (Microgrid, Smartgrid, On-board energy, etc)*

*After a first experience of 9 years in a school of the ECAM group, he is currently an Assistant Professor in the field of SMART CITY and SMART GRID at ESTP Paris. He is also responsible of the electricity laboratory and the SMART GRID platform at ESTP Paris.*

# ICOME23 AWARDS

## *Best Presentation Award*

*The ICOME event want to reward involvement, merit and professionalism of young scientist students. An award of better presentation (Phd) will be provided for each sessions and consist on the ICOME medal and free fees for the next ICOME edition.*

*On 2021 Wolfram Mathematica award involvement and merit of young scientist students doing research using theoretical/Mathematical approach. Priority is given to student using Symbolic computing.*

## *Averroes Award*

*The new edition of the Averroes[1] prize will take place at this conference, and aims to highlight a scientist or a decision maker who contributed significantly to the development and vitality of international scientific partnership with results, training of young researchers going to scribing the action in a permanent way.*


***"Ignorance leads to fear, fear leads to hatred and hatred leads to violence. That is the equation"***

***(Averroes, 1126-1198)***

[1] Averroes (Ibn Rochd) European intellectual, born in Spain, died in Morocco, both a philosopher, a theologian, a lawyer, a mathematician and a 12th century Andalusian doctor

# AVERROES PRIZES

***2020/2021: Geoffrey LEVERMORE, Emeritus Professor, UK.***

***Geoffrey LEVERMORE:*** *Emeritus Professor of the Built Environment. Author of about 130 refereed journal papers, 44 invited papers and lectures and 25 book chapters and books. He was an investigator on grants worth £14.53m, 17 with UK Research Councils worth £12.75m, PI on 12 worth £2.27m. Chair of the Task Group and editor of CIBSE Guide A Environmental Design, Chapter A2 External Design Data 1999, 2006 and 2013. In 2007 he was one of the Lead Authors of the Intergovernmental Panel on Climate Change (IPCC) awarded the Nobel Peace Prize with Al Gore. From 2002 to 2009 he was Co-ordinator of Working Commission W108: 'Impact of climate change on the built environment' of the CIB. In 2010 he was awarded a CIBSE Silver Medal. He is still researching part-time, analysing climate change, the urban heat island and building energy use. He has published 22 papers since 2011. He has given seven Keynote Speeches to conferences in Turkey, Dubai, France and China since 2017 and is a member of the Daikin European Konwakai which recently met in Japan.*

***2019: Abdelilah BENYOUSSEF, member of the Moroccan Academy of Science and Technology (Hassan II)***

***Abdelilah BENYOUSSEF:*** *received his (Doctorat d'état) degree from the Paris-Sud University in 1983. He is a permanent member of the Moroccan Hassan II Academy of Science and Technology, since 2006. He is associate professor in the materials and nanomaterials center of the Moroccan Foundation for Advanced Science, Innovation and Research. He is National coordinator of the Competences*

*Pole of Condensed Matter and Systems Modeling. He is also an editor in chief of the Moroccan Journal of Condensed Matter. He is President of the Moroccan Society of Statistical Physics and Condensed Matter. He has been visiting professor in many centers, laboratories and Universities. The main interest topics of Abdelilah Benyoussef are Ab initio calculation and Monte carlo method in modeling and simulation of new materials for renewable energy; Magnetism and phase transition in condensed matter; complex systems and critical self-organization in statistical physics. He is a co-author of more than 400 research publications and book chapters and about 100 conference presentations including numerous invited papers and talks.*

## *2018: Sassi BEN NASRALLAH, Presidential award in 2003*


***Sassi BEN NASRALLAH:*** *born in 1955, Sassi Ben Nasrallah is a doctor in physical sciences. He joined higher education as an assistant professor at ENIS and then as a lecturer and was then promoted to the post of Professor of Higher Education at ENIM. He has contributed a lot to teaching, especially research, since in 1999 he created the Laboratory of Thermal and Energetic Systems, which is one of the most renowned laboratories both nationally and internationally. He is the author of more than 300 scientific articles in major journals, and he supervised several PhD students. Sassi Ben Nasrallah won a presidential award in 2003. The professor has also led several research projects as well as scientific meetings. He has been a professor in both Tunisian and French universities, and is well known for his studies at the Central School of Paris, IMFT Toulouse, Mine's School of Nantes and many others. Sassi Ben Nasrallah founded and chaired the Tunisian Energy Association (ATE). The Ministry of Higher Education announced, on June 30 2017, the death of Sassi Ben Nasrallah, professor of higher education at the National School of Engineering of Monastir.*

## *2017: Abdul Majeed MOHAMAD, Education Excellence awards*

***Abdul Majeed MOHAMAD:*** *Professor in Eastern Mediterranean University, Cyprus (1993-1999). Since 2000 he is Prof. of thermofluid in Dept. of Mechanical Engineering, University of Calgary, Canada. Dr. Mohamad held few admin positions, director of graduate studies, acting director for Centre for Environmental Engineering Centre for Research and Education. Dr. Mohamad has been invited by many institutes around the world (France, Germany, China, USA, Poland, Saudi Arabia, Canada, Portugal, Morocco, Tunisia, Turkey, Indonesia, and Ecuador), as invited Professor and lecturer. He is one of the highly cited researches. Dr. Mohamad elected Fellow Member of American Society of Mechanical Engineer (ASME).Scientific council member of International Centre for Heat and Mass Transfer. He has been awarded Research Excellence and Graduate Teaching Excellence awards from University of Calgary, Dept. of Mechanical Engineering, Canada.*

## *2016: Michel COMBARNOUS, French Academy of Sciences*

***Michel COMBARNOUS:*** *Professor "Emeritus" at the University of Bordeaux has been associate professor at the University of Gabès (Tunisia) (2006-2011). A specialist in fluid mechanics and energetics, he was encharged of the Department « Engineering Sciences » at CNRS (1980-1985). He is a founding member of « Académie des Technologies », and Corresponding Member of the Academy of Sciences, since 1978 (www.academie-sciences.fr). Prof. Combarnous has accomplished a huge cooperative work involving north-south Mediterranean cooperation*

# PROGRAM

MATERIALS & ENERGY

## INTERNATIONAL CONFERENCE ON MATERIALS & ENERGY

### International Conference 2023 - CASERTA Italy

MATERIALS & ENERGY

https://webhorloge.fr/heure/

| Central European local time CET | 08:30 | 09:00 10:00 | 10:00 10:45 | 10:45 11:15 | 11:15 12:00 | 12:00 13:15 | 13:15 14:00 | 14:00 14:45 | 14:45 16:15 16:45 | | 16:45 18:30 | | 20:00 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tuesday May 30th | Registration | Opening Ceremony ICOME23 (Main Room) | Keynote N°1<br>Y. Jaluria<br>Chair: Mohammed El Ganaoui | Coffee Break | Keynote N°2<br>GL. Morini<br>Chair: Rachid Bennacer | Session A<br>Energy Systems I<br>Chair:A.Saad<br>Session B<br>Biomaterials/ Bioarchitecture<br>Chair:B.Amghar | Lunch Break | Keynote N°3<br>FJ .Chatelon<br>Chair: Sekkat Zouhair | Symposium n.1<br>Fire physics and simulations<br>Chair: S. Meradji<br>Symposium n. 2<br>Waste derived biomaterials and biostimulants for sustainable agriculture<br>Chair: P. Carillo | Session C<br>Waste & Biomaterials<br>Chair: D.Guilbert | Session D<br>Innovative Materials I<br>Chair: Y. Mebdoua<br>Session E<br>Computational Methods<br>Chair: A. Merabtine | Relax | Gala Dinner |

| Central European local time CET | 08:30 9:00 | 9:00 9:45 | 9:45 10:30 | 10:30 11:00 | 11:00 12:45 | 13:00 14:00 | 14:20 15:30 | 15:30 16:30 | | 17:00 | 19:00 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Wednesday May 31st | Registration | Keynote N°4<br>M. Lappa<br>Chair: Biagio Morrone | Keynote N°5<br>M. Minale<br>Chair: Helene Ageorges | Coffee Break | Session F<br>Heat Mass Transfer in Buildings<br>Chair: M. Minale<br>Session G<br>Innovative Materials II<br>Chair: H. Derbal | Lunch Break | Lecturer:<br>Y. Mebouda Lamar<br>Session H<br>Innovative Materials III<br>Lecture<br>B. Amghar<br>Session I<br>Energy Systems II | Online session<br>Chair: S.Morsli | Relax | Guided Tour of the Royal Palace Caserta | Free evening |

| Central European local time CET | 08:30 9:00 | 9:00 9:45 | 9:45 10:30 | 10:30 11:00 | 11:00 13:00 | 13:00 14:00 | 14:00 15:30 | 16:30 17:30 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Thursday June 1st | Registration | Keynote N°6<br>A. Runchal (Online)<br>Chair: Mohammed El Ganaoui | Keynote N°7<br>M. Tabaa<br>Chair: Souad MORSLI | Coffee Break | Lecturer:<br>A. Merabitine<br>Session J<br>Heat Mass Trasfer in Buildings II<br>Lecturer:<br>A. Amirante<br>Session K<br>Energy Systems III | Lunch Break | Symposium n.3<br>Photonics for Energy<br>Chair: J.M. Nunzi | Session L<br>Phase Change Materials<br>Chair:Y. Amellas<br>Session M<br>Other Topics<br>Chair: A. Zaoui | Online Session<br>Chair:S. Meradji | Student Award & Closing Ceremony<br>Main Room |

# ICOME23 SPONSORS