



ASME 2021 TURBO EXPO

Final Program

JUNE 7 - 11, 2021
VIRTUAL CONFERENCE

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS® (ASME®)

[EVENT.ASME.ORG/TURBO-EXPO](https://event.asme.org/turbo-expo)



Providing the best-in-class simulation software to design the next generation of sustainable turbomachinery

- / Empowering the net-zero movement
- / Enabling more efficient aircraft
- / Leveraging hydrogen combustion for decarbonization
- / Optimizing overall performance

TABLE OF CONTENTS

CLICK ANY [*Section Title*](#) BELOW TO VIEW THE DESIRED PAGE.

CLICK **HOME** ON ANY PAGE TO RETURN TO THIS PAGE.

*Welcome to
Turbo Expo*

4

*Sponsors &
Exhibitors*

5

*Conference
Information*

13

*Awards
Recipients &
Information*

20

*Featured
Sessions*

24

*Networking
Events*

29

Student News

33

*Session
Participant
Information*

39

*Committee
Officers*

40

*Exhibit
Advisory
Committee*

42

*Point Contacts
& Vanguard
Chairs*

43

*Registration
Information*

47

*Tutorials &
Joint Sessions*

49

*Schedule at a
Glance*

51

*Session
Schedule*

52

WELCOME TO TURBO EXPO

Good day and welcome to the ASME 2021 Turbo Expo (TE) a virtual event.

This year's theme is aimed at furthering the discussion on "Sustainable Energy – Accelerating the Transition by Advancing Turbine Technology" in which our community has an important role to address. Across the world, we are aggressively moving towards developing sustainable solutions to reduce carbon dioxide and other greenhouse gas emissions that are harmful to our environment while still meeting our energy demands. Our Turbo Expo community has an opportunity and responsibility to take a leadership role in this critical area providing both near and far term solutions. To derive these sustainable solutions, we will need new digital design tools, advanced manufacturing, integrated sensing, machine learning with artificial intelligence, and advanced thermodynamic systems. These discussions and more will be the focus for the 2021 Turbo Expo.

As you may know this year's event has been planned as a virtual event due to the pandemic caused by COVID-19. While we are still learning to accommodate the virtual world for conferences and meetings, we knew to seek feedback on what worked and what did not work in 2020 from our stakeholders. As a result of extensive discussions with our ASME IGTI technical committees, with the ASME IGTI Executive Committee, and the Gas Turbine Segment Leadership Team, we have developed a format and schedule that we believe will be engaging through the offering of live presentations. We have developed a format that includes ten parallel agendas on each day. Each day is similar and begins with a morning plenary supporting the welcoming remarks, a keynote, three plenary panels and a scholar lecture. The traditional IGTI awards are distributed across the morning plenaries to recognize leaders in our field. Each day supports four technical sessions that will be offered in ten parallel tracks that include Deep Dive Talks and Rapid Talks. Traditional TE events and functions such as the TE Exhibit, Tutorials, Women in Engineering Networking, the Student Poster Session and ad hoc round table discussions that will be available around the clock to accommodate different time zones. Within the constraints of our resources, we hope that this group-sourced format delivers a TE experience that exceeds your expectations.

Our Deep Dive Presentations will be given live and will not be recorded. However, just like last year, each publication at the conference will be accompanied by a pre-recorded video on demand for all to conveniently view at any time. In addition to the Deep Dive Talks, each session will include a

30-minute period for Rapid Talks where numerous authors will also present their most important findings live over a 10 minute period.

Included in the morning plenary sessions will be Turbo Expo award ceremonies where winners of ASME and ASME IGTI awardees will be honored from both 2020 and 2021 since we were unable to recognize the awardees in 2020. The awards include the ASME R. Tom Sawyer Award, ASME Gas Turbine Award, ASME IGTI Industrial Gas Turbine Technology, ASME Aircraft Engine Technology, IGTI Scholar, John P. Davis Award, and the Early Career Engineer Award in memory of the late Dilip R. Ballal. Please visit the ASME web site for a description of these awards and the distinguished recipients.

In conclusion, on behalf of the ASME Turbo Expo Organizing Committee, we wish to thank our sponsors who have so generously contributed to success of this event. Also, we wish to acknowledge the dedicated service of our Executive Conference Chair Richard Dennis, US DOE NETL; our Local Liaison Committee Chair Michael Ducker, Mitsubishi Hitachi Power Systems Americas; Technical Program Chair Stephen Spence, Trinity College Dublin; the Review Chair Harald Schoenenborn, MTU Aero Engines AG; and the Vice Review Chairs Keun Ryu, Hanyang University; Andrew Nix, West Virginia University; and Natalie Smith, Southwest Research Institute; Tutorial Chair Guillermo Paniagua, Purdue University. Special thanks to the Keynote speaker and plenary chairs and panelists who volunteered their time and helped to present a pathway for turbine technology development. Turbo Expo would not be the world's premier turbine technology event without the dedicated time and effort by the authors, reviewers, session chairs, committee leaders and ASME staff, especially this year given the new format. We thank you all. Finally, we hope you find the time that you commit to attending this virtual event is worth your while and you leave with new knowledge and insight.



Karen Thole
Conference Chair
Penn State University



Richard A. Dennis
Executive Conference Chair
Department of Energy NETL

SPONSORS & EXHIBITORS

Thank You

to the Virtual Event Sponsors and Exhibitors! Be sure to visit them during the LIVE event, June 7-11, and after for the following 90 days.

For a current listing of the participating exhibitors, visit
event.asme.org/turbo-expo/sponsor-exhibit.

Gold Sponsor



ANSYS

2600 ANSYS Dr, Canonsburg, PA 15317 USA

www.ansys.com

Providing the best-in-class simulation software to design the next generation of sustainable turbomachinery.

Silver Sponsors



Fogale Nanotech

125, rue de l'Hostellerie, Batiment A - Ville Active, NIMES, Gard, 30900 France

www.fogale.fr

High temperature non-contact clearance and vibration measurement system for gas turbine blade and shaft monitoring.



Cadence Design Systems, Inc.

2655 Seely Avenue, San Jose, CA, 95134 USA

www.cadence.com

Cadence adds Numeca and Pointwise to our suite of Intelligent System Design products.



Siemens

Interleuvenlaan 68, Leuven, 3001, Belgium

www.siemens.com/simcenter

Our portfolio of simulation and test applications help you to deliver the products of tomorrow, today.



Telemetrie Elektronik GmbH

Berliner Allee 42, D-30855 Langenhagen, Germany

www.datatel-telemetry.de/de/

Advanced telemetry for vibration, temperature and pressure surveys of rotating applications in engines or component rigs.

SPONSORS & EXHIBITORS

Bronze & Keynote Sponsor



Flownex Simulation Environment

24 Totius Street, Totius Park, Potchefstroom,
Wes, 2530 South Africa

www.flownex.com

Flownex provides simulation software that enables engineers to comprehend thermal-fluid system behaviour and the future impact of design decisions.

Bronze Sponsors



APEX Turbine Testing Technologies

1039 Parkway Drive, Spring Hill,
Tennessee, 37174 USA

www.apexturbine.com

Preferred Turbomachinery Testing Partner to Most Major Turbine OEMs and Testing Facilities World-Wide.

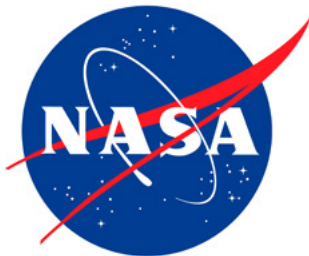


GadCap Technical Solutions

3 Rutherford Road, Washington,
Tyne and Wear, NE37 3HX UK

www.capacisense.com

High temperature non-contact clearance measurement systems for gas turbine clearance monitoring of blades and shafts.



National Aeronautics and Space Administration (NASA)

21000 Brookpark Rd, Cleveland, OH 44135 USA

www.nasa.gov

NASA's Vision: We reach for new heights and reveal the unknown for the benefit of humankind.

SPONSORS & EXHIBITORS

Bronze Sponsors (Continued)



Nord-Lock Group

1200 Clifford Ball Drive, Clinton, PA 15026 USA

www.nord-lock.com/en-us

A leader in creating a safer world by focusing on the integrity of mechanical solutions.

Solar[®] Turbines

A Caterpillar Company

Solar Turbines Incorporated

2200 Pacific Highway, P.O. Box 85376,
San Diego, CA, 92186-5376 USA

www.solarturbines.com

Solar Turbines provides gas turbine packages and services for oil and gas and power generation industries.



Torquemeters Limited

West Haddon Road, Ravensthorpe,
Northamptonshire, NN6 8ET UK

www.torquemeters.com

Torquemeters specialises in the design & manufacture of high-performance torque meters, couplings, drivelines and test rigs.

Supporting Sponsors

The logo for Cadence, featuring the word "cadence" in a lowercase, black, sans-serif font. A small red horizontal bar is positioned above the letter "a".

Cadence Design Systems, Inc.

2655 Seely Avenue, San Jose, CA, 95134 USA

www.cadence.com

Cadence adds Numeca and Pointwise to our suite of Intelligent System Design products.



Southwest Research Institute

6220 Culebra Road, San Antonio, TX 78238, USA

www.machinery.swri.org

Southwest Research Institute® (SwRI®) performs turbomachinery R&D for power, compression, and propulsion applications.

SPONSORS & EXHIBITORS

Exhibitors



Ansys, Inc.

2600 Ansys Drive,
Canonsburg, PA 15317 USA

www.ansys.com

Providing the best-in-class simulation software to design the next generation of sustainable turbomachinery.



APEX Turbine Testing Technologies

1039 Parkway Drive, Spring Hill,
Tennessee, 37174 USA

www.apexturbine.com

Preferred Turbomachinery Testing Partner to Most Major Turbine OEMs and Testing Facilities World-Wide.



ASME Gas Turbine Segment

11757 Katy Freeway, Ste 1500,
Houston, TX 77079 USA

event.asme.org/Turbo-Expo

Join us online for the 2021 ASME Turbo Expo Technical Conference and Exhibition.



ATE Antriebstechnik und Entwicklungs GmbH & Co. KG

Brandenburger Str. 10,
88299 Leutkirch, Germany

www.ate-system.de/en

Development and manufacturing of high-speed electrical motors (stators, rotors) and prototypes according to customer specification.



Calnetix Technologies

16323 Shoemaker Avenue,
Cerritos, CA 90703 USA

www.calnetix.com

Calnetix specializes in high-performance, high-speed motor generators and best-in-class advanced control systems and magnetic bearings.

CAPTURE 3D

Capture 3D

3207 S Shannon St, Santa
Ana, CA 92614 USA

www.capture3d.com

Leader in innovative non-contact metrology solutions that optimize 3D scanning, inspection, additive manufacturing and reverse engineering applications for product development, quality control, manufacturing, and production.



CEROBEAR GmbH

Kaiserstraße 100, Herzogenrath,
North Rhine-Westphalia,
52134 Germany

www.cerobear.com

Germany based CEROBEAR is specialized in custom engineered hybrid & all-ceramic ball & roller bearings.



Concepts NREC

217 Billings Farm Road, White River
Junction, Vermont 05001-9486 USA

www.conceptsnrec.com

Concepts NREC is the industry leading source for turbomachinery design, development, testing, manufacturing, and software.



Cross Manufacturing

Devizes South Site, Hopton Road,
Devizes, Wiltshire, SN10 2EU UK

www.crossmanufacturing.com

Since the 1920's, Cross Manufacturing has specialized in the design and manufacture of metallic seals for the aerospace, power generation and automotive industries.

SPONSORS & EXHIBITORS

Exhibitors (Continued)



Dassault Systèmes SIMULIA

1301 Atwood Ave #101w,
Johnston, RI 02919 USA

www.3ds.com/simulia

Dassault Systèmes SIMULIA reveals the world we live in through realistic simulation of product, nature & life.



Dutch Gas Turbine Association

Einsteinbaan 1, 3439 NJ
Nieuwegein, The Netherlands

www.dgta.nl

DGTA's aim is to strengthen the technological, commercial and labour market position of this industry.



Elektromaschinen und Antriebe, AG

Bachstrasse, 10, Möhlin,
CH-4313 Switzerland

www.eandausa.com

e+a designs and manufactures high-speed, high-power rotors and stators for Turbomachinery applications.



ENOGIA

19 Avenue Paul Heroult
13015 Marseille France

www.enogia.com

ENOGIA is one of the world leading companies for micro-turbomachinery development and manufacturing.



Flownex Simulation Environment

24 Totius Street, Totius
Park, Potchefstroom, Wes,
2530 South Africa

www.flownex.com

Flownex provides simulation software that enables engineers to comprehend thermal-fluid system behaviour and the future impact of design decisions.



FOGALE NANOTECH

125, rue de l'Hostellerie,
Batiment A - Ville Active,
NIMES, Gard, 30900 France

www.fogale.fr

High temperature non-contact clearance and vibration measurement system for gas turbine blade and shaft monitoring.



GadCap Technical Solutions

3 Rutherford Road, Washington,
Tyne and Wear, NE37 3HX UK

www.capacisense.com

High temperature non-contact clearance measurement systems for gas turbine clearance monitoring of blades and shafts.



Haynes International, Inc.

1020 W. Park Avenue P.O. Box
9013, Kokomo, IN, 46904 USA

www.haynesintl.com

Leading developer, manufacturer, and distributor of HASTELLOY® and HAYNES® high-performance alloys for use in high-temperature and corrosion applications.



KnewMethod / INDO-MIM

United States-Europe /
Tirupathi, India-Phoenix, Az

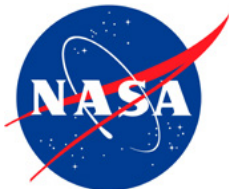
www.knewmethod.com

www.indo-mim.com

KnewMethod-Technical Casting Support and Sales. INDO-MIM - Premium Investment Castings, Steel Castings, Machining, MIM.

SPONSORS & EXHIBITORS

Exhibitors (Continued)



National Aeronautics and Space Administration (NASA)

21000 Brookpark Rd,
Cleveland OH 44135 USA

www.nasa.gov

NASA's Vision: We reach for new heights and reveal the unknown for the benefit of humankind.

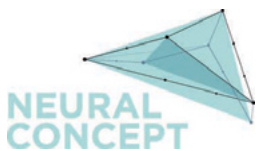


National Energy Technology Laboratory

626 Cochran's Mill Road,
Pittsburgh, PA, 15236 USA

www.netl.doe.gov

The National Energy Technology Laboratory (NETL) is a U.S. Department of Energy (DOE) national laboratory that produces technological solutions to America's energy challenges.



Neural Concept SA

EPFL Innovation Park, Bâtiment C,
1015 Lausanne, Switzerland

www.neuralconcept.com

Neural Concept is an AI solution for real time CAE simulations and performance maps in turbomachinery.



Nord-Lock Group

1200 Clifford Ball Drive
Clinton, PA 15026 USA

www.nord-lock.com/en-us

A leader in creating a safer world by focusing on the integrity of mechanical solutions.



Cadence Design Systems, Inc.

2655 Seely Avenue,
San Jose, CA, 95134 USA

www.cadence.com

Cadence adds Numeca and Pointwise to our suite of Intelligent System Design products.



OROS

23 Chemin des Prés,
38240 Meylan, France

www.oros.com

OROS designs and manufactures noise and vibration testing and analysis solutions.



Photron

9520 Padgett Street Suite 110,
San Diego, CA 92126 USA

www.photron.com

Photron is a global leader in high-speed imaging technology, ultra-high-speed camera systems and slow-motion analysis.



QTH 54 Inc. / Machine Document

59 Beech St, Lackawanna,
New York 14218 USA

www.machinedocument.com

Machine and Equipment Point of Use Documentation. Everything from manuals to Service/Tech Bulletins to schematics and video support and more at Field Service fingertips.



Scanivalve Corporation

1722 N. Madson St., Liberty
Lake, WA 99019, USA

www.scanivalve.com

Scanivalve is the industry leader in multi-channel pressure and temperature measurement solutions. Let us help!

SPONSORS & EXHIBITORS

Exhibitors (Continued)

SIEMENS

Ingenuity for life

Siemens

Interleuvenlaan 68,
Leuven, 3001, Belgium

www.siemens.com/simcenter

Our portfolio of simulation and test applications help you to deliver the products of tomorrow, today.



Sensor Coating Systems Ltd

Londoneast-UK Business &
Technical Park, The Cube, Yewtree
Avenue, London, RM10 7FN UK

www.sensorcoatings.com

SCS provides a unique surface-temperature measurement service. Their self-developed coatings deliver thousands of data points.

Solar® Turbines

A Caterpillar Company

Solar Turbines Incorporated

2200 Pacific Highway, P.O.
Box 85376, San Diego,
CA, 92186-5376 USA

www.solarturbines.com

Solar Turbines provides gas turbine packages and services for oil and gas and power generation industries.



TURBOMACHINERY
LABORATORY

TEES - Turbomachinery Laboratory

323 Texas A&M University, 3254
TAMU, College Station, TX 77843

tps.tamu.edu

The Turbomachinery & Pump Symposia is a vital industry event offering a forum for the exchange of ideas between rotating equipment engineers and technicians worldwide.

datatel

TELEMETRY

Telemetrie Elektronik GmbH

Berliner Allee 42, D-30855
Langenhagen, Germany

www.datatel-telemetry.de

Advanced telemetry for vibration, temperature and pressure surveys of rotating applications in engines or component rigs.



Tema Energy Srl

Via Cavellas 15, 24060
Casazza (BG) - Italy

www.tema-energy.it

We manufacture burners, combustors, transition pieces, nozzles for GT in several high-alloy materials.



TOffeeAM

TOffeeAM Ltd

Mappin House, 4 Winslet
Street, London W1W 8HF, UK

www.toffeeam.co.uk

Intelligent Design for Additive Manufacturing: Cloud Based Software for Fluid and Structure Optimization with the latest Machine Learning solutions.

Torquemeters

LIMITED

high performance test & measurement systems

Torquemeters Limited

West Haddon Road, Ravensthorpe,
Northamptonshire, NN6 8ET UK

www.torquemeters.com

Torquemeters specialises in the design & manufacture of high-performance torquemeters, couplings, drivelines and test rigs.



Waukesha Bearings

N17 W24222 Riverwood Drive,
Waukesha, WI 53188 USA

www.waukbearing.com

A global leader in hydrodynamic bearings, active magnetic bearing systems and brush seals for turbomachinery.



EVENT.ASME.ORG/GT-INDIA



VIRTUAL

Gas Turbine India Conference

December 2 – 3, 2021

Why the Gas Turbine India Conference?

ATTEND this virtual conference to exchange ideas on research, development, and best practices on gas turbines and allied areas.

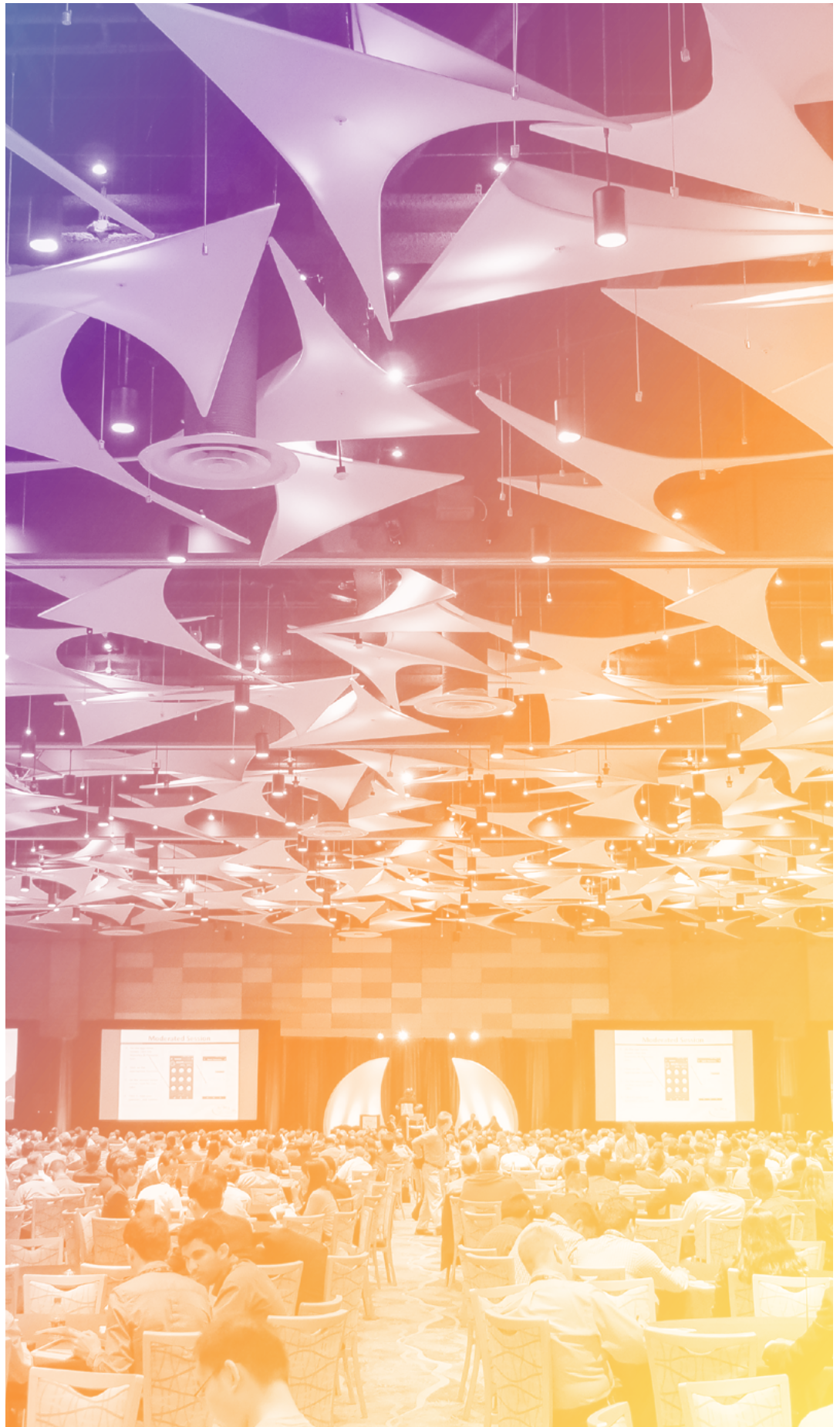
VIRTUAL EXHIBITION will allow exhibitors to make connections and showcase products and services.

SPONSOR and get your brand in front of conference attendees and establish your company as an industry leader!

REGISTER to take advantage of attending, exhibiting, or sponsoring the Gas Turbine India Conference! Earn Professional Development Hours!

Contact igtiprogram@asme.org with any inquiries.

CONFERENCE INFORMATION



SUSTAINABLE ENERGY—ACCELERATING THE TRANSITION BY ADVANCING TURBINE TECHNOLOGY

Turbines thru Time... in the Future

Monday, June 7th, 8 - 9:30AM EDT

Turbomachinery-enabled industrialization and defined modernity and can play a key role for our decarbonized future.



Keynote Speaker

Dr. Michael E. Webber

Chief Science and Technology Officer
ENGIE

Based in Paris, France Webber serves as the Chief Science and Technology Officer at ENGIE, a global energy & infrastructure services company. Webber is also the Josey Centennial Professor in Energy Resources at the University of Texas at Austin. Webber's expertise spans research and education at the convergence of engineering, policy, and commercialization on topics related to innovation, energy, and the environment. He was selected as a Fellow of ASME and as a member of the 4th class of the Presidential Leadership Scholars, which is a leadership training program organized by Presidents George W. Bush and William J. Clinton. Webber has authored more than 400 publications, holds 6 patents, and serves on the advisory board for Scientific American.

Webber holds a B.S. and B.A. from UT Austin, and M.S. and Ph.D. in mechanical engineering from Stanford University. He was honored as an American Fellow of the German Marshall Fund and an AT&T Industrial Ecology Fellow on four separate occasions.

Keynote Moderators



Karen Thole

Department Head and University
Distinguished Professor of Mechanical
Engineering
Penn State University



Rich Dennis

Technology Manager
Department of Energy NETL

OPENING UP THE DESIGN SPACE TO AFFORD EFFICIENT GAS TURBINES USING H₂ AND BIOFUELS

TUESDAY, JUNE 8 / 8:00 AM - 9:00 AM EDT

The plenary sessions will be held from 8:00 – 9:00 am EDT.

ASME IGTI awardees will be recognized following each plenary session from 9:00 – 9:30 am EDT.

N

ations of the world are seeking a transition to a sustainable carbon neutral existence by 2050; a society driven speed unparalleled in modern times. The ability to quickly apply and adapt turbine technology to carbon neutral fuels will help to accelerate the transition to sustainable energy systems. For stationary power generation these fuels could include, amongst others, high purity hydrogen, hydrogen and natural gas blends, ammonia, and synthetic carbon neutral natural

gas. For this panel the discussion will focus on hydrogen and natural gas blends and high purity hydrogen fuels for stationary gas turbine power generation. For flight applications carbon neutral fuels, owing to the high specific energy requirements, will likely include liquid fuels based on biomass or synthetic fuels based on recycled carbon upgraded with renewable hydrogen. The panel will explore the impact of these carbon neutral fuels on gas turbine performance, components, ancillary equipment, and the fundamental mechanism effecting performance of these machines for stationary power and flight applications.

Speakers



Geert Laagland
Head of Engineering
Vattenfall NV



John Mason
Director, Technology
and New Product
Development,
Turbomachinery Products
Solar Turbines Inc.



Brian Allen
Vice President, Product
Line Management
Mitsubishi Power Americas



Dr. Sean Bradshaw
Fellow, Sustainable
Propulsion
Pratt & Whitney



Jeff Benoit
Power Systems Mfg., LLC



Christer Björkqvist
ETN Global

Moderators

OPENING UP THE DESIGN SPACE THROUGH COMPUTATIONS AND MACHINE LEARNING

WEDNESDAY, JUNE 9 / 8:00 AM - 9:00 AM EDT

The plenary sessions will be held from 8:00 – 9:00 am EDT.

ASME IGTI awardees will be recognized following each plenary session from 9:00 – 9:30 am EDT.



as turbines have transformed the world impacting billions of people around the globe on a daily basis. In 2019 gas turbines transported 4.5 billion people by air¹ and generated nearly 6300 Terawatt-hours²

respectively. The global population is expected to grow from 7.7 billion in 2019 to over 9 billion in 2040. As demand increases for the aviation and power generation industries sustainability will be an increasingly important design consideration. Improved component and sub-system designs will play a critical role in enabling sustainable designs and their integration at the system level will become increasingly important: engine/airframe for aviation and gas turbine/grid for power generation. Human innovation is the key to meeting market demands subjected to environmental constraints. Modeling and simulation (M&S) will play a key role in fueling innovation at the component, sub-system and system level unlocking the potential of emerging technologies and their integration into larger ecosystems.

¹ ICAO Annual Report, 2019

² bp.com/statisticalreview

Advances in 5 key M&S pillars will play an important role in next generation designs:

1. Digital thread
2. Digital twin
3. First principles high fidelity simulation
4. Multi-fidelity MDAO and
5. Machine learning / artificial intelligence.

As algorithms, physics models, software and hardware evolve, the strategic role of these 5 key pillars for early to advanced design phases needs to be defined and operationalized by industry to remain competitive.

Technical Topics of Interests for Design:

- Digital Thread
- Digital Twin
- First principles high-fidelity simulation
- Multi-fidelity MDAO
- Machine Learning / AI

Speakers



Christopher Lorence
Chief Engineer
GE Aviation



Robert D. Gregg III
Chief Aerodynamicist
Boeing Commercial
Airplanes – Flight Sciences



Dr. Dirk Nürnberger
Manager GT Technologies
Siemens Energy



Douglas B. (Doug) Kothe, Ph.D.
Director, Exascale
Computing Project
Oak Ridge National
Laboratory



Dr. Gregory M. Laskowski
Director of Fluid Dynamics
Dassault Systèmes



Dr. James D. Heidmann
Manager of NASA's
Advanced Air Transport
Technology Project

Moderators

ENGINEERING IN 2030 – HOW MUST OUR EDUCATIONAL PROGRAMS CHANGE TO BETTER EQUIP THE NEEDED WORKFORCE?

THURSDAY, JUNE 10 / 8:00 AM - 9:00 AM EDT

The plenary sessions will be held from 8:00 – 9:00 am EDT.

ASME IGTI awardees will be recognized following each plenary session from 9:00 – 9:30 am EDT.

A

daptation of critical industries like power generation, transportation, and heavy industry for an ever-shifting society, economy, and climate, necessitates an agile workforce. Educational innovation from primary school through professional development can

be used to provide students the necessary skills to not only adapt to varying conditions, but be the drivers of change. There is clear momentum towards climate neutral

targets in both aviation and power generation sectors, which means that the next generation of engineers must be able to work at the intersection of turbine technology that will be integrated renewables, zero carbon fuels like hydrogen, hybridized and electric propulsion systems, and cyber-physical systems. The workforce must also be cognizant of the external forces driving the direction of the discipline, including regulation, security, economics, and globalization. Four distinguished panelists will discuss innovative ideas for addressing our industry's need for a next-generation workforce.

Speakers



Bryan D. Morreale, Ph.D.

Associate Laboratory Director, Research and Innovation Center
National Energy Technology Laboratory
U.S. Department of Energy



Barbara Esker

Deputy Director, Advanced Air Vehicles Program
NASA Aeronautics Research
Mission Directorate (ARMD)



Mark Jefferies

Chief of University Research Liaison
Rolls-Royce Group
Honorary Professor
University of Birmingham

Moderators



Jacqueline O'Connor, Ph.D.

Associate Professor of Mechanical Engineering & Director
Penn State Center for Gas Turbine
Research, Education, and Outreach



James R. Dawson

Professor, Deputy Head of Department for Research
Norwegian University of
Science and Technology

LEADERSHIP TEAM

ASME Gas Turbine Segment Leadership Team



Mark Zelesky
Leader, TEC Liaison
Pratt & Whitney



Zolti Spakovsky
Vice Leader
MIT



Nicole Key
Member
Purdue University



Daniela Gentile
Member
Ansaldo Energia



Tim Stone
Member
GE



Damian Vogt
Member
University of Stuttgart



Charles Soothill
Member
Sulzer



Nateri Madavan
Member
NASA



Susan Scofield
Member
Siemens

Turbo Expo Organizing Committee



Conference Chair
Karen Thole
Penn State University



Executive Conference Chair
Rich Dennis
Department of Energy NETL



Technical Program Chair
Stephen Spence
Trinity College Dublin



Review Chair
Harald Schoenenborn
MTU Aero Engines AG



Vice Review Chair
Keun Ryu
Hanyang University



Vice Review Chair
Andrew Nix
West Virginia University



Vice Review Chair
Natalie Smith
Southwest Research Institute



Tutorial of Basics Chair
Guillermo Paniagua
Purdue University



IGTI EC Representative
Akin Keskin
Rolls-Royce



Professor Ricardo Martinez-Botas, FREng
Chair
Imperial College London



Kenneth Suder, PhD
Vice Chair
NASA Glenn Research Center



Professor Damian Vogt, PhD MSc
Past Chair
University of Stuttgart

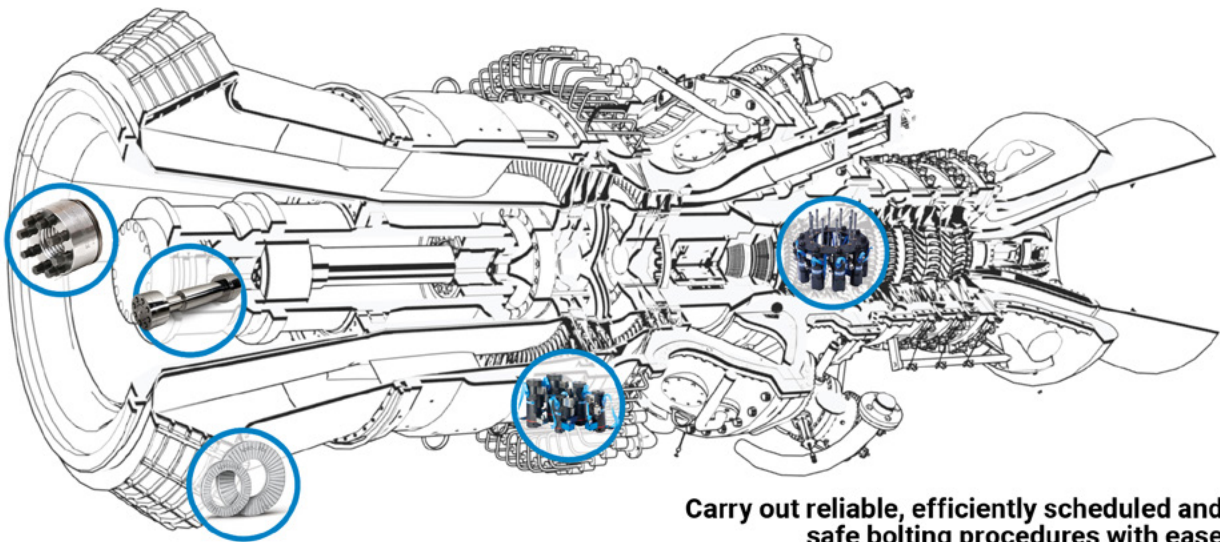


Douglas Hofer
Member
Heliogen



Akin Keskin
Member
Rolls Royce

COMPLETE BOLTING SOLUTIONS. COMPLETE PEACE OF MIND.



Carry out reliable, efficiently scheduled and safe bolting procedures with ease

Visit www.nord-lock.com or contact us at bolting@nord-lock.com to learn more.

NORD-LOCK
GROUP

Congratulations to all AWARD RECIPIENTS

For more details on the award winners, please refer to the 2021 Awards Program that can be found online at: www.turboexpo.org.



ongratulations to all award recipients and thank you to all ASME IGTI committee award representatives whose

work assists the awards and honors chair and the awards committee in the recognition of important gas turbine technological achievements. Thank you to William Cousins for serving as the IGTI Honors and Awards Committee Chair, John Gülen as Industrial Gas Turbine Technology Award Committee Chair, and Wilfried Visser as the Aircraft Engine Technology Award Committee Chair.

2021 ASME Dedicated Service Award *

Awarded to...

Richard Dennis
Dr. Damian Vogt

The ASME Dedicated Service Award honors unusual dedicated voluntary service to the Society marked by outstanding performance, demonstrated effective leadership, prolonged and committed service, devotion, enthusiasm and faithfulness.

2019 John P. Davis Award *

Awarded to...

Dr. David John Rajendran
Dr. Vassilios Pachidis

Awarded to a paper that focuses on new or continuing gas turbine applications, identifies planning, installation, operating and/or maintenance problems and their solutions, and exemplifies candid exposure of real-world problems and solutions.

2019 ASME Gas Turbine Award *

Awarded to...

Dr. Masha Folk
Robert J. Miller
Dr. John D. Coull

The Gas Turbine Award was established in 1963 to be given in recognition of an outstanding contribution to the literature of combustion gas turbines or gas turbines thermally combined with nuclear or steam power plants.

2021 ASME R. Tom Sawyer Award *

Awarded to...

Prof. Robert E. Kielb
Duke University

Awarded to an individual who has made important contributions to advance the purpose of the gas turbine industry and the International Gas Turbine Institute over a substantial period of time. The contribution may be in any area of Institute activity but must be marked by sustained forthright efforts.

2021 Scholar Award

Awarded to...

Dr. Zoltan S Spakovszky

The International Gas Turbine Institute Scholar Award is bestowed upon an individual who submits a learned and comprehensive paper that makes a significant and timely contribution to the science and practice of gas turbine engineering. The Scholar presents the award winning paper as a lecture to an audience of his peers.

2021 Aircraft Engine Technology Award *

Awarded to...

Guillermo Paniagua

For outstanding contribution to air breathing propulsion through inspiring leadership, education, and research having major impacts on aircraft engine operational capability, performance, and design.

2021 Industrial Gas Turbine Technology Award *

Awarded to...

Richard Dennis

For outstanding contributions and leadership in gas turbine technology research and development in electric power generation industry.

2021 Dilip R. Ballal Early Career Award *

Awarded to...

Lt. Col Brian Bohan

Awarded to an individual who has made significant contributions in the gas turbine industry within the first five years of their career.

* To be recognized during the virtual event on Tuesday, June 8, 9 - 9:30 AM EDT

* To be recognized during the virtual event on Wednesday, June 9, 9 - 9:30 AM EDT

* To be recognized during the virtual event on Thursday, June 10, 9 - 9:30 AM EDT

BEST PAPERS

Aircraft Engine

GT2020-14597: *Towards Primary Breakup Simulation of a Complete Aircraft Nozzle at Realistic Aircraft Conditions*

Katharina Warncke, Amsini Sadiki, Max Stauffer, Christian Hasse, Johannes Janicka

GT2020-14174: *Flow Distortion Into the Core Engine for an Installed Variable Pitch Fan in Reverse Thrust Mode*

David John Rajendran, Vassilios Pachidis

Ceramics

GT2020-15521: *Fatigue Characterization of Sic/sic Ceramic Matrix Composites in Combustion Environment*

Ragavendra Prasad Panakarajupally, Joseph El Rassi, Manigandan Kannan, Gregory Morscher

Coal, Biomass & Alternative Fuels

GT2020-14702: *An Investigation of Fundamental Combustion Properties of the Oxygenated Fuels DME and OME*

John M. Ngugi, Marina Braun-Unkhoff, Sandra Richter, Clemens Naumann, Uwe Riedel

Combustion, Fuels, and Emissions

GT2020-14564: *Experimental Investigation of the Combustion Behavior of Single-Nozzle Liquid-Flox®-Based Burners on an Atmospheric Test Rig*

Saeed Izadi, Jan Zanger, Oliver Kislal, Benedict Enderle, Felix Grimm, Peter Kutne, Manfred Aigner

GT2020-15460: *Soot Emission Simulations of a Single Sector Model Combustor Using Incompletely Stirred Reactor Network Modeling*

Savvas Gkantonas, Jenna M. Foale, Andrea Giusti, Epaminondas Mastorakos

GT2020-14665: *Analysis of Thermoacoustic Modes in Can-Annular Combustors Using Effective Bloch-Type Boundary Conditions*

Jakob von Saldern, Alessandro Orchini, Jonas Moeck

Controls, Diagnostics, and Instrumentation

GT2020-15081: *An Additively Manufactured Four Sensor Fast Response Aerodynamic Probe*

Alexandros C. Chasoglou, Panagiotis Tsirikoglou, Anestis I. Kalfas, Reza S. Abhari

GT2020-14748: *Real Time Diagnostic Method of Gas Turbines Operating Under Transient Conditions in Hybrid Power Plants*

Elias Tsoutsanis, Moussa Hamadache, Roger Dixon

Cycle Innovations

GT2020-15391: *Aero Engine Concepts Beyond 2030: Part 1 – The Steam Injecting and Recovering Aero Engine*

Oliver Schmitz, Hermann Klingels, Petra Kufner

GT2020-15634: *Recuperator performance assessment in humidified micro gas turbine applications using experimental data extended with preliminary support vector regression model analysis.*

Ward De Paepe, Alessio Pappa, Diederik Coppitters, Marina Montero Carrero, Panagiotis Tsirikoglou, Francesco Contino

Education

GT2020-14395: *Development of Web-Based Short Courses on Control, Diagnostics, and Instrumentation*

Ioanna Aslanidou, Valentina Zaccaria, Amare Fentaye, Konstantinos G. Kyprianidis

Electric Power

GT2020-15714: *Assessment of Current Capabilities and Near-Term Availability of Hydrogen-Fired Gas Turbines Considering a Low-Carbon Future*

David Noble, Leonard Angello, David Wu, Benjamin Emerson, Scott Sheppard, Tim Lieuwen

Fans & Blowers

GT2020-15353: *A Machine-Learnt Wall Function for Rotating Ducts*

Lorenzo Tieghi, Alessandro Corsini, Giovanni Delibra, Francesco Aldo Tucci

Heat Transfer

GT2020-16129: *Scaling Considerations for Thermal and Pressure Sensitive Paint Methods Used to Determine Adiabatic Effectiveness*

Luke J. McNamara, Jacob P. Fischer, James L. Rutledge, Marc D. Polanka

GT2020-16234: *Exploring Applicability of Acoustic Heat Transfer Enhancement Across Various Perturbation Elements*

Tapish Agarwal, Maximilian Stratmann, Simon Julius, Beni Cukurel

GT2020-16103: *Some Observations on the Computational Sensitivity of Rotating Cavity Flows*

Tom Hickling, Li He

GT2020-14603: *An Experimentally Validated Low Order Model of the Thermal Response of Double-Wall Effusion Cooling Systems for Hp Turbine Blades*

Alexander V. Murray, Peter T. Ireland, Eduardo Romero

Industrial and Cogeneration

GT2020-14187: *Complex Energy Networks Optimization: Part I — Development and Validation of a Software for Optimal Load Allocation*

Maria Alessandra Ancona, Michele Bianchi, Lisa Branchini, Andrea De Pascale, Francesco Melino, Antonio Peretto, Jessica Rosati

Manufacturing Materials & Metallurgy

GT2020-14449: *Durable Abrasive Tip Design for Single Crystal Turbine Blades*

Douglas Nagy, Robert Tollett

Mircoturbines, Turbochargers, and Small Turbomachinery

GT2020-14428: *Generation Mechanism of Broadband Whoosh Noise in an Automotive Turbocharger Centrifugal Compressor*

Rick Dehner, Pranav Sriganesh, Ahmet Selamet, Keith Miazgowicz

GT2020-15804: *Theoretical and Experimental Investigation of a 36 Watt Radial-Inflow Steam Turbine With Partial-Admission*

Patrick Hubert Wagner, Jan Van Herle, Jürg Schiffmann

Oil & Gas Applications

GT2020-15476: *Deposition Pattern Analysis on a Fouled Multistage Test Compressor*

Alessio Suman, Alessandro Vulpio, Nicola Casari, Michele Pinelli, Rainer Kurz, Klaus Brun

Steam Turbine

GT2020-14813: *Detection of Cracks in Turbomachinery Blades by Online Monitoring*

Manish Kumar, Roger Heinig, Mark Cottrell, Christian Siewert, Henning Almstedt, Drew Feiner, Jerry Griffin

GT2020-16064: *Large Eddy Simulation of a Condensing Wet Steam Turbine Cascade*

Pascal Post, Benjamin Winhart, Francesca Di Mare

Structures & Dynamics

GT2020-14943: *Pumping Loss of Shrouded Meshed Spur Gears*

Michael Hurrell, Jerzy Sawicki

Supercritical CO₂ Power Cycle

GT2020-15541: *Part Load Strategy Definition and Annual Simulation for Small Size sCO₂ Based Pulverized Coal Power Plant*

Dario Alfani, Marco Astolfi, Marco Binotti, Paolo Silva

Turbomachinery

GT2020-14305: *Aerodynamic Loading Considerations of a Three-Shaft Engine Compression System During Surge*

Jose Moreno, John Dodds, Christopher Sheaf, Fanzhou Zhao, Mehdi Vahdati

GT2020-15655: *Dynamic Model Based Identification of Cavitation Compliance and Mass Flow Gain Factor in Rocket Engine Turbopump Inducers*

Yu Wan, Marco Manfredi, Angelo Pasini, Zoltán Spakovszky

GT2020-15157: *Averaging for High Fidelity Modelling: Towards Large Eddy Simulations in Multi-Passage Multi-Row Configurations*

L He

Wind Energy

GT2020-15278: *Comparison of Blind Diagnostic Indicators for Condition Monitoring of Wind Turbine Gearbox Bearings*

Konstantinos Gryllias, Alexandre Mauricio, Junyu Qi

IGTI Staff will mail your award once back in the office. Please make sure igtiawards@asme.org has your mailing address.

AWARD OPPORTUNITIES

2022 ASME R. Tom Sawyer Award

Nominations due to
igtiawards@asme.org by...

August 30, 2021

2022 Dilip R. Ballal Early Career Award

Nominations due to
igtiawards@asme.org by...

August 1, 2021

For more information on how to submit a nomination for an award, visit community.asme.org/international_gas_turbine_institute_igti/wiki/4029.honors-and-awards.aspx.

2022 ASME IGTI Industrial Gas Turbine Technology Award

Nominations due to
igtiawards@asme.org by...

October 15, 2021

2022 ASME IGTI Aircraft Engine Technology Award

Nominations due to
igtiawards@asme.org by...

October 15, 2021

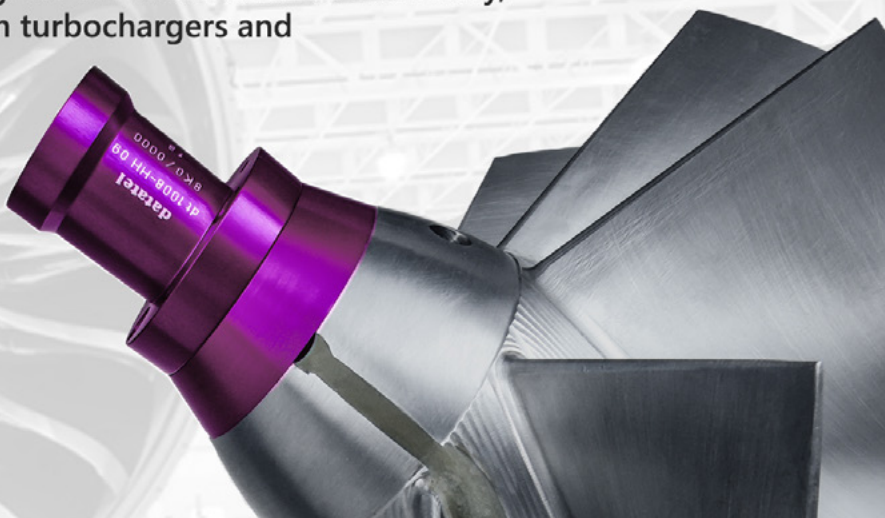
datatel TELEMETRY

ROTATING INSTRUMENTATION SOLUTIONS
Customized. Efficient. Reliable.

High performance telemetry systems for measurement of blade vibration, temperature and static/dynamic pressure in aero engines or industrial turbomachinery, on gas and steam turbine rotors, on turbochargers and many other applications

Telemetrie Elektronik GmbH
Berliner Allee 42
30855 Langenhagen, Germany

Tel. +49 511 97 83 96 0
sales@datatel-telemetry.de
www.datatel-telemetry.de
Follow us on **Linked in**



FEATURED SESSIONS



Future

- Understanding
- Flexibility
- Diversity
- Flexible
- Reliability
- Moderation
- Energy
- Education

INSTABILITIES **EVERYWHERE!** HARD PROBLEMS IN AERO-ENGINES

FRIDAY, JUNE 11 / 8:00 AM - 9:00 AM EDT

To be recognized on Friday, June 11 at 9 - 9:15 AM EDT after the lecture.



Many of the challenges that limited aero-engine operation in the 1960s, 70s and 80s were mostly static in nature: hot components exceeding temperature margins, stresses in the high-speed rotating structure approaching safety limits, and turbomachinery aerodynamic

efficiencies missing performance goals. Modeling tools have greatly improved since, mostly due to better computers enabling large simulations of the fluid flow and supporting structure, and have helped enhance jet engine design. The situation is thus different today, where most problems encountered past the design and development phases are

dynamic in nature. These can jeopardize engine certification and lead to major delays and increased program cost.

A real challenge is the characterization of damping and the related dynamic behavior of rotating and stationary components and assemblies, and of the fluid-structure interactions and coupling. The theme of this lecture is instability in the broadest sense. A number of problems of technological interest in aero-engines are discussed with focus on modeling and identification of the underlying mechanisms. Future perspectives on outstanding seminal problems and grand challenges are also given.



By Zoltan S Spakovszky

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Dr. Spakovszky is Professor of Aeronautics and Astronautics at the Massachusetts Institute of Technology and the director of the Gas Turbine Laboratory. He obtained his Dipl. Ing. degree in Mechanical Engineering from the Swiss Federal Institute of Technology (ETH) Zürich and his MS and Ph.D. degrees in Aeronautics and Astronautics from MIT.

Dr. Spakovszky's principal fields of interest include propulsion and energy conversion, internal flows in fluid machinery, compressor aerodynamics and stability, micro-fluidics and rotordynamics, aero-acoustics, aircraft design for environment, and electrified aviation. He currently directs analytical and experimental research in these areas and teaches graduate and undergraduate courses in thermodynamics, propulsion and fluid mechanics, and aero-acoustics. He has authored a large number of technical papers in refereed journals and has been awarded several ASME International Gas Turbine Institute best paper awards, the ASME Melville Medal, the ASME Gas Turbine Award, the ASME John P. Davis Award, a NASA Honor Award, several Aero-Astro Undergraduate Advising / Teaching Awards, and the Ruth and Joel Spira Award for Excellence in Teaching.

Dr. Spakovszky is a technical consultant to industry and government agencies, a Fellow of the ASME, the Vice Leader of the ASME Gas Turbine Segment Leadership Team, an Associate Fellow of the AIAA, and served as the chair of the turbomachinery committee and review chair of the ASME International Gas Turbine Institute, and as an associate editor for the ASME Journal of Turbomachinery.

This lecture will NOT have a video on demand (VOD). This lecture will be held "live".

TWO DECADES OF US DOE GAS TURBINE RESEARCH AND INNOVATION

MONDAY, JUNE 7 / 2:15 - 3:45 PM EDT

To be recognized on Wednesday, June 9 from 9 - 9:30 AM EDT



By Richard A. Dennis

NATIONAL ENERGY TECHNOLOGY LABORATORY

Mr. Richard Dennis is currently the Technology Manager for Advanced Turbines and Supercritical Carbon Dioxide Power Cycle Programs at the U.S. Department of Energy's National Energy Technology Laboratory (NETL). These programs support US university, industry and U.S. national laboratory research, development and demonstration projects.

Rich has a Bachelor and Master of Science degrees in Mechanical Engineering from West Virginia University. From 1983 to 1992 Mr. Dennis worked in the on-site research group of NETL where he conducted research related to pressurized fluidized bed combustion, gasification and gas stream particulate cleanup for advanced coal based power generation. From 1993 to 2000 Mr. Dennis managed contracted research for the DOE Office of Fossil Energy in advanced fossil fuel power generation including coal combustion, gasification, fuel cells, and gas turbines. In 2002 Richard was selected as a Technology Manager. Currently Richard is serving as the Technology Manager for Advanced Turbines and Supercritical Carbon Dioxide Power Cycles programs at NETL. Additionally, Richard was the 2018-19 leader of the American Society of Mechanical Engineers (ASME) Gas Turbine Segment (GTS). Richard is an ASME Fellow.

This lecture will NOT have a video on demand (VOD). This lecture will be held "live".

NUMECA LUNCH & LEARN SESSION

MONDAY, JUNE 7 / 11:15 AM EST

Complimentary Registration
Click here to register!

Our traditional Turbo Expo Lunch & Learn session goes virtual. Join us and be part of a major revolution in Turbomachinery design and analysis as we talk about the next generation of multiphysics simulation and optimization, with live demos.

OMNIS™ /Turbo - From design to analysis within one collaborative environment

Turbomachinery **Multiphysics & External Aero**

Meshing **Marine**

Preliminary and detailed 3D design **Full engine CFD simulation with NLH** **Robust Design Optimization with Uncertainty Quantification** **Fully coupled aero-vibro-acoustics suite with wizard-based automation**

TURBINE INNOVATIONS FOR SMALL CORE ENGINES

THURSDAY, JUNE 10

4:00 - 5:30 PM EDT

To be recognized on Wednesday, June 9th
at 9 - 9:30 AM EDT after the plenary.



By Guillermo Paniagua

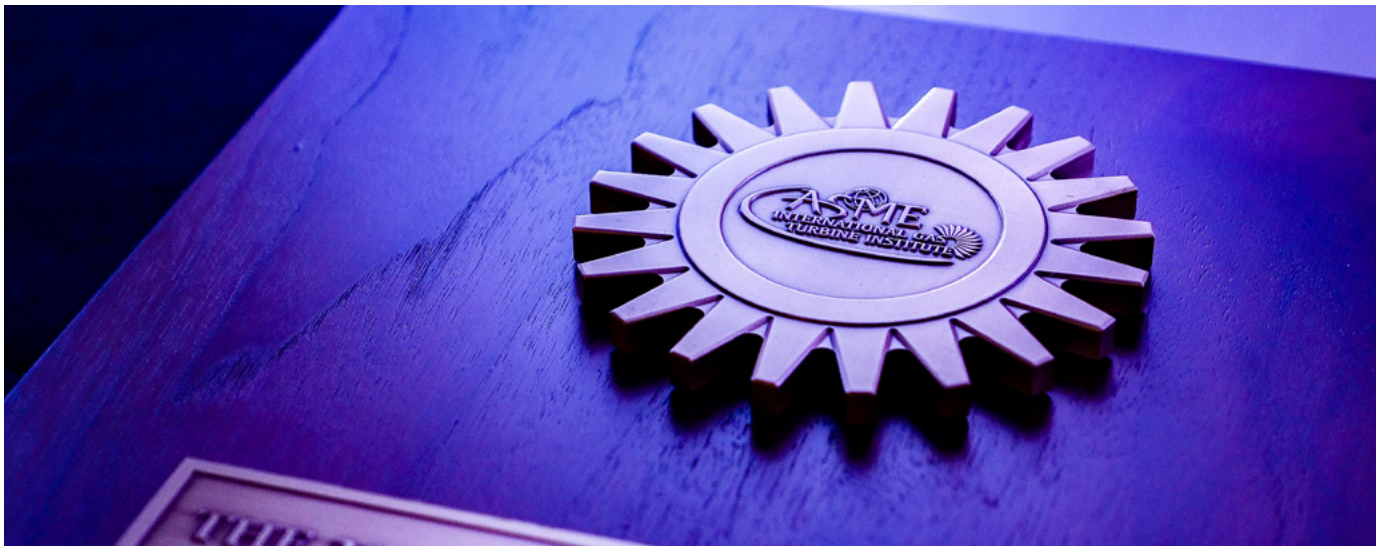
PURDUE UNIVERSITY

Guillermo Paniagua has pioneered innovative turbine research in transonic turbines and counter-rotating turbines. He demonstrated pulsating trailing edge blowing method to control shock waves and manage the base flow pressure. He invented a new generation of turbines that can operate under high supersonic inlet conditions: supersonic axial, supersonic radial outflow turbines, and bladeless axial turbines. Based on experimental studies of large variations in heat flux on the turbine rotor casing, he co-invented several turbine rotor over-tip concepts that resulted in three patents, enhancing turbine efficiency. After 18 years at the prestigious von Karman Institute, he joined Purdue in 2014 and founded the Purdue Experimental Turbine Aerothermal Lab, developing a tri-sonic turbine facility with modular test sections to enable TRL1 to 6. Professor Paniagua's research is encapsulated in 100 journal articles and 182 proceeding papers at leading conferences.

Prof. Paniagua holds an MSc in Electro-Mechanical Engineering (Spain), a Research Master from the von Karman Institute (Belgium), and a Ph.D. with highest distinction in Engineering from the Universite Libre de Bruxelles (Belgium). Since 2016 he is a Part-time Faculty Research Participant in the ORISE program at the National Energy Technology Laboratory.

This lecture will NOT have a video on demand (VOD). This lecture will be held "live".

We will be recognizing the 2020 and 2021 award winners during the 2021 Virtual Event.



MIND THE GAP: UNLOCKING DE&I IN GAS TURBINE ENGINEERING

TUESDAY, JUNE 8 / 12:15 - 1:45 PM EDT



inding creative solutions and developing new product lines require diverse and talented teams, especially given the industry-wide push towards sustainable propulsion and power generation. There are challenges, however, in recruiting diverse employees as a result of the

available talent pool and also in nurturing an inclusive culture in which all employees from all backgrounds can contribute and succeed. This panel will discuss some of the current challenges and highlight the keys to success in fostering and supporting an inclusive culture – especially in engineering – to help unlock the future of gas turbine design and research.

Session Speakers



Joe Allen
Chief Diversity Officer
GE Aviation



Chela Gage
Senior Executive, Diversity,
Equity & Inclusion
Pratt & Whitney



Mary FitzPatrick
Global Head of Diversity and Inclusion
Rolls Royce

Session Moderators



Karen Thole
The Pennsylvania State University



Eric J. Ruggiero
GE Aviation

NETWORKING EVENTS



These networking sessions are available to all Turbo Expo virtual conference attendees. [Register](#) to attend these networking events to strengthen existing relationships, establish new ones, connect with key influencers and to socialize with like-minded individuals.

47-02 WOMEN IN ENGINEERING NETWORKING EVENT

TUESDAY, JUNE 8 / 11:30 AM - 12:00 PM EDT

Female registrants are invited to join their colleagues for a networking event that will feature a motivating talk by Heather M. Quedenfeld of National Energy Technology Laboratory (NETL). Attendees will have the opportunity to network with women in the industry and learn about the career paths of some successful women in the industry.



Heather M. Quedenfeld

**DEPUTY DIRECTOR, TECHNOLOGY DEVELOPMENT CENTER
U.S. DEPARTMENT OF ENERGY'S NATIONAL ENERGY TECHNOLOGY
LABORATORY (NETL)**

Heather Quedenfeld is employed at the U.S. Department of Energy's National Energy Technology Laboratory (NETL) and serves as the Deputy Director for the laboratory's Technology Development Center. In this capacity Ms. Quedenfeld is responsible for implementation of the Nation's \$5.0B portfolio of active energy research, development, demonstration, and deployment projects in support of the Office of Fossil Energy and other Department of Energy programs. With an emphasis on maturing technology from "early concept development to market-ready", under her leadership, teams of federal project managers work collaboratively with partners in academia, industry, small businesses, non-profit organizations and national laboratories to deliver federally sponsored energy technological innovations to the nation.

Ms. Quedenfeld has 30 years of federal service. She has diverse experience at laboratory, having worked in all technology program-related areas. She has held senior level positions, including her current role as Deputy Director for the Technology Development Center, and previous positions as Associate Director for Advanced Coal and Carbon Management research, Acting Chief of Staff for the Laboratory Director, Acting Lead for the Office of Science and Technology Career Management.

Ms. Quedenfeld holds a B.S. in Mechanical Engineering from Penn State University, and a M.S. in Industrial Engineering from West Virginia University. She resides in the Washington, Pennsylvania area, just south of Pittsburgh, with her husband and three kids.



Moderator

Natalie R. Smith, Ph.D.
Senior Research Engineer
Southwest Research Institute

STUDENT MIXER

The Student Advisory Committee (SAC) has arranged for three virtual networking opportunities for students. This is an opportunity for students to reconnect with friends, make new friends, and build their professional network in a casual atmosphere. Students are encouraged to attend one or ALL of the following student mixer networking events:

Student Mixer 1

SUNDAY, JUNE 6
4:00 – 4:30 PM EDT

[Click Here to
Attend via Zoom](#)

Student Mixer 2

MONDAY, JUNE 7
7:15 – 7:45 AM EDT

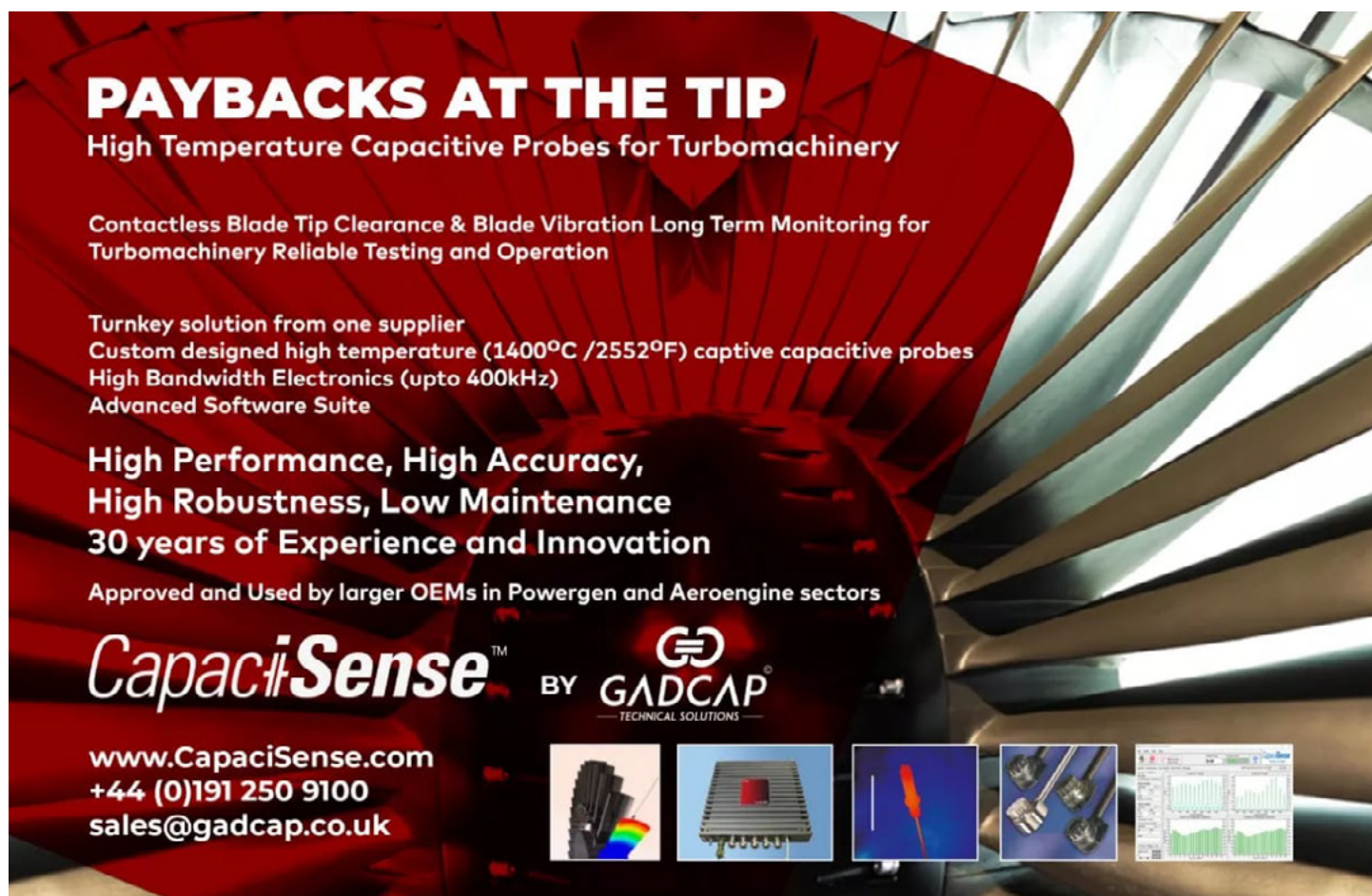
[Click Here to
Attend via Zoom](#)

Student Mixer 3

WEDNESDAY, JUNE 9
11:30 AM – 12 PM EDT

[Click Here to
Attend via Zoom](#)

Questions may be sent to igtisac@asme.org



PAYBACKS AT THE TIP
High Temperature Capacitive Probes for Turbomachinery

Contactless Blade Tip Clearance & Blade Vibration Long Term Monitoring for Turbomachinery Reliable Testing and Operation


Turnkey solution from one supplier
Custom designed high temperature (1400°C /2552°F) captive capacitive probes
High Bandwidth Electronics (upto 400kHz)
Advanced Software Suite

**High Performance, High Accuracy,
High Robustness, Low Maintenance
30 years of Experience and Innovation**

Approved and Used by larger OEMs in Powergen and Aeroengine sectors

CapaciSense™ BY **GADCAP®**
— TECHNICAL SOLUTIONS —

www.CapaciSense.com
+44 (0)191 250 9100
sales@gadcap.co.uk





VIRTUAL

Advanced Manufacturing & Repair for Gas Turbines Symposium AMRGT

October 5 – 8, 2021

EVENT.ASME.ORG/AMRGT

Now In It's Third Year...

SPONSOR put your brand in front of attendees during these unique times.

ATTEND this virtual symposium to network and learn from the experts in advanced manufacturing for gas turbines. Plus, you will earn professional development hours (PDH)!

REGISTER so you can network with:

Manufacturing Engineers
Welding Engineers
Repair Development Engineers
Plus more!

Thursday, September 13th at 1pm Eastern Time

Attendees who register by September 10, 2021 will be invited to attend a complimentary webinar:

Introduction to Additive Manufacturing in Turbomachinery Applications

Presented by

Carl Popelar, Staff Engineer, Southwest Research Institute
Nathan F. Andrews, Group Leader, Southwest Research Institute

The American Society of Mechanical Engineers®
ASME®



STUDENT NEWS



STUDENT NEWS



The [ASME IGTI Student Advisory Committee \(SAC\)](#) is a group of students who work to foster student engagement in the IGTI community and improve the Turbo Expo conference every year. Towards this goal, the SAC organizes various sessions and events during the conference, provides opportunities for students to work behind the scenes with leaders in their technical area, and awards travel funds to eligible degree seeking individuals.

[See this ASME IGTI video to learn more!](#)

Student Virtual Networking Mixer

The ASME IGTI SAC has arranged for three virtual networking opportunities for students. This is an opportunity for students to reconnect with friends, make new friends, and build their professional network in a casual atmosphere. Students are encouraged to attend one or ALL of the following student mixer networking events:

Student Mixer 1

SUNDAY, JUNE 6
4:00 - 4:30 PM EDT

[Click to Join
via Zoom](#)

Student Mixer 2

MONDAY, JUNE 7
7:15 - 7:45 AM EDT

[Click to Join
via Zoom](#)

Student Mixer 3

WEDNESDAY, JUNE 9
11:30 AM - 12 PM EDT

[Click to Join
via Zoom](#)

Questions may be sent to igtisac@asme.org.

Student Poster Competition

The Student Advisory Committee is once again sponsoring a student poster competition session at the virtual Turbo Expo event. The Student posters will be available on the virtual event platform 24 hours per day 7 days a week from June 1 – December 2021. Support the students by visiting their posters to see the results of their work and encourage them to become active in the ASME IGTI community. Cast your vote for the People's Choice Best Student Poster. Complete instructions on how to cast your vote are available on the program addendum..

Join us for a **roundtable** and **networking opportunity** to learn about student memberships, benefits, the mentorship platform and our new [ASMESTore.com!](#) Stick around to get any of your questions answered!

SAC Committee Members



Chair

Deepanshu Singh
University of Oxford, UK



Vice Chair

Mavroudis Kavvalos
Mälardalen University, Sweden



Secretary

Manas Payyappalli
Indian Institute of Technology Bombay



Past-Chair

Shawn Siroka
Penn State University



Student Paper Review Initiative Chair

Curtis Stimpson
Honeywell

CASH PRIZES FOR POSTER COMPETITION WINNERS

1 st Place	\$500
2 nd Place	\$250
People's Choice	\$100

Two opportunities:

MONDAY, JUNE 7
11:30 AM - 12 PM EDT

WEDNESDAY, JUNE 9
11:30 AM - 12 PM EDT

31-01 FUTURE GOALS, CURRENT THRESHOLDS, AND INVISIBLE COMPETENCIES: A GRADUATE STUDENT WORKSHOP ON NAVIGATING ACADEMIC ENGINEERING

THURSDAY, JUNE 10 / 2:15 - 3:45 PM EDT



Informed by over 5 years of NSF-funded research in graduate engineering socialization, attrition, and persistence, this workshop is based around the idea of “invisible competencies” and “threshold concepts” that graduate students often struggle through and may not be able to articulate, but are critical to success in academic engineering. This workshop will illuminate these

often invisible competencies and threshold concepts, help students identify appropriate resources and strategies to approach these common issues, and discuss “triage” issues related to graduate student well-being, handling advisor conflict, and considering departure from their academic program. Out of this live interactive session, students will come away with easily implemented strategies through which to approach issues arising in their own education and a template for personalized professional development at their own institutions pertaining to their own career goals.



Dr. Catherine G.P. Berdanier

**ASSISTANT PROFESSOR AND CLYDE W. SHUMAN JR. AND
NANCY SHUMAN EARLY CAREER PROFESSOR OF MECHANICAL
ENGINEERING**

PENNSYLVANIA STATE UNIVERSITY

DIRECTOR OF THE ONLINE MSME PROGRAM

Dr. Catherine G.P. Berdanier is an Assistant Professor and Clyde W. Shuman Jr. and Nancy Shuman Early Career Professor of Mechanical Engineering at the Pennsylvania State University and is the Director of the Online MSME Program. She earned her B.S. in Chemistry from The University of South Dakota, her M.S. in Aeronautical and Astronautical Engineering and Ph.D. in Engineering Education from Purdue University.

She directs the Engineering Cognitive Research Laboratory (E-CRL), which focuses attention on graduate-level engineering education and methodological development within a disciplinary setting. Her research has been published in Journal of Engineering Education, International Journal of Engineering Education, IEEE Transactions on Professional Communication, and many other journal and conference venues. She is a recent winner of an NSF CAREER grant studying master's-level departure from the engineering doctorate.

2021 Student Advisory Committee Travel Award Winners

Hessein Ali
University of Central Florida

Papa Aye Nyansafo Aye-Addo
Purdue University

Lakshya Bhatnagar
Purdue University

Simone Braccio
Université Savoie Mont Blanc

Jaime Aaron Cano
University of Texas at El Paso

Daniel Castillo
Imperial College London

Louis Edward Christensen
The Ohio State University

Eric T DeShong
Pennsylvania State University

Hossein Ebrahimi
University of Central Florida

Ryan Douglas Edelson
Pennsylvania State University

Dimitra Eirini Diamantidou
Mälardalen University (MDH)

Alfredo Fantetti
Imperial College London

Tania Sofia Cacao Ferreira
*von Karman Institute/
Université Catholique de Louvain*

Benjamin Francolini
McGill University

Emmanuel Gabriel-Ohanu
University of Central Florida

Vipul Goyal
University of Central Florida

Shreyas Hegde
Duke University

Richard Lee Hollenbach, III
Duke University

Kristyn Blake Johnson
West Virginia University

Mohammed Ibrahim Kittur
University of Malaya

Brian Frederick Knisely
Pennsylvania State University

Amit Kumar
*Indian Institute of Technology
Bombay, Mumbai*

Austin Carl Matthews
Georgia Institute of Technology

Andrea Notaristefano
Politecnico di Milano

Antonio Escamilla Perejón
University of Seville

Hien Minh Phan
University of Oxford

CP Premchand
*Indian Institute of Technology
Bombay*

Avinash Ambadas Renuke
University of Genova, Italy

Alessandro Romei
Politecnico di Milano

Alexander J Rusted
The Pennsylvania State University

Izzet Sahin
Texas A&M University

Jainam Shah
Ahmedabad University

Aravind Chandh Velayuthapattnam Shanmugam
Georgia Institute of Technology

Ajey Singh
IIT Kharagpur

Spencer Jordan Sperling
The Ohio State University

Mohammed Aqeel Talikoti
Vesvesvaraya Technological University

Vamsi Krishna Undavalli
*Moscow Aviation Institute
(National Research University)*

Peter Ove Warren
University of Central Florida

Peter Hansen Wilkins
Pennsylvania State University

2021 Young Engineer Turbo Expo Participation Award Winners

Amrita Basak
Pennsylvania State University

Eva van Beurden
CoolII Sustainable Energy Solutions B.V

Xiao He
Imperial College

Richard Hollenbach
Duke University

Nikola Kafedzhiyski
Siemens Energy AB

Amit Kumar
*Indian Institute of Technology
Bombay*

Marcel Otto
University of Central Florida

Ajey Singh
*Indian Institute of Technology
Kharagpur*

Alberto Vannoni
University of Genoa

Peter Warren
University of Central Florida

Tingcheng Wu
Texas A&M University

STUDENT POSTER PRESENTERS

**Zihao Bao, Shenyang
Aerospace University**

GT2021-1317: *Unsteady Film Cooling Performance on the High Pressure Turbine Shroud Under Rotor-Stator Interaction for an Aero-Engine*

**Marco Casoni, Università
Di Padova**

GT2021-1300: *Transonic Cascade Optimization Under Variable Inlet Mach Number*

**Katerina Chagoya, University
of Central Florida**

GT2021-1268: *Harvesting Heat From Safer, Energy-Dense Slow Pyrolytic Mixtures for Future Space Missions*

Hyung-Hee Cho, Yonsei Univ

GT2021-1309: *Heat Transfer Enhancement by Additional Internal Structures at Impingement/Effusion Cooling*

GT2021-1315: *Effects of Extended Holes on Impingement/Effusion Cooling With a Hollow Cylinder Structure*

GT2021-1320: *Maximum Hot Gas Ingestion Through the Upstream Cavity of Axial Turbine With Double Rim Seal*

GT2021-1321: *Array Impingement/Effusion Cooling With Additively Manufactured Lattice Structure*

GT2021-1322: *Effect of Rotational Reynolds Number on Upstream and Downstream Rim Seal Cavity in 1.5 Stage Turbine*

GT2021-1324: *Effect of Inner Entrance Hole Size on Heat Transfer in Ribbed Leading Edge Channel*

**Matthew Demond, Georgia
Southern University**

GT2021-1313: *An Innovative Elasto-Hydrodynamic Seal Concept for Supercritical CO₂ Power Cycles*

**Antonio Escamilla Perejón,
University of Seville**

GT2021-1318: *Micro-Gas Turbine as Chemical Energy Storage*

**Jack Fergusson,
University of Georgia**

GT2021-1319: *Auto-Ignition of High-Pressure Hydrogen on Jet Engines and Prevention Methods*

**Angelos Gaitanis, Université
Catholique De Louvain-Institute of
Mechanics, Materials and Civil Eng**

GT2021-1311: *Towards Real Time Transient Mgt Performance Assessment: Effective Prediction Through Efficient Adaption of Component Maps*

Tim Hertwig, TU Braunschweig

GT2021-1310: *Simulation of the Condensation Phenomena in the Turbine of a Fuel Cell Turbocharger*

**Md Abir Hossain, The University
of Texas At El Paso**

GT2021-1314: *Modeling Spatial Uncertainty for Creep Resistant Alloy*

**Marina Kovaleva, Cardiff
University, School Of Engineering**

GT2021-1304: *The Development and Testing of an Ammonia/Hydrogen/methane Combustion System for a 50kw Micro Gas Turbine*

**Patrick Meyer, Technische
Universität Braunschweig**

GT2021-1305: *Design of Propellers for Electric Propulsion Systems*

**Yuki Mizushima,
Shizuoka University**

GT2021-440: *A Novel Thickness Measurement Method of Liquid Film in Air Flow via Optical-Fiber-Based Reflective Probe*

Norzaima Nordin, UPM

GT2021-1316: *Experimental Investigation of Savonius Wind Turbine Blade for Low Wind Speed Region*

**Catherine Julia Sophie Rau,
Institute of Jet Propulsion
and Turbomachinery**

GT2021-1302: *Simulation of the Particle Transport in the Fan Stage of a Jet Engine*

**Alberto Terragno,
University of Salento**

GT2021-1307: *Applying Fuzzy Logic to the Energy Management of a Hybrid Electric Rotorcraft for UAM*

**Antoine Verhaeghe,
University of Mons**

GT2021-1303: *Towards a Carbon Clean Micro Gas Turbine: Carbon Capture Penalty Reduction Using Exhaust Gas Recirculation*

Yaguang Wu, Beihang University

GT2021-1306: *Should We Also Consider Blade-Disk Coupling and Parameter Correlation When Designing Underplatform Dampers?*

THANK YOU

STUDENT POSTER COMPETITION POSTER JUDGES

The ASME IGTI Student Advisory Committee would like to take this opportunity to thank the Turbo Expo Student Poster Competition Session Judges for their diligent and meticulous judging efforts.

Marco Astolfi

Politecnico di Milano

Pete Loftus

Evalu8ion Ltd

Ward De Paepe

University of Mons (UMONS)

Arnab Roy

NETL - Leidos

Jeff Defoe

University of Windsor

Stephen Lynch

Penn State

Marc Polanka

AFIT

David Sánchez

University of Seville

Atul Kohli

Pratt & Whitney

Lorenzo Mazzei

Ergon Research

Fabrizio Reale

CNR - STMS

Lorenzo Tieghi

Sapienza University of Rome

VISIT OUR VIRTUAL BOOTH

ASME TURBO EXPO 2021

Flownex® provides turbomachinery engineers with an *easy to use, off-the-shelf tool* for modelling combustion chambers, secondary air systems, blade cooling flows, lubrication systems with oil-air mixtures, as well as overall cycle integration and operation.

For more information, visit:

<https://flownex.com/industries/gas-turbines/>

FLOWNEX®
SIMULATION ENVIRONMENT

SESSION PARTICIPANT

Information

Online Access to the Final Papers

All Technical Conference registrants are eligible to receive online access to the final papers. Presentations, such as panels, posters, tutorials, workshops, keynote, and plenary sessions that do not have an accompanying peer reviewed technical paper are considered to be “Oral Presentation Only” and do not appear in the online paper site.

Please note that this is NOT the official proceedings of the Conference, which is published after the Conference and is also made available online on the ASME Digital Collection at asmedigitalcollection.asme.org. As such, papers that appear in the system may not be cited until after the official Proceedings have been published.

Registration

As a non-profit organization, ASME requires all presenters to register for the conference and pay an appropriate registration fee.

Video on Demand (VOD)

All authors were required to submit a 30-minute presentation VOD. This VOD will be available on-demand on the virtual event platform 24 hours per day; seven days per week from June 1 until December 2021.

During the “live” sessions, authors will present in **one** of the following methods:

- “Live” **Deep Dive** Talk presentation which will be 20 minutes of a live author presentation (not to be an exact copy of the video content – the on-demand video will not be played or available to be played). Authors must be prepared to present “live”. Ten minutes will be allotted for question and answer (will not be recorded). In total there will be 30 minutes of time allocated per paper (20 minutes of live talk plus 10 minutes of question and answer).
- “Live” **Rapid Talk** presentations. Eight minutes of “live” summary of the paper plus two minutes of question and answer (will not be recorded). The on-demand video will not be played during the live session presentations.

The Turbo Expo 2021 Virtual Event will be available on-demand until December 2021.

KEEP UP WITH IGTI ON SOCIAL MEDIA



facebook.com/asmeigti



twitter.com/IGTI



instagram.com/asmeigti



linkedin.com/company/asme-international-gas-turbine-institute



linkedin.com/groups/4058160

COMMITTEE OFFICERS

Aircraft Engine

Konstantinos Kyprianidis

Current Chair

Oscar Kogenhop

Current Vice Chair

Ceramics

Rajesh S. Kumar

Current Chair

Prof Martin Bache

Current Vice Chair

Coal, Biomass & Alternative Fuels

Pierre Q. Gauthier

Current Chair

Dr Marina Braun-Unkloff

Current Vice Chair

Combustion, Fuels & Emissions

Christian Oliver Paschereit

Current Chair

Rudy Dudebout

Current Vice Chair & Incoming 2021 Chair

Dr. Sebastien Ducruix

Incoming 2021 Vice Chair

Controls, Diagnostics & Instrumentation

Liang Tang

Current Chair

Igor Loboda

Current Vice Chair

Cycle Innovations

Mario L. Ferrari

Current Chair

Panos Laskaridis

Current Vice Chair & Incoming 2021 Chair

Ward De Paepe

Incoming 2021 Vice Chair

Education

Subith Vasu

Current Chair

Ioanna Aslanidou

Current Vice Chair

Electric Power

John Gülen

Current Chair

Richard Tomlinson

Current Vice Chair

Fans and Blowers

Dr. Giovanni Delibra

Current Chair

Dr. Zhiping Wang

Current Vice Chair

Heat Transfer

Marc D. Polanka

Current Chair

Atul Kohli

Current Vice Chair

Industrial & Cogeneration

Francesco Melino

Current Chair

Clement Joly

Current Vice Chair & Incoming 2021 Chair

Sergio M. Camporeale

Incoming 2021 Vice Chair

Manufacturing Materials & Metallurgy

William David Day

Current Chair

Sascha Gierlings

Current Vice Chair

Marine

Jeffrey S. Patterson

Current Chair

Andy Cullis

Current Vice Chair

Microturbines, Turbochargers & Small Turbomachines

Fabrizio Reale

Current Chair

Jose Ramon Serrano

Current Vice Chair & Incoming 2021 Chair

Grant Musgrove

Incoming 2021 Vice Chair

Oil & Gas Applications

Klaus Brun

Current Chair

Mauro Venturini

Current Vice Chair & Incoming 2021 Chair

Jason Wilkes

Incoming 2021 Vice Chair

ORC Power Systems

Marco Astolfi

Current Chair

Michele Fontana

Current Vice Chair

Steam Turbine

Markus Schatz
Current Chair

Henning Almstedt
Current Vice Chair

Grant Ingram
Incoming 2021 Chair

Kane Chandler
Incoming 2021 Vice Chair

Structures & Dynamics

Michael Gorelik
Current Chair

Thomas Weiss
Current Vice Chair

Student Advisory

Deepanshu Singh
Current Chair

Mavroudis Kavvalos
Current Vice Chair & Incoming 2021 Chair

Supercritical CO₂

Grant Musgrove
Current Chair

Nathan Weiland
Current Vice Chair & Incoming 2021 Chair

Timothy Allison
Incoming 2021 Vice Chair

Turbomachinery

Dale Van Zante
Current Chair

Luca Porreca
Current Vice Chair & Incoming 2021 Chair

Dr. Bronwyn Power
Incoming 2021 Vice Chair

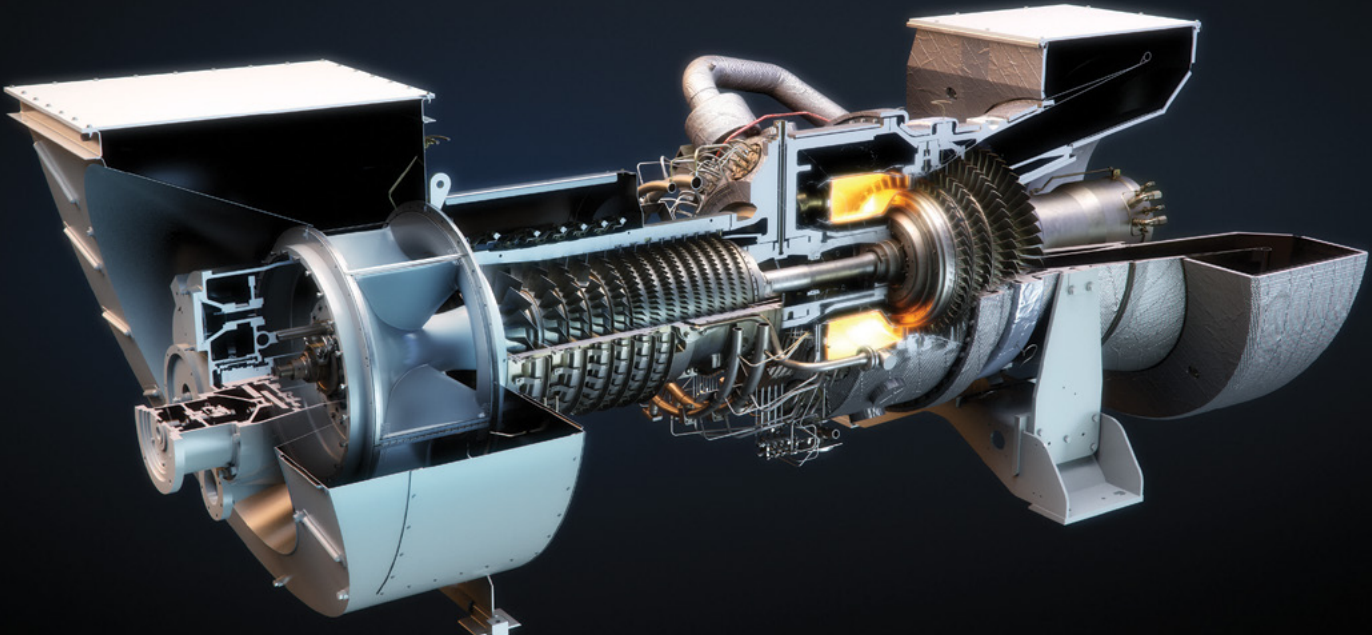
Wind Energy

Alessandro Bianchini
Current Chair

Alexandrina Untaroiu
Current Vice Chair

Juan Carlos Juaregui Correa
Incoming 2021 Chair

Giacomo Persico
Incoming 2021 Vice Chair



Solar® Turbines
A Caterpillar Company

WWW.SOLARTURBINES.COM

ENGINEERING EXCELLENCE

EXHIBIT ADVISORY COMMITTEE ROSTER

Mission: To assist in the growth and expansion of the Turbo Expo exhibit with continued support to exhibiting companies and ASME IGTI

expositions staff. Representatives serve as experts for fielding questions and providing resources and initiatives for continued success of the exposition.

Frederic Bouchet

MMP Technology/BINC Industries

5579 Spellmire Dr
West Chester, Ohio 45246 USA

Term: 2020-2024

Dr. Leonid Moroz

SoftInWay Inc.

15 New England Executive Park
Burlington, Massachusetts 01803 USA

Term: 2018-2021

Kate Guerrina

Concepts NREC

217 Billings Rd
White River, Junction, Vermont 05001 USA

Term: 2020-2024

Dr. Jakob Hermann

IfTA Systems GmbH

Junkersstrasse 8
D-82178 Puchheim, Germany

Term: 2018-2021

Kristin Barranger

ASME International Gas Turbine Institute

barrangerk@asme.org

Term: Staff Liaison

If you are interested in joining this committee,
contact Kristin Barranger at igtiexpo@asme.org.

POINT CONTACTS AND VANGUARD CHAIRS

Aircraft Engine

Parthiv Shah, *ATA Engineering, Inc.*
Konstantinos Kyprianidis, *Mälardalen University*
Oscar Kogenhop, *NLR*
Vassilios Pachidis, *Cranfield University*

Ceramics and Ceramic Composites

Kumar Rajesh, *United Technologies Research Ctr*

Coal, Biomass, Hydrogen & Alternative Fuels

Angela Serra, *Baker Hughes*
Pierre Gauthier, *Siemens Energy*
Marina Braun-Unkhoff, *German Aerospace Center (DLR)*

Combustion, Fuels & Emissions

Gilles Bourque, *Siemens Energy Canada Limited*
Jacqueline O'Connor, *Pennsylvania State University*
Adnan Eroglu, *Siemens Energy*
Christian Oliver Paschereit, *Technische Universität Berlin*
Rudy Dubebout, *Honeywell*

Controls, Diagnostics & Instrumentation

Liang Tang, *Pratt & Whitney*
Peter Loftus, *Evalu8ion Ltd*
Igor Loboda, *National Polytechnic Inst*
Lorenzo Ferrari, *University of Pisa - DESTEC*
Lubomir Ribarov, *Pratt & Whitney*

Cycle Innovations

Mario Luigi Ferrari, *University of Genoa*
Panagiotis Laskaridis, *Cranfield University*
Ward De Paepe, *University of Mons*

Cycle Innovations: Energy Storage

Klaus Brun, *Elliot Turbines*
David Sánchez, *University of Seville*
Tim Allison, *Southwest Research*

Education

Subith Vasu, *University of Central Florida*
Ioanna Aslanidou, *Mälardalen University*

Electric Power

Bin Zhou, *FM State Global*
John Gulen, *Bechtel Infrastructure & Power, Inc.*
Thomas Christiansen, *Strategic Power Systems Inc*
Rick Tomlinson, *Chevron*

Fans and Blowers

Giovanni Delibra, *Sapienza University of Rome*
Zhiping Wang, *Morrison Products Inc*
Johan Van der Spuy, *Stellenbosch University*
Alessandro Corsini, *Sapienza University of Rome*
Chunill Hah, *NASA Glen Research Center*

Heat Transfer: Combustors

Steve Burd, *Pratt & Whitney*
Steve Lynch, *The Pennsylvania State University*
Eric J. Ruggiero, *GE Aviation*

Heat Transfer: Film Cooling

Lamyaa El-Gabry, *Princeton University*
Jay Rutledge, *University of Texas*
Eric J. Ruggiero, *GE Aviation*

Heat Transfer: General Interest

Riccardo Da Soghe, *Baker Hughes*

Alexander Mirzamoghadam, *Northrop Grumman*

Eric J. Ruggiero, *GE Aviation*

Heat Transfer: Internal Air Systems

Axel Glahn, *Pratt & Whitney*

Peter Smout, *Rolls Royce*

Eric J. Ruggiero, *GE Aviation*

Heat Transfer: Internal Cooling

Lesley Wright, *Texas A&M University*

Harika Kahveci, *Middle East Technical University*

Eric J. Ruggiero, *GE Aviation*

Heat Transfer: Tutorials

Andrew Nix, *West Virginia University*

Eric J. Ruggiero, *GE Aviation*

Industrial & Cogeneration

Francesco Melino, *University of Bologna*

Clement Joly, *SoftInWay, Inc*

Sergio Camporeale, *Politecnico di Bari*

Lisa Branchini, *University of Bologna*

Manufacturing Materials & Metallurgy

William David Day, *W. David Day Inc*

Sascha Gierlings, *Fraunhofer-Institute
for Production Technology*

Marine

Jeffrey Patterson, *NAVSEA*

Andy Cullis, *Woodward*

Microturbines, Turbochargers & Small Turbomachines Microturbines & Small Turbomachines

Fabrizio Reale, *Istituto Motori, CNR*

José Ramon Serrano Cruz, *Universitat
Politécnica De València*

**Pioneering
high-performance
driveline solutions**

Torquemeters

Couplings

Torquemeters

Drivelines

Permanent-magnet motors

Test rigs

torquemeters.com

Oil & Gas Applications

Klaus Brun, *Elliott Group*

Mauro Venturini, *Università degli Studi di Ferrara*

Steam Turbine

Henning Almstedt, *Siemens AG*

Grant Ingram, *GE Power*

Kane Chandler, *GE Power*

Structures and Dynamics: Aerodynamics Excitation & Damping

S. Stapelfeldt, *Imperial College London Chair*

Mateusz Golebiowski, *GE*

Thomas Weiss, *Rolls Royce*

Michael Gorelik, *FAA*

Structures and Dynamics: Bearing & Seal Dynamics

Adolfo Delgado, *Texas A&M*

Mateusz Golebiowski, *GE*

Thomas Weiss, *Rolls Royce*

Michael Gorelik, *FAA*

Structures and Dynamics: Emerging Methods in Design & Eng.

Partha Das, *Honeywell International, Inc.*

Mateusz Golebiowski, *GE*

Thomas Weiss, *Rolls Royce*

Michael Gorelik, *FAA*

Structures and Dynamics: Fatigue, Fracture & Life Prediction

A. Ramaglia, *Ansaldo*

Mateusz Golebiowski, *GE*

Thomas Weiss, *Rolls Royce*

Michael Gorelik, *FAA*

Structures and Dynamics: Probabilistic Methods

Liping Wing, *GE Corp Research*

Mateusz Golebiowski, *GE*

Thomas Weiss, *Rolls Royce*

Michael Gorelik, *FAA*

Structures and Dynamics: Rotordynamics

Ted Brockett, *Honeywell*

Mateusz Golebiowski, *GE*

Thomas Weiss, *Rolls Royce*

Michael Gorelik, *FAA*

Structures and Dynamics: Structural Mechanics & Vibration

Mateusz Golebiowski, *GE*

Thomas Weiss, *Rolls Royce*

Michael Gorelik, *FAA*

Azzedine Dadouche, *National Research Council Canada*

Student Advisory

Deepanshu Singh, *University of Oxford*

Mavroudis Kavvalos, *Mälardalen University*

Shawn Siroka, *Penn State University*

Manas Payyappalli, *Indian Institute of Technology Bombay*

Student Poster

Deepanshu Singh, *University of Oxford*

Mavroudis Kavvalos, *Mälardalen University*

Shawn Siroka, *Penn State University*

Manas Payyappalli, *Indian Institute of Technology Bombay*

Supercritical CO₂

Grant Musgrove, *Southwest Research Institute*

David Sanchez, *AICIA*

Turbomachinery: Axial Flow Fan & Compressor Aerodynamics

Bronwyn Power, *Pratt & Whitney*

Turbomachinery: Axial Flow Turbine Aerodynamics

Emil Göttlich, *Graz University of Technology*

Turbomachinery: Deposition, Erosion, Fouling, and Icing

Jeffrey Bons, *Ohio State University*

Turbomachinery: Design Methods & CFD Modeling for Turbomachinery

Mahmoud L. Mansour, *Honeywell International Inc*

Turbomachinery: Ducts, Noise & Component Interactions

Jeff Defoe, University of Windsor

Turbomachinery: Multidisciplinary Design Approaches, Optimization, and Uncertainty Quantification

Ingrid Lepot, Cnraero

Turbomachinery: Radial Turbomachinery Aerodynamics

Hamid Hazby, Mercedes AMG High Performance Powertrains

Turbomachinery: Turbomachinery General Interest

Luca Porreca, MAN Energy Solutions Schweiz AG

Turbomachinery: Tutorials

Andreas Peters, GE Aviation

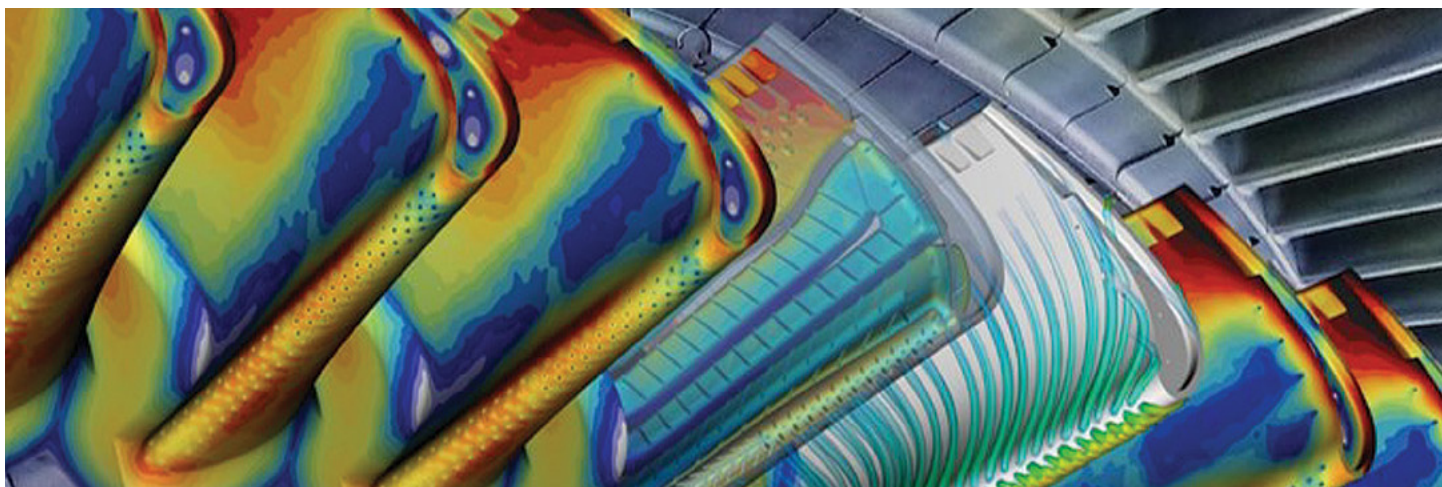
Turbomachinery: Unsteady Flows in Turbomachinery

Natalie Smith, Southwest Research Institute

Wind Energy

Alessandro Bianchini, University of Florence

Alexandrina Untaroiu, Virginia Tech



WHERE ENGINEERING MEETS TOMORROW

Simcenter

How do you thrive in a changing market? Simcenter gives you the power to accurately predict performance and rapidly explore design alternatives. From design start to first fire through to field operations, find out how our solutions can support you at every stage of your digital journey.

[siemens.com/simcenter](https://www.siemens.com/simcenter)

SIEMENS

REGISTRATION INFORMATION



Be sure to register for ASME Turbo Expo as soon as possible to avoid delays in accessing the virtual event platform as well as access to the online paper site. Continue reading to see the full details on rates and benefits.

REGISTRATION

Technical Conference Registration

- Access to every session in the Technical Conference
- Online access to the Turbo Expo 2021 Final Papers
- Professional Development Hours (PDHs) Certificate
- Admission to the following networking events:
 - Welcome & Keynote (June 7)
 - Tuesday Plenary Panel: Opening up the Design Space to Afford Efficient Gas Turbines Using H2 and Biofuels (June 8)
 - Wednesday Plenary Panel: Opening up the Design Space Through Computations and Machine Learning (June 9)
 - Thursday Plenary Panel: Engineering in 2030 – How Must Our Educational Programs Change to Better Equip the Needed Workforce (June 10)
 - Exhibition (June 7 – 11)

Conference Proceedings

Printed volumes of the official Conference Proceedings may be ordered after the Conference by emailing customercare@asme.org or by calling **1-800-THE-ASME**. All ASME Conference Proceedings are submitted for indexing to the Engineering index, which publishes COMPENDEX, SCOPUS, and a host of other indexing databases. Proceedings are also submitted to ISI for indexing in the Thomson Reuters Conference Proceedings Citation Index. Only presented papers are submitted.

Free ASME Membership

Non-member registration categories, without a discount applied, are eligible to receive a one-year complimentary ASME Membership.

Technical Papers

The collection of the technical papers accepted for presentation and publication are posted online. Presentations, such as panels or posters that do not have an accompanying paper are considered to be “Oral Presentation Only” and do not appear in the system. Please note that this is NOT the official proceedings of the Conference, which is published after the Conference and is also made available online on the ASME Digital Collection at asmedigitalcollection.asme.org. As such, papers that appear in the system may not be cited until after the official Proceedings have been published.

The Next Generation of Data Acquisition and Analysis



LOCATE



CONFIGURE



RECORD



ANALYZE

Utilize Network discovery technology to easily locate, configure, record and analyze data streams from a variety of hardware simultaneously. Acquire Time-synchronized data from a network of digitizers, regardless of sample rate or sensor type. Work with hardware from industry-leading brands Datatel, National Instruments, VTI Instruments/Ametek, Prime Photonics and Scanivalve.



<https://apexturbine.com/nextgendaq/>



TUTORIALS OF BASICS & JOINT SESSIONS

A **Tutorial of Basics** covers a basic topic within the coverage area of a committee. The goal of a tutorial of basics is to present an 'Introduction to a track, allowing a typical turbo expo attendee to understand the basics in that particular area. Dates and times listed are in the **Eastern Time Zone**.

Tutorials of Basics

01 Aircraft Engine

Friday, June 11 9:45 - 11:15 am

* **01-09**, Basics of Turboshaft Engine Cycle Design and Optimization

Presented by: Taylan Ercan, *Middle East Technical University*

03 Coal, Biomass, Hydrogen and Alternative Fuels

Thursday, June 10 4:00 - 5:30 pm

03-06, Life Cycle Assessment Basics and Application to Optimize the Environmental Sustainability of Gas Turbines During New Product Development

Presented by: Angela Serra, *Baker Hughes*

04 Combustion, Fuels & Emissions

Monday, June 7 9:45 - 11:15 am

* **04-00**, Combustion Dynamics Tutorial

Presented by: Jacqueline O'Connor, *Pennsylvania State University*

06 Cycle Innovations

Thursday, June 10 2:15 - 3:45 pm

* **06-05**, Power Plant State of the Art Solutions for Enhanced Flexibility and Energy Storage

Presented by: Alberto Traverso, *University Of Genova*

07 Cycle Innovations - Energy Storage

Tuesday, June 8 4:00 - 5:30 pm

* **07-02**, Hydrogen for Power and Energy Storage

Presented by: Stefan Cich, *Southwest Research Institute*

Wednesday, June 9 4:00 - 5:30 pm

* **07-03**, Overview of Grid-Scale Energy Storage Systems and Technologies

Presented by: Timothy Allison, *Southwest Research Institute*

10 Fans and Blowers

Thursday, June 10 9:45 - 11:15 am

* **10-04**, Artificial Neural Networks: From Basics to Turbomachinery Applications

Presented by: Lorenzo Tieghi, *Sapienza University of Rome*

16 Heat Transfer: Tutorials

Wednesday, June 9 2:15 - 3:45 pm

* **16-01**, Secondary Flow and End-wall Losses in Turbine Passages

Presented by: Om Sharma, *Raytheon Technologies Research Center*

17 Industrial & Cogeneration

Wednesday, June 9 9:45 - 11:15 am

* **17-03**, Combustion and Emissions Tutorial

Presented by: Mike Klassen, *Combustion Science & Engineering, Inc.*

* This tutorial will NOT have a video on demand (VOD). This is a "live" tutorial presentation.

18 Manufacturing Materials & Metallurgy

Wednesday, June 9 12:15 - 1:45 pm

* **18-08**, Metallurgy for the Non-Metallurgist

Presented by: Paul Lowden,
Liburdi Engineering Ltd

Thursday, June 10 12:15 - 1:45 pm

* **18-09**, Materials Selection for Turbomachinery in Oil and Gas Applications

Presented by: Derrick Bauer,
Elliott Company

21 Oil & Gas

Tuesday, June 8 2:15 - 3:45 pm

* **21-05**, Wet Gas Compression Considerations

Presented by: Griffin Beck,
Southwest Research Institute

Thursday, June 11 2:15 - 3:45 pm

* **21-06**, Oil and Gas Applications for Turbomachinery

Presented by: Rainer Kurz,
Solar Turbines

Joint Sessions

Wednesday, June 9 2:15 – 3:45 pm

04-20, Combustor Wall Cooling: A Joint Session between the Combustion, Fuels & Emissions and the Heat Transfer Committee

Friday, June 11 2:15 – 3:45 pm

05-03, Topics in Instrumentation: A Joint Session between the Aircraft Engine Committee and the Controls, Diagnostics & Instrumentation Committee

28 Structures & Dynamics

Monday, June 7 2:15 - 3:45 pm

* **28-03**, Probabilistic Methods

Presented by: Gavin Jones, *SmartUQ*

33 Supercritical CO₂

Monday, June 7 4:00 - 5:30 pm

* **33-18**, Heat Exchangers for Supercritical CO₂ Power Cycle Applications

Presented by: Michael Marshall,
Southwest Research Institute

Tuesday, June 8 9:45 - 11:15 am

* **33-14**, Materials for Supercritical Carbon Dioxide Applications

Presented by: Henry Saari,
Carleton University

42 Turbomachinery Tutorials

Monday, June 7 12:15 - 1:45 pm

42-01, Introduction to Cycle Design of Conventional and Hybrid-Electric Aero Engines

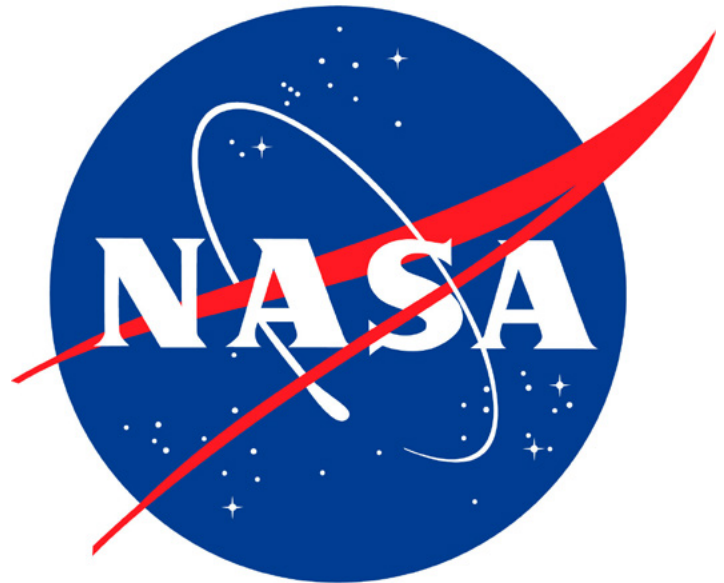
Presented by: Pieter Dermont,
Modelon Inc.

44 Wind Energy

Wednesday, June 9 4:00 - 5:30 pm

* **44-02**, Recent Developments in Wind Turbine Technology and Research

Presented by: Alessandro Bianchini,
Università degli Studi di Firenze



* This tutorial will NOT have a video on demand (VOD). This is a "live" tutorial presentation.

SCHEDULE AT A GLANCE

Times listed are in Eastern Time

JUNE 7 Monday	JUNE 8 Tuesday	JUNE 9 Wednesday	JUNE 10 Thursday	JUNE 11 Friday
<u>Welcome & Keynote</u> 8:00 - 9:30am	<u>Plenary: Opening up the Design Space to Afford Efficient Gas Turbines Using H₂ and Biofuels</u> 8:00 - 9:00am Awards 9:00 - 9:30am	<u>Plenary: Opening up the Design Space Through Computations and Machine Learning</u> 8:00 - 9:00am Awards 9:00 - 9:30am	<u>Plenary: Engineering in 2030 – How Must Our Educational Programs Change to Better Equip the Needed Workforce</u> 8:00 - 9:00am Awards 9:00 - 9:30am	Scholar Lecture by Dr. Zoltan S Spakovszky, MIT 8:00 - 9:00am Awards 9:00 - 9:15am See YOU in 2022! 9:15 - 9:30am
Break – Visit the <u>Exhibits, Sponsors, Student Posters</u>, Create your own Roundtable Discussions: 9:30 – 9:45 am				
Live 5-Paper Session 2-Deep Dive Talks 9:45 – 10:45am 3-Rapid Talks 10:45 - 11:15am	Live 5-Paper Session 2-Deep Dive Talks 9:45 – 10:45am 3-Rapid Talks 10:45 - 11:15am	Live 5-Paper Session 2-Deep Dive Talks 9:45 – 10:45am 3-Rapid Talks 10:45 - 11:15am	Live 5-Paper Session 2-Deep Dive Talks 9:45 – 10:45am 3-Rapid Talks 10:45 - 11:15am	Live 5-Paper Session 2-Deep Dive Talks 9:45 – 10:45am 3-Rapid Talks 10:45 - 11:15am
Lunch, Dinner, Midnight Snack, <u>Student Posters</u>, Visit <u>Exhibit & Sponsors</u>, or Create your own Roundtable Discussions 11:15am – 12:15pm	Women in Engineering Networking Event 11:30am – 12:00pm Lunch, Dinner, Midnight Snack, <u>Student Posters</u>, Visit <u>Exhibit & Sponsors</u>, or Create your own Roundtable Discussions 11:15am – 12:15pm	Lunch, Dinner, Midnight Snack, <u>Student Posters</u>, Visit <u>Exhibit & Sponsors</u>, or Create your own Roundtable Discussions 11:15am – 12:15pm		
Live 5-Paper Session 2-Deep Dive Talks 12:15 – 1:15pm 3-Rapid Talks 1:15 – 1:45pm	Live 5-Paper Session 2-Deep Dive Talks 12:15 – 1:15pm 3-Rapid Talks 1:15 – 1:45pm	Live 5-Paper Session 2-Deep Dive Talks 12:15 – 1:15pm 3-Rapid Talks 1:15 – 1:45pm	Live 5-Paper Session 2-Deep Dive Talks 12:15 – 1:15pm 3-Rapid Talks 1:15 – 1:45pm	Live 5-Paper Session 2-Deep Dive Talks 12:15 – 1:15pm 3-Rapid Talks 1:15 – 1:45pm
Break – Visit the <u>Exhibits, Sponsors, Student Posters</u>, Create your own Roundtable Discussions: 1:45 – 2:15 pm				
Live 5-Paper Session 2-Deep Dive Talks 2:15 – 3:15pm 3-Rapid Talks 3:15 – 3:45pm	Live 5-Paper Session 2-Deep Dive Talks 2:15 – 3:15pm 3-Rapid Talks 3:15 – 3:45pm	Live 5-Paper Session 2-Deep Dive Talks 2:15 – 3:15pm 3-Rapid Talks 3:15 – 3:45pm	Live 5-Paper Session 2-Deep Dive Talks 2:15 – 3:15pm 3-Rapid Talks 3:15 – 3:45pm	Live 5-Paper Session 2-Deep Dive Talks 2:15 – 3:15pm 3-Rapid Talks 3:15 – 3:45pm
Break – Visit the <u>Exhibits, Sponsors, Student Posters</u>, Create your own Roundtable Discussions: 3:45 – 4:00 pm				
Live 5-Paper Session 2-Deep Dive Talks 4:00 – 5:00pm 3-Rapid Talks 5:00 – 5:30pm	Live 5-Paper Session 2-Deep Dive Talks 4:00 – 5:00pm 3-Rapid Talks 5:00 – 5:30pm	Live 5-Paper Session 2-Deep Dive Talks 4:00 – 5:00pm 3-Rapid Talks 5:00 – 5:30pm	Live 5-Paper Session 2-Deep Dive Talks 4:00 – 5:00pm 3-Rapid Talks 5:00 – 5:30pm	Live 5-Paper Session 2-Deep Dive Talks 4:00 – 5:00pm 3-Rapid Talks 5:00 – 5:30pm

SCHEDULE SUBJECT TO CHANGE

SESSION SCHEDULE

Session ID Key

The session ID is comprised of the track number and session number from the conference webtool.

- Consult pages XXX – XXX for the detailed technical conference schedule.
- All Tutorials of Basics sessions are listed on page XXX.
- All sessions are conducted in the English language.

Technical Sessions

These sessions are comprised of papers that have undergone a strict peer review process.

Tutorial Sessions

A Tutorial of Basics session covers a basic topic within the coverage area of a committee. The goal of a tutorial of basics is to present an 'Introduction to a track, allowing a typical turbo expo attendee to understand the basics in that particular area.

Panel Sessions

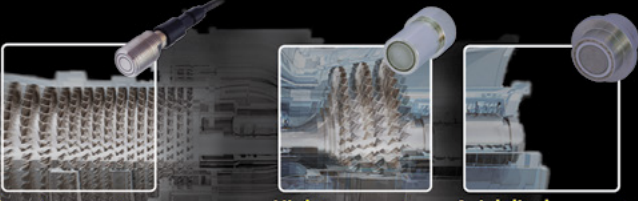
These are discussions organized by committee chairs/track chairs made up of industry leaders that focus on a subject.

*A complete solution for Turbomachinery
from the Leader in Capacitive Technology*

FOGALE turbo


Blade Clearance & Vibration Measurements

Capacitive sensors
for low & high temperature applications

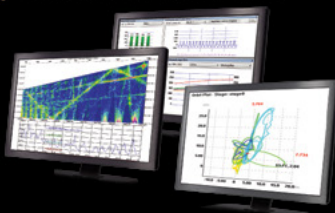


Low temperature High temperature Axial displacement

Integrated system
for testing & monitoring



Dedicated software
for real-time tip-clearance
& vibration measurements



- Proprietary Sensors, Electronics and Analysis Software
- Comprehensive sensor range for temperatures up to 1400°C (2552°F)
- Blade and shaft monitoring for Aeroengines and Powergen
- Test bench and on-site continuous operation
- Static & Dynamic measurements
- Worldwide customer base including the top manufacturers

FOGALE turbo • <https://www.fogale.com/turbomachinery/> • +33 (0)466 620 555 • info@fogale.com

SESSION SCHEDULE

(Continued)

The following VODs are not available on the virtual event platform.
The authors will be available during the “live” session.

<i>Paper No.</i>	<i>Paper Title</i>	<i>Session Title</i>	<i>Date & Time</i>
GT2021-59470	Gt36 Turbine Development And Full-Scale Validation	09-02: Gas Turbine and Power Plant	June 8 2:15 - 3:45 pm
GT2021-59457	Turn-Down Capability Of Ansaldo Energia's Gt26	09-02: Gas Turbine and Power Plant	June 8 2:15 - 3:45 pm
GT2021-59042	Gt26 2006 Turbine Stage 1 Blade Reconditioning Development And Qualification At Ansaldo Repair Centre	18-04 Repair and Welding	June 8 4:00 - 5:30 pm
GT2021-59546	Design And Validation Of A Novel Turbogenerator's Robotized Inspection System	05-01 Topics in Control & Automation	June 9 2:15 - 3:45 pm
GT2021-59074	Center Body Burner For Sequential Combustion: Superior Performance At Lower Emissions	04-15 Dry Low-NOx Combustor Development and Emissions	June 9 4:00 - 5:30 pm
GT2021-58903	Delay Identification In Thermoacoustics	04-09 Combustion Dynamics: Low-Order Modelling	June 10 2:15 - 3:45 pm
GT2021-58650	Hydrogen Blending Into Ansaldo Energia Ae94.3a Gas Turbine: High Pressure Tests, Field Experience And Modelling Considerations	04-19 Novel Combustion Concepts	June 11 12:15 - 1:45 pm
GT2021-59063	Modelling Of Turbulent Premixed Ch ₄ /H ₂ /Air Flames Including The Influence Of Stretch And Heat Losses	04-13 Combustion Modelling I	June 11 9:45 - 11:15 am
GT2021-59163	Experimental Investigations Into The Effect Of Surface Roughness And Contact Force On Leakage Between Two Rigid Metallic Surfaces	14-03 Rotating Cavities and Rim Seals	June 11 9:45 - 11:15 am

Turbo Expo Technical Conference Program Information

Sessions are detailed vertically. The top rows contain general information, and the bottom rows list the organizer and paper details. The name of the presenting author is underlined. Presentation start times are noted to the left. Deep Dive presentations are 30 minutes. Rapid Talk presentations are for 10 minutes.

Column Detail

COMMITTEE NAME	
Session Title	
Session Type • Session ID	
Session Chair, Affiliation Session Co-Chair, Affiliation	
Presentation Time	ASME Paper Number Pres Type Paper Title FirstAuthor Name ¹ SecondAuthor Name ² ThirdAuthor Name ¹ 1. First Affiliation; 2. Second Affiliation

Example

HEAT TRANSFER: COMBUSTORS	
Combustor Heat Transfer and Effusion Cooling	
Technical Session • 11-01	
Session Organizer: Nagaraja Rudrapatna , Honeywell Session Co-Chairs: Steven Burd , Pratt & Whitney; David Flodman , Mitsubishi Heavy Industries America; Andrew Nix , West Virginia University	
9:45	GT2021:59687 Deep Dive High-resolution Thermal Profiling of a Combustor in a Non-dedicated Test Using Thermal History Coatings David Peral ¹ <u>Solon Karagiannopoulos</u> ¹ Christoph Benninghoven ² David Kluß ² Silvia Araguas-Rodriguez ¹ Ahmed Zaid ¹ Robert Krewinkel ² Jörg Feist ¹ 1. Sensor Coating Systems Ltd, United Kingdom; 2. MAN Energy Solutions SE, Germany
10:45	GT2021:59217 Deep Dive Analysis of Swirl Number Effects on Effusion Flow Behaviour Using Time Resolved PIV <u>Tommaso Lenzi</u> , Alessio Picchi, Antonio Andreini, Bruno Facchini University of Florence, Italy
10:45	GT2021:59384 Rapid Talk Reduced-order Models for Effusion Modeling in Gas Turbine Combustors Simone Paccati, Lorenzo Mazzei, Bruno Facchini, Antonio Andreini University of Florence, Italy

KEYNOTE & PLENARIES

Keynote: Sustainable Energy – Accelerating the Transition by Advancing Turbine Technology

Plenary Session •46-01

Sustainable Energy – Accelerating the Transition by Advancing Turbine Technology

Dr. Michael E. Webber

Chief Science and Technology Officer, ENGIE

8:00

8:30

9:00

	AIRCRAFT ENGINE	COAL, BIOMASS, HYDROGEN AND ALTERNATIVE FUELS	COMBUSTION, FUELS AND EMISSIONS
	Advanced Future Engine Technologies (Combines Combustion and Emissions, Novel Concepts, and Hybrid Aero Engines)	Hydrogen	CFE Tutorial of Basics
	Technical Session • 01-01	Technical Session • 03-02	Tutorial Session • 04-00
	Session Organizer: Antonio Ficarella , University of Salento Session Co-Chairs: Stefan Bretschneider , MTU Aero Engines North America Inc.; Jacopo Tacconi , Rolls-Royce plc; Andrew Nix , West Virginia University	Session Organizer: Angela Serra , Baker Hughes - Nuovo Pignone Session Co-Organizer: Marina Braun-Unkhoff , Institute of Combustion Technology	Session Organizer: Jacqueline O'Connor , Pennsylvania State University Session Co-Organizer: Timothy Lieuwen , Georgia Institute of Technology
9:45	GT2021:59526 Deep Dive On the Use of an Inflatable Rubber Lip to Improve Reverse Thrust Flow Field in a Variable Pitch Fan David John Rajendran, Vassilios Pachidis <i>Cranfield University, United Kingdom</i>	GT2021:59842 Deep Dive Numerical Investigation of Potential Cause of Instabilities in a Hydrogen Micromix Injector Array Xiaoxiao Sun ¹ David Abbott ¹ Abhay Vir Singh ¹ Pierre Gauthier ² Bobby Sethi ¹ 1. Cranfield University, United Kingdom; 2. Siemens Energy, Canada	GT2021:63922 Tutorial Combustion Dynamics Tutorial Jacqueline O'Connor ¹ Timothy Lieuwen ² 1. Pennsylvania State University, USA; 2. Georgia Institute of Technology, USA ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".
10:15	GT2021:59500 Deep Dive On the Shaft Speed Selection of Parallel Hybrid Aero Engines Michael Sielemann ¹ Jesse Gohl ² Xin Zhao ³ Konstantinos Kyprianidis ⁴ Giorgio Valente ⁵ Sharmila Sumsurooah ⁶ 1. Modelon, Germany; 2. Modelon, USA; 3. Chalmers University of Technology, Sweden; 4. Mälardalen University, Sweden; 5. Romax Technology, Hexagon Manufacturing Intelligence, United Kingdom; 6. University of Nottingham, United Kingdom	GT2021:59777 Deep Dive Prediction of Pressure Rise in a Gas Turbine Exhaust Duct Under Flameout Scenarios While Operating on Hydrogen and Natural Gas Blends Priyank Saxena ¹ Orlando Ugarte-Almeyda ² Suresh Menon ² Wayne Rattigan ³ Paul Winstanley ⁴ Michel Akiki ⁵ Terry R. Tarver ⁵ 1. Solar Turbines, Caterpillar, USA; 2. Georgia Institute of Technology, USA; 3. Health and Safety Laboratory, United Kingdom; 4. Energy Technologies Institute, United Kingdom; 5. Solar Turbines Inc., USA	T U T O R I A L
10:45	GT2021:58751 Rapid Talk Provision of Rotating Spindle in Simplex Atomizer to Improve Spray Atomization. Kushal Gbate <i>Indian Institute of Technology, Madras, India</i>	GT2021:58870 Rapid Talk Laminar Flame Speed Measurements of Hydrogen/natural Gas Mixtures for Gas Turbine Applications Gihun Kim, Subith Vasu, Ritesh Ghorpade <i>University of Central Florida, USA</i>	
10:55	GT2021:58658 Rapid Talk Influence of Atomization Characteristics on Lean Blow-out Limits in a Gas Turbine Combustor Xiwei Wang, Yong Huang, Lei Sun, Donghui Wang, Yunfeng Liu <i>Beihang University, China</i>	GT2021:59844 Rapid Talk Thermoacoustic Behaviour of a Hydrogen Micromix Aviation Gas Turbine Combustor Under Typical Flight Conditions David Abbott ¹ Giannotta Alessandro ¹ Xiaoxiao Sun ¹ Pierre Gauthier ² Bobby Sethi ¹ 1. Cranfield University, United Kingdom; 2. Siemens Energy, Canada	
11:15	GT2021:58945 Rapid Talk Multi-Objective Optimization of Aero Engine Combustor Adopting an Integrated Procedure for Aero-thermal Preliminary Design Carlo Alberto Elmi ¹ Hauke Reese ² Ignazio Vitale ³ Antonio Andreini ¹ 1. University of Florence, Italy; 2. Ansys Germany, Germany; 3. AvioAero - a GE Aviation Business, Italy		

	COMBUSTION, FUELS AND EMISSIONS	HEAT TRANSFER: COMBUSTORS	INDUSTRIAL AND COGENERATION
	Ignition	Combustor Heat Transfer and Effusion Cooling	Energy Systems I
	Technical Session • 04-03	Technical Session • 11-01	Technical Session • 17-01
	Session Organizer: Ponnuthurai Gokulakrishnan , LPP Combustion LLC	Session Organizer: Nagaraja Rudrapatna , Honeywell Session Co-Chairs: Steven Burd , Pratt & Whitney; David Flodman , Mitsubishi Heavy Industries America; Andrew Nix , West Virginia University	Session Organizer: Clement Joly , Softinway, Inc
9:45	GT2021:59380 Deep Dive LES Based CFD Investigation of the Ignition Process in a Lean Spray Burner Antonio Andreini, <u>Matteo Amerighi</u> , Lorenzo Palanti, Bruno Facchini <i>University of Florence, Italy</i>	GT2021:59687 Deep Dive High-resolution Thermal Profiling of a Combustor in a Non-dedicated Test Using Thermal History Coatings David Peral ¹ Solon Karagiannopoulos ¹ Christoph Benninghoven ² David Kluß ² Silvia Araguas-Rodriguez ¹ Ahmed Zaid ¹ Robert Krewinkel ² Jörg Feist ¹ 1. Sensor Coating Systems Ltd, United Kingdom; 2. MAN Energy Solutions SE, Germany	GT2021:59218 Deep Dive Optimal Design of Renewable Hydrogen Production for Gas Turbine Test Facilities Maria Alessandra Ancona, Michele Bianchi, Lisa Branchini, Andrea De Pascale, <u>Federico Ferrari</u> , Francesco Melino, Antonio Peretto <i>University of Bologna, Italy</i>
10:15	GT2021:58770 Deep Dive A Computationally Efficient Method That Predicts Light-around for Both Gas- and Liquid-fueled Combustion Ellen Meeks, Chitralkumar Naik, Giuliana Litrico, Samir Rida <i>Ansys, Inc., USA</i>	GT2021:59217 Deep Dive Analysis of Swirl Number Effects on Effusion Flow Behaviour Using Time Resolved PIV <u>Tommaso Lenzi</u> , Alessio Picchi, Antonio Andreini, Bruno Facchini <i>University of Florence, Italy</i>	GT2021:58560 Deep Dive Evaluation of Performance Gain by Interstage Injection in a Four-stage Axial Compressor <u>Tobias Doerr</u> , Sebastian Schuster, Dieter Brillert <i>University Duisburg-Essen, Germany</i>
10:45	GT2021:58699 Rapid Talk Spark Ignition of SPP Injector Under Sub-atmospheric Conditions <u>Qianpeng Zhao</u> , Yong Mu, Jinhu Yang, Yulan Wang, Gang Xu <i>Institute of Engineering Thermophysics, Chinese Academy of Sciences, China</i>	GT2021:59384 Rapid Talk Reduced-order Models for Effusion Modeling in Gas Turbine Combustors Simone Paccati, Lorenzo Mazzei, Bruno Facchini, Antonio Andreini <i>University of Florence, Italy</i>	GT2021:58718 Rapid Talk Impact on Cycle Efficiency of Small Combined Heat and Power Plants From Increasing Firing Temperature Enabled by Additive Manufacturing of Turbine Blades and Vanes <u>Selcuk Can Uysal</u> ¹ James Black ² Douglas Straub ² 1. KeyLogic Systems Inc., USA; 2. National Energy Technology Laboratory, USA
10:55	GT2021:60097 Rapid Talk A Comprehensive Model for Cetane Number Prediction Using Machine Learning Abdul Gani Abdul Jameel <i>King Fahd University of Petroleum and Minerals, Saudi Arabia</i>	GT2021:59312 Rapid Talk Effect of Spanwise Hole to Hole Spacing on Overall Cooling Effectiveness of Effusion Cooled Combustor Liners for a Swirl Stabilized Can Combustor Shoaib Ahmed ¹ Benjamin Wahls ¹ Srinath Ekkad ¹ Hanjie Lee ² Yin-Hsiang Ho ² 1. North Carolina State University, USA; 2. Solar Turbines, USA	GT2021:59778 Rapid Talk Associated Gas Utilization Using a Reheat Gas Turbine – Part 1: The Impact of Engine Degradation on the Optimized Power, Energy, and Revenue From Sold Electricity <u>Mafel Obhuo</u> ¹ Dodeye Igbong ² Duabari Aziaka ³ Ibirabo Obhuo ⁴ 1. Nigeria Maritime University, Nigeria; 2. Cross River University of Technology, Nigeria; 3. Cranfield University, United Kingdom; 4. Quaternary International Company, Warri, Nigeria, Nigeria
11:05	GT2021:60319 Rapid Talk Combustion and Oxidation of Lube Oils at Gas Turbine Conditions: Experimental Methods Eric Petersen, Olivier Mathieu, James Thomas, Sean Cooper, David Teitge, Raquel Juarez, Nobel Gutierrez, Chad Mashuga <i>Texas A&M University, USA</i>	GT2021:59429 Rapid Talk Influence of Opposing Dilution Jets on Effusion Cooling M. Riley Creer ¹ Karen A. Thole ² 1. Solar Turbines, USA; 2. The Pennsylvania State University, USA	GT2021:60264 Rapid Talk Unlocking the Green Economy for Aero-derivative Gas Turbines <u>Nicholas Corbett</u> ¹ Michel Hoode ² Kathleen Bohan ² Simon Batt ¹ 1. Industrial Turbine Company (UK) Limited, United Kingdom; 2. Siemens Energy Canada Limited, Canada

	STEAM TURBINE	STRUCTURES AND DYNAMICS: AERODYNAMICS EXCITATION AND DAMPING	TURBOMACHINERY: DUCTS, NOISE AND COMPONENT INTERACTIONS
	Mechanical Aspects	Aerodynamic Forcing	Noise
	Technical Session • 23-04	Technical Session • 24-01	Technical Session • 38-01
	Session Organizer: Christian Siewert , Siemens Energy Session Co-Chairs: Christian Kontermann , Technical University of Darmstadt; Thomas Mayer , ZHAW - Zurich University of Applied Sciences; Vamadevan Gowreesan , Sulzer	Session Organizer: Patrick Buchwald , University of Stuttgart Session Co-Organizer: Toshinori Watanabe , The University of Tokyo	Session Organizer: Trevor Wood , GE Session Co-Organizer: Rick Dehner , Ohio State University
9:45	GT2021:60355 Deep Dive Fast Reconstruction Method of the Stress Field for the Steam Turbine Rotor Based on Deep Fully Convolutional Network <u>Ding Guo¹ Di Zhang¹ Yonghui Xie² Tianyuan Liu³</u> 1. MOE Key Laboratory of Thermo-Fluid Science and Engineering, Xi'an Jiaotong University, China; 2. Shaanxi Engineering Laboratory of Turbomachinery and Power Equipment, School of Energy and Power Engineering, Xi'an Jiaotong University, China; 3. School of Energy and Power Engineering, China	GT2021:59149 Deep Dive Forced Response Excitation Due to the Stator Vanes of Two and Three Compressor Stages Away <u>Toshimasa Miura, Naoto Sakai, Naoki Kanazawa, Kentaro Nakayama</u> Kawasaki Heavy Industries, Ltd., Japan	GT2021:58739 Deep Dive Noise Reduction Analysis of Electronic Device Cooling Fan with Duct and Its Application Under Variable Working Conditions <u>Zonghan Sun¹ Jie Tian² Grzegorz Liśkiewicz³ Zhaohui Du² Hua Ouyang²</u> 1. Shanghai Jiao Tong University, China; 2. School of Mechanical Engineering, Shanghai Jiao Tong University, China; 3. Institute of Turbomachinery, Łódź University of Technology, Poland
10:15	GT2021:59242 Deep Dive Thrust Force Measurements in an Axial Steam Turbine Test Rig: Effect of Disk Balance Holes <u>Diganta Narzary, David Stasenko, Nikhil Rao Elliott Group, Ebara Corp., USA</u>	GT2021:58846 Deep Dive Effective Clearance and Differential Gapping Impact on Seal Flutter Modelling and Validation <u>Roque Corral, Michele Greco, Almudena Vega</u> Universidad Politécnica de Madrid, Spain	GT2021:58929 Deep Dive Investigation on Mode Characteristics of Rotating Instability and Rotating Stall in an Axial Compressor <u>Zeyuan Yang, Yadongwu Wu, Hua Ouyang</u> Shanghai Jiao Tong University, China
10:45	GT2021:59234 Rapid Talk Assessment of Rotor Stability for Steam Turbine Considering Labyrinth Seal Characteristics of Fluid Destabilization Force and Vibrational Frequency Effect of Bearing Coefficients <u>Ryokichi Hombō¹ Kenichi Murata¹ Yuichiro Waki¹ Nobuhiro Nagata² Makoto Iwasaki² Kazuyuki Matsumoto²</u> 1. Mitsubishi Power, Ltd., Japan; 2. Mitsubishi Heavy Industries, Ltd., Japan	GT2021:60346 Rapid Talk Physical Modal for Acoustic Resonance Based on the Circular Cavity Structure in the Compressor <u>Fengtong Zhao¹ Jianfei Chen¹ Mingsui Yang² Yundong Sha¹ Xiaochi Luan¹</u> 1. Shenyang Aerospace University, China; 2. Shenyang Engine Research Institute, China	GT2021:59214 Rapid Talk Research on Noise Characteristics of Automobile Cooling Fan Based on Circumferential Mode Analysis <u>Pengfei Chai, Zonghan Sun, Zhiqiang Chang, Zhigang Peng, Jie Tian, Hua Ouyang</u> Shanghai Jiao Tong University, China
10:55	GT2021:59535 Rapid Talk Steam Turbine Casing Analyses to Determine Temperature and Pressure Limits <u>Paul Smith¹ Dan Griffin²</u> 1. Elliott, USA; 2. Design Automation Associates, Inc., USA		GT2021:60037 Rapid Talk Experimental Investigation of Rossiter Modes for an Open Cavity with Adjustable Depth <u>Steffen Hammer¹ Jens Fridh¹ Mattias Billson²</u> 1. KTH Royal Institute of Technology, Sweden; 2. GKN Aerospace AB, Sweden
11:15	GT2021:60247 Rapid Talk Research on Coupled Fault Detection of Steam Turbine Rotor Unbalance and Misalignment Based on Numerical Simulation and Convolutional Neural Network <u>Di Zhang¹ Chongyu Wang² Yonghui Xie³</u> 1. Xi'an Jiaotong University, China; 2. MOE Key Laboratory of Thermo-Fluid Science and Engineering, Xi'an Jiaotong University, China; 3. Shaanxi Engineering Laboratory of Turbomachinery and Power Equipment, School of Energy and Power Engineering, Xi'an Jiaotong University, China		

	TURBOMACHINERY: UNSTEADY FLOWS IN TURBOMACHINERY		
	Unsteady Flows in Compressors		
	Technical Session • 43-02		
	Session Organizer: Michael Barton , Honeywell Session Co-Chairs: Yuan Dong , Pratt & Whitney; Tianyu Pan , Beihang University		
9:45	GT2021:59869 Deep Dive Rotating Mechanism of Diffuser Stall in a Centrifugal Compressor with Vaneless Diffuser Nobumichi Fujisawa, Yuki Agari, Yoshifumi Yamao, Yutaka Ohta <i>Waseda University, Japan</i>		
10:15	GT2021:58937 Deep Dive Understanding the Dynamics of Critical Transition in a Contra-rotating Axial Fan Manas Madasseri Payyappalli, A M Pradeep <i>Indian Institute of Technology Bombay, India</i>		
10:45	GT2021:59051 Rapid Talk Mechanism of Circumferential Static Pressure Oscillation in a Centrifugal Compressor with Volute Ce Yang, Botai Su, Xin Shi, Hanzhi Zhang, Wenli Wang, Changmao Yang <i>Beijing Institute of Technology, China</i>		
10:55	GT2021:59921 Rapid Talk Numerical Investigation on Propagation Characteristics of Inlet Total-pressure Distortion in a Centrifugal Compressor Mingyi Wang, Zhiheng Wang, Yurun Li, Guang Xi <i>Xi'an Jiaotong University, China</i>		
11:15	GT2021:58492 Rapid Talk Numerical Study of the Intermittent Tip Leakage Vortex Breakdown in a Subsonic Compressor Rotor Fan Yang, Yanhui Wu <i>Northwestern Polytechnical University, China</i>		

	AIRCRAFT ENGINE	COMBUSTION, FUELS AND EMISSIONS	HEAT TRANSFER: FILM COOLING
	Inlets, Ducts and Boundary Layer Ingestion	Lean Blow-out and Ignition	Unsteadiness and Turbulence
	Technical Session • 01-02	Technical Session • 04-01	Technical Session • 12-01
	Session Organizer: Keith Boyer , Practical Aeronautics Session Co-Organizer: Curtis Vedder , Honeywell	Session Organizer: Brandon Sforzo , ANL Session Co-Chairs: Vincent Mc Donell , University of California; Debolina Dasgupta , Argonne National Laboratory	Session Organizer: Richard Anthony , Air Force Research Lab Session Co-Chairs: John McClintic , Honeywell; Lamyaa El-Gabry , Princeton University; James Rutledge , Air Force Institute of Technology; Eric Ruggiero , GE Aviation; Silvia Ravelli , University of Bergamo - Department of Engineering
12:15	GT2021:59079 Deep Dive Inlet Flow Distortion in an Advanced Civil Transport Boundary Layer Ingesting Engine Installation David Hall ¹ Edward Greitzer ¹ Alejandra Uranga ¹ Mark Drela ¹ Shishir Pandya ² 1. Massachusetts Institute of Technology, USA; 2. NASA, USA	GT2021:58938 Deep Dive Lean Blowout Simulation of Natural Gas Fueled, Premixed Turbulent Jet Flame Arrays with LES and FGM-Modeling Alexander Schwagerus, Peter Habisreuther, Nikolaos Zarzalis Karlsruhe Institute of Technology, Germany	GT2021:59825 Deep Dive Coupling of Mainstream Velocity Fluctuations with Plenum Fed Film Cooling Jets Spencer Sperling ¹ Louis Christensen ¹ Richard Celestina ¹ Randall Mathison ¹ Hakan Aksoy ² Jong Liu ² Jeremy Nickol ² 1. The Ohio State University, USA; 2. Honeywell Aerospace, USA
12:45	GT2021:58829 Deep Dive Fan-intake Coupling with Conventional and Short Intakes Ewan Gunn ¹ Tobias Brandvik ¹ Mark Wilson ² 1. Turbostream Ltd, United Kingdom; 2. Rolls-Royce plc, United Kingdom	GT2021:59484 Deep Dive Evaluation of Blow-off Dynamics in Aero-engine Combustors Using Recurrence Quantification Analysis Ho Yin Leung, Efstathios Karlis, Yannis Hardalupas, Andrea Giusti Imperial College London, United Kingdom	GT2021:59663 Deep Dive Effect of Self-sustained Pulsation of Coolant Flow on Adiabatic Effectiveness and Net Heat Flux Reduction on a Flat Plate Nicola Rosafio ¹ Simone Salvadori ¹ Daniela Anna Misul ¹ Mirko Baratta ¹ Mauro Carnevale ² Christian Saumweber ³ 1. Politecnico di Torino, Italy; 2. University of Bath, United Kingdom; 3. University of Applied Sciences, Germany
1:15	GT2021:60335 Rapid Talk A Study on the Aerodynamic Characteristics of a Blended-Wing-Body Aircraft with a Serpentine Inlet Using Flow Control Techniques Min-Sik Youn ¹ Youn-Jea Kim ² 1. Graduate School of Mechanical Engineering, Sungkyunkwan University, Korea; 2. School of Mechanical Engineering, Sungkyunkwan University, Korea	GT2021:60167 Rapid Talk Ozone Production with Plasma Discharge: Comparisons Between Activated Air and Activated Fuel/Air Mixture Ghazanfar Mehdi, Maria Grazia De Giorgi, Donato Fontanarosa, Sara Bonuso, Antonio Ficarella università del Salento, Italy	GT2021:58889 Rapid Talk Unsteady Film Cooling Performance on the High Pressure Turbine Shroud Under Rotor-stator Interaction for an Aero-engine Zihao Bao, Zhihai Kou, Bo Han, Guangchao Li Shenyang Aerospace University, China
1:25	GT2021:60230 Rapid Talk Investigation of a Passive Flow Control Device in an S-Duct Inlet at High Subsonic Flow Courtney Rider ¹ Asad Asghar ¹ William Allan ¹ Robert Stowe ² Grant Ingram ³ Rogerio Pimentel ² 1. Royal Military College of Canada, Canada; 2. Defence Research and Development Canada - Valcartier Research Centre, Canada; 3. Durham University - Department of Engineering, United Kingdom	GT2021:58830 Rapid Talk Experimental Study on Lean Blowout Limits of Turbulent Premixed Hydrogen/Ammonia/Air Mixtures Andreas Goldmann, Friedrich Dinkelacker Leibniz Universität Hannover - Institut für Technische Verbrennung, Germany	GT2021:58661 Rapid Talk Analysis of LES and 1D Hot-wire Data to Determine Main Flow Turbulence in a Film Cooling Test Rig Lukas Fischer, Michael Straußwald, Michael Pfitzner Universität der Bundeswehr München, Germany
1:35	GT2021:58849 Rapid Talk Internal Aerodynamic Performance Evaluation of a Double Entrance S-Duct Intake at High Subsonic Conditions Satpreet Sidhu ¹ Asad Asghar ¹ William Allan ¹ Robert Stowe ² Rogerio Pimentel ² 1. Royal Military College of Canada, Canada; 2. Defence Research and Development Canada - Valcartier Research Centre, Canada	GT2021:59809 Rapid Talk A Semi-analytical Model for Prediction of Wall Quenching Distances of Premixed Flames Huang Xia, Liu Weijie Aero-Engine Academy of China, China	

	INDUSTRIAL AND COGENERATION	MANUFACTURING MATERIALS AND METALLURGY	STEAM TURBINE
	Energy Systems II	Additive Manufacturing	Operational Aspects
	Technical Session • 17-02	Technical Session • 18-01	Technical Session • 23-03
	Session Organizer: Lisa Branchini , University of Bologna	Session Organizer: Robin Day , Fraunhofer Institut of Productiontechnology Session Co-Organizer: Timothy W. Simpson , Pennsylvania State University	Session Organizer: Ivan Mcbean , GE Session Co-Organizer: Roland G. Grein , Siemens AG
12:15	GT2021:58752 Deep Dive On the Design of an ORC Axial Turbine Based Expander Working as a Mechanical Driver in Gas Compressor Stations Lisa Branchini ¹ Cesar Celis ² Sebastian Ruiz ² Rene Aguilar ² Andrea De Pascale ¹ Francesco Melino ¹ 1. University of Bologna, Italy; 2. Pontificia Universidad Católica del Perú, Peru	GT2021:59482 Deep Dive Electrochemical Defect Analysis (EC-D) of Additive Manufactured Components Florian Sous ¹ Tim Herrig ¹ Thomas Bergs ¹ Florian Karges ² Nicole Feiling ² Markus Zeis ² 1. Laboratory for Machine Tools and Production Engineering of RWTH Aachen University, Germany; 2. MTU Aero Engines AG, Germany	GT2021:60049 Deep Dive Multi-parameter Prediction for Steam Turbine Based on Real-time Data Using Deep Learning Approaches Lei Sun ¹ Tianyuan Liu ¹ Yonghui Xie ¹ Xinlei Xia ² 1. Institute of Turbomachinery, China; 2. Shanghai Electric Power Generation Equipment Co., Ltd. Turbine Plant Shanghai, P. R. China, China
12:45	GT2021:59180 Deep Dive A Comparison Between ORC and Supercritical CO2 Bottoming Cycles for Energy Recovery from Industrial Gas Turbines Exhaust Gas Maria Alessandra Ancona, Michele Bianchi, Lisa Branchini, Andrea De Pascale, Francesco Melino, Antonio Peretto, Noemi Torricelli Università di Bologna, Italy	GT2021:59738 Deep Dive A Computational Study Summarizing the Effects of Composition on the Melt Pool Geometry in Additive Manufacturing Daniel Gwynn, Amrita Basak Pennsylvania State University, USA	GT2021:59135 Deep Dive Experimental and Numerical Study for Improved Understanding of Mixed-Convection Type of Flows in Turbine Casing Cavities During Shut-down Regimes Oguzhan Murat ¹ Budimir Rosic ¹ Koichi Tanimoto ² Ryo Egami ² 1. University of Oxford, United Kingdom; 2. Mitsubishi Heavy Industries, Japan
1:15	GT2021:60317 Rapid Talk The Development of Turboexpander-Generators for Gas Pressure Letdown Part II: Economic Analysis Jeremy Liu, Rasish Khatri, Freddie Sarhan, Eric Blumber Calnetix Technologies, USA	GT2021:58844 Rapid Talk Performance Testing of L-PBF Produced Honeycombs Out of IN625 Timo Heitmann ¹ Ole Geisen ¹ Lisa Hühn ² Oliver Munz ² Andreas Bardenhagen ³ 1. Siemens Energy, Germany; 2. Karlsruhe Institute of Technology, Germany; 3. Technische Universität Berlin, Germany	GT2021:59252 Rapid Talk Thermal Characterization of a Steam Turbine Casing Including Measuring of Adiabatic Wall Temperatures Using Proprietary Sensors Wieland Uffrecht ¹ Stefan Odenbach ¹ Thomas Polklas ² Bernhard Valerian Weigel ¹ 1. Technical University of Dresden, Germany; 2. MAN Energy Solutions SE, Germany
1:25		GT2021:58786 Rapid Talk Microstructure of IN738LC Fabricated Using Laser Powder Bed Fusion Additive Manufacturing Nandana Menon ¹ Tanjheel Mahdi ² Amrita Basak ¹ 1. Pennsylvania State University, USA; 2. Bangladesh University of Textiles (BUTEX), Bangladesh	GT2021:59685 Rapid Talk Test Bench for Characterization and Design Against Steam Turbine Fouling Gabriele Girezzi ¹ Damaso Checcacci ¹ Lorenzo Cosi ¹ Andrea Achilli ² Andrea Maggi ³ Alessandro Sani ³ 1. Baker Hughes, Italy; 2. SIET, Italy; 3. Transient Group, Italy
1:35		GT2021:59755 Rapid Talk Dependence of LPBF Surface Roughness on Laser Incidence Angle and Component Build Orientation Ramesh Subramanian ¹ David Rule ² Onur Nazik ³ 1. Siemens Energy, USA; 2. Siemens Energy Inc, Germany; 3. Beuth Hochschule für Technik Berlin, Germany	GT2021:59257 Rapid Talk Steam Turbine Overspeed Scenarios: Comparison Between API Energy Method and Dynamic Simulation Federico Bucciarelli ¹ Damaso Checcacci ¹ Fabrizio Piras ¹ Filippo Ingrassiotta ² 1. Baker Hughes, Italy; 2. Private, Italy

	STRUCTURES AND DYNAMICS: AERODYNAMICS EXCITATION AND DAMPING	TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS	TURBOMACHINERY: AXIAL FLOW TURBINE AERODYNAMICS
	Compressor Aerodynamic Damping and Mistuning	Manufacturing, Variations and Deterioration	Aerodynamic Analyses
	Technical Session • 24-04	Technical Session • 34-08	Technical Session • 35-03
	Session Organizer: Roque Corral Garcia , Universidad Politecnica de Madrid Session Co-Organizer: Christoph Brandstetter , Technische Universität Darmstadt	Session Organizer: Daniel Wilkin II , GE Aviation	Session Organizer: Giacomo Persico , Politecnico Di Milano
12:15	GT2021:59416 Deep Dive Effect of Shock Wave Behavior on Unsteady Aerodynamic Characteristics of Oscillating Transonic Compressor Cascade Jiuliang Gan, Toshinori Watanabe, Takehiro Himeno <i>The University of Tokyo, Japan</i>	GT2021:58676 Deep Dive Effects of Surface Waviness on Fan Blade Boundary Layer Transition and Profile Loss – Part I: Methodology and Computational Results Jinwook Lee ¹ Zoltán Spakovszky ¹ Edward Greitzer ¹ Mark Drela ¹ Jérôme Talbotec ² <i>1. Massachusetts Institute of Technology, USA; 2. Safran Aircraft Engines, France</i>	GT2021:59112 Deep Dive Evaluating the Influence of Rotor-casing Eccentricity on Turbine Efficiency Including Time-resolved Flow Field Measurements Eric Deshong, Shawn Siroka, Reid Berdanier, Karen Thole <i>Pennsylvania State University, USA</i>
12:45	GT2021:58780 Deep Dive Influence of Disc Modes and Sideband Excitations on the Mistuned Forced Response Behaviour of an Embedded Compressor Rotor Shreyas Hegde ¹ Andrew Madden ² Robert Kielb ¹ <i>1. Duke University, USA; 2. Ansys Inc., USA</i>	GT2021:58678 Deep Dive Effects of Surface Waviness on Fan Blade Boundary Layer Transition and Profile Loss – Part II: Experimental Assessments Jinwook Lee ¹ Vaishnavi Ramaswamy ¹ Zoltán Spakovszky ¹ Edward Greitzer ¹ Mark Drela ¹ Jérôme Talbotec ² <i>1. Massachusetts Institute of Technology, USA; 2. Safran Aircraft Engines, France</i>	GT2021:59388 Deep Dive Determining Total Pressure from Velocimetry Measurements in a Transonic Turbine Flowfield Alexander Rusted, Stephen Lynch <i>The Pennsylvania State University, USA</i>
1:15	GT2021:58818 Rapid Talk Insight on Aerodynamic Damping of the Civil Transonic Fan Blade Bo Lian, Ping Hu, Yong Chen, Xiaocheng Zhu, Zhaohui Du <i>Shanghai Jiao Tong University, China</i>	GT2021:59452 Rapid Talk Aerodynamic Mitigation of Mechanical Constraints in Small Core Compressors Tony Dickens ¹ James Taylor ¹ Chris Hall ² Rob Miller ¹ <i>1. Whittle Laboratory, University of Cambridge Department of Engineering, United Kingdom; 2. Rolls-Royce plc., United Kingdom</i>	GT2021:60013 Rapid Talk Development of Turbulent Quantities Inside an Axial Turbine Vane Stephan Behre ¹ Dragan Kožulović ² Christian Hoesgen ³ Peter Jeschke ⁴ <i>1. MTU Aero Engines AG, Germany; 2. Department Automotive & Aeronautical Engineering, Hamburg University of Applied Science, Germany; 3. Leybold GmbH, Germany; 4. Institute of Jet Propulsion and Turbomachinery, RWTH Aachen University, Germany</i>
1:25	GT2021:59999 Rapid Talk High-efficiency Active Damping on a Fan Rotor Blade in Case of Resonant Vibrations by Means of PZT Actuators Andrea Rossi ¹ Fabio Botta ² Ambra Giovannelli ² Nicola Pio Belfiore ² <i>1. Roma Tre University, Italy; 2. University of Roma Tre, Italy</i>	GT2021:58823 Rapid Talk Influence of Thickness Deviation of Axial Flow Compressor Blade on Its Performance Tianyuan Ji, Wuli Chu, Zhengtao Guo, Jibo Yang <i>Northwestern Polytechnical University, China</i>	GT2021:59897 Rapid Talk Effect of Microcylinder and D-cylinder at the Leading Edge of a Wells Turbine Harvesting Wave Energy P Sadees, Madhan Kumar, Abdus Samad <i>Indian Institute of Technology, Madras, India</i>
1:35	GT2021:60075 Rapid Talk A Comprehensive Deep Learning Model for the Flow Field Prediction and Optimization of an Oscillating Airfoil Yunzhu Li, Tianyuan Liu, Jiarui You, Yonghui Xie <i>Institute of Turbomachinery, China</i>	GT2021:59099 Rapid Talk Considerations for the Evaluation of Fouling Resistant Coatings for Centrifugal Compressors Scot Laney <i>Elliott Group, USA</i>	

TURBOMACHINERY: TUTORIALS

**Turbomachinery Tutorial:
Introduction to Cycle Design of
Conventional and Hybrid-Electric
Aero Engines**

Tutorial Session • 42-01

Session Organizer: **Andreas Peters**, GE Aviation

GT2021:65164 [Tutorial](#)
**Introduction to Cycle Design of Conventional
and Hybrid-electric Aero Engines**
Pieter Dermont¹ Michael Sielemann² Midhun Joy¹
*1. Modelon Inc., USA; 2. Modelon Deutschland
GmbH, Germany*

*** This tutorial will NOT have a video on demand
(VOD). This tutorial will be held "live".*

**T
U
T
O
R
I
A
L**

	AIRCRAFT ENGINE	COAL, BIOMASS, HYDROGEN AND ALTERNATIVE FUELS	COMBUSTION, FUELS AND EMISSIONS
	Modeling, Simulation, and Validation	Alternative Fuels	Emissions: Modelling and Experiments
	Technical Session • 01-03	Technical Session • 03-01	Technical Session • 04-17
	Session Organizer: Charles Krouse , Southwest Research Institute Session Co-Organizer: William Gallops , Gallops AE	Session Organizer: Pierre Gauthier , Siemens Energy Canada	Session Organizer: Francesca Di Mare , Ruhr-Universität Bochum Session Co-Chairs: Vincent Mc Donell , University of California; Andrew Zink , Pratt & Whitney; Priyank Saxena , Solar Turbines, Caterpillar; Ivan Langella , Technical University of Delft
2:15	GT2021:59489 Deep Dive Estimation of Design Parameters and Performance for a State-of-the-art Turbofan <u>Oliver Sjögren</u> , Carlos Xisto, Tomas Grönstedt <i>Chalmers University of Technology, Sweden</i>	GT2021:60078 Deep Dive A Study on Fundamental Combustion Properties of Oxymethylenether-2, OME2 <u>John Mburu Ngugi</u> ¹ Sandra Richter ¹ Marina Braun-Unkhoff ¹ Clemens Naumann ¹ Markus Köhler ¹ Uwe Riedel ² <i>1. Institute of Combustion Technology, German Aerospace Center (DLR), Germany; 2. Institute of Low-carbon Industrial Processes, German Aerospace center (DLR), Germany</i>	GT2021:59071 Deep Dive NOx Emission Modelling for Lean Premixed Industrial Combustors with a Diffusion Pilot Burner <u>Johann Moritz Reumschüssel</u> ¹ Jakob Georg Raimund Von Saldern ² Thomas Ludwig Kaiser ² Thoralf Reichel ¹ Jan Paul Beuth ² Bernhard Cosic ³ Franklin Genin ⁴ Kilian Oberleithner ² Christian Oliver Paschereit ¹ <i>1. Chair of Fluid Dynamics, Technische Universität Berlin, Germany; 2. Laboratory for Flow Instabilities and Dynamics, Technische Universität Berlin, Germany; 3. MAN Energy Solutions SE, Germany; 4. MAN Energy Solutions SE, Switzerland</i>
	GT2021:59089 Deep Dive Evolutionary Algorithm for Enhanced Gas Path Analysis in Turbofan Engines <u>Tim Rootliep</u> ¹ Wilfried Visser ¹ Michel Nollet ² <i>1. Delft University of Technology, Netherlands; 2. KLM Engineering & Maintenance, Netherlands</i>	GT2021:60093 Deep Dive Reaction Model Development of Selected Aromatics as Relevant Molecules of a Kerosene Surrogate – the Importance of M-Xylene within the Combustion of 1,3,5-Trimethylbenzene <u>Astrid Ramirez Hernandez</u> ¹ Trupti Kathrotia ² Torsten Methling ² Marina Braun-Unkhoff ² Uwe Riedel ¹ <i>1. University of Stuttgart, Germany; 2. German Aerospace Centre (DLR), Germany</i>	GT2021:59215 Deep Dive A Novel Les-based Process for NOx Emission Assessment in a Premixed Swirl Stabilized Combustion System <u>Roberto Meloni</u> ¹ Antonio Andreini ² Pier Carlo Nassini ² <i>1. Baker Hughes, Italy; 2. Università di Firenze, Italy</i>
3:15	GT2021:58905 Rapid Talk Sensitivity Analysis of an Aircraft Engine Model Under Consideration of Dependent Variables <u>Julian Salomon</u> ¹ Jan Göing ² Sebastian Lück ² Matteo Broggi ³ Jens Friedrichs ⁴ Michael Beer ³ <i>1. Leibniz University Hannover, Germany; 2. Institute of Jet Propulsion and Turbo Machinery, Germany; 3. Institute for Risk and Reliability, Germany; 4. Jet Propulsion and Turbo Machinery, Germany</i>	GT2021:58802 Rapid Talk Carbon and Hydrocarbon Particle Seeding in Air-breathing Rotating Detonation Engine <u>Robert Burke</u> , Taha Rezzag, Kareem Ahmed <i>University of Central Florida, USA</i>	GT2021:59744 Rapid Talk Combustion of Hydrogen-Methane-Air Mixtures in a Generic Triple Swirl Burner: Numerical Studies <u>Neha Vishnoi</u> ¹ Agustin Valera Medina ² Aditya Saurabh ³ Lipika Kabiraj ¹ <i>1. Indian Institute of Technology Ropar, India; 2. Cardiff University, United Kingdom; 3. Indian Institute of Technology Kanpur, India</i>
3:25	GT2021:60029 Rapid Talk The Use of Enhanced Nozzle Maps for Gas-Turbine Performance Modelling <u>Aws Al-Akam</u> ¹ Theoklis Nikolaidis ² David Macmanus ² Alvise Pellegrini ² <i>1. University of Babylon, Iraq; 2. Cranfield University, United Kingdom</i>	GT2021:59206 Rapid Talk Improved CFD Predictions of Pyrolysis Oil Combustion Using Advanced Spray Measurements and Numerical Models <u>Eva Van Beurden</u> ¹ Thijs Bouten ² Jan Withag ² Artur Pozarlik ¹ Lars-Uno Axelsson ² Bima Putra ¹ Gerrit Brem ¹ <i>1. University of Twente, Netherlands; 2. OPRA Turbines International B.V., Netherlands</i>	GT2021:60057 Rapid Talk Experimental Study on High Pressure Combustion of Decomposed Ammonia <u>Mario Ditaranto</u> ¹ Inge Saanum ¹ Jenny Larfeldt ² <i>1. SINTEF Energi AS, Norway; 2. Siemens Industrial Turbomachinery AB, Sweden</i>
3:35	GT2021:58503 Rapid Talk A Mathematical Model for Windmilling of a Turbojet Engine <u>Erkan Abdulhamitbilal</u> ¹ Elbrous Jafarov ² <u>Sinan Sal</u> ¹ <i>1. Kale Research & Development Inc., Turkey; 2. Istanbul Technical University, Turkey</i>		GT2021:59202 Rapid Talk CO Emission Modeling in a Heavy Duty Annular Combustor Operating with Natural Gas <u>Roberto Meloni</u> ¹ Stefano Gori ¹ Antonio Andreini ² Pier Carlo Nassini ² <i>1. Baker Hughes, Italy; 2. Università di Firenze, Italy</i>

	HEAT TRANSFER: FILM COOLING	STEAM TURBINE	STRUCTURES AND DYNAMICS: AERODYNAMICS EXCITATION AND DAMPING
	General Film Cooling	Last Stages and Exhausts	Forced Response in Compressors, Turbines and Cavities
	Technical Session • 12-03	Technical Session • 23-02	Technical Session • 24-02
	Session Organizer: Randall Mathison , Ohio State University Session Co-Organizer: Hongzhou Xu , Solar Turbines Inc.	Session Organizer: Shigeki Senoo , Mitsubishi Hitachi Power Systems, Ltd. Session Co-Organizer: Michal Hoznedl , Doosan Škoda Power	Session Organizer: Almudena Vega , Siemens Gamesa
2:15	GT2021:59780 Deep Dive CFD Evaluation of Turbine Blade Leading Edge Film Cooling with Varying Shaped Hole Geometries Christopher Easterby, Jacob Moore, David Bogard <i>The University of Texas at Austin, USA</i>	GT2021:58704 Deep Dive Detached Eddy Simulation of Rotating Instabilities in a Low-pressure Model Steam Turbine Operating Under Low Volume Flow Conditions Ilgit Ercan ¹ Damian Vogt ² <i>1. Siemens Energy, Germany; 2. Institute of Thermal Turbomachinery and Machinery Laboratory, University of Stuttgart, Germany</i>	GT2021:59040 Deep Dive A Practical Method for Burner Staging Turbine Forced Response Evaluation Nikola Kafedzhiyski, Maria Mayorca <i>Siemens Energy AB, Sweden</i>
2:45	GT2021:60015 Deep Dive Experimental and Computational Investigation of Film Cooling Performance and External Flowfield Effects Due to Impingement Coolant Feed in the Leading Edge of a Turbine Blade Jacob Moore, Christopher Easterby, David Bogard <i>The University of Texas at Austin, USA</i>	GT2021:59315 Deep Dive Design and Validation of a Large Steam Turbine End-Stage Blade to Meet Current and Future Market Demands Bertold Luebbe, Jens Aschenbruck, Oliver Puetz, Mira Theidel <i>Siemens Energy, Germany</i>	GT2021:59188 Deep Dive Global Stability Analysis of an Academic Rotor/stator Cavity Subject to Periodic and Simple Wall Oscillations Mark Noun ¹ Laurent Gicquel ² Gabriel Staffelbach ² <i>1. CNES, France; 2. CERFACS, France</i>
3:15	GT2021:60014 Rapid Talk Effects on Film Cooling Performance in the Showerhead From Geometric Parameterization of Shaped Hole Designs Jacob Moore, Christopher Easterby, David Bogard <i>The University of Texas At Austin, USA</i>	GT2021:59268 Rapid Talk Development of a Design Approach for the Optimization of Steam Turbine Exhaust System Performance Through CFD Modelling Tommaso Diurno ¹ Stella Grazia Tomasello ¹ Tommaso Fondelli ¹ Antonio Andreini ¹ Bruno Facchini ¹ Leonardo Netti ² Lorenzo Arcangeli ² <i>1. University of Florence, Italy; 2. Baker Hughes, Italy</i>	GT2021:59147 Rapid Talk Forced Response Excitation of a Compressor Stator Owing to Shock Wave Induced by Adjacent Rotor Blade Toshimasa Miura, Naoto Sakai, Naoki Kanazawa, Kentaro Nakayama <i>Kawasaki Heavy Industries, Ltd., Japan</i>
3:25	GT2021:59150 Rapid Talk DDES Numerical and Experimental Investigations on Film Cooling Characteristics of the Trailing-edge Cutback with Upstream Cylinder Hole at Different Blowing Ratios Xiangtao Xiao, Pei Wang, Qiang Du, Qingzong Xu, Jun Liu <i>The Key Lab of Light-duty Gas-turbine, Institute of Engineering Thermophysics, Chinese Academy of Sciences and University of Chinese Academy of Sciences, China</i>		GT2021:58779 Rapid Talk Influence of Stator Hub Cavities on the Forced Response Behaviour of an Embedded Compressor Rotor Shreyas Hegde ¹ Laith Zori ² Rubens Campregher ³ Robert Kielb ¹ <i>1. Duke University, USA; 2. Ansys Inc., USA; 3. Ansys Inc., Canada</i>
3:35	GT2021:59269 Rapid Talk Uncertainty Analysis of Film Cooling of Fan-shaped Holes on a Stator Vane Under Realistic Inlet Conditions Jian Pu ¹ Hai Wang ² Jian-Hua Wang ² Chun-Hua Wang ³ Hai-Ying Lu ⁴ Ming-Hou Liu ² Xin-Dang Zhu ² <i>1. University of Science and Technology of China, China; 2. USTC, China; 3. Nanjing University of Aeronautics and Astronautics, China; 4. Shenyang Aero-engine Institute of Aero Engine Corporation of China, China</i>		GT2021:58923 Rapid Talk On the Forced Response Predictions and Life Improvements of an Industrial Axial Compressor Rotor Blade Giuseppe Bruni, Agnieszka Frach, Senthil Krishnababu <i>Siemens, United Kingdom</i>

STRUCTURES AND DYNAMICS: PROBABILISTIC METHODS		TURBOMACHINERY: DEPOSITION, EROSION, FOULING, AND ICING	TURBOMACHINERY: DESIGN METHODS AND CFD MODELING FOR TURBOMACHINERY	
Structures and Dynamics: Probabilistic Methods Tutorial		Modeling Erosion, Deposition, and Fouling	Novel Solver and Simulation Framework	
Tutorial Session • 28-03		Technical Session • 36-01	Technical Session • 37-09	
Session Organizer: Liping Wang , GE Corporate Research & Development Session Co-Chairs: Michael Gorelik , FAA; Andrew Milliken , Pratt & Whitney		Session Organizer: Ryan Lundgreen , Pratt & Whitney Session Co-Organizer: Bruce Varney , Rolls-Royce Corporation	Session Organizer: Kai Willem Koerber , MTU Aero Engines AG Session Co-Organizer: Yifang Gong , Kendall Square Consulting	
2:15	T U T O R I A L	GT2021:60696 Tutorial Introduction to Probabilistic Analysis and Uncertainty Quantification Gavin Jones SmartUQ, USA ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".	GT2021:58477 Deep Dive A Discrete Element Methods-based Model for Particulate Deposition and Rebound in Gas Turbines Jack Gaskell, David Gillespie, Matthew Mcdgilvray University of Oxford, United Kingdom	GT2021:59474 Deep Dive Progresses in Particle-laden Flows Simulations in Multistage Turbomachinery with Openfoam Stefano Oliani ¹ Riccardo Friso ¹ Nicola Casari ¹ Michele Pinelli ¹ Alessio Suman ¹ Mauro Carnevale ² 1. University of Ferrara, Italy; 2. University of Bath, United Kingdom
		GT2021:60224 Deep Dive Enhancing Deposition Prediction Capability with Conjugate Mesh Morphing Christopher Bowen, Jeffrey Bons Ohio State University, USA	GT2021:58645 Deep Dive Importance of Non-equilibrium Modelling for Compressors Robert Spencer ¹ Pawel Przytarski ² Paolo Adami ³ Patrick Grothe ³ Andrew Wheeler ¹ 1. University of Cambridge, United Kingdom; 2. University of Melbourne, Australia; 3. Rolls-Royce Deutschland, Germany	
		GT2021:58673 Rapid Talk Data-driven Analysis of Engine Mission Severity Using Non-dimensional Groups Tim Brandes, Stefano Scarso, Christian Koch, Stephan Staudacher Institute of Aircraft Propulsion Systems, Germany	GT2021:59028 Rapid Talk Performance of Unsteady Reynolds-averaged Navier-stokes and Hybrid Scale-resolving Simulation Approaches in Simulating a Low-speed Axial Compressor Single Rotor Xiangyi Chen ¹ Björn Koppe ¹ Martin Lange ¹ Wuli Chu ² Ronald Mailach ¹ 1. Technische Universität Dresden, Germany; 2. Northwestern Polytechnical University, China	
		GT2021:60064 Rapid Talk A Method for the Simulation of Time-dependent In-service Performance Change Bill Dawes ¹ Rich Evans ² Matt Hunt ² 1. Whittle Lab., University of Cambridge, United Kingdom; 2. Cambridge Flow Solutions Ltd, United Kingdom	GT2021:59436 Rapid Talk Turbomachinery Loss Analysis: The Relationship Between Mechanical Work Potential and Entropy Analyses John Leggett ¹ Yaomin Zhao ¹ Edward Richardson ² Richard Sandberg ¹ 1. University of Melbourne, Australia; 2. University of Southampton, United Kingdom	
		GT2021:59661 Rapid Talk Numerical Study of Droplet Erosion in the First-Stage Rotor of an Axial Flow Compressor Giuliano Agati ¹ Francesca Di Gruttola ¹ Domenico Borello ¹ Franco Rispoli ¹ Paolo Venturini ² Serena Gabriele ¹ Domenico Simone ³ 1. Sapienza University of Rome, Italy; 2. Dipartimento di Meccanica e Aeronautica, Sapienza, Italy; 3. University of Brasilia, Brazil		
2:45				
3:00				
3:10				
3:20				

HONORS AND AWARDS

Industrial Gas Turbine Technology
Award Lecture

Award Session • 45-02

Session Organizer: **John Gulen**,
Bechtel Corporation

**Award Lecture: Two Decades of US DOE Gas
Turbine Research and Innovation**
Richard Dennis
Department of Energy NETL, USA

L
E
C
T
U
R
E

2:15

2:45

3:00

3:10

3:20

MONDAY JUNE 7			04:00 PM - 05:30 PM		
COMBUSTION, FUELS AND EMISSIONS		ELECTRIC POWER		HEAT TRANSFER: FILM COOLING	
Combustion Dynamics: Flame Transfer Functions		H2 Utilization/Transportation/Storage/Production and CCS		Blade Tips and Endwalls	
Technical Session • 04-07		Panel Discussion • 09-03		Technical Session • 12-04	
Session Organizer: James Dawson , NTNU Session Co-Organizer: Thierry Schuller , Institut De Mécanique Des Fluides De Toulouse		Session Organizer: Jeffrey Benoit , Power Systems Mfg., LLC Session Co-Chairs: Richard Dennis , U.S. Department of Energy; Bin Jou , FM Global		Session Organizer: Michael Benson , U.S. Military Academy Session Co-Organizer: Seth Lawson , US Department of Energy	
4:00	GT2021:58832 Deep Dive Modal Decomposition and Linear Modeling of Swirl Fluctuations in the Mixing Section of a Model Combustor Based on PIV Data <u>Jens S. Müller</u> ¹ <u>Finn Lückhoff</u> ¹ <u>Thomas Kaiser</u> ¹ <u>Christian Oliver Paschereit</u> ² <u>Kilian Oberleithner</u> ¹ <i>1. Laboratory for Flow Instabilities and Dynamics, TU Berlin, Germany; 2. Chair of Fluid Dynamics, Technische Universität Berlin, Germany</i>	Panelists: Dan Hancu, <i>Department of Energy</i> Pratyush Nag, <i>Siemens</i> Peter Stuttaford, <i>Thomassen</i> Peter Luessen, <i>Mitsubishi Power</i> ** This panel will NOT have a video on demand (VOD). This panel will be held "live".		GT2021:59015 Deep Dive Improving the Film Cooling Performance of a Turbine Endwall with Multi-fidelity Modelling Considering Conjugate Heat Transfer <u>Hongyan Bu</u> , <u>Yufeng Yang</u> , <u>Liming Song</u> , <u>Jun Li</u> <i>Institute of Turbomachinery, Xi'an Jiaotong University, China</i>	P A N E L
	GT2021:60058 Deep Dive The Origin of Gain and Phase Modulations in CH4/H2 and H2 Flame Transfer Functions <u>Eirik Aesøy</u> ¹ <u>José G. Aguilar</u> ¹ <u>Mirko R. Bothien</u> ² <u>Nicholas A. Worth</u> ¹ <u>James R. Dawson</u> ¹ <i>1. Norwegian University of Science and Technology, Norway; 2. Zurich University of Applied Sciences, Switzerland</i>			GT2021:59229 Deep Dive Comparison of Film Cooling Performance for Different Purge Slot Configurations in a Cylindrical and State-of-the-art Nozzle Guide Vane <u>Christian Landfester</u> ¹ <u>Gunther Müller</u> ¹ <u>Robert Krewinkel</u> ² <u>Clemens Domnick</u> ² <u>Martin Böhle</u> ¹ <i>1. University of Kaiserslautern, Germany; 2. MAN Energy Solutions SE, Germany</i>	
	GT2021:59553 Rapid Talk The Effects of Forcing Direction on the Flame Transfer Function of a Lean-burn Spray Flame <u>Nicholas Treleaven</u> ¹ <u>André Fischer</u> ² <u>Claus Lahiri</u> ² <u>Max Staufer</u> ² <u>Andrew Garmory</u> ³ <u>Gary Page</u> ³ <i>1. STFS, TU-Darmstadt, Germany; 2. Rolls-Royce Deutschland, Germany; 3. Loughborough University, United Kingdom</i>			GT2021:59366 Rapid Talk Film Cooling Measurement on Flat and Squealer Blade Tips With High Density Ratios at Transonic Cascade Flow Conditions Using the Pressure Sensitive Paint Technique <u>Izhar Ullah</u> , <u>Sulaiman M Alsaleem</u> , <u>Lesley Wright</u> , <u>Chao-Cheng Shiau</u> , <u>Je-Chin Han</u> <i>Texas A&M University, USA</i>	
	GT2021:59561 Rapid Talk Ranking of Aircraft Fuel-Injectors Regarding Low Frequency Thermoacoustics Based on an Energy Balance Method <u>André Fischer</u> , <u>Claus Lahiri</u> <i>Rolls-Royce Deutschland Ltd & Co KG, Germany</i>			GT2021:59993 Rapid Talk The Film Cooling and Aerodynamic Performance on a Multi-cavity Squealer Tip <u>Feng Li</u> , <u>Zhao Liu</u> , <u>Zhenping Feng</u> <i>Xi'an Jiaotong University, China</i>	
	GT2021:59267 Rapid Talk Thermoacoustic Stability Analysis of a Full-annular Lean Combustor for Heavy-duty Applications <u>Daniele Pampaloni</u> ¹ <u>Antonio Andreini</u> ¹ <u>Alessandro Marini</u> ² <u>Giovanni Riccio</u> ² <u>Gianni Ceccherini</u> ² <i>1. University of Florence, Italy; 2. Baker Hughes, Italy</i>			GT2021:59496 Rapid Talk The Influence of Purge Flow Parameters on Heat Transfer and Film Cooling in Turbine Center Frames <u>Patrick Jagerhofer</u> ¹ <u>Marios Patinios</u> ² <u>Tobias Glasenapp</u> ³ <u>Emil Göttlich</u> ¹ <u>Federica Farisco</u> ¹ <i>1. Graz University of Technology, Austria; 2. Turbomachinery and Propulsion Department, von Karman Institute for Fluid Dynamics, Belgium; 3. MTU Aero Engines AG, Germany</i>	
5:20					

MONDAY JUNE 7		04:00 PM - 05:30 PM			
MANUFACTURING MATERIALS AND METALLURGY		STEAM TURBINE		STRUCTURES AND DYNAMICS: AERODYNAMICS EXCITATION AND DAMPING	
Novel and Experimental Material Test Methods		General Aspects		Aeroelastic Instabilities and Mistuning	
Panel Discussion • 18-06		Technical Session • 23-01		Technical Session • 24-03	
Session Organizer: Calvin Stewart , University of Texas at El Paso Session Co-Chairs: William Day , W. David Day, Inc.; Sascha Gierlings , Fraunhofer-Institute For Production Technology; Ashok Koul , Life Prediction Technologies Inc		Session Organizer: Alexander Mirzamoghadam , Northrop Grumman Session Co-Chairs: Bastian Dolle , Universität Duisburg-Essen; Matteo Pini , Propulsion & Power, Delft University of Technology; Alex Stein , GE Energy		Session Organizer: Yoon Choi , GE Aviation Session Co-Organizer: Lorenzo Pinelli , University of Florence	
4:00 					

STRUCTURES AND DYNAMICS: BEARING AND SEAL DYNAMICS		SUPERCRITICAL CO2		TURBOMACHINERY: DESIGN METHODS AND CFD MODELING FOR TURBOMACHINERY		
Dampers and Bearings		Tutorial: Introduction to sCO2 Power Cycles		Whole Engine and Reduced Order Models		
Technical Session • 25-04		Tutorial Session • 33-18		Technical Session • 37-10		
Session Organizer: Karim Shalash , Teqtoniq Gmbh Session Co-Organizer: Tingcheng Wu , Siemens Energy		Session Organizer: Grant Musgrove , Southwest Research Institute Session Co-Chairs: David Sanchez , AICIA; Subith Vasu , University of Central Florida; Jason Wilkes , Southwest Research Institute; Michael Marshall , Southwest Research Institute		Session Organizer: Gorazd Medic , United Technologies Research Center Session Co-Chairs: Mahmoud Mansour , Honeywell International Inc; Yifang Gong , Kendall Square Consulting		
4:00	GT2021:58979 Deep Dive Numerical Evaluation and High-speed Rotating Test on Circular Arc Spring Dampers for Centrifugal Compressors Ryota Takeuchi ¹ Hidetsugu Ishimaru ¹ Hideaki Yamashita ¹ Takahiko Inoue ¹ Shota Yabui ² Tsuyoshi Inoue ² 1. Kawasaki Heavy Industries, Ltd., Japan; 2. Nagoya University, Japan	T U T O R I A L		GT2021:59719 Deep Dive Virtual Gas Turbines Part I: a Top-down Geometry Modelling Environment for Turbomachinery Application Davendu Kulkarni ¹ Gan Lu ² Feng Wang ² Luca Di Mare ² 1. Rolls-Royce Plc, United Kingdom; 2. Vibration UTC, Imperial College London, United Kingdom		
	GT2021:60007 Deep Dive Frequency Dependency of Dynamic Force Coefficients for Hermetic Squeeze Film Dampers Utilizing Fluid-Bounding Flexible Structures Bugra Ertas ¹ Keith Gary ² 1. GE Global Research Center, USA; 2. GE Research, USA			GT2021:59720 Deep Dive Virtual Gas Turbines Part 2: an Automated Whole-engine Secondary Air System Model Generation Davendu Kulkarni ¹ Luca Di Mare ² 1. Rolls-Royce Plc, United Kingdom; 2. Vibration UTC, Imperial College London, United Kingdom		
	GT2021:58627 Rapid Talk On the Experimental Dynamic Force Performance of a Squeeze Film Damper Supplied Through a Check Valve and Sealed with O-Rings Luis San Andrés, <u>Bryan Rodriguez</u> Texas A&M University, USA			GT2021:60087 Rapid Talk Numerical Investigation of the Interaction Between Gas-Turbine Engine Components with Dynamic Mode Tracking Carlos Pérez Arroyo, Jérôme Dombard, Florent Duchaine, Laurent Gicquel, Nicolas Odier CERFACS, France		
	GT2021:60159 Rapid Talk Optimization of an Oil Film Journal Bearing for Temperature Reduction Steven Chatterton ¹ Paolo Pennacchi ¹ Andrea Vania ¹ Phuoc Vinh Dang ² 1. Politecnico di Milano - Dept. Mechanical Engineering, Italy; 2. Department of Mechanical Engineering, The University of Danang—University of Science and Technology, Vietnam			GT2021:59951 Rapid Talk Approximation Method of the Gas Turbine Engine Compressor Characteristics <u>Sergey Avdeev</u> , Andrey Tkachenko Samara University, Russia		
	GT2021:60360 Rapid Talk Experimental Results, Numerical Predictions, and Mitigation of Flow Turbulence in a Thrust Collar Thomas Kerr, Adolfo Delgado Texas A&M University, USA			GT2021:59136 Rapid Talk Aeroderivative Gas Turbine Enclosure Ventilation System <u>Ravinder Yerram</u> , Balakrishnan Ponnuraj, Richard Watkins GE Gas Power, USA		

	TURBOMACHINERY: DESIGN METHODS AND CFD MODELING FOR TURBOMACHINERY		
	Adjoint Optimization and Reduced Order Models		
	Technical Session • 37-13		
	Session Organizer: Marcus Meyer , Rolls Royce Session Co-Organizer: Sebastian Mann , MTU		
4:00	GT2021:58605 Deep Dive Adjoint-based Inverse Design of Axial Compressor Airfoils Christophe Geuens ¹ Tom Verstraete ² <i>1. Delft University of Technology, Belgium;</i> <i>2. von Karman Institute for Fluid Dynamics, Belgium</i>		
4:30	GT2021:59515 Deep Dive A Rapid Viscous-inviscid Interaction Method for the Preliminary Design of S-shaped Transition Ducts Alan Veyrat ¹ Jon F Carrotte ¹ A Duncan Walker ¹ Chris Hall ² Harry Simpson ² <i>1. Loughborough University, United Kingdom;</i> <i>2. Rolls-Royce plc., United Kingdom</i>		
5:00	GT2021:58668 Rapid Talk Inlet Distortion Simulations of a Transonic Fan with CFD and Low-order Methods Carlo Favaron, Andrea Magrini, Alessandro Visentin, Luca Menegozzo, Ernesto Benini <i>Università degli Studi di Padova, Italy</i>		
5:10	GT2021:59012 Rapid Talk Effect of Accelerating Convergence in Adjoining 1D Domains Having Large Difference in Thermal Time Scales Tanvi Kaushik ¹ Jaydeep Basani ¹ Liangyu Wang ² Fang Xu ² <i>1. Honeywell Technology Solutions, India;</i> <i>2. Honeywell Aerospace, USA</i>		
5:20	GT2021:59610 Rapid Talk The Development and Verification of a Discrete Adjoint Solver Using Automatic Differentiation Hangkong Wu, Shenren Xu, Xiuquan Huang, Dingxi Wang <i>Northwestern Polytechnical University, China</i>		

KEYNOTE & PLENARIES

Plenary: Opening up the Design Space to Afford Efficient Gas Turbines Using H2 and Biofuels

Plenary Session •46-02

Session Organizer: **Jeff Benoit**, Power Systems Mfg., LLC
Session Co-Organizer: **Christer Björkqvist**, ETN Global

Opening up the Design Space to Afford Efficient Gas Turbines Using H2 and Biofuels

Sean Bradshaw¹ Geert Laagland² John Mason³ Brian Allen⁴

1. Pratt & Whitney, USA; 2. Vattenfall NV, Netherlands; 3. Solar Turbines Inc., USA; 4. Mitsubishi Power Americas, USA

8:00

8:30

9:00

	CERAMICS AND CERAMIC COMPOSITES	COAL, BIOMASS, HYDROGEN AND ALTERNATIVE FUELS	COMBUSTION, FUELS AND EMISSIONS
	Mechanical Behavior of Ceramics and CMCs I	e-LCA and Eco-Design I	Combustion Dynamics: Experimental Investigations I
	Technical Session • 02-01	Technical Session • 03-04	Technical Session • 04-04
	Session Organizer: Rajesh Kumar , United Technologies Research Center Session Co-Organizer: Michael Presby , NASA	Session Organizer: Francesco Fantozzi , Dipartimento Di Ingegneria - Università Di Perugia Session Co-Organizer: Pierre Gauthier , Siemens Energy Canada	Session Organizer: Thierry Schuller , Institut De Mécanique Des Fluides De Toulouse Session Co-Chairs: Kilian Oberleithner , Technical University Berlin; Nicolas Noiray , ETH Zurich; Bernhard Cosic , MAN Energy Solutions
9:45	GT2021:69493 Deep Dive Matrix Crack Networks in SiCf/SiC Composites: In-situ Characterisation and Metrics Steven Jordan ¹ Spencer Jeffs ¹ Christopher Newton ¹ Louise Gale ² Pascual Nicholson ³ Martin Bache ¹ 1. Swansea University, United Kingdom; 2. Rolls-Royce plc, United Kingdom; 3. TWI Technology Centre Wales, United Kingdom	GT2021:60176 Deep Dive Gas Turbine Based Electric Vehicle Charging Station Manjush Ganiger ¹ Maneesh Pandey ¹ Rahul Wagh ¹ Rakesh Govindasamy ² 1. Baker Hughes, India; 2. Baker Hughes, Italy	GT2021:59113 Deep Dive Relative Effects of Velocity- and Mixture-coupling in a Thermoacoustically Unstable, Partially-premixed Flame Ashwini Karmarkar ¹ Jacqueline O'Connor ¹ Isaac Boxx ² 1. Pennsylvania State University, USA; 2. DLR, German Aerospace Center, Germany
10:15	GT2021:60277 Deep Dive Life Limiting Aspects of an MI SiC/SiC Ceramic Matrix Composite (CMC) in Interlaminar Shear at Elevated Temperature Sung Choi, Sean Kane, Ashlynn Stanley, Luis Sanchez, D. Calvin Faucett Naval Air Systems Command, USA	GT2021:60120 Deep Dive Development of a 25 MWth Flameless Pressurized Oxy-vombustion Pilot Joshua Schmitt ¹ Massimo Malavasi ² 1. Southwest Research Institute, USA; 2. ITEA S.p.A., Italy	GT2021:60011 Deep Dive Dynamical Characterization of Thermoacoustic Oscillations in a Hydrogen-enriched Partially Premixed Swirl-Stabilized Methane/air Combustor Abhishek Kushwaha ¹ Praveen Kasthuri ¹ Samadhan A. Pawar ¹ R. I. Sujith ¹ Ianko Chterevev ² Isaac Boxx ² 1. Indian Institute of Technology, Madras, India; 2. German Aerospace Centre (DLR), Germany
10:45	GT2021:58485 Rapid Talk Micromechanical Modeling Tension-compression Fatigue Hysteresis Loops Model of Fiber-reinforced Ceramic-matrix Composites Considering Fibers Failure Longbiao Li Nanjing University of Aeronautics and Astronautics, China	GT2021:60269 Rapid Talk Gas Turbine Based Fuel Cell Vehicle Charging Station Manjush Ganiger ¹ Maneesh Pandey ¹ Rahul Wagh ¹ Rakesh Govindasamy ² 1. Baker Hughes, India; 2. Baker Hughes, Italy	GT2021:59226 Rapid Talk Numerical Study on Effect of Rib Shape on Thermal Performance and NOx Emission in Premixed Ammonia-Fueled Micro-combustors Siliang Ni, Dan Zhao University of Canterbury, New Zealand
10:55	GT2021:59789 Rapid Talk Temperature Dependent Fracture Mechanics-informed Damage Model for Ceramic Matrix Composites Travis Skinner, Aditi Chattopadhyay Arizona State University, USA	GT2021:60334 Rapid Talk A Study of Flow Characteristics for Improving Fuel Efficiency with Various Configurations of an Ejector in a Fuel Cell Seok Beom Yun ¹ Youn-Jea Kim ² 1. Graduate School of Mechanical Engineering, Sungkyunkwan University, Korea; 2. Sungkyunkwan University, Korea	GT2021:60216 Rapid Talk Experimental Investigation on Nonlinear Response of a Low-swirl Flame to Acoustic Excitation with Large Amplitude Weijie Liu, Liang Zhang, Ranran Xue, Qian Yang, Huiru Wang Aero-Engine Academy of China, China
11:05			GT2021:58602 Rapid Talk Design and Validation of a Novel Test-rig for RQL Flame Dynamics Studies Martin March, Julian Renner, Christoph Hirsch, Thomas Sattelmayer Technical University of Munich, Germany

	COMBUSTION, FUELS AND EMISSIONS	ELECTRIC POWER	HEAT TRANSFER: FILM COOLING
	Novel Combustion Concepts	Digitalization with Applied Analytics	Unusual Cooling Configurations
	Technical Session • 04-19	Technical Session • 09-01	Technical Session • 12-02
	Session Organizer: Khawar Syed , Infosys Session Co-Organizer: Krishna Miduturi , Siemens Energy	Session Organizer: Pratyush Nag , Siemens Power Gen Inc Session Co-Organizer: Ali Baghchehsara , LISA Deutschland GmbH	Session Organizer: Ali Ameri , Ohio State University Session Co-Chairs: Lamyaa El-Gabry , Princeton University; James Rutledge , Air Force Institute of Technology; Eric Ruggiero , GE Aviation; Prashant Singh , Mississippi State University; Nirm Nirmalan , NIRMVision LLC
9:45	GT2021:58650 Deep Dive Hydrogen Blending Into Ansaldo Energia AE94.3A Gas Turbine: High Pressure Tests, Field Experience and Modelling Considerations <u>Andrea Ciani</u> ¹ <u>Luis Tay-Wo-Chong</u> ¹ <u>Alberto Amato</u> ² <u>Edoardo Bertolotto</u> ² <u>Giuseppe Spataro</u> ² 1. Ansaldo Energia, Switzerland; 2. Ansaldo Energia, Italy	GT2021:58698 Deep Dive Detection of Machinery Failure Signs From Big Time-series Data Obtained by Flow Simulation of Intermediate-pressure Steam Turbines <u>Kazuhiko Komatsu</u> , <u>Hironori Miyazawa</u> , <u>Cheng Yiran</u> , <u>Masayuki Sato</u> , <u>Takashi Furusawa</u> , <u>Satoru Yamamoto</u> , <u>Hiroaki Kobayashi</u> Tohoku University, Japan	GT2021:60050 Deep Dive An Experimental Study of Turbine Vane Film Cooling Using Endoscope-based PSP Technique in a Single-passage Wind Tunnel <u>Kechen Wang</u> , <u>Hongyi Shao</u> , <u>Xu Zhang</u> , <u>Di Peng</u> , <u>Yingzheng Liu</u> , <u>Wenwu Zhou</u> Shanghai Jiao Tong University, China
10:15	GT2021:58622 Deep Dive Synergistic Effect of Soot Formation in Ethylene/propane Co-flow Diffusion Flames at Elevated Pressures <u>Dongsheng Zheng</u> , <u>Xin Hui</u> , <u>Xin Xue</u> , <u>Weitao Liu</u> Beihang University, China	GT2021:59082 Deep Dive Prediction Enhancement of Machine Learning Using Time Series Modeling in Gas Turbines <u>Vipul Goyal</u> , <u>Mengyu Xu</u> , <u>Ladislav Vesely</u> , <u>Jayanta Kapat</u> University of Central Florida, USA	GT2021:59413 Deep Dive Enhanced Film Cooling Effect Downstream a Cylindrical Hole Using SDBD and DBD-VGs Plasma Actuators <u>Yuefeng Huang</u> , <u>Zihan Zhang</u> , <u>Kun He</u> , <u>Xin Yan</u> Xi'an Jiaotong University, China
10:45	GT2021:59934 Rapid Talk Investigation on Flowfield and Fuel/air Premixing Uniformities of Low Swirl Injector for Lean Premixed Gas Turbine Combustors <u>Fujun Sun</u> , <u>Jianqin Suo</u> , <u>Zhenxia Liu</u> Northwestern Polytechnical University, China	GT2021:59572 Rapid Talk The Epri Gas Turbine Digital Twin – a Platform for Operator Focused Integrated Diagnostics and Performance Forecasting <u>Christopher Perullo</u> ¹ <u>Jamie Lim</u> ¹ <u>Rachel Whitacre</u> ² <u>Joseph Milton</u> ² <u>Chris Griffin</u> ³ <u>David Noble</u> ⁴ <u>Lea Boche</u> ⁴ <u>Leonard Angello</u> ⁴ <u>Steven Seachman</u> ⁴ <u>Susan Maley</u> ⁴ <u>Timothy Lieuwen</u> ¹ <u>Chris Jackson</u> ⁵ 1. Turbine Logic, USA; 2. Chevron Pipeline & Power, USA; 3. Duke Energy, USA; 4. Electric Power Research Institute, USA; 5. Luminant, USA	GT2021:58451 Rapid Talk Film Cooling Effectiveness Enhancement Using Multi-longitudinal Vortex Generated by Alternating Elliptical Film Holes <u>Kun Xiao</u> , <u>Juan He</u> , <u>Zhenping Feng</u> Xi'an Jiaotong University, China
10:55	GT2021:59941 Rapid Talk Investigation of Adjacent Lifted Flames Interaction in an Inline and Inclined Multi- burner Arrangement <u>Mohamed Shamma</u> ¹ <u>Sven Hoffmann</u> ² <u>Stefan Raphael Harth</u> ¹ <u>Nikolaos Zarzalis</u> ¹ <u>Dimosthenis Trimis</u> ¹ <u>Rainer Koch</u> ² <u>Hans-Jörg Bauer</u> ² <u>Leonardo Langone</u> ³ <u>Sofia Galeotti</u> ³ <u>Antonio Andreini</u> ³ 1. Engler-Bunte-Institute, Division of Combustion Technology, Karlsruhe Institute of Technology, Germany; 2. Institute of Thermal Turbomachinery, Karlsruhe Institute of Technology, Germany; 3. Heat Transfer and Combustion group DIEF, Department of Industrial Engineering, University of Florence, Italy	GT2021:58933 Rapid Talk Data Fusion: A Project Update & Pathway Forward <u>Salvatore Della Villa, Jr.</u> ¹ <u>Robert Steele</u> ¹ <u>Dongwon Shin</u> ² <u>Sangkeun (Matt) Lee</u> ² <u>Travis Johnston</u> ² <u>Yong Liu</u> ³ <u>Youhai Wen</u> ³ <u>David Alman</u> ³ <u>Christopher Perullo</u> ⁴ 1. Strategic Power Systems, Inc., USA; 2. Oak Ridge National Laboratory, USA; 3. U.S. Department of Energy National Energy Technology Laboratory, USA; 4. Turbine Logic, USA	GT2021:59530 Rapid Talk Implementation of Vortex Generator and Ramp to Improve Film Cooling Effectiveness on Blade Endwall <u>Sadam Hussain</u> , <u>Xin Yan</u> Xi'an Jiaotong University, China
11:05	GT2021:60258 Rapid Talk Investigation on the Effects of Field Emission Plasma on the Performance of a Micro- combustor <u>Maria Grazia De Giorgi</u> , <u>Giacomo Cinieri</u> , <u>Donato Fontanarosa</u> , <u>Antonio Ficarella</u> University of Salento, Department of Engineering for Innovation, Italy		GT2021:59423 Rapid Talk Conjugate Heat Transfer Characteristics of Double Wall Cooling with Gradient Diameter of Film and Impingement Holes <u>Juan He</u> , <u>Qinghua Deng</u> , <u>Zhenping Feng</u> Xi'an Jiaotong University, China

	STRUCTURES AND DYNAMICS: BEARING AND SEAL DYNAMICS	SUPERCRITICAL CO ₂	TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS
	Seals II	Tutorial: Materials	Endwall, Seal, and Leakage Flows
	Technical Session • 25-02	Tutorial Session • 33-14	Technical Session • 34-05
	Session Organizer: Min Zhang , Praxair, Inc. Session Co-Organizer: Tingcheng Wu , Siemens Energy	Session Organizer: Grant Musgrove , Southwest Research Institute Session Co-Organizer: Ganesan Subbaraman , Gas Technology Institute	Session Organizer: Sungho Yoon , GE Global Research
9:45	GT2021:58958 Deep Dive An Analytical Two-phase Flow Model for Prediction of Leakage in Wet Gas Labyrinth Seals and Pocket Damper Seals. Is Simplicity Still Desired? <u>Jing Yang</u> , Luis San Andres <i>Texas A&M University, USA</i>	GT2021:60361 Tutorial Materials for Supercritical Carbon Dioxide Applications <u>Ganesan Subbaraman</u> ¹ <u>Steven Kung</u> ² <u>Henry Saari</u> ³ <i>1. Gas Technology Institute, USA; 2. Electric Power Research Institute, USA; 3. Carleton University, Canada</i> ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".	GT2021:58551 Deep Dive Periodic Unsteady Kinematics of Stator Hub Flow in a Shrouded Multi-stage Low-speed Axial Compressor <u>Jaehyoung Lee</u> ¹ <u>Hyoun-Woo Shin</u> ² <u>Sungryong Lee</u> ³ <u>Seung Jin Song</u> ⁴ <u>Sungkyung Lim</u> ⁵ <i>1. Hanwha Power Systems, Korea; 2. GE Aviation (Retired), USA; 3. Doosan Heavy Industries & Construction, Korea; 4. Seoul National University, Korea; 5. Hyundai Motor Company, Korea</i>
10:15	GT2021:59371 Deep Dive A Novel Hybrid Seal: Design and Experimental Validation on a High Pressure Rotordynamic Test Rig <u>Giuseppe Vannini</u> ¹ <u>Benjamin Defoy</u> ² <u>Manjush Ganiger</u> ³ <u>Carlo Mazzali</u> ⁴ <i>1. Baker Hughes, Italy; 2. Baker Hughes, France; 3. Baker Hughes, India; 4. Equinor, Norway</i>	T U T O R I A L	GT2021:60115 Deep Dive Details of Shrouded Stator Hub Cavity Flow in a Multi-stage Axial Compressor Part 2: Leakage Flow Characteristics in Stator Wells <u>Nitya Kamdar</u> ¹ <u>Fangyuan Lou</u> ² <u>Nicole Key</u> ² <i>1. Purdue University, School of Mechanical Engineering, USA; 2. Purdue University, USA</i>
10:45	GT2021:60106 Rapid Talk Effects of Increased Tooth Clearance on the Performance of a Labyrinth Seal with Oil-rich Bubbly Laminar Flow <u>Min Zhang</u> ¹ <u>Dara Childs</u> ² <i>1. Praxair, Inc., USA; 2. Texas A&M University, USA</i>		GT2021:60103 Rapid Talk Details of Shrouded Stator Hub Cavity Flow in a Multi-stage Axial Compressor Part 1: Interactions with the Primary Flow <u>Nitya Kamdar</u> ¹ <u>Fangyuan Lou</u> ² <u>Nicole Key</u> ² <i>1. Purdue University, School of Mechanical Engineering, USA; 2. Purdue University, USA</i>
10:55	GT2021:58893 Rapid Talk Visualization of Destabilization Force of Labyrinth Gas Seal Using Fast-Responding Pressure Sensitive Paint <u>Shingo Nishida</u> ¹ <u>Makoto Iwasaki</u> ¹ <u>Naoto Omura</u> ¹ <u>Kazuyuki Nakakita</u> ² <u>Tsutomu Nakajima</u> ² <i>1. Mitsubishi Heavy Industries, Japan; 2. Japan Aerospace Exploration Agency, Japan</i>		GT2021:58742 Rapid Talk Endwall Boundary Layer Development in a Multistage Low-speed Compressor with Tandem Stator Vanes <u>Michael Hopfinger</u> ¹ <u>Volker Guemmer</u> ² <i>1. Technical University of Munich, Germany; 2. Institute of Turbomachinery and Flight Propulsion - Technical University of Munich, Germany</i>
11:05	GT2021:58956 Rapid Talk Making Better Swirl Brakes Using Computational Fluid Dynamics: Performance Enhancement from Geometry Variation <u>Jing Yang</u> , Luis San Andres <i>Texas A&M University, USA</i>		GT2021:58388 Rapid Talk Numerical Evaluation of Losses in Shrouded and Cantilevered Stators of a Multistage Axial Compressor <u>Ilaria De Dominicis</u> ¹ <u>Sebastian Robens</u> ² <u>Volker Gümmer</u> ¹ <i>1. Technical University of Munich, Germany; 2. Siemens AG, Germany</i>

	TURBOMACHINERY: RADIAL TURBOMACHINERY AERODYNAMICS		
	Centrif Compressor Design/Peform. Optimization I		
	Technical Session • 40-02		
	Session Organizer: Hideaki Tamaki , IHI Corporation Session Co-Organizer: Friedrich Froehlig , MTU Friedrichshafen GmbH		
9:45	GT2021:58548 Deep Dive Loss Characterization of Advanced VIGV Configurations with Adjustable Blade Geometry Roman Gawin Frank ¹ Christian Wacker ² Reinhard Niehuis ¹ <i>1. Universität der Bundeswehr München, Germany; 2. MAN Energy Solutions SE, Germany</i>		
10:15	GT2021:59462 Deep Dive Unsteady Effects of Blade Row Interaction on Flow Field and Aerodynamic Performance of a Transonic Centrifugal Compressor Impeller Kazutoyo Yamada ¹ Kosuke Kubo ¹ Kenichiro Iwakiri ² Yoshihiro Ishikawa ² Hiroataka Higashimori ³ <i>1. Iwate University, Japan; 2. Mitsubishi Heavy Industries, Ltd., Japan; 3. MHI Solution Technologies Co., Ltd., Japan</i>		
10:45	GT2021:59255 Rapid Talk Experimental and Numerical Investigation of Vaned Hub and Shroud Wall Contoured Diffusers Designed to Improve Flexibility and Efficiency of an Open Impeller Centrifugal Compressor Stage Daniel Hermann ¹ Manfred Wirsum ¹ Douglas Robinson ² Philipp Jenny ² <i>1. Institute of Power Plant Technology, Steam and Gas Turbines, RWTH Aachen University, Germany; 2. MAN Energy Solutions Schweiz AG, Switzerland</i>		
10:55	GT2021:59555 Rapid Talk On the Correlation Between Span-wise Inducer Incidence and Impeller Diffusion for Ruled Surface and Barreled Sweep-bow Impeller Design at IGV-off-design Andre Hildebrandt, Thomas Ceyrowsky, Jan Klausmann, Kolja Andrej Metz <i>MAN Energy Solutions SE, Germany</i>		

	AIRCRAFT ENGINE	CERAMICS AND CERAMIC COMPOSITES	COAL, BIOMASS, HYDROGEN AND ALTERNATIVE FUELS
	Thermal Management and Aero-engine Oil Systems	Mechanical Behavior of Ceramics and CMCs-II	e-LCA and Eco-Design II and Storage
	Technical Session • 01-04	Technical Session • 02-02	Technical Session • 03-05
	Session Organizer: Ioannis Roumeliotis , Cranfield University Session Co-Organizer: Francesco Saverio Mastropierro , Cranfield University	Session Organizer: Rajesh Kumar , United Technologies Research Center Session Co-Organizer: Martin R. Bache , Swansea University	Session Organizer: Marina Braun-Unkhoff , Institute of Combustion Technology
12:15	GT2021:58942 Deep Dive Design and Analysis of an Aircraft Thermal Management System Linked to a Low-bypass Ratio Turbofan Engine Robert Clark, Mingxuan Shi, Jonathan Gladin, Dimitri Mavris <i>Georgia Institute of Technology, USA</i>	GT2021:60384 Deep Dive Experimental Analysis and Material Characterization of Ultra High Temperature Ceramic Composites <u>Anindya Ghoshal</u> ¹ Michael Walock ¹ Andy Nieto ² Muthuvel Murugan ¹ Luis Bravo ¹ Clara Mock ³ Marc Pepi ³ Andrew Wright ⁴ Jian Luo ⁴ <i>1. US Army Research Lab, USA; 2. Naval Postgraduate School, USA; 3. CCDC Army Research Lab, USA; 4. University of California, San Diego, USA</i>	GT2021:59640 Deep Dive Comparing Environmental Impacts of Additive Manufacturing vs. Investment Casting for the Production of a Shroud for Gas Turbine <u>Angela Serra</u> ¹ Francesco Fantozzi ² Pietro Bartocci ² Giulio Buia ² Martina Malarco ¹ Alessandro Musacchio ¹ <i>1. Baker Hughes - Nuovo Pignone, Italy; 2. Department of Engineering, University of Perugia, Italy</i>
12:45	GT2021:58988 Deep Dive Numerical Investigation of Air-oil Two-phase Flow Pattern Transition in the Scavenge Line of an Aeroengine <u>Ghofrane Sekrani</u> ¹ Jean Sébastien Dick ² Sébastien Poncet ¹ Sravan Kumar Nallamothu ³ <i>1. Université de Sherbrooke, Canada; 2. Pratt and Whitney Canada, Canada; 3. Ansys Software Pvt Ltd, India</i>	GT2021:59125 Deep Dive High Temperature Solid Particle Erosion in a Melt-infiltrated SiC/SiC Ceramic Matrix Composite Michael Presby <i>NASA, USA</i>	GT2021:58595 Deep Dive Cryogenic Fuel Storage Modelling and Optimisation for Aircraft Applications <u>Pavlos Rompokos</u> ¹ Andrew Rolt ¹ Devaiah Nalianda ¹ Thierry Sibilli ² Claire Benson ³ <i>1. Cranfield University, United Kingdom; 2. Safran S.A., France; 3. London South Bank University, United Kingdom</i>
1:15	GT2021:59992 Rapid Talk Transient Analysis of Aircraft Oil Supply System with Fuel-oil Heat Exchangers During Abrupt Change in Engine Operating Modes <u>Viktor Yevlakhov</u> , Leonid Moroz, Andrii Khandrymailov, Yuriy Hyrka <i>SoftInWay Inc., USA</i>	GT2021:60395 Rapid Talk Constituent and Ply Level Understanding of Electrical Resistance in Si-Containing SiC/SiC Composites <u>Joseph El Rassi</u> , Gregory Morscher <i>The University of Akron, USA</i>	GT2021:59689 Rapid Talk Decarbonizing Materials and Machining Sourcing for the Energy Sector Through Life Cycle Assessment <u>Angela Serra</u> ¹ Francesco Fantozzi ² Pietro Bartocci ² Alessandro Musacchio ¹ Simone Colantoni ¹ Luca Cencioni ² <i>1. Baker Hughes - Nuovo Pignone, Italy; 2. Department of Engineering, University of Perugia, Italy</i>
1:25	GT2021:58964 Rapid Talk Study of Oil Film Heat Transfer in Gas Turbine Engine Bearing Chamber <u>Illia Petukhov</u> , <u>Taras Mykhailenko</u> , Oleksii Lysytsia, Artem Kovalov <i>National Aerospace University "Kharkiv Aviation Institute", Ukraine</i>	GT2021:59782 Rapid Talk Erosion Evaluation of Gas-turbine Grade CMCs at Room and Elevated Temperatures <u>Amirhossein Eftekharian</u> ¹ Ragav P Panakarajupally ² Dr. Gregory N. Morscher ² Dade Huang ¹ Frank Abdi ¹ Dr. Sung Choi ³ <i>1. AlphaSTAR Corporation, USA; 2. University of Akron, USA; 3. NAVAIR, USA</i>	GT2021:59393 Rapid Talk A Novel Long-duration Hydrogen Storage Concept Without Liquefaction and High Pressure Suitable for Onsite Blending <u>Marcel Otto</u> , Manoj Prabakar Sargunaraj, Adil Riahi, Jayanta Kapat <i>University of Central Florida, USA</i>
1:35	GT2021:59418 Rapid Talk A Method of Solving Three Temperature Problem of Turbine with Adiabatic Wall Temperature <u>Zeyu Wu</u> , Xiang Luo, Jianqin Zhu, Yang Yang, Jiahua Liu <i>BeiHang University, China</i>		

COMBUSTION, FUELS AND EMISSIONS		ELECTRIC POWER		STRUCTURES AND DYNAMICS: BEARING AND SEAL DYNAMICS	
Combustor Flows, Instability and Passive Control		Voice of Customers/Users		Seals and Bearings	
Technical Session • 04-02		Panel Discussion • 09-04		Technical Session • 25-05	
Session Organizer: Marc Furi , Siemens Energy Canada Session Co-Chairs: Ben Emerson , Georgia Institute of Technology; James Dawson , NTNU		Session Organizer: Robert Steele , EPRI Session Co-Chairs: Christer Bjorkqvist , ETN; Bin Jou , FM Global		Session Organizer: Rahul Bidkar , GE Research Session Co-Organizer: Ryan McGowan , DEVCOM Army Research Laboratory	
12:15	GT2021:58341 Deep Dive Gradient-Free Optimization in Thermoacoustics: Application to a Low-order Model Johann Moritz Reumschüssel ¹ Jakob Georg Raimund Von Saldern ² Yiqing Li ³ Alessandro Orchini ¹ Christian Oliver Paschereit ¹ <i>1. Chair of Fluid Dynamics, Technische Universität Berlin, Germany; 2. Laboratory for Flow Instabilities and Dynamics, Technische Universität Berlin, Germany; 3. Center for Turbulence Control, Harbin Institute of Technology, Shenzhen, China</i>	P A N E L		GT2021:59122 Deep Dive Bearing Skidding Detection for High Speed and Aero Engine Applications Azzedine Dadouche, Rami Kerrouche <i>National Research Council Canada, Canada</i>	
	GT2021:58535 Deep Dive Influence of Hole-to-Hole Interaction on the Acoustic Behavior of Multi-orifice Perforated Plates Alireza Javareshkian, Alexis Dancelme, Hongyu Chen, Thomas Sattelmayer <i>Lehrstuhl für Thermodynamik, Germany</i>			GT2021:58547 Deep Dive Experimental Studies on Dry Gas Seals with Time-resolved Film Thickness Measurements Jingjing Luo, Dieter Brillert <i>Universität Duisburg-Essen, Germany</i>	
	GT2021:58653 Rapid Talk Experimental Investigation of the Confinement Effects in Radial-Radial Swirlers Firat Kiyici, Mustafa Percin <i>Middle East Technical University, Turkey</i>			GT2021:59872 Rapid Talk Determination of the Area of Rational Use of Hybrid Bearings with Steel Rings and Ceramic Rolling Elements in High-speed Aircraft Engine Yury Lavrentyev, Nikolay Petrov, Yury Nozhnitsky <i>CIAM, Russia</i>	
	GT2021:59164 Rapid Talk Numerical Investigation on the Flow Characteristics in a Cover-Plate Pre-swirl System Menghua Jian, Xuesen Yang, Wei Dong <i>Shanghai Jiao Tong University, China</i>			GT2021:60175 Rapid Talk Numerical Investigation on Hydrodynamic Characteristics of Supercritical CO2 Cylindrical Film Seal Qiuwan Du ¹ Zhufeng Liu ² Di Zhang ¹ Yonghui Xie ³ <i>1. MOE Key Laboratory of Thermo-Fluid Science and Engineering, Xi'an Jiaotong University, China; 2. Shaanxi Engineering Laboratory of Turbomachinery and Power Equipment, School of Energy and Power Engineering, China; 3. Shaanxi Engineering Laboratory of Turbomachinery and Power Equipment, School of Energy and Power Engineering, Xi'an Jiaotong University, China</i>	
	GT2021:60122 Rapid Talk Experimental Investigation of a High Velocity Gaseous Jet Injection Into an Oscillating Crossflow Jong Guen Lee, Jinkwan Song, Johnathan Wilson <i>University of Cincinnati, USA</i>			GT2021:58804 Rapid Talk Experimental Investigation Into Gravity Drained Journal Bearings Rohit Khattar, Sudeep Bosu, Kashinath Akki, Amit Paspulati <i>Siemens Energy Inc., USA</i>	

	STRUCTURES AND DYNAMICS: EMERGING METHODS IN DESIGN AND ENGINEERING	TURBOMACHINERY: AXIAL FLOW TURBINE AERODYNAMICS	TURBOMACHINERY: DESIGN METHODS AND CFD MODELING FOR TURBOMACHINERY
	Advances in Design, Analysis and Additive Manufacturing	High-Speed LPT and Turbine Rear Structures	Fan / Compressor Design Methods and Applications
	Technical Session • 26-01	Technical Session • 35-07	Technical Session • 37-02
	Session Organizer: Partha Das , Honeywell International Inc Session Co-Organizer: Bernd Beirow , Brandenburgische TU Cottbus/lkmz	Session Organizer: Jochen Gier , MTU	Session Organizer: Frederic Goenaga , Rolls-Royce plc Session Co-Organizer: Shraman Goswami , Honeywell
12:15	GT2021:59003 Deep Dive On Virtual Clearance Monitoring of Steam Turbine by Using Model Order Reduction <u>Hiroshi Ito¹ Shoichiro Hosomi² Norikazu Tezuka² Tomohiro Ishida¹</u> 1. Mitsubishi Heavy Industries, Ltd, Japan; 2. Mitsubishi Power, Ltd, Japan	GT2021:59224 Deep Dive Experimental and Numerical Flow Analysis of an Engine Realistic State-of-the-art Turbine Rear Structure <u>Valentin Vikhorev¹ Pär Nylander² Valery Chernoray¹ Jonas Larsson² Oskar Thulin²</u> 1. Chalmers University of Technology, Sweden; 2. GKN Aerospace Engine Systems, Sweden	GT2021:59468 Deep Dive Non-equilibrium Turbulence Modelling for Compressor Corner Separation Flows <u>Wei Sun</u> China Aero Engine Research Institute, China
12:45	GT2021:60201 Deep Dive Design, Development and Validation of Additively Manufactured 1st Stage Turbine Vane for F Class Industrial Gas Turbine <u>Alex Torkaman, Gregory Vogel, Lonnie Houck</u> Power Systems Mfg., LLC, USA	GT2021:59219 Deep Dive Design and Testing of a Multi-stage IP Turbine for Future Geared Turbofans <u>Diego Torre Ruiz¹ Guillermo Garcia-Valdecasas Santa Isabel¹ Salvador Luque Martinez¹ Daniel Hernández Martín¹ Andoni Puente Morales²</u> 1. ITP Aero, Spain; 2. CTA - Centro de Tecnologías Aeronáuticas, Spain	GT2021:59121 Deep Dive Selecting a Compressor Meridional Topology: Axial, Mixed, Radial <u>Jonathan M. Smyth, Robert J. Miller</u> Whittle Laboratory, University of Cambridge, United Kingdom
1:15	GT2021:59863 Rapid Talk Identification of Slip Load, Friction Force and External Force Using Unscented Kalman Filter for a Frictionally Damped Turbine Blade <u>Alok Sinha, Himanshu Patel</u> Pennsylvania State University, USA		GT2021:59238 Rapid Talk Mathematical Model to Describe Double Circular Arc and Multiple Circular Arc Compressor Blade Profiles <u>John Kidikian, Chelesty Badrieh, Marcelo Reggio</u> Polytechnique Montreal, Canada
1:25	GT2021:59996 Rapid Talk An Understanding of Stress and Pretension Behaviour of Aero Engine Rotor Bolted Joint <u>Venkateshwarlu Mogullapally, Shine Jyoth, Sanju Kumar, Rashmi Rao, Rajeevalochanam Bukkapatna Ananthappa</u> Gas Turbine Research Establishment, India		GT2021:60003 Rapid Talk Influence of Roughness on Transition Modeling in Compressor Flows <u>Vera Tolkdsdorf, Anubhav Gokhale, Daniel Kessler, Leroy Benjamin, Jens Friedrichs, Christoph Bode</u> Technische Universitaet Braunschweig, Germany
1:35	GT2021:58462 Rapid Talk Discrete Element Method Simulations of Additively Manufactured Components with Integrated Particle Dampers <u>Daniel Kiracofe¹ Matthew Postell¹ Onome Scott-Emuakpor² Brian Runyon² Tommy George²</u> 1. University of Cincinnati, USA; 2. Air Force Research Laboratory, USA		

SPECIALTY

Mind the Gap: Unlocking DE&I in Gas Turbine Engineering

Panel Discussion • 47-02

Session Organizer: **Karen Thole**, Pennsylvania State University
 Session Co-Organizer: **Eric J. Ruggiero**, GE Aviation

Panelists:

Joe Allen, *Chief Diversity Officer, GE Aviation*
 Chela Gage, *Senior Executive, Diversity, Equity & Inclusion, Pratt & Whitney*
 Mary FitzPatrick, *Global Head of Diversity and Inclusion, Rolls Royce*

**** This panel session will NOT have a video on demand (VOD). This panel will be held "live".**

P
A
N
E
L

12:15

12:45

1:15

	CERAMICS AND CERAMIC COMPOSITES	COAL, BIOMASS, HYDROGEN AND ALTERNATIVE FUELS	COMBUSTION, FUELS AND EMISSIONS
	Thermal and Environmental Barrier Coatings	Bio-fuels	Dry Low-NOx Combustor Development (incl. Micro GT's and Pressure Gain Combustors)
	Technical Session • 02-03	Technical Session • 03-03	Technical Session • 04-16
	Session Organizer: Michael Presby , NASA Session Co-Organizer: Rajesh Kumar , United Technologies Research Center	Session Organizer: Pierre Gauthier , Siemens Energy Canada Session Co-Organizer: Angela Serra , Baker Hughes - Nuovo Pignone	Session Organizer: K. Michael Duesing , Ansaldo Energia Switzerland Session Co-Chairs: Matteo Cerutti , GE Oil&Gas Nuovo Pignone; Jon Runyon , Cardiff University; R V Manikantachari Kancherla , University of Central Florida; Srinivasa Krishna Addepalli , Argonne National Laboratory; Francesca Di Mare , Ruhr-Universität Bochum; Robert Gordon , The University of Melbourne
2:15	GT2021:59649 Deep Dive Synchrotron X-Ray Diffraction to Quantify In-situ Strain on Rare-earth Doped Yttria-stabilized Zirconia Thermal Barrier Coatings Quentin Fouliard ¹ Hossein Ebrahimi ¹ Johnathan Hernandez ¹ Khanh Vo ¹ Frank Accornero ² Mary Mccay ² Jun-Sang Park ³ Jonathan Almer ³ Ranajay Ghosh ¹ Seetha Raghavan ¹ 1. University of Central Florida, USA; 2. Florida Institute of Technology, USA; 3. Argonne National Laboratory, USA	GT2021:58761 Deep Dive Progress in Using Liquid Bio-fuels in DLE Industrial Gas Turbines Priyank Saxena ¹ William C. Steele ² Luke H. Cowell ² 1. Solar Turbines, Caterpillar, USA; 2. Solar Turbines, USA	GT2021:60102 Deep Dive On-design Component-level Multiple-objective Optimization of a Small-scale Cavity-stabilized Combustor Alejandro Briones ¹ Timothy Erdmann ² Brent Rankin ² 1. University of Dayton Research Institute, USA; 2. Air Force Research Laboratory, USA
2:45	GT2021:59408 Deep Dive Predicting EBC Temperature Limits for Industrial Gas Turbines Bruce A. Pint, Padraig Stack, Kenneth Kane Oak Ridge National Laboratory, USA	GT2021:59830 Deep Dive Part-load Operation of Gas Turbines Induced by Co-gasification of Coal and Biomass in an Integrated Gasification Combined Cycle Power Plant Silvia Ravelli University of Bergamo - Department of Engineering and Applied Sciences, Italy	GT2021:58814 Deep Dive A Kinematic Study of Individual Rotating Detonation Engine Waves Using K-Means Algorithm Taha Rezzag, Robert Burke, Kareem Ahmed University of Central Florida, USA
3:15	GT2021:58972 Rapid Talk Thermal Barrier Coating Applied to the Structural Shroud of the Inside-out Ceramic Turbine Patrick K. Dubois ¹ Antoine Gauvin-Verville ¹ Benoît Picard ² Jean-Sébastien Plante ¹ Mathieu Picard ¹ 1. Université de Sherbrooke, Canada; 2. Exonetik Turbo, Canada	GT2021:58784 Rapid Talk Design and Development of Biogas Venturi Mixture for Stationary Diesel Engine Using Analytical and CFD Approach Harshal S. Salave ¹ Avinash D. Desai ² 1. M.E.S.College of Engineering, India; 2. Shri Ramchandra College of Engineering, Wagholi, Pune, India	GT2021:58706 Rapid Talk Experimental Investigation of Dual-Swirl Spray Flame in a Fuel Staged Optical Model Combustor with Laser Diagnostics Siheng Yang ¹ Jianchen Wang ¹ Zhichao Wang ¹ Meng Han ¹ Yexin Wang ² Yuzhen Lin ¹ 1. Beihang University, China; 2. COMAC Shanghai Aircraft Design & Research Institute, China
3:25			GT2021:59029 Rapid Talk A Design of Experiments Based Investigation of the Influence of Hot Cross-flow Gas on a Flox®-based Single-nozzle Liquid Burner Saeed Izadi ¹ Cedric Kraus ² Jan Zanger ¹ Oliver Kislal ¹ Benedict Enderle ¹ Felix Grimm ¹ Peter Kutne ¹ Manfred Aigner ¹ 1. Institute of Combustion Technology, German Aerospace Center (DLR), Germany; 2. University of Stuttgart, Germany
3:35			GT2021:59009 Rapid Talk Optimization of Fuel Nozzle Diameter in a Novel Cross Flow Lean Direct Injection Burner Kingshuk Chakraborty, Satyanarayanan R Chakravarthy Indian Institute of Technology, Madras, India

ELECTRIC POWER		HEAT TRANSFER: FILM COOLING	OIL AND GAS APPLICATIONS
Gas Turbine and Power Plant		Advanced Materials with Film Cooling Flows	Wet Gas Compression Considerations
Technical Session • 09-02		Technical Session • 12-05	Tutorial Session • 21-05
Session Organizer: Rick Tomlinson , Chevron Session Co-Organizer: Brock Ramey , Industrial Info Resources		Session Organizer: John McClintic , Honeywell Session Co-Organizer: Khosro Mollahosseini , Honeywell Aerospace	Session Organizer: Rainer Kurz , Solar Turbines Inc.
2:15	GT2021:59317 Deep Dive Experimental Development of On-line Flame Transfer Function Measurements for Fielded Gas Turbines Austin Matthews ¹ Anna Cobb ¹ Subodh Adhikari ¹ David Wu ¹ Benjamin Emerson ¹ Jim Blust ² Tim Lieuwen ¹ <i>1. Georgia Institute of Technology, USA; 2. Solar Turbines Inc., USA</i>	GT2021:59602 Deep Dive Effect of a Ceramic Matrix Composite Surface on Film Cooling Peter Wilkins ¹ Stephen Lynch ¹ Karen Thole ¹ Tyler Vincent ² San Quach ² Dominic Mongillo ² <i>1. The Pennsylvania State University, USA; 2. Pratt & Whitney, a division of Raytheon Technologies Corporation, USA</i>	GT2021:59372 Tutorial Wet Gas Compression Considerations Griffin Beck, Carolyn Day, Steven Green, Abhay Patil <i>Southwest Research Institute, USA</i> ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".
2:45	GT2021:59457 Deep Dive Turn-down Capability of Ansaldo Energia's GT26 Ralf Jakoby ¹ Jörg Rinn ¹ Christoph Appel ² Adrien Studerus ¹ <i>1. Ansaldo Energia Switzerland, Switzerland; 2. Ansaldo Energia Switzerland, Taiwan</i>	GT2021:58950 Deep Dive Experimental and Computational Investigation of Integrated Internal and Film Cooling Designs Incorporating a Thermal Barrier Coating Matthew Horner, Christopher Yoon, Michael Furgeson, Todd Oliver, David Bogard <i>The University of Texas at Austin, USA</i>	T U T O R I A L
3:15	GT2021:59470 Rapid Talk GT36 Turbine Development and Full-scale Validation Shailendra Naik, Bruno Stephan, Marc Henze <i>Ansaldo Energia Switzerland, Switzerland</i>	GT2021:59038 Rapid Talk Film Cooling Effectiveness Measurement of Fan-shaped Holes Manufactured Using Electrical Discharge Machining Technique Samaneh Rouina ¹ Hamed Abdeh ¹ Giovanna Barigozzi ¹ Vittorio Odemondo ² Luca Abba ² Matteo Iannone ³ <i>1. University of Bergamo - Department of Engineering and Applied Sciences, Italy; 2. Ansaldo Energia, Italy; 3. Prosoft Intesys s.r.l, Italy</i>	
3:25	GT2021:59291 Rapid Talk Achieving Better Power Plant Guarantees Through a New Exergy-based Approach for the HRSG Raub Smith <i>General Electric/Gas Power Systems, USA</i>	GT2021:58991 Rapid Talk Additively Manufactured Porous Geometries for Hybrid Turbine Blade Cooling Nathan Fier, David Bogard <i>University of Texas at Austin, USA</i>	
3:35	GT2021:59403 Rapid Talk Application of Ultra-low NOX Combustor to the Mitsubishi Power Existing Gas Turbine Takashi Nishiumi, Sosuke Nakamura, Hirofumi Ohara, Kotaro Miyauchi, Toshishige Ai, Masahito Kataoka <i>Mitsubishi Power, Ltd., Japan</i>	GT2021:59638 Rapid Talk Flow Check and Adiabatic Effectiveness Measurements on Traditionally versus Additively Manufactured Film-cooling Holes Simone Cubeda ¹ Luca Andrei ¹ Luca Innocenti ¹ Fabrizio Paone ¹ Lorenzo Cocchi ² Alessio Picchi ² Bruno Facchini ² <i>1. Baker Hughes, Italy; 2. University of Florence, Italy</i>	

			STRUCTURES AND DYNAMICS: BEARING AND SEAL DYNAMICS	SUPERCRITICAL CO ₂	TURBOMACHINERY: DESIGN METHODS AND CFD MODELING FOR TURBOMACHINERY
			Oil Bearings	SCO ₂ Panel Session	Novel Approaches for Turbine Optimization
			Technical Session • 25-03	Panel Discussion • 33-08	Technical Session • 37-04
			Session Organizer: Timothy Dimond , Solar Turbines Inc. Session Co-Organizer: Bradley Nichols , Virginia Commonwealth University	Session Organizer: Grant Musgrove , Southwest Research Institute	Session Organizer: Jong-shang Liu , Honeywell Session Co-Organizer: Ezra McNichols , NASA Glenn Research Center
2:15	2:45	3:15	GT2021:59401 Deep Dive Effect of Pad Material, Copper vs. Steel, on the Performance of a Tilting Pad Journal Bearing: Measurements and Predictions Hussain Kaizar ¹ Luis San Andrés ² Hardik Jani ³ Manish Thorat ⁴ 1. Dover Precision Components, USA; 2. Texas A&M University, USA; 3. Honeywell, USA; 4. Elliott Group, USA	P A N E L	GT2021:59197 Deep Dive A New Turbomachine for Clean and Sustainable Hydrocarbon Cracking Dylan Rubini ¹ Liping Xu ² Budimir Rosic ¹ Harri Johannesdahl ³ 1. University of Oxford, United Kingdom; 2. University of Cambridge, United Kingdom; 3. Coolbrook Oy, Finland
			GT2021:58771 Deep Dive Measurements to Quantify the Effect of a Reduced Flow Rate on the Performance of a Tilting Pad Journal Bearing (LBP) with Flooded Ends Luis San Andrés, Jonathan Toner, Andy Alcantar Texas A&M University, USA		GT2021:59520 Deep Dive Towards a Machine Learning Based Design for Fouling of an Axial Turbine Vane Riccardo Friso ¹ Stefano Olini ¹ Nicola Casari ¹ Michele Pinelli ¹ Alessio Suman ¹ Francesco Montomoli ² 1. University of Ferrara, Italy; 2. Imperial College London, United Kingdom
3:25	3:35	3:35	GT2021:60396 Rapid Talk A Model for Tilting Pad Thrust Bearings Operating with Reduced Flow Rate – Do Benefits Outweigh Risks? Rasool Koosha, Luis San Andres Texas A&M University, USA		GT2021:58749 Rapid Talk Adaptive Geometry Representation of Turbine Vane Frames for Use in Optimization Sebastian F. Riebl ¹ Christian Wakelam ² Reinhard Niehuis ¹ 1. Bundeswehr University Munich, Germany; 2. GE Aviation, Germany
			GT2021:58734 Rapid Talk Mechanical and Thermal Deformation Analysis of a Large Polymer Lined Tilting Pad Journal Bearing Michael Stottrop, Beate Bender Ruhr-University Bochum, Product Development, Germany		GT2021:59523 Rapid Talk Hot Turbine Guide Vane Performance Improvement with Metal Additive Manufacturing at Siemens Energy Ilya Fedorov, Magnus Hallberg, Martin Lindbaeck, Dikran Barhanko Siemens Energy AB, Sweden
			GT2021:60203 Rapid Talk Thermohydrodynamic Modeling of a Tapered-land Thrust Bearing with Validation Against Experimental Data Seckin Gokaltun Kingsbury Inc., USA		GT2021:59616 Rapid Talk Aerodynamic Design Optimization of a Variable Geometry Vane for Automotive Turbochargers Lee Galloway ¹ Sung In Kim ¹ Jongyoon Park ² Seong Kwon ² Sejong Yoo ² 1. Queen's University Belfast, United Kingdom; 2. KeyYang Precision Co., Korea

TURBOMACHINERY: MULTIDISCIPLINARY DESIGN APPROACHES, OPTIMIZATION, AND UNCERTAINTY QUANTIFICATION		
Axial Compressors and Aeroderivative Industrial Gas Turbines Design Optimization		
Technical Session • 39-04		
Session Organizer: Stéphane Hiernaux , Safran Session Co-Organizer: Kai Willem Koerber , MTU Aero Engines AG		
2:15	GT2021:59058 Deep Dive Coupling of Endwall and Aerofoil Optimisation on a Low-speed Compressor Tandem Stator Mattia Straccia, Volker Gümmer <i>Department of Turbomachinery and Flight Propulsion, Technische Universität München, Germany</i>	
2:45	GT2021:59373 Deep Dive Quantifying Model Uncertainties and Sensitivities in Parallel Compressor Models Jonas Voigt ¹ Keith-Noah Jurke ¹ Julius Schultz ² Ulrich Römer ² Jens Friedrichs ¹ <i>1. Institut für Flugantriebe und Strömungsmaschinen, TU Braunschweig, Germany; 2. Institut für Dynamik und Schwingungen, TU Braunschweig, Germany</i>	
3:15	GT2021:58600 Rapid Talk Axial-radial Diffuser with Integrated Exhaust Hood for an Automotive Turbocharger with Axial Turbine Christoph Kuestner, Joerg R. Seume <i>Institut fuer Turbomaschinen und Fluid-Dynamik, Germany</i>	
3:25	GT2021:58925 Rapid Talk High Fidelity Multi-physics Digital Twin of Industrial Gas Turbines Omar Valero, Roger Wells, Senthil Krishnababu <i>Siemens, United Kingdom</i>	
3:35	GT2021:59682 Rapid Talk Improvement of Aerodynamic and Strength Characteristics of a Multi-shaft Axial Turbine of a Turboshaft Engine Grigorii Popov ¹ Evgenii Goriachkin ¹ Igor Egorov ² Oleg Baturin ¹ Anton Salnikov ³ Anastasia Solovieva ⁴ Yurii Zhurenkov ⁴ <i>1. Samara National Research University, Russia; 2. Moscow Aviation Institute National Research University, Russia; 3. Central Institute of Aviation Motors, Russia; 4. JSC "UEC-Klimov", Russia</i>	

TUESDAY JUNE 8			04:00 PM - 05:30 PM		
AIRCRAFT ENGINE		COMBUSTION, FUELS AND EMISSIONS		CYCLE INNOVATIONS: ENERGY STORAGE	
Aircraft Engine Panel Session: Machine Learning in Aero Engines		Chemical Kinetics		Tutorial: Hydrogen for Power and Energy Storage	
Panel Discussion • 01-06		Technical Session • 04-12		Tutorial Session • 07-02	
Session Organizer: Jacopo Tacconi , <i>Rolls-Royce plc</i> Session Co-Chair: Charles Krouse , <i>Southwest Research Institute</i>		Session Organizer: Mike Klassen , Combustion Science & Engineering, Inc.		Session Organizer: Klaus Brun , Elliot Group Session Co-Chairs: David Sanchez , AICIA; Tim Allison , Southwest Research Institute	
4:00 <					

TUESDAY JUNE 8			04:00 PM - 05:30 PM
	HEAT TRANSFER: FILM COOLING	MANUFACTURING MATERIALS AND METALLURGY	MARINE
	Film Cooling Optimization	Repair and Welding	Design, Development and Applications
	Technical Session • 12-06	Technical Session • 18-04	Technical Session • 19-01
	Session Organizer: Greg Laskowski , Dassault Session Co-Organizer: Prashant Singh , Mississippi State University	Session Organizer: Ramesh Chandra Raju Keshava Bhattu , Power Systems Manufacturing LLC Session Co-Organizer: Greg McAuley , GWM Consulting	Session Organizer: Jeffrey Patterson , Navsea Philadelphia Code 934 Session Co-Chairs: Morgan Hendry , SSS Clutch; Andy Cullis , Woodward Governor
4:00	GT2021:59332 Deep Dive Adjoint Optimization of Film Cooling Hole Geometry <u>Fraser Jones</u> , Todd Oliver, David Bogard <i>The University of Texas at Austin, USA</i>	GT2021:58709 Deep Dive Express Wire Coil Cladding (E W 2 C) as an Advanced Technology to Accelerate Additive Manufacturing and Coating <u>Marius Gipperich</u> ¹ Jan Riepe ² Robin Day ² Thomas Bergs ¹ <i>1. Fraunhofer Institute for Production Technology IPT; Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Germany; 2. Fraunhofer Institute for Production Technology IPT, Germany</i>	GT2021:69480 Deep Dive Case Closed: the Completion of the United States Navy 501-K34 Gas Turbine Engine Radcon Program (2011 - 2019) <u>Jeffrey Patterson</u> ¹ Dennis Russom ² Kevin Fauvell ² Phyllis Petronello ³ Willie Durosseau ³ Javier Moralez ⁴ <i>1. , USA; 2. Naval Surface Warfare Center - Philadelphia Division, USA; 3. Naval Sea Systems Command, USA; 4. RWG (Repair and Overhaul) Inc., USA</i>
4:30	GT2021:59196 Deep Dive Autonomous Large Eddy Simulations Setup for Cooling Hole Shape Optimization <u>Shubham Agarwal</u> ¹ Laurent Gicquel ¹ Florent Duchaine ¹ Nicolas Odier ¹ Jérôme Dombard ¹ Damien Bonneau ² Michel Slusarz ² <i>1. CERFACS, France; 2. Safran Aircraft Engines, France</i>	GT2021:60316 Deep Dive Computed Tomography Wall Thickness Inspection to Support Gas Turbine Blade Life Extension <u>Scott Hastie</u> ¹ Anthony Chan ¹ Kevin Wiens ¹ Paul Lowden ² Doug Nagy ¹ Robert Tollett ² <i>1. Liburdi Turbine Services, Canada; 2. Liburdi Engineering Limited, Canada</i>	GT2021:60318 Deep Dive Upgrading Marine Engine Materials for Future Navy Ships <u>David Shifler</u> , Donald Hoffman <i>Office of Naval Research, USA</i>
5:00	GT2021:59326 Rapid Talk Parametric Optimization of Film Cooling Hole Geometry <u>Fraser Jones</u> , Dale Fox, Todd Oliver, David Bogard <i>The University of Texas at Austin, USA</i>	GT2021:58851 Rapid Talk Weldability and Properties of a Newly Developed LW4280 High Gamma Prime Nickel Based Superalloy for 3D AM and Repair of Turbine Engine Components <u>Alexandre Gontcharov</u> ¹ Paul Lowden ¹ Ashutosh Jena ² Sunyong Kwon ² Mathieu Brochu ² <i>1. Liburdi Turbine Services, Canada; 2. McGill University, Canada</i>	GT2021:59075 Rapid Talk The OP16 Gas Turbine Gen-Set for Marine Power Generation <u>Jan Horvath</u> <i>OPRA Turbines, Netherlands</i>
5:10	GT2021:59144 Rapid Talk Experimental Investigation and Optimal Design on the Film Cooling Performance of Fan-shaped Hole with Vortex Generator Fed by Crossflow <u>Jie Wang</u> , Chao Zhang, Xuebin Liu, Liming Song, Jun Li, Zhenping Feng <i>Xi'an Jiaotong University, China</i>	GT2021:59042 Rapid Talk GT26 2006 Turbine Stage 1 Blade Reconditioning Development and Qualification at Ansaldo Repair Centre <u>Elisa Mela</u> ¹ Federico Fignino ¹ Alessio Gabrielli ¹ Paola Guarnone ¹ Rudolf Kellerer ² Emanuele Porro ¹ Matthias Staempfli ² <i>1. Ansaldo Energia SpA, Italy; 2. Ansaldo Energia, Switzerland</i>	GT2021:69478 Rapid Talk Hybrid Electric Drive Systems in the US Navy <u>Gianfranco Buonamici</u> <i>Naval Surface Warfare Center - Philadelphia Division, USA</i>
5:20			GT2021:59788 Rapid Talk Research on Matching Characteristics of Ship-Engine-Propeller of COGAG <u>Zhitao Wang</u> , Jiayi Ma, Haichao Yu, Tielei Li <i>Harbin Engineering University, China</i>

TUESDAY JUNE 8		04:00 PM - 05:30 PM			
OIL AND GAS APPLICATIONS		STRUCTURES AND DYNAMICS: BEARING AND SEAL DYNAMICS		TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS	
Compressor Applications		Seals I		Compressor Design	
Technical Session • 21-04		Technical Session • 25-01		Technical Session • 34-01	
Session Organizer: Brian Pettinato , Elliott Session Co-Chairs: Jason Wilkes , Southwest Research Institute; Michele Pinelli , University of Ferrara Endif		Session Organizer: Jing Yang , Texas A&M University Session Co-Organizer: Giuseppe Vannini , GE Oil & Gas		Session Organizer: Nick Nolcheff , Honeywell Session Co-Organizer: Anton Streit , Siemens AG	
4:00	GT2021:64838 Deep Dive Alarms, Shutdowns and Trip Rationalization Rainer Kurz ¹ Rasidi Mohamed ² Syafeq Moazari Sukeri ² Robert Mendoza ¹ <i>1. Solar Turbines, USA; 2. Petronas, Malaysia</i>	GT2021:60108 Deep Dive Performance of a Long Smooth Pump Seal Under Different Flow Regimes Min Zhang ¹ Dara Childs ² <i>1. Praxair, Inc., USA; 2. Texas A&M University, USA</i>	GT2021:58730 Deep Dive The Topology of Corner Separations Ivo Dawkins ¹ Rob Miller ¹ Xavier Ottavy ² James Taylor ¹ <i>1. University of Cambridge, United Kingdom; 2. École Centrale de Lyon, France</i>		
4:30	GT2021:69482 Deep Dive Assessment of Non-standard Procedure in Field Testing of Gas Turbine Driven Centrifugal Compressors Nicola Casari ¹ Ettore Fadiga ¹ Michele Pinelli ¹ Alessio Suman ¹ Kevin Davis ² Rainer Kurz ² Flavio Marin ³ <i>1. University of Ferrara, Italy; 2. Solar Turbines, USA; 3. Snam Rete Gas, Italy</i>	GT2021:58543 Deep Dive Static Performance of Smooth Liquid Annular Seals in the Transition and Turbulent Regimes Dara Childs ¹ Joshua Bulock ² <i>1. Texas A&M University, USA; 2. Valero, USA</i>	GT2021:59968 Deep Dive Understanding the Blade Row Interactions in a Multi-stage Axial Compressor From the Circumferentially Reconstructed Flow Field Fangyuan Lou, Douglas Matthews, Nicole Key, Nicholas J. Kormanik III <i>Purdue University, USA</i>		
5:00	GT2021:69483 Rapid Talk Dynamic Model of Multistage Centrifugal Compressor with a Stage-by-Stage Anti-surge Recirculating System Nicola Casari ¹ Michele Pinelli ¹ Alessio Suman ¹ Matteo Manganelli ² Mirko Morini ² Klaus Klaus ³ Vishal Jariwal ³ Louis Larosillere ³ <i>1. University of Ferrara, Italy; 2. University of Parma, Italy; 3. Elliott Group, USA</i>	GT2021:58631 Rapid Talk CFD Analysis of the Influence of Gas Content on the Rotordynamic Force Coefficients for a Circumferentially Grooved Annular Seal for Multiple Phase Pumps Tingcheng Wu ¹ Luis San Andrés ² Xueliang Lu ³ <i>1. Siemens Energy, USA; 2. Texas A&M University, USA; 3. Atlas Copco Comptec LLC, USA</i>	GT2021:58657 Rapid Talk Numerical Investigation of the Aerodynamic Performance of Hybrid Aerofoils in a 1.5-Stage Low-speed Compressor Jannik Eckel, Volker Gümmer <i>Chair of Turbomachinery and Flight Propulsion / Technical University of Munich, Germany</i>		
5:10		GT2021:58996 Rapid Talk Effects of Oblique Angle on the Static and Rotordynamic Characteristics for Two Novel Hole-Pattern Annular Liquid Seals with Axially-/Circumferentially- Oblique Hole Cavities Zhi Fang, Zhigang Li, Jun Li, Zhenping Feng <i>Xi'an Jiaotong University, China</i>	GT2021:59589 Rapid Talk Comprehensive Performance Improvement for a 16-stage Axial Compressor Grigorii Popov ¹ Alexey Vorobyev ² Vasilii Zubanov ¹ Oleg Baturin ¹ Maxim Miheev ¹ <i>1. Samara National Research University, Russia; 2. JSC "Power machines", Russia</i>		

	TURBOMACHINERY: RADIAL TURBOMACHINERY AERODYNAMICS		
	Centrif Compressor Design/Perform. Optimization II		
	Technical Session • 40-04		
	Session Organizer: Philipp Jenny , MAN Energy Solutions Schweiz AG Session Co-Organizer: Laura McLaughlin , Queen's University Belfast		
4:00	GT2021:58876 Deep Dive Prediction and Validation of the Transient Pressure Field in a Centrifugal Compressor with Vaned Diffuser for the Application in High Cycle Fatigue Stress Estimations Gökyay Bacakci ¹ Friedrich Fröhlig ¹ Lukas Stuhldreier ² Johannes Deutsch ² Peter Jeschke ² 1. MTU Friedrichshafen GmbH, Germany; 2. Institute of Jet Propulsion and Turbomachinery, RWTH Aachen University, Germany		
4:30	GT2021:59334 Deep Dive A Detailed Loss Analysis Methodology for Centrifugal Compressors Luying Zhang ¹ Loukia Kritioti ¹ Peng Wang ² Jiangnan Zhang ¹ Mehrdad Zangeneh ³ 1. Advanced Design Technology, United Kingdom; 2. Advanced Design Technology, China; 3. University College London, United Kingdom		
5:00	GT2021:59473 Rapid Talk Centrifugal Compressor Aero-mechanical Design: a Machine Learning Approach Marco Sanguineti ¹ Andrea Perrone ¹ Luca Ratto ¹ Gianluca Ricci ¹ Dario Barsi ² 1. NSI S.R.L., Italy; 2. University of Genova, Italy		

KEYNOTE & PLENARIES

Plenary: Opening up the Design Space Through Computations and Machine Learning

Plenary • 46-03

Session Organizer: **Greg Laskowski**, Dassault
Session Co-Organizer: **James Heidmann**, NASA

Opening up the Design Space Through Computations and Machine Learning

Dirk Nürnberger¹ Robert . Gregg III² Douglas B. (Doug) Kothe³ Christopher Lorence⁴

1. Siemens Energy, Germany; 2. Boeing Commercial Airplanes – Flight Sciences, USA

3. Oak Ridge National Laboratory, USA; 4. GE Aviation, USA

8:00

8:30

9:00

	COMBUSTION, FUELS AND EMISSIONS	CONTROLS, DIAGNOSTICS AND INSTRUMENTATION	CYCLE INNOVATIONS
	Combustion Dynamics: Machine Learning	Machine Learning and Advanced Topics in Diagnostics	System and Turbomachinery Optimization in ORC and Other Small Applications
	Technical Session • 04-10	Technical Session • 05-02	Technical Session • 06-04
	Session Organizer: Nicholas Magina , GE Global Research Center Session Co-Organizer: Hanna Ek , Georgia Institute of Technology	Session Organizer: Igor Loboda , National Polytechnic Institute Session Co-Chairs: Liang Tang , Pratt & Whitney; Craig Davison , National Research Council Canada	Session Organizer: David Sanchez , AICIA Session Co-Organizer: Marco Astolfi , Politecnico Di Milano
9:45	GT2021:58352 Deep Dive Confidence in Flame Impulse Response Estimation from LES with Uncertain Thermal Boundary Conditions Sagar Kulkarni ¹ , Shuai Guo, Camilo F. Silva, Wolfgang Polifke <i>Technische Universität München, Germany</i>	GT2021:60116 Deep Dive Anomaly Detection for Fleets of Industrial Equipment Utilizing Machine Learning with Applications to Power Plant Monitoring Cody Allen ¹ , Chad Holcomb ¹ , Mauricio De Oliveira ² <i>1. Solar Turbines Inc., USA; 2. University of California, USA</i>	GT2021:59444 Deep Dive A Reduced-order Model for the Preliminary Design of Small-scale Radial Inflow Turbines Marco Manfredi, Marco Alberio, Marco Astolfi, Andrea Spinelli <i>Politecnico Di Milano, Italy</i>
10:15	GT2021:60074 Deep Dive Predicting the Amplitude of Thermoacoustic Instability Using Universal Scaling Behaviour Induja Pavithran ¹ , Vishnu R. Unni ² , Alan J. Varghese ¹ , R. I. Sujith ¹ , Abhishek Saha ² , Norbert Marwan ³ , Juergen Kurths ³ <i>1. Indian Institute of Technology, Madras, India; 2. University of California - San Diego, USA; 3. Potsdam Institute for Climate Impact Research, Germany</i>	GT2021:58578 Deep Dive Considerations for the Extension of Gas Path Health Management Techniques to Electrified Aircraft Propulsion Systems Donald Simon ¹ , Randy Thomas ¹ , Kyle Dunlap ² <i>1. NASA Glenn Research Center, USA; 2. University of Cincinnati, USA</i>	GT2021:60241 Deep Dive The Effect of Compressibility Factor on Turbine Performance David Baumgärtner ¹ , John Otter ² , Andrew Wheeler ² <i>1. University of Cambridge, Germany; 2. University of Cambridge, United Kingdom</i>
10:45	GT2021:60283 Rapid Talk Bayesian Neural Networks Trained on Dynamic Pressure Information to Improve Prediction of the Onset of Combustion Instability Michael McCartney ¹ , Ushnish Sengupta ² , Matthew Juniper ² <i>1. GE Aviation, Germany; 2. University of Cambridge, United Kingdom</i>	GT2021:60020 Rapid Talk Adjustment and Validation of Monitoring System Algorithms on the Simulated Historical Data of an Aircraft Engine Fleet Igor Loboda ¹ , Victor Manuel Pineda Molina ¹ , Juan Luis Pérez Ruiz ² <i>1. Instituto Politécnico Nacional, Mexico; 2. Universidad del Sur, Mexico</i>	GT2021:59194 Rapid Talk Thermodynamic Analysis of Waste Heat Recovery Systems in Large Waste Heat Generating Industries Shantanu Thada, Yash Rajan, A M Pradeep, Arunkumar Sridharan <i>Indian Institute of Technology Bombay, India</i>
10:55	GT2021:59601 Rapid Talk Towards Reduced Order Models of Small-Scale Acoustically Significant Components in Gas Turbine Combustion Chambers Suhas Kowshik ¹ , Sumukha Shridhar ² , Nicholas Treleaven ³ <i>1. Indian Institute of Science, India; 2. RV college of Engineering, India; 3. STFS, TU-Darmstadt, Germany</i>	GT2021:59249 Rapid Talk A Lesson on Operationalizing Machine Learning for Predictive Maintenance of Gas Turbines Paolo Pileggi ¹ , Elena Lazovik ¹ , Ron Snijders ¹ , Lars-Uno Axelsson ² , Sietse Drost ² , Giulio Martinelli ³ , Max De Grauw ⁴ , Joris Graff ⁵ <i>1. TNO, Netherlands; 2. OPRA Turbines, Netherlands; 3. University of Trento, Italy; 4. Radboud University, Netherlands; 5. Utrecht University, Netherlands</i>	GT2021:59013 Rapid Talk Critical and Choking Mach Numbers for Organic Vapor Flows Through Turbine Cascades Stefan Aus Der Wiesche, Felix Reinker, Robert Wagner, Leander Hake, Max Passmann <i>Muenster University of Applied Sciences, Germany</i>
11:05	GT2021:59203 Rapid Talk A Numerical Study on the Influence of Hydrogen Addition on Soot Formation in a Laminar Aviation Kerosene (Jet A1) Flame at Elevated Pressures Mingshan Sun, Zhiwen Gan <i>Beihang University, China</i>	GT2021:59289 Rapid Talk A Novel Gas Path Fault Diagnostic Model for Gas Turbine Based on Explainable Convolutional Neural Network with Lime Method Yao Chen, Yueyun Xi, Jinwei Chen, Huisheng Zhang <i>Shanghai Jiao Tong University, China</i>	GT2021:59328 Rapid Talk Experimental Characterization of Losses in Bladeless Turbine Prototype Avinash Renuke, Federico Reggio, Alberto Traverso, Matteo Pascenti <i>University of Genoa, Italy</i>

HEAT TRANSFER: GENERAL INTEREST		INDUSTRIAL AND COGENERATION	MANUFACTURING MATERIALS AND METALLURGY
Main Annulus Heat Transfer		Combustion and Emissions Tutorial	Subtractive Manufacturing
Technical Session • 13-01		Tutorial Session • 17-03	Technical Session • 18-02
Session Organizer: Lorenzo Mazzei , Ergon Research Session Co-Chairs: Robert Krewinkel , MAN Energy Solutions; Alexander Mirzamoghadam , Northrop Grumman		Session Organizer: Mike Klassen , Combustion Science & Engineering, Inc. Session Co-Chairs: Manfred Klein , NA; Leonard Angello , EPRI	Session Organizer: Lonnie Houck , Power Systems Manufacturing Session Co-Organizer: Balaji Jayaraj , Siemens Energy
9:45	GT2021:59304 Deep Dive A New Experimental Approach for Heat Transfer Coefficient and Adiabatic Wall Temperature Measurements on a Nozzle Guide Vane with Inlet Temperature Distortions Tommaso Bacci ¹ Alessio Picchi ¹ Bruno Facchini ¹ Simone Cubeda ² 1. University of Florence, Italy; 2. Baker Hughes, Italy	GT2021:65170 Tutorial Combustion and Emissions Tutorial Mike Klassen ¹ Manfred Klein ² 1. Combustion Science & Engineering Inc., USA; 2. MA Klein & Associates, Canada ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".	GT2021:59172 Deep Dive Influence of the Tool Wear on the Quality and Service Life of Gears for the Geared Turbofan Technology Machined by Five-axis Milling Thomas Lakner, Christoph Zachert, René Greschert, Daniel Schraknepper, Thomas Bergs Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Germany
	GT2021:59634 Deep Dive Development and Application of a Concentration Probe for Mixing Flows Tracking in Turbomachinery Applications Giulia Babazzi ¹ Tommaso Bacci ¹ Alessio Picchi ¹ Tommaso Fondelli ¹ Tommaso Lenz ¹ Bruno Facchini ¹ Simone Cubeda ² 1. University of Florence, Italy; 2. Baker Hughes, Italy		GT2021:59266 Deep Dive Tolerance-based Optimization of Sinking EDM for Industrial Seal-slot Manufacture Timm Petersen ¹ Markus Zeis ² Thomas Bergs ¹ 1. Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Germany; 2. MTU Aero Engines AG, Germany
	GT2021:59995 Rapid Talk Physics-based Thermal Management System Components Design for All Electric Propulsion Systems Soheil Jafari, Theoklis Nikolaidis, Roopesh Chowdary Sureddi Cranfield University, United Kingdom		GT2021:59479 Rapid Talk A Cradle to Gate Approach for Life-Cycle-Assessment of Blisk Manufacturing Kilian Fricke, Philipp Ganzer, Sascha Gierlings, Martin Seimann, Thomas Bergs Fraunhofer Institute for Production Technology, Germany
	GT2021:58806 Rapid Talk Design and Development of a New Rotating Turbine Research Facility for Investigating the Interaction between Mainstream and Various Secondary Air at Relevant Engine Conditions Yoji Okita ¹ Hisao Futamura ¹ Takashi Yamane ¹ Masaya Suzuki ¹ Nozomi Tanaka ² Haruyuki Tanimitsu ² Junichi Iguchi ³ 1. Japan Aerospace Exploration Agency, Japan; 2. IHI Corporation, Japan; 3. INC Engineering Co., Ltd., Japan		GT2021:59652 Rapid Talk Manufacturing Technologies for Fir Tree Slots: A Technological and Economic Evaluation Lukas Heidemanns ¹ Ugur Küpper (Tombul) ¹ Tobias Seelbach ¹ Martin Seimann ² Thomas Bergs ¹ 1. Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Germany; 2. Fraunhofer Institute for Production Technology IPT, Germany
	GT2021:59874 Rapid Talk Simulation of Air/Mist Cooling Among Shock Waves and Passing Wakes Interactions in a Transonic Gas Turbine Stage Ting Wang, Ramy Abdelmaksoud The University of New Orleans, USA		

T
U
T
O
R
I
A
L

	MICROTURBINES, TURBOCHARGERS AND SMALL TURBOMACHINES	STRUCTURES AND DYNAMICS: FATIGUE, FRACTURE AND LIFE PREDICTION	TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS
	Radial Inflow Turbines	Data Driven Life Analysis	Tip Clearance Flows
	Technical Session • 20-01	Technical Session • 27-05	Technical Session • 34-06
	Session Organizer: Lukas Benjamin Inhestern , Technical University Berlin Session Co-Organizer: Jorge García Tiscar , Universitat Politècnica de Valencia	Session Organizer: Amrita Basak , Pennsylvania State University Session Co-Chairs: Rajeev Verma , Magna International; Ramesh Rajasekaran , Terrapower, LLC; Richard Neu , Georgia Institute of Technology	Session Organizer: Simon Evans , United Technologies Research Center Session Co-Organizer: Stefano Bianchi , Airbus Commercial Aircraft
9:45	GT2021:58472 Deep Dive The Influence of Condensation on the Performance Map of a Fuel Cell Turbocharger Turbine Tim Wittmann, Sebastian Lück, Tim Hertwig, Christoph Bode, Jens Friedrichs <i>Technische Universität Braunschweig - Institute of Jet Propulsion and Turbomachinery, Germany</i>	GT2021:59905 Deep Dive Fretting Fatigue – an Integral Simulation Approach to Strengthening by Shot-peening Patrick Gerken ¹ Christoph H. Richter ² <i>1. Rheinmetall Electronics GmbH, Germany; 2. Osnabrueck University of Applied Sciences, Germany</i>	GT2021:59182 Deep Dive Effect of an Axially Tilted Variable Stator Vane Platform on Penny Cavity and Main Flow Johannes Janssen ¹ Daniel Pohl ¹ Peter Jeschke ¹ Alexander Halcoussis ² Rainer Hain ³ Thomas Fuchs ³ <i>1. Institute of Jet Propulsion and Turbomachinery, RWTH Aachen University, Germany; 2. MTU Aero Engines AG, Germany; 3. Institute of Fluid Mechanics and Aerodynamics, Bundeswehr University Munich, Germany</i>
10:15	GT2021:59123 Deep Dive Influence of Supersonic Nozzle Design Parameters on the Unsteady Stator-rotor Interaction in Radial-inflow Turbines for Organic Rankine Cycles Alessandro Cappiello, Raffaele Tuccillo <i>University of Naples Federico II, Italy</i>	GT2021:59914 Deep Dive Data Driven Approach for Analyzing the Impact of Power Plant Cycling on Air Preheater Degradation and Remaining Useful Life Himanshu Sharma, Veronica Adetola, Laurentiu Marinovici, Herbert T. Schaeff <i>Pacific Northwest National Laboratory, USA</i>	GT2021:59007 Deep Dive Effect of Differential Tip Clearance on the Performance of a Tandem Rotor Amit Kumar, Hitesh Chhugani, Shubhali More, A M Pradeep <i>Indian Institute of Technology Bombay, India</i>
10:45	GT2021:58759 Rapid Talk Reduced-Order Modeling of Extreme Speed Turbochargers David Fellows ¹ Daniel Bodony ¹ Ryan McGowan ² <i>1. University of Illinois at Urbana-Champaign, USA; 2. CCDC Army Research Laboratory, USA</i>	GT2021:58493 Rapid Talk A Novel Vibration-based Fault Detection Approach of Bolted Engineering Structures Without Reference Quankun Li, Zengde Shao, Mingfu Liao <i>Northwestern Polytechnical University, China</i>	GT2021:58745 Rapid Talk Flow Physics in a Large Rotor Tip Gap in a Multi-stage Axial Compressor Chunill Hah <i>NASA Glen Research Center, USA</i>
10:55	GT2021:59139 Rapid Talk Improving Vibration Response of Radial Turbine in Variable Geometry Turbochargers with CFD Analysis Bipin Gupta ¹ Toyotaka Yoshida ¹ Shinji Ogawa ¹ Yosuke Danmoto ² Takashi Yoshimoto ² <i>1. Mitsubishi Heavy Industries Ltd., Japan; 2. Mitsubishi Heavy Industries Engine and Turbocharger, Japan</i>	GT2021:59681 Rapid Talk Computational Model of Mechano-electrochemical Effect of Aluminum Alloys Corrosion Hessein Ali, Zachary Stein, Quentin Fouliard, Hossein Ebrahimi, Peter Warren, Seetha Raghavan, Ranajay Ghosh <i>University of Central Florida, USA</i>	GT2021:60233 Rapid Talk Numerical Investigations on Application of Cantilever Stator on Aerodynamic Performance of Tandem Bladed Axial-flow Compressor Stage Bhanu Pratap Singh Tanwar, Ajey Singh, Chetankumar Mistry <i>Indian Institute of Technology Kharagpur, India</i>
11:05	GT2021:58934 Rapid Talk Design and Testing of an Internally-cooled Radial Turbine with High Tip Speed Grant Musgrove, January Smith, Ellen Smith, Steve White <i>Southwest Research Institute, USA</i>		GT2021:59899 Rapid Talk Experimental Study on Different Tip Clearance of Low-speed Axial Fan Ming Zhang, Jia Li, Xu Dong, Dakun Sun, Xiaofeng Sun <i>Beihang University, China</i>

**TURBOMACHINERY: DESIGN
METHODS AND CFD MODELING
FOR TURBOMACHINERY**
Centrifugal Compressor Design
Technical Session • 37-06

Session Organizer: **Michael Barton**, Honeywell
Session Co-Chairs: **Koen Hillewaert**, Université
De Liege | Aerospace and Mechanics
Department; **Fangyuan Lou**, Purdue University

9:45

GT2021:59210 [Deep Dive](#)
**On Choosing the Optimal Impeller Exit
Velocity Triangles in Preliminary Design**
Fangyuan Lou, Nicole Key
Purdue University, USA

10:15

GT2021:59595 [Deep Dive](#)
**Aerodynamic Functional Diagnostics Based
on Angular Momentum Transport Lines**
Xiang Yang¹ Vishal Jariwala² Haosen Xu¹ Louis
Larosiliere²
1. Pennsylvania State University, USA; 2. Elliott
Group, USA

10:45

GT2021:58962 [Rapid Talk](#)
**Preliminary Design Tool for Centrifugal
Compressors**
Lily Baye-Wallace, Grant Musgrove
Southwest Research Institute, USA

10:55

GT2021:59879 [Rapid Talk](#)
**Flow Field Analysis and Optimization of a
Centrifugal Compressor Volute**
Pablo Ale¹ Maria Esperanza Barrera-Medrano¹
Ricardo Martinez-Botas¹ Isao Tomita² Tadashi
Kanzaka² Seiichi Ibaraki²
1. Imperial College London, United Kingdom;
. Mitsubishi Heavy Industries Ltd., Japan

	COMBUSTION, FUELS AND EMISSIONS	CONTROLS, DIAGNOSTICS AND INSTRUMENTATION	CYCLE INNOVATIONS
	Combustion Dynamics: High-Frequency Instabilities and Instability Analysis	Topics in Instrumentation (B)	Simple, Combined and Low Emission Cycles
	Technical Session • 04-08	Technical Session • 05-04	Technical Session • 06-01
	Session Organizer: Alessandro Orchini , Technical University Berlin Session Co-Chairs: Vishal Acharya , Georgia Tech; Davide Laera , CERFACS	Session Organizer: Lorenzo Ferrari , University of Pisa - DESTEC Session Co-Chairs: Igor Loboda , National Polytechnic Institute; Yiguang Li , Cranfield University	Session Organizer: Majed Sammak , GE Gas Power Session Co-Organizer: Alessandro Sorce , University of Genoa
12:15	GT2021:60285 Deep Dive Optimum Multi-nozzle Configuration for Minimizing the Rayleigh Integral During High-frequency Transverse Instabilities <u>Vishal Acharya</u> ¹ Timothy Lieuwen ² 1. Gatech, USA; 2. Georgia Institute of Technology, USA	GT2021:58618 Deep Dive Numerical Calibration and Investigation of the Influence of Reynolds Number on Measurements with Five Hole Probes in Compressible Flows <u>Christian Schäffer</u> , Konstantin Speck, Volker Gümmer Technical University of Munich - Chair of Turbomachinery and Flight Propulsion, Germany	GT2021:59587 Deep Dive Ancillary Services Potential for Flexible Combined Cycles <u>Alberto Vannoni</u> ¹ Jose Angel Garcia ² Weimar Mantilla ² Rafael Eduardo Guedez Mata ² Alessandro Sorce ¹ 1. Polytechnic School of Genoa, Italy; 2. KTH Royal Institute of Technology, Sweden
12:45	GT2021:58456 Deep Dive Amplitude-dependent Damping and Driving Rates of High-frequency Thermoacoustic Oscillations in a Lab-scale Lean-premixed Gas Turbine Combustor Thomas Hofmeister, Thomas Sattelmayer Technische Universität München, Germany	GT2021:59886 Deep Dive Development of a Lifetime Pressure Sensitive Paint Procedure for High-pressure Vane Testing <u>Papa Aye Nyansafo Aye-Addo</u> ¹ <u>Guillermo Paniagua</u> ¹ <u>David Cuadrado Gonzalez</u> ¹ <u>Lakshya Bhatnagar</u> ¹ <u>Antonio Castillo</u> ¹ <u>James Braun</u> ¹ <u>Mateo Gomez-Gomez</u> ¹ <u>Terry Meyer</u> ¹ <u>Matthew Bloxham</u> ² 1. Purdue University, USA; 2. Rolls Royce Corporation, USA	GT2021:59282 Deep Dive Influence of Blade Profile Change on Gas Path Performance and Their Ontology-Based Fault Knowledge Express <u>Yuanfu Li</u> , Yueyun Xi, Jinwei Chen, Huisheng Zhang Shanghai Jiao Tong University, China
1:15	GT2021:59718 Rapid Talk Flow Response of an Industrial Gas Turbine Combustor to Acoustic Forcing Extracted from Unforced Data <u>Jan Paul Beuth</u> ¹ <u>Jakob G. R. Von Saldern</u> ² <u>Thomas Ludwig Kaiser</u> ² <u>Thoralf G. Reichel</u> ³ <u>Christian Oliver Paschereit</u> ⁴ <u>Bernhard Cosic</u> ⁵ <u>Kilian Oberleithner</u> ² 1. Technical University of Berlin, Germany; 2. Technical University of Berlin - Laboratory for Flow Instabilities and Dynamics, Germany; 3. Chair of Fluid Dynamics, Technische Universität Berlin, Germany; 4. Technical University of Berlin - Institute of Fluid Dynamics and Technical Acoustics, Germany; 5. MAN Energy Solutions SE, Germany	GT2021:59702 Rapid Talk Uncertainty in High-pressure Stator Performance Measurement in an Annular Cascade at Engine Representative Reynold's and Mach <u>Lakshya Bhatnagar</u> ¹ <u>Guillermo Paniagua</u> ¹ <u>David Gonzalez Cuadrado</u> ¹ <u>Papa Aye N Aye-Addo</u> ¹ <u>Antonio Castillo Sauca</u> ¹ <u>Francisco Lozano</u> ¹ <u>Matthew Bloxham</u> ² 1. Purdue University, USA; 2. Rolls Royce Corporation, USA	GT2021:59316 Rapid Talk Operational Scenarios to Minimize the Gas Turbine's Carbon Footprint <u>Daniel Burnes</u> , Priyank Saxena Solar Turbines Inc., USA
1:25	GT2021:58691 Rapid Talk On the Effect of Noise Induced Dynamics on Linear Growth Rates of Oscillations in an Electroacoustic Rijke Tube Simulator <u>Neha Vishnoi</u> ¹ <u>Pankaj Wahi</u> ² <u>Aditya Saurabh</u> ² <u>Lipika Kabiraj</u> ¹ 1. Indian Institute of Technology Ropar, India; 2. Indian Institute of Technology Kanpur, India	GT2021:59103 Rapid Talk Characterisation and Validation of an Optical Pressure Sensor for Combustion Monitoring at Low Frequency <u>Gianluca Nicchiotti</u> ¹ <u>Krzysztof Solinski</u> ¹ <u>Stephane A. Page</u> ¹ <u>Nina Paulitsch</u> ² <u>Lukas Andracher</u> ³ <u>Fabrice Giuliani</u> ² 1. Meggit SA, Switzerland; 2. Combustion Bay One e.U., Austria; 3. FH JOANNEUM GmbH, Austria	GT2021:58674 Rapid Talk Analysis of the Emission Reduction Potential and Combustion Stability Limits of a Hydrogen-fired Gas Turbine with External Exhaust Gas Recirculation <u>Nils Petersen</u> , <u>Thomas Bexten</u> , <u>Christian Goßrau</u> , <u>Manfred Wirsum</u> Institute For Power Plant Technology, Steam and Gas Turbines, RWTH Aachen University, Germany
1:35	GT2021:59540 Rapid Talk Self-Excited High-Frequency Transverse Limit-cycle Oscillations and Associated Flame Dynamics in a Gas Turbine Reheat Combustor Experiment <u>Jonathan McClure</u> ¹ <u>Frederik Berger</u> ¹ <u>Michael Bertsch</u> ¹ <u>Bruno Schuermans</u> ² <u>Thomas Sattelmayer</u> ¹ 1. Lehrstuhl für Thermodynamik, Technische Universität München, Germany; 2. Institute for Advanced Study, Technische Universität München, Switzerland	GT2021:59259 Rapid Talk Hot-wire Measurements in Non-calibrated Conditions <u>Yuxin Wang</u> , <u>Hui ren Zhu</u> , <u>Tao Guo</u> Northwestern Polytechnical University, China	GT2021:59358 Rapid Talk Improving Combined Cycle Part Load Performance and Reducing Plant Costs by Using Exhaust Gas Recirculation with an Ejector <u>Majed Sammak</u> ¹ <u>Chi Ho</u> ² <u>Alaaeldin Dawood</u> ³ <u>Abdurrahman Khalidi</u> ⁴ 1. GE Gas Power, Sweden; 2. GE Gas Power, USA; 3. GE Gas Power, Kuwait; 4. GE Gas Power, United Arab Emirates

WEDNESDAY JUNE 9			12:15 PM - 01:45 PM			
FANS AND BLOWERS		MANUFACTURING MATERIALS AND METALLURGY		MICROTURBINES, TURBOCHARGERS AND SMALL TURBOMACHINES		
Optimization for Fans and Blowers		Metallurgy for the Non-Metallurgist		Turbocharger System and Compressors		
Technical Session • 10-02		Tutorial Session • 18-08		Technical Session • 20-02		
Session Organizer: Massimo Masi , University of Padova - DTG Session Co-Organizer: Lorenzo Tieghi , Sapienza University of Rome		Session Organizer: William Day , W. David Day, Inc.		Session Organizer: Luis Miguel Garcia-Cuevas , CMT - Motores Termicos. Universitat Politecnica De Valencia Session Co-Organizer: Roberto Navarro , N/A		
12:15	GT2021:59465 Deep Dive Optimization of a Tip Appendage for the Control of Tip Leakage Vortices in Axial Flow Fans Thomas Meyer ¹ Sybrand J. Van Der Spuy ¹ Christiaan J. Meyer ¹ Alessandro Corsini ² 1. Stellenbosch University, South Africa; 2. Sapienza University of Rome, Italy	T U T O R I A L		GT2021:58843 Deep Dive Aerodynamic Optimization of a Turbocharger Unit Based on the Overall Efficiency Enhancement of an Internal Combustion Engine for Stationary Power Production Iacopo Catalani ¹ Andrea Agnolucci ¹ Francesco Balduzzi ¹ Giovanni Vichi ² Ryota Minamino ² Go Asai ² Alessandro Bellissima ² Alessandro Bianchini ¹ Andrea Arnone ¹ Giovanni Ferrara ¹ 1. Università degli Studi di Firenze, Italy; 2. Yanmar R&D Europe, Italy		
	GT2021:59832 Deep Dive Performance Modification of an Erosion-damaged Large-sized Centrifugal Fan Nicola Aldi ¹ Nicola Casari ¹ Michele Pinelli ¹ Alessio Suman ¹ Alessandro Vulpio ¹ Paolo Saccenti ² 1. University of Ferrara, Italy; 2. Boldrocchi, Italy			GT2021:60326 Deep Dive Use of an Integrated Approach for Analysis and Design of Turbocharged Internal Combustion Engine Thiago Ebel ¹ Mark Anderson ¹ Parth Pandya ² Mat Perchanok ² Nick Tiney ² Steve Gravante ² 1. Concepts NREC, USA; 2. Ricardo Software, USA		
	GT2021:58967 Rapid Talk Optimization of a High Pressure Industrial Fan Edward De Jesús Rivera ¹ Fanny Besem-Cordova ² Jean Charles Bonaccorsi ² 1. Illinois Blower, USA; 2. NUMECA USA, Inc., USA			GT2021:59439 Rapid Talk On the Challenge of Determining the Surge Limit of Turbocharger Compressors: Part 1 – Experimental and Numerical Analysis of the Operating Limits Tobias Dielenschneider ¹ Johannes Ratz ¹ Sebastian Leichtfuß ¹ Heinz-Peter Schiffer ¹ Werner Eißler ² 1. Technical University of Darmstadt, Germany; 2. Hochschule RheinMain, Germany		
	GT2021:59554 Rapid Talk Morphing of Reversible Axial Fan Blades: a FSI-FEM Study Valerio Barnabei ¹ Alessio Castorrini ² Alessandro Corsini ¹ Franco Rispoli ¹ 1. La Sapienza Università di Roma, Italy; 2. Università degli Studi della Basilicata, Italy			GT2021:58840 Rapid Talk On the Challenge of Determining the Surge Limit of Turbocharger Compressors: Part 2 – Capabilities of a Geometrically Reduced Numerical Model Werner Eißler ¹ Dominik Paul ¹ Johannes Ratz ² 1. Hochschule RheinMain, Germany; 2. Technische Universität Darmstadt, Germany		
				GT2021:59518 Rapid Talk A Marine Turbocharger Compressor Multi-point 3D Design and Optimization Tool Konstantinos Ntonas, Nikolaos Aretakis, Konstantinos Mathioudakis National Technical University of Athens, Greece		
1:35						

	OIL AND GAS APPLICATIONS	STRUCTURES AND DYNAMICS: STRUCTURAL MECHANICS AND VIBRATION	TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS
	Multi Phase Machinery	Mistuning	Compressor Design II
	Technical Session • 21-01	Technical Session • 30-01	Technical Session • 34-02
	Session Organizer: Michele Pinelli , University of Ferrara Endif	Session Organizer: Alain Batailly , École Polytechnique De Montréal	Session Organizer: Tianyu Pan , Beihang University
12:15	GT2021:59078 Deep Dive Development of a Robust Scrubber Level Controller Carolyn Day ¹ Griffin Beck ¹ Scott Schubring ² <i>1. Southwest Research Institute, USA; 2. Williams, USA</i>	GT2021:59283 Deep Dive Mistuning and Damping of a Radial Turbine Wheel. Part 1: Fundamental Analyses and Design of Intentional Mistuning Pattern Alex Nakos ¹ Bernd Beirrow ¹ Arthur Zobel ² <i>1. BTU Cottbus, Germany; 2. Universität Stuttgart, Germany</i>	GT2021:59284 Deep Dive Low Reynolds Number Effects on the Separation and Wake of a Compressor Blade Qiang Liu, Cesare Hall, Will Ager, Andrew Wheeler <i>Whittle Lab, Cambridge University, United Kingdom</i>
12:45	GT2021:59353 Deep Dive Wet Gas Formation and Carryover in Compressor Suction Equipment Griffin Beck, Nathan Andrews, Grey Berry, Amy McCleney <i>Southwest Research Institute, USA</i>	GT2021:59927 Deep Dive Searching of the Optimal Arrangement of Mistuned Blades on the Basis of the Solution of Travelling Salesman Problem Alexander Selivanov, Nikolay Serebriakov <i>Central Institute of Aviation Motors, Russia</i>	GT2021:60314 Deep Dive Effect of the Axial Casing Groove Geometry on the Production and Distribution of Reynolds Stresses in the Tip Region of an Axial Compressor Rotor Subhra Shankha Koley, Ayush Saraswat, Huang Chen, Joseph Katz <i>Johns Hopkins University, USA</i>
1:15	GT2021:59543 Rapid Talk Wet Gas Compression – Effects of Fouling Dagfinn Mæland ¹ Lars E Bakken ² <i>1. Equinor ASA, Norway; 2. Norwegian University of Science and Technology, Norway</i>	GT2021:58722 Rapid Talk Effect of Bladed Packets on Transient Vibration Localization Behaviors of Mistuned Whole Bladed Disk System Kan Xuanen <i>Xi'an University of Technology, China</i>	GT2021:60325 Rapid Talk Experimental Characterization of the Evolution of Global Flow Structure in the Passage of an Axial Compressor Ayush Saraswat, Subhra Shankha Koley, Joseph Katz <i>Johns Hopkins University, USA</i>
1:25	GT2021:59398 Rapid Talk Power and Compression Analysis of Power-to-Gas Implementations in Natural Gas Pipelines with Up to 100% Hydrogen Concentration Timothy Allison ¹ John Klaerner ¹ Rainer Kurz ² Stefan Cich ¹ Marybeth McBain ³ <i>1. Southwest Research Institute, USA; 2. Solar Turbines Inc., USA; 3. Kinder Morgan, USA</i>		GT2021:58798 Rapid Talk Performance Evaluation of Leading Edge Tubercles Applied to the Blades in a 2-D Compressor Cascade Satpreet S. Sidhu, Asad Asghar, William Allan <i>Royal Military College of Canada, Canada</i>
1:35	GT2021:60125 Rapid Talk The Development of Turboexpander-Generators for Gas Pressure Letdown Part I: Design and Analysis Rasish Khatri ¹ Jeremy Liu ¹ Freddie Sarhan ¹ Ovais Najeeb ¹ Hiroshi Kajita ² Mitsuru Kozuka ² <i>1. Calnetix Technologies, USA; 2. Toho Gas Co., Ltd., Japan</i>		GT2021:58708 Rapid Talk Performance of a Subsonic Compressor Airfoil with Upstream, End-wall Injection Flow Aaron Pope ¹ Andrew Oliva ¹ Scott C. Morris ¹ Mark Stephens ² Kenneth Clark ² Lisa Brilliant ² Aleksander Jemcov ¹ <i>1. University of Notre Dame, USA; 2. Pratt & Whitney, USA</i>

**TURBOMACHINERY: AXIAL FLOW
TURBINE AERODYNAMICS**
Wakes, Transition and Purge Flows
Technical Session • 35-04

Session Organizer: **Paul Giel**, ASRC Aerospace
Session Co-Organizer: **Reid Berdanier**,
Pennsylvania State University

12:15

GT2021:59192 [Deep Dive](#)
**Influence of Surface Roughness on the
Flat-plate Boundary Layer Transition Under
a High-lift Airfoil Pressure Gradient and Low
Freestream Turbulence**

Heechan Jeong, Seung Jin Song
Seoul National University, Korea

12:45

GT2021:59701 [Deep Dive](#)
**Vortex Tracking of Purge-mainstream
Interactions in a Rotating Turbine Stage**

Alex Mesny¹ Mark Glozier¹ Oliver Pountney¹
James Scobie¹ Yan Sheng Li² David Cleaver¹ Carl
Sangan¹

1. University of Bath, United Kingdom; 2. Siemens
Industrial Turbomachinery Ltd., United Kingdom

1:15

GT2021:58563 [Rapid Talk](#)
**Simulation of Passing Wakes Inducing
Unsteady Boundary Layer Transition Around
Low-pressure Turbine Blade**

Antoine Dufau¹ Julien Marty² Estelle Piot² Daniel
Man¹

1. Safran Aircraft Engines, France; 2. ONERA - the
French Aerospace Lab, France

COMBUSTION, FUELS AND EMISSIONS		COMBUSTION, FUELS AND EMISSIONS	CONTROLS, DIAGNOSTICS AND INSTRUMENTATION
Joint Session CFE-HT: Combustor Wall Cooling		Use of Ammonia as Energy/ Hydrogen Carrier in Gas Turbines	Topics in Control and Automation
Technical Session • 04-20		Panel Discussion • 04-22	Technical Session • 05-01
Session Organizer: Samir Rida , Ansys, Inc. Session Co-Organizer: Antonio Andreini , University of Florence		Session Organizer: Andrea Gruber , Sintef Session Co-Organizer: James Dawson , NTNU	Session Organizer: Donald Simon , NASA Glenn Research Center Session Co-Chairs: Alex Tsai , United States Coast Guard Academy; Igor Loboda , National Polytechnic Institute
2:15	GT2021:59170 Deep Dive Characterization of a Designed Test Bench for Near-Wall Reactions of CH₄ and H₂ Rahand Dalshad, Tobias Sander, Michael Pfitzner <i>Bundeswehr University Munich, Germany</i>	P A N E L	GT2021:59375 Deep Dive Revolutionary Vertical Lift Technology (RVL) Side-by-Side Hybrid Concept Vehicle Powertrain Dynamic Model Christine Chevalier ¹ Santino Bianco ² Jonathan Litt ² Joshua Smith ² Jeffreys Chapman ² Jonathan Kratz ² <i>1. HX5, LLC, USA; 2. NASA Glenn Research Center, USA</i>
2:45	GT2021:59443 Deep Dive Influence of Alternative Fuels on the Liner Metal Temperatures in a V2500 Combustor Lukas Schaefflein, Marco Konle, Ludovic De Guillebon <i>MTU Aero Engines AG, Germany</i>		GT2021:58744 Deep Dive Binary Repetitive Model Predictive Active Flow Control Applied to an Annular Compressor Stator Cascade with Periodic Disturbances Benjamin Fietzke ¹ Rudibert King ¹ Jan Mihalyovics ² Dieter Peitsch ² <i>1. Technische Universität Berlin, FG Mess- und Regelungstechnik, Germany; 2. Technische Universität Berlin, FG Luftfahrtantriebe, Germany</i>
3:15	GT2021:58961 Rapid Talk Combustor Wall Surface Temperature and Heat Flux Measurement Using a Fiber-coupled Long Wave Infrared Hyperspectral Sensor Aravind Chandh ¹ Oleksandr Bibik ² Subodh Adhikari ² David Wu ² Ben Emerson ² Paul Hsu ³ Suresh Roy ³ Ruth Sikorski ⁴ Tim Lieuwen ² <i>1. Ben T Zinn Combustion lab, Georgia Institute of technology, USA; 2. Georgia Institute of Technology, USA; 3. Spectral Energies LLC, USA; 4. Air Force Research Laboratory, USA</i>		GT2021:59546 Rapid Talk Design and Validation of a Novel Turbogenerator's Robotized Inspection System Enrico Pignone ¹ Gianfranco Martorana ¹ Carlo Canali ² Fabrizio D'agostino ¹ Alessandro Pistone ² <i>1. Ansaldo Energia, Italy; 2. IIT, Italy</i>
3:25	GT2021:59306 Rapid Talk High Speed OH PLIF Measurements of Combustor Effusion Films in a High Pressure, Liquid Fueled Combustor Aravind Chandh ¹ Shivam Patel ² Oleksandr Bibik ² Subodh Adhikari ² David Wu ² Ben Emerson ² Tim Lieuwen ² Reza Rezvani ³ Dustin Davis ³ <i>1. Ben T Zinn Combustion lab, Georgia Institute of technology, USA; 2. Georgia Institute of Technology, USA; 3. Pratt & Whitney, USA</i>		GT2021:59801 Rapid Talk Rapid Defect Detection and Classification in Images Using Convolutional Neural Networks Peter Warren, Hessein Ali, Hossein Ebrahimi, Ranajay Ghosh <i>University of Central Florida, USA</i>
3:35	GT2021:58896 Rapid Talk Analytical Formulation-Based Soot Modelling in Ethylene Laminar Jet Diffusion Flames Amit Makhija, Krishna Sesha Giri <i>Indian Institute of Technology Palakkad, India</i>		GT2021:60220 Rapid Talk An Efficient Prediction Method for the Azimuthal Migration of Combustion Inhomogeneity in Multi-stage Cooled Turbines Qingfu He, Zhongran Chi, Shusheng Zang <i>Shanghai Jiao Tong University, China</i>

WEDNESDAY JUNE 9			02:15 PM - 03:45 PM		
CYCLE INNOVATIONS: ENERGY STORAGE		HEAT TRANSFER: TUTORIALS		MICROTURBINES, TURBOCHARGERS AND SMALL TURBOMACHINES	
Renewable Energy Storage		Heat Transfer: Tutorials		Microturbines: Combustion, Fuels and Components	
Technical Session • 07-01		Tutorial Session • 16-01		Technical Session • 20-03	
Session Organizer: Klaus Brun , Elliot Group Session Co-Organizer: Tim Allison , Southwest Research Institute		Session Organizer: Andrew Nix , West Virginia University Session Co-Organizer: Eric Ruggiero , GE Aviation		Session Organizer: Grant Musgrove , Southwest Research Institute Session Co-Organizer: Alessandro Cappiello , Università di Napoli "Federico II", Italy	
2:15	GT2021:59073 Deep Dive Techno-economic Analysis of a Hydrogen Production and Storage System for the On-site Fuel Supply of Hydrogen-fired Gas Turbines Thomas Bexten, Tobias Sieker, Manfred Wirsum <i>Institute of Power Plant Technology, Steam and Gas Turbines / RWTH Aachen University, Germany</i>	GT2021:67053 Tutorial Secondary Flow and End-wall Losses in Turbine Passages Om Sharma <i>Raytheon Technologies Corporation Research Centre, USA</i> ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".		GT2021:58869 Deep Dive Thermal-spray Coated Titanium Cooling Layer for an Inside-out Ceramic Turbine Antoine Gauvin-Verville ¹ Patrick K. Dubois ¹ Benoit Picard ² Alexandre Landry-Blais ¹ Jean-Sébastien Plante ¹ Mathieu Picard ¹ <i>1. Université de Sherbrooke, Canada; 2. Exonetik Turbo, Canada</i>	
	GT2021:59487 Deep Dive A Novel Energy Storage System Based on Carbon Dioxide Unique Thermodynamic Properties Marco Astolfi ¹ Ennio Macchi ¹ Dario Rizzi ² Claudio Spadacini ² <i>1. Politecnico di Milano, Italy; 2. Energy Dome Srl, Italy</i>			GT2021:59618 Deep Dive Performance and Emission Assessment on a 3kw Micro Gas Turbine: Comparison of Rans and Les Alessio Pappa ¹ Francesco Nicolosi ² Antoine Verhaeghe ¹ Laurent Bricteux ¹ Massimiliano Renzi ² Ward De Paepe ¹ <i>1. University of Mons (UMONS), Belgium; 2. Free University of Bozen/Bolzano, Italy</i>	
	GT2021:60185 Rapid Talk Off-design of a Pumped Thermal Energy Storage Based on Closed Brayton Cycles Guido Francesco Frate, Luigia Paternostro, Lorenzo Ferrari, Umberto Desideri <i>University of Pisa, Italy</i>			GT2021:58960 Rapid Talk Prediction of Dynamic Behavior of a Single- shaft Gas Turbine Using NARX Models Hamid Asgari, Emmanuel Ory <i>VTT Technical Research Center of Finland Ltd., Finland</i>	
	GT2021:59688 Rapid Talk Evaluation of Thermoacoustic Applications Using Waste Heat to Reduce Carbon Footprint Philip Spoor ¹ Deoras Prabhudharwadkar ² Srinath Somu ² Saumitra Saxena ² Deanna Lacoste ² William Roberts ² <i>1. Phuzzy Arts and Science, USA; 2. King Abdullah University of Science and Technology, Saudi Arabia</i>			GT2021:59654 Rapid Talk A Supercritical CO2 Brayton Cycle Micro Turbine for Waste Heat Conversion: Optimization Layout in Cogenerative Applications Fabrizio Reale ¹ Raniero Sannino ¹ Raffaele Tuccillo ² <i>1. Consiglio Nazionale delle Ricerche - Istituto di Scienze e Tecnologie per l'Energia e la Mobilità Sostenibili, Italy; 2. Department of Industrial Engineering Università Federico II", Naples, Italy, Italy</i>	
	GT2021:60253 Rapid Talk Potential of Micro Gas Turbines to Provide Renewable Heat and Power in Off-grid Applications for Desalination and Industrial Wastewater Treatment Jesús Montes-Sánchez, Blanca De Weert, Blanca Petit, Lourdes Garcia-Rodríguez, <u>David Sanchez</u> <i>University of Seville, Spain</i>			GT2021:59448 Rapid Talk Start-up Process of 50kw-class Gas Turbine Firing Ammonia Gas Osamu Kurata ¹ Norihiko Iki ¹ Yong Fan ¹ Takayuki Matsunuma ¹ Takahiro Inoue ¹ Taku Tsujimura ¹ Hirohide Furutani ¹ Masato Kawano ² Keisuke Arai ² Ekenechukwu Chijioke Okafor ¹ Akihiro Hayakawa ³ Hideaki Kobayashi ³ <i>1. National Institute of Advanced Industrial Science and Technology (AIST), Japan; 2. Toyota Energy Solutions Inc., Japan; 3. Tohoku University, Japan</i>	

	OIL AND GAS APPLICATIONS	STRUCTURES AND DYNAMICS: FATIGUE, FRACTURE AND LIFE PREDICTION	TURBOMACHINERY: MULTIDISCIPLINARY DESIGN APPROACHES, OPTIMIZATION, AND UNCERTAINTY QUANTIFICATION
	Oil and Gas Machinery	Constitutive Materials Modelling	UQ and Robust Design - Operation and Geometric Uncertainties
	Technical Session • 21-02	Technical Session • 27-03	Technical Session • 39-01
	Session Organizer: Tim Allison , Southwest Research Institute Session Co-Organizer: Brian Pettinato , Elliott	Session Organizer: Marcus Thiele , Technical University of Dresden Session Co-Chairs: Sachin Shinde , Siemens Energy, Inc.; Calvin Stewart , University of Texas at El Paso; Dino Celli , Air Force Research Laboratory	Session Organizer: Marcus Meyer , Rolls Royce Session Co-Organizer: Marc Nagel , MTU Aero Engines
2:15	GT2021:58914 Deep Dive Data Selection and Feature Engineering for the Application of Machine Learning to the Prediction of Gas Turbine Trip <u>Enzo Losi</u> ¹ Mauro Venturini ¹ Lucrezia Manservigi ¹ Giuseppe Fabio Ceschini ² Giovanni Bechini ² Giuseppe Cota ³ Fabrizio Riguzzi ¹ 1. Università degli Studi di Ferrara, Italy; 2. Siemens Energy, Germany; 3. Università degli Studi di Parma, Italy	GT2021:60070 Deep Dive Mechanical Testing of Additively Manufactured Super-alloy Lugs <u>Sushovan Roychowdhury</u> , Henrik Karlsson, Björn Henriksson, Pher-Ola Carlson GKN Aerospace Sweden AB, Sweden	GT2021:59642 Deep Dive Stator Blades Manufacturing Geometrical Variability in Axial Compressors and Impact on the Aeroelastic Excitation Forces <u>Marco Gambitta</u> ¹ Arnold Kühhorn ¹ Bernd Beirow ¹ Sven Schrape ² 1. Brandenburg University of Technology (BTU), Germany; 2. Rolls-Royce Deutschland Ltd. & Co.KG, Germany
2:45	GT2021:58916 Deep Dive Prediction of Gas Turbine Trip: a Novel Methodology Based on Random Forest Models <u>Enzo Losi</u> ¹ Mauro Venturini ¹ Lucrezia Manservigi ¹ Giuseppe Fabio Ceschini ² Giovanni Bechini ² Giuseppe Cota ³ Fabrizio Riguzzi ¹ 1. Università degli Studi di Ferrara, Italy; 2. Siemens Energy, Germany; 3. Università degli Studi di Parma, Italy	GT2021:58787 Deep Dive Energy Dissipation Metrics for Fatigue Damage Detection in the Short Crack Regime for Aluminum Alloys <u>Susheel Dharmadhikari</u> , Amrita Basak Pennsylvania State University, USA	GT2021:58603 Deep Dive Robust Design Optimization of an Industrial 1.5 Stage Axial Compressor Under Operational and Geometrical Uncertainties <u>Alexandre Gouttière</u> ¹ Dirk Wunsch ¹ Rémy Nigro ² Virginie Barbieux ¹ Charles Hirsch ³ 1. NUMFLO S.A., Belgium; 2. Safran Aero Boosters, Belgium; 3. NUMECA International, Belgium
3:15	GT2021:59318 Rapid Talk Unit Health Assessment- Oil & Gas Equipment Probabilistic Case Study <u>Azman Nor</u> , Andrew Findlay Siemens Energy Inc., USA	GT2021:59581 Rapid Talk Crystal Visco-plastic Model for Directionally Solidified Ni-base Superalloys Under Monotonic and Low Cycle Fatigue <u>Navindra Wijeyeratne</u> , Firat Irmak, Ali Gordon University of Central Florida, USA	GT2021:58604 Rapid Talk Uncertainty Quantification of a Jet Engine Performance Model Under Scarce Data Availability <u>Norbert Ludwig</u> ¹ Giulia Antinori ² Marco Daub ¹ Fabian Duddeck ¹ 1. Technische Universität München, Germany; 2. MTU Aero Engines AG, Germany
3:25	GT2021:58989 Rapid Talk On Small Scale LNG Concepts <u>Rainer Kurz</u> ¹ Min Ji ¹ Tim Allison ² Griffin Beck ² 1. Solar Turbines Inc., USA; 2. Southwest Research Institute, USA	GT2021:59828 Rapid Talk Method and Verification for Material Calibration of the Chaboche Plasticity Model for Multiple Material Directions <u>Charles Krouse</u> ¹ Grant Musgrove ¹ Seungmin Lee ² Taewoan Kim ² Muhyoung Lee ² Seongyong Jeong ² 1. Southwest Research Institute, USA; 2. Doosan Heavy Industries & Construction Co., Ltd., Korea	GT2021:59442 Rapid Talk Probabilistic Approach for Optimizing Uncertainties of Input Variables to Reach a Desired Confidence Level <u>Andriy Prots</u> ¹ Matthias Voigt ¹ Philip Magin ² Florian Danner ² Ronald Mailach ¹ 1. Technische Universität Dresden, Germany; 2. MTU Aero Engines AG, Germany
3:35	GT2021:59458 Rapid Talk A Stochastics Model for Nanoparticle Deposits Growth <u>Alessio Suman</u> , Alessandro Vulpio, Nicola Casari, Michele Pinelli University of Ferrara, Italy	GT2021:59608 Rapid Talk Experimental and Analytical Investigation of Cyclic Crack Initiation in Nickel Based Super Alloy with Stress Concentration Features <u>Alex Torkaman</u> ¹ Steve Fiebigler ¹ Nathan O'nora ¹ Devin O'neal ² Ali Gordon ² 1. Power Systems Mfg., LLC, USA; 2. University of Central Florida, USA	

**TURBOMACHINERY:
RADIAL TURBOMACHINERY
AERODYNAMICS**
Radial and Mixed Flow Turbines
Technical Session • 40-01

Session Organizer: **Bob Mischo**, MAN Energy Solutions Schweiz AG
Session Co-Organizer: **Nicolas Lachenmaier**, Rolls Royce Power Systems AG

2:15

**GT2021:58901 [Deep Dive](#)
Aeromechanical Optimization of Scaloping in Mixed Flow Turbines**

Matthew Elliott¹ Stephen Spence² Martin Seiler³
Marco Geron¹
1. Queen's University Belfast, United Kingdom;
2. Trinity College Dublin, Ireland; 3. ABB Switzerland, Turbocharging, Switzerland

2:45

**GT2021:59382 [Deep Dive](#)
Investigation of a Novel Turbine Housing to Produce a Non-uniform Spanwise Flow Field at the Inlet to a Mixed Flow Turbine and Provide Variable Geometry Capabilities**

Richard Morrison¹ Stephen Spence² Charles Stuart¹ Sung In Kim¹ Thomas Leonard³ Andre Starke³
1. Queen's University Belfast, United Kingdom;
2. Trinity College Dublin, Ireland; 3. IHI Charging Systems International GmbH, Germany

3:15

**GT2021:59736 [Rapid Talk](#)
Combination of Turbocharger and Industrial Technologies for the Development of an Improved Mixed-flow Turbine Design**

Holger Franz, Jens Niewöhner, Stefan Mühlenbrock
MAN Energy Solutions SE, Germany

3:25

**GT2021:60069 [Rapid Talk](#)
One Dimensional Modelling for Pulsed Flow Twin-entry Turbine**

Bijie Yang¹ Ricardo Martinez-Botas¹ Yingxian Xian² Mingyang Yang²
1. Imperial College London, United Kingdom;
2. Shanghai Jiao Tong University, China

3:35

**GT2021:60239 [Rapid Talk](#)
Numerical Analysis of Non-Radial Blading in a Low Speed-Low Pressure Turbine for Electric Turbocompounding Applications**

Eva Alvarez-Regueiro¹ Maria Esperanza Barrera-Medrano¹ Srithar Rajoo² Ricardo Martinez-Botas¹
1. Imperial College London, United Kingdom;
2. Universiti Teknologi Malaysia, Malaysia

WEDNESDAY JUNE 9		04:00 PM - 05:30 PM			
COMBUSTION, FUELS AND EMISSIONS		CYCLE INNOVATIONS: ENERGY STORAGE		HEAT TRANSFER: GENERAL INTEREST	
Dry Low-NOx Combustor Development and Emissions		Overview of Grid-Scale Energy Storage Systems and Technologies		Heat Transfer Methods and Technologies	
Technical Session • 04-15		Tutorial Session • 07-03		Technical Session • 13-03	
Session Organizer: Keith McManus , GE Global Research Center Session Co-Chairs: Robert Corr , GT Consultant; Joshua Gray , National Academy of Sciences; Geoffrey Myers , Mitsubishi Heavy Industries America		Session Organizer: : Tim Allison , Southwest Research Institute		Session Organizer: Kenneth Moore , GE Session Co-Organizer: Robert Proctor , BPTF Consulting, LLC	
4:00	GT2021:58660 Deep Dive The Development Problems of Two-fuel Burner for the Gas Turbine Combustion Chamber Alexander Vasilyev ¹ Oganess Chelebyan ¹ Anna Maiorova ¹ Anton Tarasenko ¹ Vladimir Zakharov ¹ Dmitriy Tarasov ² 1. Central Institute of Aviation Motors, Russia; 2. JSC «Power Machines», Russia	GT2021:61601 Tutorial Overview of Grid-Scale Energy Storage Systems and Technologies Tim Allison ¹ Natalie Smith ¹ Aaron Rimpel ¹ Aaron Mcclung ¹ Antonio Perejon ² Antonio Perejon David Sanchez ² David Sanchez 1. Southwest Research Institute, USA; 2. University of Seville, Spain ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".		GT2021:58838 Deep Dive Experimental Determination of Heat Transfer Coefficient on Impingement Cooled Gear Flanks: Validation of the Evaluation Method Emre Ayan, Felix Von Plehwe, Marc Keller, Christian Kromer, Corina Schwitzke, Hans-Jörg Bauer Institute of Thermal Turbomachinery, Germany	
	GT2021:59162 Deep Dive Development and Integration of the Dual Fuel Combustion System for the MGT Gas Turbine Family Bernhard Cosic ¹ Frank Reiß ¹ Marc Blümer ¹ Christian Frekers ¹ Franklin Genin ² Judith Pähr ¹ Dominik Waßmer ¹ 1. MAN Energy Solutions SE, Germany; 2. MAN Energy Solutions Schweiz AG, Switzerland			GT2021:59603 Deep Dive Calibration of a CFD Methodology for the Simulation of Roughness Effects on Friction and Heat Transfer in Additive Manufactured Components Lorenzo Mazzei, Riccardo Da Soghe, Cosimo Bianchini Ergon Research, Italy	
	GT2021:59061 Rapid Talk Flow Fields, Emission and Stabilization in Premixed Centrally-staged Swirl Flames with Different Air Split Ratios Xiao Han, Tong Su, Yuzhen Lin, Chi Zhang Beihang University, China			GT2021:58820 Rapid Talk A Discussion: Issue Improving the Accuracy of Turbine Blade Heat Transfer Simulation Shenghui Zhang ¹ Shuiting Ding ¹ Chuankai Liu ¹ Gang Zhao ¹ Jie Wang ² 1. Beihang University, China; 2. Beijing University, China	
	GT2021:59074 Rapid Talk Center Body Burner for Sequential Combustion: Superior Performance at Lower Emissions Andrea Ciani, John Wood, Michael Maurer, Birute Bunkute, Douglas Pennell, Sergei Riazantsev, Gerhard Früchtel Ansaldo Energia, Switzerland			GT2021:69491 Rapid Talk Rotating Brush Seal Design and Performance Testing Neelesh Sarawate ¹ Deepak Trivedi ² 1. GE Global Research, USA; 2. GE Research, USA	
5:20	GT2021:60105 Rapid Talk Grid Plate Flame Stabilizer for High Intensity Gas Turbine Combustion: The Influence of the Method of Fuel Injection on Mixing, Flame Development and NOx Emissions José Ramón Quiñonez Arce, Gordon E. Andrews, Alan D. Burns, Naman AlDabbagh University of Leeds, United Kingdom				

	MICROTURBINES, TURBOCHARGERS AND SMALL TURBOMACHINES	OIL AND GAS APPLICATIONS	STEAM TURBINE
	Rotordynamics and Testing in the Design Loop	Fouling and Performance Assessment	Wet Steam
	Technical Session • 20-04	Technical Session • 21-03	Technical Session • 23-05
	Session Organizer: Silvia Marelli , University of Genoa Session Co-Organizer: Kostandin Gjika , KG Turbomachinery	Session Organizer: Jason Wilkes , Southwest Research Institute Session Co-Organizer: Rainer Kurz , Solar Turbines Inc.	Session Organizer: Tadashi Tanuma , Teikyo University Session Co-Organizer: Tao Guo , GE Power
4:00	GT2021:59513 Deep Dive Stability and Unbalance Analysis of Rigid Rotors Supported by Spiral Groove Bearings: Comparison of Different Approaches <u>Elia Iseli</u> ¹ <u>Jürg Schiffmann</u> ² 1. Fischer Spindle AG, Switzerland; 2. Ecole Polytechnique Fédérale Lausanne (EPFL), Switzerland	GT2021:59190 Deep Dive An Approach to Measure Total-head in Wakes and Near End Walls at High Fogging Conditions <u>Janneck Harbeck</u> , <u>Silvio Geist</u> , <u>Markus Schatz</u> <u>Helmut Schmidt University, Germany</u>	GT2021:59541 Deep Dive Investigation of Moisture Removal on Last Stage Stationary Blade in Actual Steam Turbine <u>Hideaki Sato</u> ¹ <u>Soichiro Tabata</u> ¹ <u>Naoto Tochitani</u> ¹ <u>Yasuhiro Sasao</u> ¹ <u>Ryo Takata</u> ² <u>Masaki Osako</u> ² 1. Mitsubishi Power, Ltd., Japan; 2. Mitsubishi Heavy Industries, Ltd., Japan
4:30	GT2021:59517 Deep Dive Blade Tip Clearance Measurement Systems for High Speed Turbo-machinery Applications and the Potential for Blade Tip Timing Applications <u>Jack Stubbs</u> <u>Rotadata Ltd, United Kingdom</u>	GT2021:59678 Deep Dive Centrifugal Compressor Polytropic Performance Evaluation Using Cubic Polynomial Approximation for the Temperature-entropy Polytropic Path <u>Matt Taher</u> ¹ <u>Fred Evans</u> ² 1. Bechtel Oil, Gas & Chemicals, USA; 2. Consultant, USA	GT2021:59645 Deep Dive Two Phase Flow CFD Modeling of a Steam Turbine Low Pressure Section: Comparison with Data and Correlation <u>Nicola Maceli</u> ¹ <u>Lorenzo Arcangeli</u> ¹ <u>Andrea Arnone</u> ² 1. Baker Hughes, Italy; 2. University of Florence, Italy
5:00	GT2021:59175 Rapid Talk Design and Testing of a Static Rig for Tesla Turbine Flow Visualization <u>Marco Ferrando</u> ¹ <u>Michael Caminale</u> ² <u>Federico Reggio</u> ¹ <u>Paolo Silvestri</u> ¹ 1. Università degli studi di Genova, Italy; 2. Ansaldo Energia SpA, Italy	GT2021:59715 Rapid Talk Mathematical Modeling of the Polytropic Process Using the Sequential Cubic Polynomial Approximation <u>Matt Taher</u> <u>Bechtel Oil, Gas & Chemicals, USA</u>	GT2021:59241 Rapid Talk Experimental and Numerical Investigation of the Effects of Real Shape Modeling and Non-Equilibrium Condensation Modeling on the Flow Pattern in Steam Turbine <u>Soichiro Tabata</u> , <u>Yasuhiro Sasao</u> , <u>Kiyoshi Segawa</u> , <u>Eiji Konishi</u> <u>Mitsubishi Power, Ltd, Japan</u>
5:10		GT2021:59449 Rapid Talk A Quantitative Approach for the Estimation of the Fouling Rate on the Stationary Parts of a Multistage Test Compressor <u>Alessandro Vulpio</u> , <u>Alessio Suman</u> , <u>Nicola Casari</u> , <u>Michele Pinelli</u> <u>University of Ferrara, Italy</u>	
5:20		GT2021:59455 Rapid Talk Washing Effectiveness Assessment of Different Cleaners on a Small-scale Multistage Compressor <u>Alessandro Vulpio</u> ¹ <u>Alessio Suman</u> ¹ <u>Nicola Casari</u> ¹ <u>Michele Pinelli</u> ¹ <u>Craig Appleby</u> ² <u>Simon Kyte</u> ² 1. University of Ferrara, Italy; 2. ZOK International Group Ltd, United Kingdom	

	STRUCTURES AND DYNAMICS: FATIGUE, FRACTURE AND LIFE PREDICTION	TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS	TURBOMACHINERY: DUCTS, NOISE AND COMPONENT INTERACTIONS
	Fatigue Damage Analysis	Experiments, Rigs and Facility Operation	Ducts and Component Interactions
	Technical Session • 27-02	Technical Session • 34-09	Technical Session • 38-02
	Session Organizer: Karl Michael Kraemer , Technical University of Darmstadt - MPA/IfW Session Co-Organizer: Andrew Moffat , Frazer- Nash Consultancy	Session Organizer: Senthil Krishnababu , Siemens Industrial Turbomachinery Ltd Session Co-Organizer: Cleopatra Cucumita , Comoti R&D Institute for Gas Turbines	Session Organizer: Markus Brettschneider , MTU Aero Engines AG Session Co-Chairs: Panagiota Tsifourdaris , Pratt & Whitney Canada; Mark Cunningham , Pratt & Whitney Canada
4:00	GT2021:58836 Deep Dive Creep-fatigue Calculations for Effusion Holes in Transpiration Cooled Gas Turbine Blades Christos Skamniotis, Alan Cocks <i>University of Oxford, United Kingdom</i>	GT2021:58793 Deep Dive Effects of Rotation on the Flow Structure in a Compressor Cascade Jordi Ventosa-Molina, Björn Koppe, Martin Lange, Ronald Mailach, Jochen Fröhlich <i>Technische Universität Dresden, Germany</i>	GT2021:58586 Deep Dive The Interaction of Purge Flows with Secondary Flow Features in Turbine Center Frames Marios Patinios, Filippo Merli, Asim Hafizovic, Emil Göttlich <i>Graz University of Technology, Institute of Thermal Turbomachinery and Machine Dynamics, Austria</i>
4:30	GT2021:58959 Deep Dive Experimental and Numerical Investigation of High-temperature Multiaxial Fatigue Harish Ramesh Babu ¹ Marco Böcker ² Mario Raddatz ¹ Sebastian Henkel ² Uwe Gampe ¹ Horst Biermann ² 1. <i>Technische Universität Dresden, Institute of Power Engineering, Germany</i> ; 2. <i>Technische Universität Bergakademie Freiberg, Institute of Materials Engineering, Germany</i>	GT2021:58946 Deep Dive Design and Pre-test Evaluation of a Low- pressure Compressor Test Facility for Cryogenic Hydrogen Fuel Integration Isak Jonsson ¹ Carlos Xisto ² Marcus Lejons ³ Anders Dahl ⁴ Tomas Grönstedt ⁴ 1. <i>Mechanics and Maritime Sciences - Fluid Dynamics, Sweden</i> ; 2. <i>Chalmers University of Technology, Sweden</i> ; 3. <i>GKN Aerospace Trollhättan, Sweden</i> ; 4. <i>Chalmers Tekniska Högskola AB, Sweden</i>	GT2021:58879 Deep Dive Experimental Investigation of Secondary Flows and Length Reduction for a Low- pressure Compressor Transition Duct Dimitra Tsakmakidou ¹ Ian Mariah ¹ A Duncan Walker ¹ Chris Hall ² Harry Simpson ² 1. <i>Loughborough University, United Kingdom</i> ; 2. <i>Rolls-Royce plc., United Kingdom</i>
5:00	GT2021:58801 Rapid Talk Study on Relationship Between Dislocation Density and Creep Strain Rate of Single Crystal Ni Based Superalloy for Gas Turbines Using the Discrete Cosine Transform Hideo Hiraguchi <i>The Institution of Professional Engineers, Japan, Japan</i>	GT2021:59200 Rapid Talk Bayesian Inference of Experimental Data for Axial Compressor Performance Assessment Gonçalo Cruz ¹ Cedric Babin ¹ Xavier Ottavy ² Fabrizio Fontaneto ¹ 1. <i>von Karman Institute for Fluid Dynamics, Belgium</i> ; 2. <i>Laboratoire de Mécanique des Fluides et d'Acoustique, France</i>	GT2021:58667 Rapid Talk Design and Evaluation of a Flow Capturing Device for a High-speed Wind Tunnel Mattia Graiff ¹ Marian Staggl ¹ Emil Göttlich ¹ Christian Wakelam ² 1. <i>Graz University of Technology, Austria</i> ; 2. <i>GE Aviation, Germany</i>
5:10	GT2021:59626 Rapid Talk HCF Optimization of a High Speed Variable Geometry Turbine Alister Simpson ¹ Sung In Kim ¹ Jongyoon Park ² Seong Kwon ² Sejong Yoo ² 1. <i>Queen's University Belfast, United Kingdom</i> ; 2. <i>KeyYang Precision Co., Korea</i>	GT2021:59047 Rapid Talk Effects of Suction Probe Support on the Aerodynamic Performance of the Compressor Yafei Zhong, Hongwei Ma, Yi Yang <i>Beihang University, China</i>	
5:20	GT2021:58727 Rapid Talk A Method for Establishing the Central Crack Stress Intensity Factor Database for Probabilistic Risk Assessment Based on Universal Weight Function Tongge Xu, Shuiting Ding, Huimin Zhou, Guo Li <i>Aircraft/Engine Integrated System Safety Beijing Key Laboratory, School of Energy and Power Engineering, Beihang University, China</i>	GT2021:58558 Rapid Talk Evaluation of a Flow Measurement Probe Influence on the Flow Field in High Speed Axial Compressors Ryosuke Seki ¹ Satoshi Yamashita ² Ryosuke Mito ¹ 1. <i>Mitsubishi Heavy Industries, Ltd., Japan</i> ; 2. <i>Mitsubishi Heavy Industries America, Inc., USA</i>	

WIND ENERGY

Recent Developments in Wind
Turbine Technology and Research

Tutorial Session • 44-02

Session Organizer: **Alessandro Bianchini**,
University of Florence
Session Co-Organizer: **Alexandrina Untaroiu**,
Virginia Tech

GT2021:65145 [Tutorial](#)
**Recent Developments in Wind Turbine
Technology and Research**
Alessandro Bianchini
Università degli Studi di Firenze, Italy

** This tutorial will NOT have a video on demand
(VOD). This tutorial will be held "live".

T
U
T
O
R
I
A
L

4:00

4:30

5:00

KEYNOTE & PLENARIES

Plenary: Engineering in 2030 – How Must Our Educational Programs Change to Better Equip the Needed Workforce**Plenary • 46-04**

Session Organizer: **Jacqueline O'Connor**, Pennsylvania State University
Session Co-Organizer: **James R Dawson**, Norwegian University of Science and Technology

Engineering in 2030 – How Must Our Educational Programs Change to Better Equip the Needed Workforce

Bryan D. Morreale¹ Barbara Esker² Mark Jefferies³

1. *National Energy Technology Laboratory U.S. Department of Energy, USA;*
2. *NASA Aeronautics Research Mission Directorate (ARMD), USA;*
3. *Rolls-Royce Group, United Kingdom*

8:00

8:30

9:00

	COMBUSTION, FUELS AND EMISSIONS	CYCLE INNOVATIONS	FANS AND BLOWERS
	Combustion Dynamics: Experimental Investigations II	Compressor Instabilities and Novel Cycles	Artificial Neural Networks: From Basics to Turbomachinery Applications
	Technical Session • 04-11	Technical Session • 06-02	Tutorial Session • 10-04
	Session Organizer: Janith Samarasinghe , GE Session Co-Chairs: Robert Corr , GT Consultant; Joshua Gray , National Academy of Sciences	Session Organizer: Valentina Zaccaria , Mälardalen University Session Co-Organizer: Homam Nikpey Somehsaraei , University of Stavanger	Session Organizer: Lorenzo Tieghi , Sapienza University of Rome Session Co-Chairs: Giovanni Delibra , Sapienza University of Rome; Zhiping Wang , Morrison Products Inc; Sybrand Johannes Van Der Spuy , Stellenbosch University; Alessandro Corsini , Sapienza University of Rome; Chunill Hah , NASA Glenn Research Center
9:45	GT2021:58777 Deep Dive Transient Thermoacoustic Responses of CH₄-H₂ Flames in a Pressurized Annular Combustor <u>Byeonguk Ahn</u> , Thomas Indlekofer, James R. Dawson, Nicholas A. Worth <i>Norwegian University of Science and Technology, Norway</i>	GT2021:59501 Deep Dive Incipient Surge Analysis in Time and Frequency Domain for Centrifugal Compressors <u>Paolo Silvestri</u> , Silvia Marelli, Massimo Capobianco <i>University of Genova, Italy</i>	GT2021:65169 Tutorial Artificial Neural Networks: From Basics to Turbomachinery Applications <u>Lorenzo Tieghi</u> , Giovanni Delibra, Alessandro Corsini, Francesco Aldo Tucci <i>Sapienza University of Rome, Italy</i> ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".
10:15	GT2021:59098 Deep Dive Experimental Investigation of Fuel Staging Effect on Modal Dynamics of Thermoacoustic Azimuthal Instabilities in a Multi-nozzle Can Combustor <u>Jeongwon Kim</u> ¹ Wesley Gillman ¹ Tony John ¹ Subodh Adhikari ¹ David Wu ¹ Benjamin Emerson ¹ Vishal Acharya ¹ Isono Mitsunori ² Saitoh Toshihiko ² Timothy Lieuwen ¹ <i>1. Georgia Institute of Technology, USA; 2. Mitsubishi Heavy Industries, Ltd, Japan</i>	GT2021:60209 Deep Dive Control Strategy Development for Optimized Operational Flexibility From Humidified Micro Gas Turbine: Saturation Tower Performance Assessment <u>Ward De Paepe</u> ¹ Alessio Pappa ¹ Diederik Coppitters ¹ Marina Montero Carrero ² Panagiotis Tsirikoglou ³ Francesco Contino ⁴ <i>1. University of Mons (UMONS), Belgium; 2. Vrije Universiteit Brussel (VUB), Belgium; 3. Limmat Scienfitic AG, Switzerland; 4. UCLouvain, Belgium</i>	T U T O R I A L
10:45	GT2021:58358 Rapid Talk Routes to Intermittency of PVC Oscillations in Swirl Nozzles <u>Saarthak Gupta</u> ¹ Santosh Shanbhogue ² Masayasu Shimura ³ Ahmed Ghoniem ² Santosh Hemchandra ¹ <i>1. Indian Institute of Science, India; 2. Massachusetts Institute of Technology, USA; 3. Tokyo Institute of Technology, Japan</i>	GT2021:59264 Rapid Talk Surge Prevention Techniques for a Turbocharged Solid Oxide Fuel Cell System <u>Luca Mantelli</u> , Mario Luigi Ferrari, Alberto Traverso <i>University of Genoa, Italy</i>	
10:55	GT2021:58794 Rapid Talk Impact of Thermoacoustic Instability on Precessing Vortex Core Dynamics in a CH₄/ H₂/Air Technically Premixed Combustor <u>Anindya Datta</u> ¹ Saarthak Gupta ¹ Ianko Chtere ² Isaac Boxx ² Santosh Hemchandra ¹ <i>1. Indian Institute of Science, India; 2. Institute for Combustion Technology, German Aerospace Centre (DLR), Germany</i>	GT2021:59615 Rapid Talk Performance Prediction of Multi-stage Ammonia-water Turbine Under Variable Nozzle Operation via Machine Learning <u>Yang Du</u> ¹ Tingting Liu ² Yiping Dai ² Gang Fan ² Jiangfeng Wang ² Pan Zhao ² <i>1. Institute of Turbomachinery, Xi'an Jiaotong University, China; 2. Xi'an Jiaotong University, China</i>	
11:05	GT2021:59592 Rapid Talk Recursive Sequential Combustion: a Concept Study About a Momentum-Enhanced Blend of the Reactants with Recirculated Burnt Gases <u>Fabrice Giuliani</u> , Nina Paulitsch, Andrea Hofer <i>Combustion Bay One e.U., Austria</i>	GT2021:59106 Rapid Talk Prediction and Mitigation Strategies for Compressor Instabilities Due to Large Pressurized Volumes in Micro Gas Turbine Systems <u>Thomas Krummrein</u> , Martin Henke, Timo Lingstädt, Martina Hohloch, Peter Kutne <i>German Aerospace Center (DLR), Germany</i>	

	HEAT TRANSFER: GENERAL INTEREST	HEAT TRANSFER: INTERNAL COOLING	MANUFACTURING MATERIALS AND METALLURGY
	Methods and Technologies	Conjugate Heat Transfer and Optimization	Life Prediction and Prognosis
	Technical Session • 13-02	Technical Session • 15-05	Technical Session • 18-03
	Session Organizer: Carlo Carcasci , University of Florence Session Co-Organizer: Shailendra Naik , Andaldo Energia	Session Organizer: Yao-Hsien Liu , National Chiao-Tung University Session Co-Organizer: Prashant Singh , Mississippi State University	Session Organizer: Pontus Slottner , Siemens Indus Session Co-Organizer: Firat Irmak , University of Central Florida
9:45	GT2021:59275 Deep Dive Surface Heater Fabrication Using Micro-lithography for Transpiration Cooling Heat Transfer Coefficient Measurements Zheng Min, Sarwesh Parbat, Qing-Ming Wang, Minking Chyu <i>University of Pittsburgh, USA</i>	GT2021:58386 Deep Dive Study on Conjugate Thermal Performance of a Steam-Cooled Ribbed Channel with Thick Metallic Walls Lei Xi, Liang Xu, Jianmin Gao, Zhen Zhao <i>Xi'an Jiaotong University, China</i>	GT2021:60113 Deep Dive Recent Developments in Hot Isostatic Pressing (HIP) of Components for Turbomachinery Applications Chad Beamer <i>Quintus Technologies, LLC, USA</i>
10:15	GT2021:59352 Deep Dive Preliminary Study of Heat Pipe Turbine Vane Cooling in the NASA N+3 Reference Engine Ezra McNichols, Scott Jones, Arman Mirhashemi, Paht Juangphanich, Vikram Shyam <i>NASA Glenn Research Center, USA</i>	GT2021:58725 Deep Dive Multi-objective Optimization on the Fluid Flow and Heat Transfer of Semiattached Rib-Channels Xu Wang ¹ Jianhua Wang ¹ Huazhao Xu ¹ Yuefeng Li ¹ Wei Song ² <i>1. University of Science and Technology of China, China; 2. Research Institute of Aero-Engine Corporation of China, China</i>	GT2021:59977 Deep Dive Multi-parameter Optimization to Improve the Erosion Resistance of Coating Surface by 3D FE Simulation Fang Li, Shunsen Wang, Zhenping Feng, Liuxi Cai <i>Xi'an Jiaotong University, China</i>
10:45	GT2021:59062 Rapid Talk Numerical Investigations on the Aerothermal Performance and Film Cooling Effectiveness of Turbine Vane Endwall at Inlet Swirl Conditions Zhiyu Li, Kaiyuan Zhang, Zhigang Li, Jun Li <i>Institute of Turbomachinery, Xi'an Jiaotong University, China</i>	GT2021:59422 Rapid Talk Adjoint Based Heat Conduction Optimization of Struts Parameters Within Hollow Blade Yougang Ruan, Zhenping Feng <i>Xi'an Jiaotong University, China</i>	GT2021:59480 Rapid Talk Establishing an Acceptance Criteria for Assessing Fatigue of Additive Repair Processes Onome Scott-Emuakpor, Luke Sheridan, Brian Runyon, Tommy George, Joseph Beck <i>Air Force Institute of Technology, USA</i>
10:55	GT2021:58921 Rapid Talk Studying the Effect of Porosity of Porous Layer Coating on the Performance of the Horizontal Tubular Falling Film Evaporator Alaa A. Ibrahim, Ahmed M. Nagib Elmekawy, Hassan Elgamal <i>Alexandria University, Egypt</i>	GT2021:60381 Rapid Talk Investigating Heat Transfer in a Straight Cooling Passage Using Transient Infrared Temperature Data and Urans Conjugate Heat Transfer Analysis Louis Christensen ¹ Richard Celestina ¹ Spencer Sperling ¹ Randall Mathison ¹ Hakan Aksoy ² Jong Liu ² Jeremy Nickol ² <i>1. The Ohio State University, USA; 2. Honeywell Aerospace, USA</i>	GT2021:59765 Rapid Talk Developing an Implicit Creep Model from Open Literature Data William Day <i>Principal Engineer, USA</i>
11:05	GT2021:59658 Rapid Talk Assessment of CFD Models for Multiphase Heat Transfer in Different Boiling Regimes Cosimo Bianchini ¹ Riccardo Da Soghe ¹ Lorenzo Mazzei ¹ Giuseppe Caggiano ² Maddalena Angelucci ² <i>1. Ergon Research, Italy; 2. Avio, Italy</i>	GT2021:59774 Rapid Talk Thermal Performance of Double-sided, Partial Height Strip Fin Arrays in a High Aspect Ratio, Rectangular Channel Nathaniel Tracy, Lesley Wright, Je-Chin Han <i>Texas A&M University, USA</i>	GT2021:59619 Rapid Talk Comparative Low-cycle Fatigue Behavior of Haynes 244 Alloy and Waspaloy Michael Fahrman <i>Haynes International, Inc., USA</i>

	STRUCTURES AND DYNAMICS: PROBABILISTIC METHODS	SUPERCRITICAL CO ₂	TURBOMACHINERY: AXIAL FLOW TURBINE AERODYNAMICS
	Probabilistic Methods for Turbomachinery Applications	Compressors	Loss Generation and High Fidelity CFD
	Technical Session • 28-01	Technical Session • 33-01	Technical Session • 35-01
	Session Organizer: Jeff Brown , US Air Force Research Laboratory Session Co-Organizer: Andrew Milliken , Pratt & Whitney	Session Organizer: Jason Wilkes , Southwest Research Institute Session Co-Organizer: Robert Pelton , Hanwha	Session Organizer: Sergio Lavagnoli , Von Karman Institute for Fluid Dynamics Session Co-Chairs: Alex Stein , GE Energy; Cis De Maesschalck , Rolls Royce Plc
9:45	GT2021:58842 Deep Dive A Probabilistic Machine Learning Framework for Explicit Inverse Design of Industrial Gas Turbine Blades Sayan Ghosh ¹ Valeria Andreoli ² Govinda A. Padmanabha ³ Cheng Peng ³ Steven Atkinson ² Piyush Pandita ² Thomas Vandeputte ² Nicholas Zabaras ³ Liping Wang ² 1. General Electric Research, USA; 2. GE Research, USA; 3. University of Notre Dame, USA	GT2021:60275 Deep Dive Compressor Map Corrections for Highly Non-linear Fluid Properties Mark Anderson Concepts NREC, USA	GT2021:59694 Deep Dive The Effect of Inlet Conditions on Turbine Endwall Loss John Coull ¹ Christopher Clark ² 1. University of Oxford, United Kingdom; 2. University of Cambridge, United Kingdom
10:15	GT2021:59745 Deep Dive Bayesian Optimization for Multi-objective High-Dimensional Turbine Aero Design Yiming Zhang, Sayan Ghosh, Thomas Vandeputte, Liping Wang GE Research, USA	GT2021:58763 Deep Dive Comparison of Compressor Performance Map Predictions to Test Data for a Supercritical Carbon Dioxide Brayton Power Cycle Eric Clementoni Naval Nuclear Laboratory, USA	GT2021:58995 Deep Dive High-fidelity Simulations of a High-pressure Turbine Stage: Effects of Reynolds Number and Inlet Turbulence Yaomin Zhao ¹ Richard D. Sandberg ² 1. College of Engineering, Peking University, China; 2. University of Melbourne, Australia
10:45	GT2021:58620 Rapid Talk Improved Rotor Design with Combined 3D-2D Probabilistic Approach Lukas Schuchard ¹ Peter Dumstorff ² Matthias Voigt ¹ Armin De Lazzer ² Henning Almstedt ² Ronald Mailach ¹ 1. Technische Universität Dresden, Germany; 2. Siemens Energy, Germany	GT2021:59228 Rapid Talk Preliminary Design of Supercritical Carbon Dioxide Compression Test System Teng Geng ¹ Chen Laijie ¹ Shen Xin ¹ Ouyang Hua ¹ Zhu Yubo ² Fan Wei ² Liu Zhigang ² 1. School of Mechanical Engineering, Shanghai Jiao Tong University, China; 2. Shanghai Turbine Works Co., Ltd., China	GT2021:59606 Rapid Talk Numerical Investigation of Loss Development in a Low-pressure Turbine Cascade with Unsteady Inflow and Varying Inlet Endwall Boundary Layer Tobias Schubert, Reinhard Niehuis Institute of Jet Propulsion, Bundeswehr University Munich, Germany
11:15		GT2021:59961 Rapid Talk Open Source Axial Compressor Mean Line Design Tool for Supercritical Carbon Dioxide Kaden Wells, Mark Turner University of Cincinnati, USA	GT2021:58816 Rapid Talk High-fidelity Simulations of a High-pressure Turbine Vane with End Walls: Impact of Secondary Structures and Spanwise Temperature Profiles on Losses Yaomin Zhao ¹ Richard D. Sandberg ² 1. College of Engineering, Peking University, China; 2. University of Melbourne, Australia
11:25		GT2021:60252 Rapid Talk On sCO₂ Compressor Performance Maps at Variable Intake Thermodynamic Conditions Alessandro Romei, Paolo Gaetani, Giacomo Persico Politecnico di Milano, Italy	GT2021:58887 Rapid Talk A Key Flow Parameter to the Profile Loss of Low-pressure Turbine Blades Ken-Ichi Funazaki, Hidekazu Kodama Iwate University, Japan

**TURBOMACHINERY:
RADIAL TURBOMACHINERY
AERODYNAMICS**

**Centrif Compressor Design/Peform.
Optimization III**

Technical Session • 40-03

Session Organizer: **Michele Marconcini**,
University of Florence
Session Co-Chairs: **Peter Harley**, Dyson Ltd.;
Vishal Jariwala, Elliott Group

9:45

GT2021:60204 [Deep Dive](#)
**Experimental Study on Reynolds Number
Effect Using a Novel Turbocompressor Test
Facility Operating with Helium-Neon Gas
Mixtures**

Maxime Podeur, Damian M. Vogt
ITSM - University of Stuttgart, Germany

10:15

GT2021:59998 [Deep Dive](#)
**Centrifugal Compressor Stage Efficiency and
Rotor Stiffness Augmentation via Artificial
Neural Networks**

Andrea Agnolucci¹ Michele Marconcini¹ Lorenzo
Toni² Angelo Grimaldi² Marco Giachi² Andrea
Arnone¹

*1. University of Florence, Italy; 2. Baker Hughes,
Italy*

10:45

GT2021:59723 [Rapid Talk](#)
**Design and Performance Analysis of a
Supercritical CO₂ Centrifugal Compressor
with Variable Geometry**

Gang Fan, Kang Chen, Shaoxiong Zheng, Yang
Du, Yiping Dai, Jiangfeng Wang, Pan Zhao
Xi'an Jiaotong University, China

10:55

GT2021:59902 [Rapid Talk](#)
**The Comparison Study on the Stage
Performance of Centrifugal Compressors
with the Shrouded and Unshrouded Impellers**

Guang Xi, Chenxi Zhao, Yonghong Tang, Zhiheng
Wang
Xi'an Jiaotong University, China

THURSDAY JUNE 10			12:15 PM - 01:45 PM		
HEAT TRANSFER: INTERNAL COOLING		MANUFACTURING MATERIALS AND METALLURGY		STRUCTURES AND DYNAMICS: ROTOR DYNAMICS	
Jet Impingement I		Materials Selection for Turbomachinery in Oil and Gas Applications		Rotordynamic Modeling	
Technical Session • 15-01		Tutorial Session • 18-09		Technical Session • 29-01	
Session Organizer: Prashant Singh , Mississippi State University		Session Organizer: William Day , W. David Day, Inc.		Session Organizer: Rasish Khatri , Calnetix Technologies Session Co-Chairs: Wan Zhong , Solar Turbines Inc.; Athanasios Chasalevris , National Technical University of Athens; Yujiao Tao , Waukesha Bearings; Almudena Vega , Siemens Gamesa; Lawrence Hawkins , Calnetix Technologies	
12:15	GT2021:58913 Deep Dive Heat Transfer Enhancement in a Double Sequential Impingement Channel Michele Gaffuri ¹ Shailendra Naik ² Marc Henze ² Peter Ott ¹ 1. EPFL, Switzerland; 2. Ansaldo Energia, Switzerland		GT2021:104 Tutorial Materials Selection for Turbomachinery in Oil and Gas Applications ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".	GT2021:60036 Deep Dive An Unconventional Method for the Diagnosis and Study of Generator Rotor Thermal Bows Steven Chatterton, Paolo Pennacchi, Andrea Vania Politecnico di Milano - Dept. of Mechanical Engineering, Italy	
	GT2021:59568 Deep Dive Rotordynamic Characteristics of the Straight-through Labyrinth Seal Based on the Applicability Analysis of Leakage Models Using Bulk-flow Method Tianhao Wang, Zhigang Li, Jun Li Institute of Turbomachinery, Xi'an Jiaotong University, China			GT2021:59725 Deep Dive System Level Analysis of Compressor Eye-labyrinth Seal Rotordynamic Forces: a Computational Fluid Dynamics Approach MD Shujan Ali ¹ Farzam Mortazavi ² Alan Palazzolo ¹ 1. Texas A&M University, USA; 2. Rotating Machinery Services, Inc., USA	
	GT2021:58813 Rapid Talk Numerical Investigation of Array Impingement Heat Transfer on the Target with Advanced Pin Fins Tao Guo, Yunpeng Ben, Yuchao Liu, Cunliang Liu, Hui ren Zhu Northwestern Polytechnical University, China			GT2021:58800 Rapid Talk Rotordynamic Evaluation of a Large High-Speed Rotor Equipped with Flexure Pivot Journal Bearings and Integral Squeeze Film Damper Alice Innocenti ¹ Filippo Cangioli ² Jongsoo Kim ³ Giuseppe Vannini ¹ 1. Baker Hughes, Italy; 2. Waukesha Bearings, United Kingdom; 3. Waukesha Bearings, USA	
	GT2021:59573 Rapid Talk Conjugate Heat Transfer of the Narrow Impingement Channel Min Ren, Xueying Li, Jing Ren Tsinghua University, China			GT2021:58824 Rapid Talk Dynamic Analysis of a Coupled Dual-rotor with Squeeze Film Damper Considering Sudden Unbalance Ying Cui, Yuxi Huang, Guogang Yang, Yongliang Wang, Han Zhang Dalian Maritime University, China	
				GT2021:60195 Rapid Talk Dynamic Characteristics Analysis of Flexible Rotor System with Pedestal Looseness Jie Hong ¹ Qiyao Dai ² Fayong Wu ³ Yanhong Ma ¹ 1. Beihang University; Collaborative Innovation Center of Advanced Aero-Engine, China; 2. Beihang University, China; 3. AECC Shenyang Engine Research Institute, China	

	STRUCTURES AND DYNAMICS: STRUCTURAL MECHANICS AND VIBRATION	SUPERCRITICAL CO ₂	TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS
	Friction Damping	Turbines	Compressor Design Methods
	Technical Session • 30-04	Technical Session • 33-02	Technical Session • 34-03
	Session Organizer: Christian M. Firrone , Politecnico di Torino Session Co-Chairs: Giuseppe Battiatto , Politecnico Di Torino (DIMEAS)	Session Organizer: Jason Mortzheim , GE Energy	Session Organizer: Byung Joon Lee , NASA Glenn Research Center
12:15	GT2021:58817 Deep Dive On the Performance of Wave-like Dry Friction and Piezoelectric Hybrid Flexible Dampers <u>Yaguang Wu¹ Yu Fan¹ Lin Li¹ Zhimei Zhao²</u> <i>1. Beihang University, China; 2. AECC Commercial Aircraft Engine Co., Ltd, China</i>	GT2021:69465 Rapid Talk Radial Inlet and Exit Off-design Performance Prediction for a 10 MWe Supercritical CO₂ Axial Turbine <u>Michael Marshall¹ Thomas Vandeputte² Stefan Cich¹ Megan Herrera³</u> <i>1. Southwest Research Institute, USA; 2. GE Global Research, USA; 3. Gas Technology Institute, USA</i>	GT2021:58580 Deep Dive A Comprehensive Analytical Shock Loss Model for Axial Compressor Cascades <u>Milan Banjac, Teodora Savanovic, Djordje Petkovic, Milan Petrovic</u> <i>University of Belgrade, Faculty of Mechanical Engineering, Serbia</i>
12:45	GT2021:59272 Deep Dive Development of a Multi-shaker-control to Investigate the Influence of the Interblade Phase Angle on Frictionally Damped Turbine Blades <u>Florian Jäger, Ferhat Kaptan, Lars Panning-Von Scheidt, Jörg Wallaschek</u> <i>Institute of Dynamics and Vibration Research, Leibniz University Hannover, Germany</i>	GT2021:59630 Deep Dive Investigating Gas Turbine Internal Cooling Using Supercritical CO₂ at Higher Reynolds Numbers for Direct Fired Cycle Application <u>Arnab Roy¹ Matthew Searle² James Black³ Doug Straub³ Sridharan Ramesh¹</u> <i>1. NETL-Leidos, USA; 2. NETL-ORISE, USA; 3. NETL-DOE, USA</i>	GT2021:60012 Deep Dive Compressor Maps & Coupling: Symmetry, Paradox, and Clarity <u>Benjamin Ivrey</u> <i>Rolls-Royce North American Technologies, Inc., USA</i>
1:15	GT2021:58985 Rapid Talk Analysis of Loading and Vibration Histories on Natural Frequencies and Modal Damping of Blades with Friction at Root Contact Interfaces <u>Junjie Chen¹ Chaoping Zang¹ Biao Zhou¹ Evgeny Petrov²</u> <i>1. Nanjing University of Aeronautics and Astronautics, China; 2. University of Sussex, United Kingdom</i>	GT2021:58883 Rapid Talk Comparison of CFD Predictions of Supercritical Carbon Dioxide Axial Flow Turbines Using a Number of Turbulence Models <u>AbdElRahman AbdElDayem, Martin T. White, Abdulnaser I. Sayma</u> <i>City, University of London, United Kingdom</i>	GT2021:58665 Rapid Talk Highly Resolved Simulations of a CDA Compressor Cascade: Effect of Reynolds Number on Losses <u>John Leggett, Richard Sandberg</u> <i>University of Melbourne, Australia</i>
1:25	GT2021:58445 Rapid Talk New Modeling Combining Geometric Nonlinearity and Stiffness Nonlinearity in Under Platform Dampers <u>Ryuichi Umehara¹ Sotaro Takei¹ Tomohiro Akaki¹ Hiroki Kitada²</u> <i>1. Mitsubishi Heavy Industries, Ltd., Japan; 2. Mitsubishi Power, Ltd., Japan</i>	GT2021:60056 Rapid Talk Aerodynamic Prediction on the Off-design Performance of a S-CO₂ Turbine Based on Deep Learning <u>Yuqi Wang, Tianyuan Liu, Di Zhang</u> <i>Xi'an Jiaotong University, China</i>	GT2021:59926 Rapid Talk Application of a Viscous Through-flow Model to a Modern Axial Low-pressure Compressor <u>Arnaud Budo¹ Vincent E. Terrapon¹ Koen Hillewaert¹ Maarten Arnst¹ Sophie Mouriaux² Benoit Rodriguez² Jules Bartholet³</u> <i>1. Université de Liège, Belgium; 2. Safran Tech, France; 3. Safran Aero Boosters, Belgium</i>

	TURBOMACHINERY: MULTIDISCIPLINARY DESIGN APPROACHES, OPTIMIZATION, AND UNCERTAINTY QUANTIFICATION		
	Machine Learning for Turbomachinery Applications and Adjoint-Based Optimization		
	Technical Session • 39-02		
	Session Organizer: Lieven Baert , Cenaero Session Co-Organizer: F. Montomoli , ToffeeAM		
12:15	GT2021:59717 Deep Dive Structurally Constrained Aerodynamic Adjoint Optimisation of Highly Loaded Compressor Blades Cleopatra Cuciumita ¹ Alistair John ¹ Ning Qin ¹ Shahrokh Shahpar ² <i>1. University of Sheffield, Department of Mechanical Engineering, United Kingdom; 2. Rolls-Royce plc., Innovation Hub – Future Methods, United Kingdom</i>		
12:45	GT2021:60158 Deep Dive Using Autoencoders and Output Consolidation to Improve Machine Learning Models for Turbomachinery Applications Julie Pongetti ¹ Marc Emmanuelli ² Timos Kipouros ³ Richard Ahlfeld ² Shahrokh Shahpar ⁴ <i>1. University of Cambridge, United Kingdom; 2. Monolith AI, United Kingdom; 3. University of Cambridge, Department of Engineering, United Kingdom; 4. Rolls-Royce, United Kingdom</i>		
1:15	GT2021:58469 Rapid Talk Automatically Designed Deep Gaussian Process for High Dimensional Turbomachinery Application Yuan Jin ¹ Jin Chai ¹ Olivier Jung ² <i>1. Bss-Turbotech Ltd, China; 2. Safran (Beijing) Enterprise Management Co, Ltd, China</i>		
1:25	GT2021:58562 Rapid Talk Constraint Handling in Bayesian Optimization -- a Comparative Study of Support Vector Machine, Augmented Lagrangian and Expected Feasible Improvement Yuan Jin ¹ Zheyi Yang ¹ Shiran Dai ² Yann Lebre ² Olivier Jung ² <i>1. Bss-Turbotech Ltd, China; 2. Safran (Beijing) Enterprise Management Co, Ltd, China</i>		
1:35	GT2021:59580 Rapid Talk Adjoint-based Optimization of Rocket Engine Turbine Blades Bhupinder Singh Sanghera ¹ Nitish Anand ¹ Louis Souverein ² Loic Penin ³ Matteo Pini ⁴ <i>1. Delft University of Technology, Netherlands; 2. ArianeGroup GmbH, Germany; 3. ArianeGroup SAS, France; 4. Propulsion & Power, Delft University of Technology, Netherlands</i>		

COMBUSTION, FUELS AND EMISSIONS		CYCLE INNOVATIONS	ELECTRIC POWER
Combustion Dynamics: Low-order Modelling		Power Plant State of the Art Solutions for Enhanced Flexibility and Energy Storage	Pathway Forward: Gas Turbine OEM Tech Update
Technical Session • 04-09		Tutorial Session • 06-05	Panel Discussion • 09-05
Session Organizer: Wolfgang Polifke , Technical University of Munich Session Co-Chairs: Jonas Moeck , NTNU; Giovanni Campa , Ansaldo Energia		Session Organizer: Mario Luigi Ferrari , DIME - University of Genova Session Co-Chairs: Ward De Paepe , University of Mons; Panagiotis Laskaridis , Cranfield University	Session Organizer: Richard Dennis , U.S. Department of Energy Session Co-Chairs: Bin Jou , FM Global; Christer Bjorkqvist , ETN
2:15	GT2021:58903 Deep Dive Delay Identification in Thermoacoustics Francesco Gant ¹ Giulio Ghirardo ¹ Mirko R. Bothien ² Alexis Cuquel ¹ 1. <i>Ansaldo Energia Switzerland, Switzerland;</i> 2. <i>ZHAW Zürcher Hochschule für Angewandte Wissenschaften, Switzerland</i>	GT2021:64094 Tutorial Power Plant State of the Art Solutions for Enhanced Flexibility and Energy Storage Alessandro Ramaglia ¹ John Gulen ² <u>Alberto Traverso</u> ³ 1. <i>Ansaldo Energia, Italy;</i> 2. <i>Bechtel Corporation, USA;</i> 3. <i>University of Genoa, Italy</i> ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held “live”.	Panelists: Jeremee Wetherby, <i>GE Gas Power</i> Mauro Moretto, <i>Ansaldo Energia</i> Frida Björneld, <i>Siemens Energy</i> Koichi Ishizaka, <i>MHI</i> ** This panel session will NOT have a video on demand (VOD). This panel will be held “live”.
	GT2021:59321 Deep Dive A Non-Compact Effective Impedance Model for Can-to-Can Acoustic Communications: Analysis and Optimization of Damping Mechanisms <u>Jakob Von Saldern</u> ¹ Alessandro Orchini ¹ Jonas Moeck ² 1. <i>Technische Universität Berlin, Germany;</i> 2. <i>Norwegian University of Science and Technology, Norway</i>		
GT2021:58947 Rapid Talk Low-order Modeling of Can-Annular Combustors <u>Guillaume Jean Jacques Fournier</u> ¹ Max Meindl ¹ Camilo F. Silva ¹ Giulio Ghirardo ² Mirko R. Bothien ³ Wolfgang Polifke ¹ 1. <i>Technical University of Munich, Germany;</i> 2. <i>Ansaldo Energia Switzerland, Switzerland;</i> 3. <i>Zurich University of Applied Sciences, Switzerland</i>			
GT2021:59972 Rapid Talk Comparison of Model Order Reduction Methods in Thermoacoustic Stability Analysis <u>Naman Purwar</u> , Maximilian Meindl, Wolfgang Polifke <i>Technical University of Munich, Germany</i>			
GT2021:59866 Rapid Talk A Hybrid Adjoint Network Model for Thermoacoustic Optimization <u>Felicitas Schaefer</u> ¹ Luca Magri ² Wolfgang Polifke ¹ 1. <i>Technische Universität München, Germany;</i> 2. <i>University of Cambridge, United Kingdom</i>			

	HEAT TRANSFER: INTERNAL COOLING	STRUCTURES AND DYNAMICS: PROBABILISTIC METHODS	STRUCTURES AND DYNAMICS: STRUCTURAL MECHANICS AND VIBRATION
	Additive Manufacturing	Probabilistic Lifing Applications	Rotor-Casing Interaction
	Technical Session • 15-03	Technical Session • 28-02	Technical Session • 30-05
	Session Organizer: Shane Haydt , Pratt & Whitney Session Co-Organizer: Michael Benson , U.S. Military Academy	Session Organizer: Jeff Brown , US Air Force Research Laboratory Session Co-Organizer: Michael Enright , Southwest Research Institute	Session Organizer: Bogdan Epureanu , University of Michigan Session Co-Chair: Mainak Mitra , Ansys, Inc.
2:15	GT2021:59588 Deep Dive Impact of Ceramic Matrix Composite Topology on Friction Factor and Heat Transfer Trevor M. Cory ¹ Ryan Edelson ¹ Karen A. Thole ¹ Tyler Vincent ² San Quach ² Dominic Mongillo ² <i>1. Pennsylvania State University, USA; 2. Pratt & Whitney, a division of Raytheon Technologies Corporation, USA</i>	GT2021:58480 Deep Dive A Reduced Order Modeling Approach to Probabilistic Creep-damage Predictions in Finite Element Analysis Md Abir Hossain, Jacqueline R Cottingham, Calvin M. Stewart <i>The University of Texas At El Paso, USA</i>	GT2021:59298 Deep Dive Development of a Harmonic Balance Based Methodology for Blade-tip/casing Interactions: Application to NASA Rotor 37 Yann Colaitis, Alain Batailly <i>Ecole Polytechnique De Montreal, Canada</i>
2:45	GT2021:60100 Deep Dive Cooling Performance of Additively Manufactured Pin Fins in Stacked Microchannels for the Inside-out Ceramic Turbine Shroud-cooling Ring Patrick K. Dubois ¹ Alexandre Landry-Blais ¹ Rym Gazzah ¹ Sani Sivić ¹ Vladimir Brailovski ² Mathieu Picard ¹ <i>1. Université de Sherbrooke, Canada; 2. École de technologie supérieure, Canada</i>	GT2021:59295 Deep Dive High-performance Computing Probabilistic Fracture Mechanics Implementation for Gas Turbine Rotor Disks on Distributed Architectures Including Graphics Processing Units (GPUs) Mrugesh Gajjar ¹ Christian Amann ² Kai Kadau ³ <i>1. Siemens Technology and Services Pvt Ltd, India; 2. Siemens Energy, Germany; 3. Siemens Energy, USA</i>	GT2021:58931 Deep Dive Assessment of Geometric Nonlinearities Influence on NASA Rotor 37 Response to Blade Tip/Casing Rubbing Events Elise Delhez ¹ Florence Nyssen ² Jean-Claude Golinval ¹ Alain Batailly ² <i>1. University of Liege, Belgium; 2. Polytechnique Montreal, Canada</i>
3:15	GT2021:59684 Rapid Talk Convection in Scaled Turbine Internal Cooling Passages with Additive Manufacturing Roughness Gabriel Stafford ¹ Stephen McClain ¹ David Hanson ² Robert Kunz ² Karen Thole ² <i>1. Baylor University, USA; 2. The Pennsylvania State University, USA</i>		GT2021:59216 Rapid Talk Investigation on the Robustness of Rotor/Stator Contact Interactions with Small Mistuning Florence Nyssen ¹ Alain Batailly ² <i>1. Polytechnique Montreal, Canada; 2. École Polytechnique de Montréal, Canada</i>
3:25	GT2021:59114 Rapid Talk Review and Characterization of Additively Manufactured Internally Cooled Airfoil Concepts for Industrial Gas Turbine Applications Douglas Straub, Sridharan Ramesh, Matthew Searle, Arnab Roy, Jim Black <i>National Energy Technology Laboratory, USA</i>		GT2021:59008 Rapid Talk Balded-disk Rubbing Interactions Considering Coriolis Effect: a Reduced Model Based on Complex Modal Analysis Dawei Chen, Jiguo Zhang, Jianguangyi Xiao, Yong Chen <i>Shanghai Jiao Tong University, China</i>

		SUPERCritical CO2	TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS
Student Advisory Committee Workshop: Future Goals, Current Thresholds, and Invisible Competencies: A Graduate Student Workshop on Navigating Academic Engineering		Testing I	Stall and Inlet Distortion
Workshop • 31-01		Technical Session • 33-03	Technical Session • 34-07
Session Organizer: Deepanshu Singh , NA Session Co-Chairs: Shawn Siroka , Pennsylvania State University; Mavroudis Kavvalos , Mälardalen University		Session Organizer: Eric Clementoni , Bechtel Marine Propulsion Co	Session Organizer: Sam D. Grimshaw , University of Cambridge Whittle Laboratory Session Co-Organizer: David Hall , The Pennsylvania State University
2:15 2:45 3:15 3:25	W O R K S H O P	GT2021:59527 Deep Dive Challenges with Measuring Supercritical CO2 Compressor Performance when Approaching the Liquid-vapor Dome <u>Jason Mortzheim¹</u> Douglas Hofer ¹ Stephan Priebe ¹ J. Jeffrey Moore ² Stefan Cich ² Aaron McClung ² <i>1. GE Research, USA; 2. Southwest Research Institute, USA</i>	GT2021:58569 Deep Dive Sweep Effects on Fan-intake Aerodynamics at High Angle of Attack <u>Ben Mohankumar¹</u> Cesare Hall ¹ Mark Wilson ² <i>1. Whittle Laboratory, University of Cambridge, United Kingdom; 2. Rolls-Royce plc., United Kingdom</i>
		GT2021:58981 Deep Dive The STEP 10 MWe sCO2 Pilot Plant Demonstration Status Update <u>John Marion¹</u> Brian Lariviere ¹ Aaron McClung ² Jason Mortzheim ³ <i>1. GTI - Gas Technology Institute, USA; 2. SwRI - Southwest Research Institute, USA; 3. GE - General Electric Global Research, USA</i>	GT2021:58457 Deep Dive In-stall Compressor Performance and the Effects of Reynolds Number Jack Hutchings, Cesare Hall <i>University of Cambridge, United Kingdom</i>
		GT2021:59359 Rapid Talk Operation and Control of a Supercritical CO2 Compressor <u>Joshua Neveu¹</u> Stefan Cich ¹ Jeff Moore ¹ Jason Mortzheim ² <i>1. Southwest Research Institute, USA; 2. GE Global Research, USA</i>	GT2021:59186 Rapid Talk Low-pressure Compressor Near-stall Predictions Using Unsteady CFD Methods <u>David Vanpouille¹</u> <u>Dimitrios Papadogiannis¹</u> Stéphane Hiernaux ² <i>1. Safran Tech, France; 2. Safran Aero Boosters, Belgium</i>
		GT2021:59383 Rapid Talk Effect of Supercritical CO2 on Steel Ductility at 450°-650°c Bruce A. Pint, Rishi Pillai, James Keiser <i>Oak Ridge National Laboratory, USA</i>	GT2021:59851 Rapid Talk An Experimental Investigation Into the Impacts of Varying the Circumferential Extent of Tip-low Total Pressure Distortion on Fan Stability <u>Oliver Allen¹</u> Alejandro Castillo Pardo ² Cesare Hall ² <i>1. Rolls-Royce plc, United Kingdom; 2. University of Cambridge, United Kingdom</i>

**TURBOMACHINERY: UNSTEADY
FLOWS IN TURBOMACHINERY**
**Cavity Flows and Special
Applications**
Technical Session • 43-03

Session Organizer: **Reid Berdanier**,
Pennsylvania State University

2:15

GT2021:59932 [Deep Dive](#)
**Analysis of the Loss Production Mechanism
Due to Cavity-main Flow Interaction in a LPT
Stage**

Dario Barsi¹ Davide Lengani¹ Daniele Simoni¹
Giulio Venturino¹ Francesco Bertini² Matteo
Giovannini³ Filippo Rubecchini³
1. University of Genova, Italy; 2. AvioAero, Italy;
3. Morfo Design Srl, Italy

2:45

GT2021:59997 [Deep Dive](#)
**Turbocharger Radial Turbine Response to
Pulse Amplitude**

Roberto Mosca, Shyang Maw Lim, Mihai
Mihaescu
KTH Royal Institute of Technology, Sweden

3:15

GT2021:58852 [Rapid Talk](#)
**Numerical Investigations of a High Pressure
Compressor Exposed to Unsteady Pressure
Gain Combustion Employing Data-driven
Methods**

Victor Bicalho Civinelli De Almeida, Dieter
Peitsch
*Chair for Aero Engines, Technical University of
Berlin, Germany*

3:25

GT2021:58963 [Rapid Talk](#)
**Numerical Simulation on Vortex Shedding
From Airfoils of a Swirl Distortion Generator**

Andrew Hayden, Alexandrina Untaroiu, Cole
Hefner, John Gillespie, Todd Lowe
Virginia Tech, USA

THURSDAY JUNE 10				04:00 PM - 05:30 PM	
COAL, BIOMASS, HYDROGEN AND ALTERNATIVE FUELS		COMBUSTION, FUELS AND EMISSIONS		FANS AND BLOWERS	
Life Cycle Assessment Basics and Application to Optimize the Environmental Sustainability of Gas Turbines During New Product Development		High Hydrogen Combustion		CFD and Machine Learning for Fans and Blowers	
Tutorial Session • 03-06		Technical Session • 04-18		Technical Session • 10-03	
Session Organizer: Angela Serra , Baker Hughes - Nuovo Pignone Session Co-Chairs: Pierre Gauthier , Siemens Energy Canada; Marina Braun-Unkhoff , Institute of Combustion Technology		Session Organizer: Jeffrey Goldmeer , GE Energy Session Co-Organizer: David Noble , EPRI		Session Organizer: Zhiping Wang , Morrison Products Inc	
<div>4:00</div> <div>4:30</div> <div>5:00</div> <div>5:10</div> <div>5:20</div>	<div>T</div> <div>U</div> <div>T</div> <div>O</div> <div>R</div> <div>I</div> <div>A</div> <div>L</div>	GT2021:65420 Tutorial Life Cycle Assessment Basics and Application to Optimize the Environmental Sustainability of Gas Turbines During New Product Development Francesco Fantozzi ¹ Pietro Bartocci ¹ Alessandro Musacchio ² Angela Serra ² <i>1. University of Perugia, Italy; 2. Baker Hughes, Italy</i> ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".		GT2021:59666 Deep Dive Combustor Development and Engine Demonstration of Micro-mix Hydrogen Combustion Applied to M1A-17 Gas Turbine Atsushi Horikawa ¹ Kunio Okada ¹ Masato Yamaguchi ¹ Shigeki Aoki ¹ Manfred Wirsum ² Harald Funke ³ Karsten Kusterer ⁴ <i>1. Kawasaki Heavy Industries, Ltd., Japan; 2. RWTH Aachen University, Germany; 3. Aachen University Applied Science, Germany; 4. B&B-AGEMA GmbH, Germany</i>	
		GT2021:60228 Deep Dive Low-emissions Technology Development for Auxiliary Power Unit Combustion Systems Thomas Bronson, Rudy Dudebout, Nagaraja Rudrapatna <i>Honeywell International, Inc., USA</i>		GT2021:59277 Deep Dive Cascade with Sinusoidal Leading Edges: Identification and Quantification of Losses with Unsupervised Machine Learning Alessandro Corsini, Giovanni Delibra, Lorenzo Tieghi, <u>Francesco Aldo Tucci</u> <i>Sapienza University of Rome, Italy</i>	
		GT2021:58675 Rapid Talk Experimental Characterization of the Combustion in Fuel Flexible Humid Power Cycles Simeon Dybe ¹ Felix Güthe ² Michael Bartlett ² Panagiotis Stathopoulos ¹ Christian Oliver Paschereit ¹ <i>1. Technical University of Berlin, Germany; 2. Phoenix BioPower, Sweden</i>		GT2021:58505 Deep Dive Feasibility Study on the Effect of Blade Inclination for Heavy Duty Centrifugal Fans – Aerodynamic Aspects Till Biedermann ¹ Youssef Moutamassik ² Frank Kameier ¹ <i>1. Institute of Sound and Vibration Engineering ISAVE, University of Applied Sciences Dusseldorf, Germany; 2. POLLRICH GmbH, Germany</i>	
		GT2021:59236 Rapid Talk Development and Atmospheric Testing of a High Hydrogen Flamesheet™ Combustor for the OP16 Gas Turbine Thijs Bouten ¹ Joris Koomen ² Diethard Jansen ² Jan Withag ¹ Lars-Uno Axelsson ¹ Peter Stuttaford ² <i>1. OPRA Turbines International B.V., Netherlands; 2. Ansaldo Thomassen B.V., Netherlands</i>		GT2021:58728 Rapid Talk Study of CFD-based Raised-floor Data Center Cooling with Parametric CRAC Blower Airflow Patterns Zhihang Song, Wan Chen <i>Northeastern University, China</i>	
		GT2021:59425 Rapid Talk Development of 3D Printed Impinged Jet Burner for Non-premixed Hydrogen-Oxygen Gas Turbine Combustion Yong Fan, Taku Tsujimura, Norihiko Iki, Osamu Kurata, Hirohide Furutani <i>National Institute of Advanced Industrial Science and Technology (AIST), Japan</i>			

	HEAT TRANSFER: INTERNAL COOLING	STRUCTURES AND DYNAMICS: ROTOR DYNAMICS	STRUCTURES AND DYNAMICS: STRUCTURAL MECHANICS AND VIBRATION
	Rotating Heat Transfer and Turbulators	Rotordynamic Design	Prediction Methods and Optimization
	Technical Session • 15-04	Technical Session • 29-02	Technical Session • 30-07
	Session Organizer: James Rutledge , Air Force Institute of Technology Session Co-Organizer: Randall Mathison , Ohio State University	Session Organizer: Filippo Cangioli , Waukesha Bearings Session Co-Chairs: Steven Chatterton , Politecnico di Milano - Dept. Mech. Engineering; Yujiao Tao , Waukesha Bearings; Rasish Khatri , Calnetix Technologies	Session Organizer: Jeff Brown , US Air Force Research Laboratory Session Co-Chair: Evgeny Petrov , The University of Sussex
4:00	GT2021:58877 Deep Dive Heat Transfer in Rotating, Trailing Edge, Converging Channels with Full and Partial Height Strip-fins Izzet Sahin ¹ I-Lun Chen ¹ Lesley M. Wright ¹ Je-Chin Han ¹ Hongzhou Xu ² Michael Fox ³ 1. Texas A&M University, USA; 2. Solar Turbines, USA; 3. Solar Turbines Inc., USA	GT2021:59970 Deep Dive Hirth Coupling Modeling for Improved Rotordynamic Response Prediction Baik Jin Kim, Joseph Oh, Alan Palazzolo Texas A&M University, USA	GT2021:59104 Deep Dive Optimization of Non-uniform Sensor Placement for Blade Tip Timing Based on Equiangular Tight Frame Theory Zhiwei Zhang ¹ Pengfei Chai ¹ Yong Chen ^{2,3} Jie Tian ^{2,3} Hua Ouyang ^{2,3} 1. Shanghai Jiao Tong University, China; 2. School of Mechanical Engineering, Shanghai Jiao Tong University, China; 3. Engineering Research Center of Gas Turbine and Civil Aero Engine, Ministry of Education, China
4:30	GT2021:59426 Deep Dive Effect of Rotation on Heat Transfer in AR = 2:1 and AR = 4:1 Channels Connected by a Series of Crossover Jets Srivatsan Madhavan ¹ Prashant Singh ² Srinath Ekkad ¹ 1. North Carolina State University, USA; 2. Mississippi State University, USA	GT2021:59160 Deep Dive Rotor-blade Interaction During Blade Resonance Drive-through Roland G. Grein ¹ Ulrich Ehehalt ¹ Christian Siewert ¹ Norbert Kill ² 1. Siemens Energy, Germany; 2. Samtech SA, Belgium	GT2021:58470 Deep Dive Simultaneous Optimization of Mistuned Bladed Disks for Forced and Self-excited Vibration Considering Amount of Unbalance Toshio Watanabe ¹ Tatuya Furukawa ² Yasutomo Kaneko ³ 1. Mitsubishi Heavy Industries, Ltd., Japan; 2. Mitsubishi Power, Ltd., Japan; 3. Ryukoku University, Japan
5:00	GT2021:59400 Rapid Talk Heat Transfer in a Rotating, Blade-shaped, Two-pass Cooling Channel With a Variable Aspect Ratio I-Lun Chen ¹ Izzet Sahin ¹ Lesley Wright ¹ Je-Chin Han ¹ Robert Krewinkel ² 1. Texas A&M University, USA; 2. MAN Energy Solutions SE, Germany	GT2021:60162 Rapid Talk Method of Coupled Vibration Control for Dual Rotor System with Inter-shaft Bearing Yanhong Ma ¹ Chenglong Shi ² Jie Hong ¹ Bo Sun ³ 1. Beihang University; Collaborative Innovation Center of Advanced Aero-Engine, China; 2. Beihang University, China; 3. AECC Shenyang Engine Research Institute, China	GT2021:59390 Rapid Talk A Dynamic Systems Based Approach to Estimate Cyclic and Creep Damage of a Power Turbine Blade Subjected to a Random Transient Operation Dipankar Dua, Quang Le, Anthony Saladino, Deepak Thirumurthy, Jaskirat Singh Siemens Energy Inc., USA
5:10	GT2021:60182 Rapid Talk Rotating Cooling Performance of Two-pass Rectangular Channels with Cross Bridge and Oval-shaped Dimple Qi Jing, Fahui Zhu, Zhufeng Liu, Yonghui Xie, Di Zhang Xi'an Jiaotong University, China	GT2021:60301 Rapid Talk Effective Evaluation of Rotordynamic Performance Within Rotor-bearing System Design Bounds Zhuan Luo, Carl Schwarz Praxair, Inc., USA	GT2021:69461 Rapid Talk Technological Choices for Vibratory Robustness of Turbine Bladed Disk Dijoud Marc, Colette Christophe, Herran Mathieu Safran Helicopter Engines, France
5:20	GT2021:60138 Rapid Talk Investigation on Flow Mechanism Driving Heat Transfer Enhancement in a Wide Channel with Staggered Square Pin Fins Jingtian Duan, Ke Zhang, Jin Xu, Jiang Lei, Junmei Wu Xi'an Jiaotong University, China		

	SUPERCRITICAL CO₂	TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS	TURBOMACHINERY: DESIGN METHODS AND CFD MODELING FOR TURBOMACHINERY
	Testing II	Transonic Compressors	Pumps and Hydraulic Turbines
	Technical Session • 33-04	Technical Session • 34-10	Technical Session • 37-11
	Session Organizer: Douglas Hofer , Heliogen Session Co-Organizer: Aaron Rimpel , Southwest Research Institute	Session Organizer: Yuan Dong , Pratt & Whitney Session Co-Organizer: Sameer Kulkarni , NASA Glenn Research Center	Session Organizer: Ravinder Yerram , GE Gas Power Session Co-Chairs: Dale Van Zante , NASA Glenn Research Center; Mahmoud Mansour , Honeywell International Inc
4:00	GT2021:60251 Deep Dive Modeling and Testing of a Novel Ultra-low Temperature sCO₂ Opposing Piston Expander Joshua Schmitt, Jordan Nielson <i>Southwest Research Institute, USA</i>	GT2021:59166 Deep Dive Global Optimisation of a Transonic Fan Blade Through Ai-Enabled Active Subspaces Diego Lopez ¹ Tiziano Ghisu ¹ Shahrokh Shahpar ² <i>1. University of Cagliari, Italy; 2. Rolls-Royce plc, United Kingdom</i>	GT2021:59751 Deep Dive Numerical Predictions of Cavitating Flow Within a Liquid Hydrogen Inducer Rob Blumenthal, Franklyn Kelecyc <i>ANSYS, Inc., USA</i>
4:30	GT2021:69484 Deep Dive Mechanical Design and Testing of a 2.5 MW sCO₂ Compressor Loop Stefan Cich ¹ Jeffrey Moore ¹ Meera Towler ¹ Chris Kulhanek ¹ Jason Mortzheim ² <i>1. Southwest Research Institute, USA; 2. GE Global Research, USA</i>	GT2021:58828 Deep Dive Overview of Unsteady Phenomena Emerging in a Stalled 1.5-Stage Transonic Compressor Silas Mütschard ¹ Maximilian Karl ² Jan Werner ² Heinz-Peter Schiffer ² Christian Kunkel ² Sebastian Robens ³ Christoph Biela ⁴ <i>1. Technical University of Darmstadt, Institute of Gas Turbines and Aerospace Propulsion, Germany; 2. Institute of Gas Turbines and Aerospace Propulsion, Germany; 3. Siemens Gas and Power GmbH & Co. KG, Germany; 4. Siemens Energy AG, Germany</i>	GT2021:59119 Deep Dive Numerical Investigation of the Effect of Pump-out-Vanes on the First Stage of a Multistage Centrifugal Pump Yintao Wang ¹ Min Zhang ² Abhay Patil ¹ Gerald Morrison ¹ <i>1. Texas A&M University, USA; 2. Praxair, Inc., USA</i>
5:00	GT2021:69442 Rapid Talk An Update on the Status of a Reduced Flow Test of a 10MW 700°C sCO₂ Integrally Geared Compressor Kelsi Katcher, Jason Wilkes, Tim Allison <i>Southwest Research Institute, USA</i>	GT2021:59231 Rapid Talk A Novel Multi-constrained Airfoil Design Method and Its Application to the Optimization of a Transonic Multistage Compressor Xiaochen Wang ¹ Xiaodong Ren ¹ Xuesong Li ¹ Hong Wu ² Chunwei Gu ² <i>1. Tsinghua University, China; 2. China United Gas Turbine Technology CO. LTD., China</i>	GT2021:59414 Rapid Talk Evaluation of Different Turbulence Models Applied in Turbopump's Hydraulic Turbine Daniel Ferreira Corrêa Barbosa, Daniel Da Silva Tonon, Luiz Henrique Lindquist Whitacker, Jesuino Takachi Tomita, Cleverson Bringhamti <i>Instituto Tecnológico de Aeronáutica, Brazil</i>
5:10	GT2021:59544 Rapid Talk Loop Transient Performance with a Closed Loop sCO₂ Brayton Cycle Stefan Cich ¹ Jeffrey Moore ¹ Meera Towler ¹ Jason Mortzheim ² <i>1. Southwest Research Institute, USA; 2. GE Global Research, USA</i>	GT2021:69469 Rapid Talk Development of Loss Correlation and Tool Validation at Transonic Condition Based on Cascade Test Jaewoo Choi ¹ Jaewook Song ¹ Sungryong Lee ¹ Junhyuk Seo ¹ David Simurda ² Martin Luxa ² Jan Lepicovsky ² Jindrich Hala ² Tomas Radnic ² <i>1. Doosan Heavy Industries & Construction Co., Ltd., Korea; 2. Institute of Thermomechanics of the Czech Academy of Sciences, Czech Republic</i>	GT2021:60208 Rapid Talk Proper Orthogonal Decomposition Analysis and Braking Control on Hydrodynamic Retarders by Bionic Iris Effective Diameter Regulation Xiuqi Chen, Wei Wei, Tangzhu Liu, Wenhao Xie, Yifei Li, Qindong Yan <i>Beijing Institute of Technology, China</i>
5:20			GT2021:59867 Rapid Talk A Computational Fluid Dynamics (CFD) Guided Design and Performance Enhancement of a Multistage Pump Teymour Javaherchi, Susheel Brahmeshwarkar, Raja Faruq, Chinmay Deshpande <i>Energy Recovery, USA</i>

HONORS AND AWARDS

Aircraft Engine Technology
Award Lecture

Technical Session • 45-03

Session Organizer: **Wilfried Visser**, Delft
University of Technology

Turbine Innovations for Small Core Engines
Paniagua, Guillermo
Purdue University, USA

4:00

4:30

5:00

L
E
C
T
U
R
E

HONORS AND AWARDS

Scholar Lecture

45-01

Session Organizer: **William Cousins**, Aerodynamic Technology Consulting, LLC

GT2021:60864

Instabilities Everywhere! Hard Problems in Aero-engines

Zoltan Spakovszky

Massachusetts Institute of Technology, USA

8:00

8:30

9:00

FRIDAY JUNE 11		09:45 AM - 11:15 AM					
AIRCRAFT ENGINE		COMBUSTION, FUELS AND EMISSIONS		FANS AND BLOWERS			
Basics of Turboshaft Engine Cycle Design and Optimization		Combustion Modelling I		Design Methods and Experimental Studies for Fans and Blowers			
Tutorial Session • 01-09		Technical Session • 04-13		Technical Session • 10-01			
Session Organizer: Parthiv Shah , Ata Engineering Inc Session Co-Chairs: Konstantinos Kyprianidis , Mälardalen University; Vassilios Pachidis , Cranfield University		Session Organizer: Antonio Andreini , University of Florence Session Co-Organizer: Roberto Meloni , Baker Hughes		Session Organizer: Sybrand Johannes Van Der Spuy , Stellenbosch University			
9:45	T U T O R I A L	GT2021:65034 Tutorial Basics of Turboshaft Engine Cycle Design and Optimization Taylan Ercan <i>Middle East Technical University, Turkey</i> ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live".		GT2021:59395 Deep Dive Flamelet Versus Detailed Chemistry LES for a Liquid Fueled Gas-turbine Combustor: a Comparison of Accuracy and Computational Cost <u>Megan Karalus</u> ¹ <u>Piyush Thakre</u> ¹ <u>Graham Goldin</u> ¹ <u>Dustin Brandt</u> ² <i>1. Siemens Digital Industries, USA; 2. Honeywell Aerospace, USA</i>		GT2021:59491 Deep Dive Overview of the Best 2020 Axial-flow Fan Data and Inclusion in Similarity Charts for the Search of the Best Design <u>Massimo Masi</u> ¹ <u>Piero Danieli</u> ² <u>Andrea Lazzaretto</u> ³ <i>1. Department of Management and Engineering - DTG, Italy; 2. University of Padova - Department of Industrial Engineering - DII, Italy; 3. University of Padova, Italy</i>	
		GT2021:59063 Deep Dive Modelling of Turbulent Premixed Flames with CH4/H2/Air Including Influence of Stretch and Heat Losses <u>Halit Kutkan</u> ¹ <u>Alberto Amato</u> ¹ <u>Giovanni Campa</u> ¹ <u>Giulio Ghirardo</u> ² <u>Luis Tay Wo Chong</u> ² <u>Eirik Aesøy</u> ³ <i>1. Ansaldo Energia SpA, Italy; 2. Ansaldo Energia Switzerland, Switzerland; 3. Department of Energy and Process Engineering, Norwegian University of Science and Technology, Norway</i>		GT2021:58735 Deep Dive Effect of Tip Vortex Reduction on Air-cooled Condenser Axial Flow Fan Performance: an Experimental Investigation <u>Johannes Pretorius</u> , <u>Adrian Erasmus</u> <i>Stellenbosch University, South Africa</i>			
		GT2021:58926 Rapid Talk Experimental and Numerical Investigation on the Effect of Pressure on Micromix Hydrogen Combustion <u>Daniel Kroniger</u> ¹ <u>Atsushi Horikawa</u> ¹ <u>Harald H.-W. Funke</u> ² <u>Franziska Pfaeffle</u> ² <u>Tsuyoshi Kishimoto</u> ³ <u>Koichi Okada</u> ³ <i>1. Kawasaki Heavy Industries Ltd., Japan; 2. Aachen University of Applied Science, Germany; 3. Siemens PLM Software, Japan</i>		GT2021:59130 Rapid Talk Evaluation of the 24 ft. Diameter Fan Performance in the Minwatercsp Large Cooling Systems Test Facility <u>Johan Van Der Spuy</u> ¹ <u>Lorenzo Tieghi</u> ² <u>Giovanni Delibra</u> ² <u>Alessandro Corsini</u> ² <u>Francois Louw</u> ³ <u>Albert Zapke</u> ⁴ <u>Danie Els</u> ¹ <u>C. J. Meyer</u> ⁵ <i>1. Stellenbosch University, South Africa; 2. Sapienza Università di Roma, Italy; 3. Therm Development, South Africa; 4. Private, Germany; 5. NOTUS Fan Engineering, South Africa</i>			
		GT2021:59100 Rapid Talk Dynamic Mesh Adaption for Scale-resolving Reacting Flow Simulations <u>Yu Xia</u> ¹ <u>Ishan Verma</u> ² <u>Phil Stopford</u> ¹ <u>Patrick Sharkey</u> ¹ <i>1. Ansys UK Ltd., United Kingdom; 2. Ansys Software Pvt Ltd, India</i>		GT2021:59821 Rapid Talk Analysis and Design of Radial Blowers for the Pressure Ratio Range 1.2 -1.8 <u>Abraham Engeda</u> , <u>Jonathon Howard</u> <i>Michigan State University, USA</i>			
		GT2021:59538 Rapid Talk Prediction of CO Emission Index for Aviation Gas Turbine Combustor Using Flamelet Generated Manifold Combustion Model <u>Sourabh Patwardhan</u> ¹ <u>Stefano Orsino</u> ² <u>Rakesh Yadav</u> ² <u>Fang Xu</u> ³ <u>Vishwas Verma</u> ⁴ <u>Pravin Nakod</u> ¹ <i>1. Ansys India Pvt Ltd, India; 2. Ansys Inc., USA; 3. Honeywell Aerospace, USA; 4. Honeywell Technology Solutions, India, India</i>					
10:15							
10:45							
10:55							
11:05							

	HEAT TRANSFER: INTERNAL AIR SYSTEMS	HEAT TRANSFER: INTERNAL COOLING	STRUCTURES AND DYNAMICS: STRUCTURAL MECHANICS AND VIBRATION
	Rotating Cavities and Rim Seals	Jet Impingement II	Damping Technologies - Materials
	Technical Session • 14-03	Technical Session • 15-02	Technical Session • 30-03
	Session Organizer: James Scobie , University of Bath Session Co-Chairs: Arnd Reichert , Siemens Limited China; Erinc Erdem , Tusas Engine Industries	Session Organizer: Hongzhou Xu , Solar Turbines Inc. Session Co-Organizer: Hee Koo Moon , NA	Session Organizer: Fabrice Thouverez , Centrale innovation Session Co-Chair: Laurent Blanc , Ecole Centrale de Lyon
9:45	GT2021:58907 Deep Dive Flow and Heat Transfer Mechanisms in a Rotating Compressor Cavity Under Centrifugal Buoyancy-driven Convection <u>Feng Gao</u> ¹ <u>Chew John</u> ² 1. Beihang University, China; 2. University of Surrey, United Kingdom	GT2021:58895 Deep Dive Heat Transfer Measurements for Array Jet Impingement with Castellated Wall <u>Taehyun Kim</u> ¹ <u>Eui Yeop Jung</u> ² <u>Minho Bang</u> ¹ <u>Changyong Lee</u> ¹ <u>Hee Koo Moon</u> ¹ <u>Hyung Hee Cho</u> ¹ 1. Yonsei University, Korea; 2. Korea Atomic Energy Research Institute, Korea	GT2021:58919 Deep Dive Design and Validation of a New Damper <u>Paolo Di Sisto</u> , <u>Serena Gabriele</u> , <u>Giuseppe Del Vescovo</u> , <u>Simone Conti</u> <i>Baker Hughes, Italy</i>
10:15	GT2021:59163 Deep Dive Experimental Investigations Into the Effect of Surface Roughness and Contact Force on Leakage Between Two Rigid Surfaces <u>Cyrille Bricaud</u> ¹ <u>Oliver Schulz</u> ¹ <u>Thomas Zierer</u> ¹ <u>Vincent Peltier</u> ² <u>Corina Schwitzke</u> ² <u>Hans-Jörg Bauer</u> ² 1. Ansaldo Energia Switzerland, Switzerland; 2. Institute of Thermal Turbomachinery (ITS) Karlsruher Institute of Technology (KIT), Germany	GT2021:59080 Deep Dive Jet Impingement Heat Transfer Enhancement with Different Crossflow Diverter Shapes <u>Juan He</u> , <u>Qinghua Deng</u> , <u>Zhenping Feng</u> <i>Xi'an Jiaotong University, China</i>	GT2021:59940 Deep Dive Design, Optimization and Experimental Verification of a Metal Rubber Isolator for Momentum Wheels <u>Yanhong Ma</u> ¹ <u>Xiangxin Tang</u> ¹ <u>Jie Hong</u> ² 1. Research Institute of Aero-Engine, Beijing University of Aeronautics and Astronautics, China; 2. School of Energy and Power Engineering, Beijing University of Aeronautics and Astronautics, China
10:45	GT2021:58822 Rapid Talk Investigation of Unsteady Flow Characteristics in Axial Rim Seal <u>Lei Xie</u> , <u>Qiang Du</u> , <u>Guang Liu</u> , <u>Zengyan Lian</u> , <u>Ran Ren</u> <i>Institute of Engineering Thermophysics, Chinese Academy of Sciences, China</i>	GT2021:58897 Rapid Talk Experimental and Numerical Study on Impingement Heat Transfer and Flow Characteristics on a Semicircular Ribbed Target Surface <u>Haotai Kangwang</u> , <u>Hui-Ren Zhu</u> <i>Northwestern Polytechnical University, China</i>	GT2021:59461 Rapid Talk Topological Optimization of Piezoelectric Transducers for Vibration Reduction of Bladed Disks <u>Yu Fan</u> ¹ <u>Lin Li</u> ¹ <u>Yaguang Wu</u> ¹ <u>Haoye Ma</u> ¹ <u>Kaiyuan Tian</u> ¹ <u>Zhimei Zhao</u> ² 1. Beihang University, China; 2. AVIC Commercial Aircraft Engine Limited Company, China
10:55	GT2021:60189 Rapid Talk Numerical Investigation of the Effect of Pre-swirl Nozzle with Radially Angle in a Pre-swirl Rotor-Stator System <u>Gang Zhao</u> , <u>Shuiting Ding</u> , <u>Tian Qiu</u> , <u>Shenghui Zhang</u> <i>Beihang University, China</i>	GT2021:59343 Rapid Talk Jet Impingement Heat Transfer in a Rectangular Channel with Smooth and Pinned Target Walls <u>Yasser S. Alzahrani</u> , <u>Lesley M. Wright</u> , <u>Andrew Chen</u> , <u>Je-Chin Han</u> <i>Texas A&M University, USA</i>	
11:05	GT2021:59142 Rapid Talk Numerical Investigations on the Aerodynamic Performance and Endwall Cooling Characteristics of Turbine During Acceleration Process with Lagging Effects <u>Qingfeng Cong</u> , <u>Zhigang Li</u> , <u>Jun Li</u> <i>Institute of Turbomachinery, Xi'an Jiaotong University, China</i>	GT2021:59394 Rapid Talk Impingement Heat Transfer Innovations and Enhancements: a Discussion on Selected Geometrical Features <u>Sandip Dutta</u> ¹ <u>Prashant Singh</u> ² 1. Clemson University, USA; 2. Mississippi State University, USA	

	SUPERCRITICAL CO₂	TURBOMACHINERY: DESIGN METHODS AND CFD MODELING FOR TURBOMACHINERY	TURBOMACHINERY: DESIGN METHODS AND CFD MODELING FOR TURBOMACHINERY
	Combustion and Heat Transfer	Combustion Design Methods and Applications	LES and DES Methods and Applications
	Technical Session • 33-05	Technical Session • 37-03	Technical Session • 37-05
	Session Organizer: Subith Vasu , University of Central Florida Session Co-Organizer: Michael Marshall , Southwest Research Institute	Session Organizer: Stefano Orsino , Ansys, Inc.	Session Organizer: Koen Hillewaert , Université De Liege Aerospace and Mechanics Department Session Co-Organizer: Chunill Hah , NASA Glenn Research Center
9:45	GT2021:59276 Deep Dive Transient Analysis of Supercritical CO₂ Air Cooler for Molten Salt Application Ladislav Vesely, Vipul Goyal, Rusty Gentile, Jayanta Kapat <i>University of Central Florida, USA</i>	GT2021:59286 Deep Dive Numerical Investigation of the Low-swirl Flow in an Aeronautical Combustor with Angular Air Supply Sven Hoffmann, Rainer Koch, Hans-Jörg Bauer <i>Institut für Thermische Strömungsmaschinen, Karlsruher Institut für Technologie (KIT), Germany</i>	GT2021:59077 Deep Dive Numerical Strategies of Delayed-Detached Eddy Simulation for Turbomachinery Applications Fanzhou Zhao, Mehdi Vahdati, Xiao He <i>Imperial College London, United Kingdom</i>
10:15	GT2021:60328 Deep Dive Oxy-Fuel Combustor Injector Shahrokh Etemad ¹ Benjamin Baird ² Sandeep Alavandji ³ <i>1. Fairfield University, USA; 2. Precision Combustion, Inc., USA; 3. Gas Technology Institute, USA</i>	GT2021:60016 Deep Dive Novel End-End System for Combustor Design and Analysis Ashwin Kannan ¹ Jonathan Thewlis ² Akin Keskin ² <i>1. Rolls-Royce India Private Limited, India; 2. Rolls-Royce plc, United Kingdom</i>	GT2021:59193 Deep Dive Extension of Harmonic Balance Approach for Large-eddy Simulation of Unsteady Flows in Cascade Yuma Iwamoto ¹ Susumu Teramoto ¹ Koji Okamoto ² <i>1. Department of Aeronautics and Astronautics, The University of Tokyo, Japan; 2. Department of Advanced Energy, The University of Tokyo, Japan</i>
10:45	GT2021:60294 Rapid Talk Design of 1 MW a Direct-fired Combustor for sCO₂ Power Jacob Delimont, Steve White, Nathan Andrews <i>Southwest Research Institute, USA</i>	GT2021:58338 Rapid Talk Effect of Droplet Starting Conditions on the Spray Dispersion Resulting From a Swirl Cup Injector Niklas Bürkle, Simon Holz, Enrico Bärow, Rainer Koch, Hans-Jörg Bauer <i>Institute of Thermal Turbomachinery (ITS), Germany</i>	GT2021:59293 Rapid Talk Revisiting Profile Transformation for Mono Channel Turbomachinery Large Eddy Simulations Clovis Gout ¹ Jérôme Dombard ² Nicolas Odier ² Florent Duchaine ² Laurent Gicquel ² Dimitrios Papadogiannis ¹ <i>1. Safran Tech, Modelling & Simulation, France; 2. CERFACS, France</i>
10:55	GT2021:69455 Rapid Talk Design of a Cooled sCO₂ Combustion Test Rig for Steady-state Kinetics Testing Kelsi Katcher ¹ Tim Allison ¹ Michael Marshall ¹ Sungho Chang ² Chansun Lim ³ Yui Jin ³ <i>1. Southwest Research Institute, USA; 2. KEPCO Research Institute, Korea; 3. Hanwha Power Systems, Korea</i>		GT2021:58711 Rapid Talk GPU-enabled High-fidelity LES Simulations for Turbomachinery Flows Michal Osusky ¹ Rathakrishnan Bhaskaran ² Dheeraj Kapilavai ² Greg Sluyter ³ Sriram Shankaran ³ <i>1. GE, USA; 2. GE Research, USA; 3. GE Aviation, USA</i>
11:05	GT2021:59939 Rapid Talk Optimization of a Primary Heat Exchanger for Flibe Molten Salt Nuclear Reactor With sCO₂ Power System Emmanuel Gabriel-Ohanu ¹ Akshay Khadse ¹ Ladislav Vesely ¹ Nandhini Raju ¹ Marcel Otto ¹ Jayanta Kapat ¹ Kurt Harris ² <i>1. University of Central Florida, USA; 2. Flibe Energy, USA</i>		

	WIND ENERGY		
	Wind Energy		
	Technical Session • 44-01		
	Session Organizer: Alessandro Bianchini , University of Florence Session Co-Organizer: Giacomo Persico , Politecnico Di Milano		
9:45	GT2021:59102 Deep Dive A Robust Procedure to Implement Dynamic Stall Models Into Actuator Line Methods for the Simulation of Vertical-axis Wind Turbines Pier Francesco Melani, Francesco Balduzzi, Alessandro Bianchini <i>Università degli Studi di Firenze, Italy</i>		
10:15	GT2021:59156 Deep Dive Machine Learnt Prediction of Rain Erosion Damage on Wind Turbine Blade Sections Alessio Castorrini ¹ Paolo Venturini ² Fabrizio Gerboni ² Alessandro Corsini ² Franco Rispoli ² <i>1. Università della Basilicata, Italy; 2. Sapienza University of Rome, Italy</i>		
10:45	GT2021:59664 Rapid Talk High Efficiency Wind Turbine Using Co-flow Jet Active Flow Control Kewei Xu, Gecheng Zha <i>University of Miami, USA</i>		
10:55	GT2021:60237 Rapid Talk Influence of Yawed Wind Flow on the Blade Forces/bending Moments and Blade Elastic Torsion for an Axial-flow Wind Turbine Mohammad Ahmadi, Zhiyin Yang <i>University of Derby, United Kingdom</i>		
11:05	GT2021:60280 Rapid Talk Vibration-based Condition Monitoring of Wind Turbines Based on the Scattering Transform Junyu Qi, Alexandre Mauricio, Konstantinos Gryllias <i>KU Leuven, Belgium</i>		

FRIDAY JUNE 11		12:15 PM - 01:45 PM	
	COMBUSTION, FUELS AND EMISSIONS	COMBUSTION, FUELS AND EMISSIONS	HEAT TRANSFER: INTERNAL AIR SYSTEMS
	Combustion Dynamics: Numerical Modeling	Hydrogen Combustion - a Thermoacoustic Perspective	Rotating Cavities and Air Systems
	Technical Session • 04-06	Panel Discussion • 04-23	Technical Session • 14-01
	Session Organizer: Santosh Hemchandra , Department of Aerospace Engineering	Session Organizer: Mirko Bothien , Zurich University	Session Organizer: Charles Haldeman , Pratt & Whitney Session Co-Organizer: John Chew , University of Surrey
12:15	GT2021:59117 Deep Dive Describing the Mechanism of Instability Suppression Using a Central Pilot Flame with Coupled Experiments and Simulations Jihang Li ¹ Hyungkuk Kwon ¹ Drue Seksinsky ¹ Daniel Doleiden ¹ Yuan Xuan ¹ Jacqueline O'Connor ¹ James Blust ² Michel Akiki ² 1. Pennsylvania State University, USA; 2. Solar Turbines Inc., USA	P A N E L	GT2021:59090 Deep Dive Unsteady Pressure Measurements in a Heated Rotating Cavity Richard Jackson, Hui Tang, James Scobie, Oliver Pountney, Carl Sangan, John Michael Owen, Gary Lock University of Bath, United Kingdom
12:45	GT2021:59351 Deep Dive Response of Autoignition-stabilized Flames to One-dimensional Disturbances: Intrinsic Response Harish Subramanian Gopalakrishnan ¹ Andrea Gruber ² Jonas Moeck ¹ 1. Norwegian University of Science and Technology, Norway; 2. SINTEF Energy Research, Norway		GT2021:59605 Deep Dive Measurement of Heat Transfer and Flow Structures in a Closed Rotating Cavity Richard Jackson, Hui Tang, James Scobie, John Michael Owen, Gary Lock University of Bath, United Kingdom
1:15	GT2021:60009 Rapid Talk Thermoacoustic Instabilities of Hydrogen-enriched Partially Premixed Flames in a Swirl Combustor Yu Gong ¹ Daniel Fredrich ¹ William Jones ¹ Andrew Marquis ¹ Isaac Boxx ² 1. Imperial College London, United Kingdom; 2. DLR, German Aerospace Center, Germany		GT2021:59930 Rapid Talk Modelling Conjugate Heat Transfer Within a Gas Turbine Secondary Air System Using 1D and 2-3D Solid Models in Thermo-fluid System Simulation David Hunt ¹ Yuan Youming ² Ian Gardner ² 1. Mentor Graphics A Siemens Company, United Kingdom; 2. Simcenter Flomaster Mentor Graphics, United Kingdom
1:25	GT2021:60055 Rapid Talk Isentropic Formulation of the Linearized Euler Equations for Perfectly Premixed Combustion Systems Pedro Romero Vega, Thomas Hofmeister, Gerrit Heilmann, Christoph Hirsch, Thomas Sattelmayer Chair of Thermodynamics - Technical University of Munich, Germany		GT2021:59797 Rapid Talk Effect of Eccentric Jet Impingement on a Rotating Pin-fin Heat Sink Pratik Bhansali, Kishore Ramakrishnan, Srinath Ekkad North Carolina State University, USA
1:35	GT2021:60184 Rapid Talk Application of Large Eddy Simulation for HA-Class Combustion System Design to Mitigate Combustion Instabilities (Frequency, and Amplitude) Azardokht Hajiloo ¹ Hasan Karim ¹ Erin Krumencker ¹ Venkat Narra ¹ Lee Shun ² Sanjeeb Bose ² Frank Ham ² 1. GE Power, USA; 2. CASCADE Technologies Inc., USA		GT2021:59158 Rapid Talk Effect of Jet-to-Jet Distance and Pipe Position on Flow and Heat Transfer Features of Active Clearance Control Systems Lorenzo Cocchi ¹ Alessio Picchi ¹ Bruno Facchini ¹ Riccardo Da Soghe ² Lorenzo Mazzei ² Lorenzo Tarchi ² Laurent Descamps ³ Maxime Rotenberg ³ 1. Università degli Studi di Firenze, Italy; 2. Ergon Research, Italy; 3. Safran Aircraft Engines, France

FRIDAY JUNE 11		12:15 PM - 01:45 PM	
MANUFACTURING MATERIALS AND METALLURGY		STRUCTURES AND DYNAMICS: BEARING AND SEAL DYNAMICS	STRUCTURES AND DYNAMICS: STRUCTURAL MECHANICS AND VIBRATION
Cyber-Physical-Loop Enabling Power-Generation of the Future		Gas Bearings	System Vibratioån - Data Driven
Panel Discussion • 18-07		Technical Session • 25-06	Technical Session • 30-02
Session Organizer: William Day , W. David Day, Inc. Session Co-Chairs: Sascha Gierlings , Fraunhofer-Institute For Production Technology; Johannes Vrana , Vrana GmbH - NDE Consulting and Solutions		Session Organizer: Jürg Schiffmann , Ecole Polytechnique Federale De Lausanne Session Co-Organizer: Adolfo Delgado , Texas A&M University	Session Organizer: Florence Nyssen , Polytechnique Montreal Session Co-Chair: Chiara Gastaldi , Politecnico Di Torino (DIMEAS)
<div>12:15</div> <div>12:45</div> <div>1:15</div> <div>1:25</div> <div>1:35</div>	<div>P</div> <div>A</div> <div>N</div> <div>E</div> <div>L</div>	GT2021:69468 Deep Dive Influence of Ambient Pressure on Measured Stiffness and Damping of Radial Gas Foil Bearings Jason Wilkes, Steve White <i>Southwest Research Institute, USA</i>	GT2021:59887 Deep Dive Data-driven Approach for Identifying Mistuning in As-manufactured Blisks Sean Kelly, Andrea Lupini, Bogdan Epureanu <i>University of Michigan, USA</i>
		GT2021:59131 Deep Dive Measurements of Static and Dynamic Load Performance of a 102 mm Carbon-Graphite Porous Surface Tilting-Pad Gas Journal Bearing Luis San Andres ¹ Rachel Bolen ¹ Jing Yang ¹ Ryan McGowan ² <i>1. Texas A&M University, USA; 2. CCDC Army Research Laboratory, USA</i>	GT2021:60238 Deep Dive Gaussian Stochastic Process Modeling of Blend Repaired Airfoil Modal Response Using Reduced Basis Mode Shape Perturbations Jeff Brown ¹ Emily Carper ¹ Daniel Gillaugh ¹ Alex Kaszynski ² Joseph Beck ¹ <i>1. Air Force Research Laboratory, USA; 2. Advanced Engineering Solutions, USA</i>
		GT2021:59937 Rapid Talk Theoretical Study on Static Performance of Thrust Gas Foil Bearing with Staggered Bump Foil Fangcheng Xu, Jianhua Chu, Wenlin Luan, Guang Zhao <i>Dalian University of Technology, China</i>	GT2021:58982 Rapid Talk Accurate Interpolation of the Dependency of Modal Properties on the Rotation Speed for the Transient Response Analysis of Bladed Discs Jing Tong ¹ Chaoping Zang ¹ Evgeny Petrov ² <i>1. Nanjing University of Aeronautics and Astronautics, China; 2. The University of Sussex, United Kingdom</i>
			GT2021:59356 Rapid Talk Full-scale Vibration Testing of Nozzle Guide Vanes Giuseppe Macoretta ¹ Bernardo Disma Monelli ¹ Paolo Neri ¹ Federico Bucciarelli ² Damaso Checcacci ² Enrico Giusti ² <i>1. University of Pisa, Department of Civil and Industrial Engineering, Italy; 2. Baker Hughes - Nuovo Pignone, Italy</i>
			GT2021:69488 Rapid Talk Advanced Processing of a Blade Vibratory Response Obtained with Tip Timing Method Using Hyperparameters-free Sparse Estimation Method Vsevolod Kharyton ¹ Dave Zachariah ² <i>1. Siemens Industrial Turbomachinery AB, Sweden; 2. L��gerhyddsv, Sweden</i>

	SUPERCRITICAL CO2	TURBOMACHINERY: DESIGN METHODS AND CFD MODELING FOR TURBOMACHINERY	TURBOMACHINERY: MULTIDISCIPLINARY DESIGN APPROACHES, OPTIMIZATION, AND UNCERTAINTY QUANTIFICATION
	Economics	Unsteady Solvers	Aerothermal Design Optimization - Turbine Cooling Systems and Heat Exchangers
	Technical Session • 33-07	Technical Session • 37-12	Technical Session • 39-03
	Session Organizer: Seth Lawson , US Department of Energy Session Co-Organizer: David Sanchez , AICIA	Session Organizer: Sunil Patil , Ansys, Inc.	Session Organizer: Marc Nagel , MTU Aero Engines Session Co-Organizer: Marcus Meyer , Rolls Royce
12:15	GT2021:58867 Deep Dive Impact of Plant Siting on Performance and Economics of Indirect Supercritical CO2 Coal Fired Power Plants <u>Sandeep R Pidaparti</u> ¹ Charles W White ¹ Nathan T Weiland ² 1. NETL/KeyLogic, USA; 2. NETL, USA	GT2021:59329 Deep Dive Numerical Investigation of Unsteady Combustor Turbine Interaction for Flexible Power Generation Federico Lo Presti ¹ Marwick Sembritzky ¹ Pascal Post ¹ Francesca Di Mare ¹ Alexander Wiedermann ² Johannes Greving ² Robert Krewinkel ² Benjamin Winhart ¹ 1. Ruhr University Bochum, Germany; 2. MAN Energy Solutions SE, Germany	GT2021:59033 Deep Dive Investigations on the Aerothermal Performance Uncertainty Quantification of the Turbine Blade Squealer Tip <u>Ming Huang</u> , Zhigang Li, Jun Li, Liming Song <i>Institute of Turbomachinery, Xi'an Jiaotong University, China</i>
12:45	GT2021:60293 Deep Dive Influence of Working Fluid Composition on the Optimum Characteristics of Blended Supercritical Carbon Dioxide Cycles Francesco Crespi, Gonzalo S. Martinez, Pablo Rodriguez De Arriba, <u>David Sanchez</u> , Francisco José Jiménez-Espadafor <i>University of Seville, Spain</i>	GT2021:58965 Deep Dive Using System Identification and Nonlinear Stiffness to Improve a Van Der Pol Based Reduced Order Model of a Cylinder Experiencing Lock-in Richard Hollenbach, Robert Kielb, Kenneth Hall <i>Duke University, USA</i>	GT2021:59415 Deep Dive Optimization of an Additively Manufactured U-bend Channel Using a Surrogate-based Bayesian Method <u>Shinjan Ghosh</u> ¹ Sudeepta Mondal ² Jayanta Kapat ¹ Asok Ray ² Ryan Wardell ¹ Erik Fernandez ¹ 1. University of Central Florida, USA; 2. The Pennsylvania State University, USA
1:15	GT2021:58788 Rapid Talk Supercritical Pseudo Boiling in Cubic Equations of State Daniel Banuti <i>The University of New Mexico, USA</i>	GT2021:59563 Rapid Talk Coupled Time and Passage Spectral Method for an Efficient Resolution of Turbomachinery Far Upstream Wakes <u>Dingxi Wang</u> , Sen Zhang, Xiuquan Huang, Huang Huang <i>Northwestern Polytechnical University, China</i>	GT2021:60126 Rapid Talk Multi-objective Optimization of Turbine Blade Tip with Tip Cooling Holes Yang Shuai, Zhang Min, Liu Yan, Yang Jinguang <i>Dalian University of Technology, China</i>
1:25	GT2021:59756 Rapid Talk Cost Effective Options of Closed CO2 Cycles for CSP Applications <u>Simone Maccarini</u> ¹ Alberto Traverso ¹ Emanuel Pesatori ² 1. University of Genoa, Italy; 2. Franco Tosi Meccanica s.p.a., Italy		GT2021:60336 Rapid Talk Thermal Flow Multi-physics Topology Optimization for Additively Manufactured Heat Exchangers <u>Ramesh Subramanian</u> ¹ Tsz Ling Elaine Tang ² Songtao Xia ² Peter Rop ³ Steven De Wispelaere ³ Bernd Koos ⁴ 1. Siemens, USA; 2. Siemens Corporation, USA; 3. Siemens Energy, Netherlands; 4. Siemens Energy, Germany
1:35	GT2021:58865 Rapid Talk Optimized Performance and Cost Potential for Indirect Supercritical CO2 Coal Fired Power Plants <u>Sandeep R Pidaparti</u> ¹ Charles W White ¹ Nathan T Weiland ² 1. NETL/KeyLogic, USA; 2. NETL, USA		GT2021:58507 Rapid Talk Multidisciplinary Sensitivity Analysis of the Cooling System of a High-pressure Turbine Blade in the Pre-design Phase <u>Barbara Fiedler</u> ¹ Yannick Muller ¹ Matthias Voigt ² Ronald Mailach ² 1. MTU Aero Engines AG, Germany; 2. Technische Universität Dresden, Germany

	COMBUSTION, FUELS AND EMISSIONS	CONTROLS, DIAGNOSTICS AND INSTRUMENTATION	HEAT TRANSFER: INTERNAL AIR SYSTEMS
	Combustion Dynamics: Liquid Fuels	Topics in Instrumentation (A): Joint Session with the Aircraft Engines Committee	Turbine Rim Sealing
	Technical Session • 04-05	Technical Session • 05-03	Technical Session • 14-02
	Session Organizer: Mirko Bothien , Zurich University Session Co-Chairs: Brandon Sforzo , ANL; Fei Han , GE Global Research; Vincent Mc Donell , University of California	Session Organizer: Peter Loftus , Evalu8ion Ltd Session Co-Chairs: Igor Loboda , National Polytechnic Institute; Vassilios Pachidis , Cranfield University	Session Organizer: Alexander Mirzamoghadam , Northrop Grumman Session Co-Chairs: Riccardo Da Soghe , Ergon Research; Carl Sangan , University of Bath
2:15	GT2021:59421 Deep Dive Localized Breakup Instabilities for a Liquid Fuel Jet in Crossflow Sheikh Salauddin, Wilmer Flores, Michelle Otero, Kareem Ahmed <i>University of Central Florida, USA</i>	GT2021:58998 Deep Dive Turbine Inlet Temperature Measurements in an 8200 KW Gas Turbine Engine Using Water Vapor Emission Dale Tree ¹ Dustin Badger ¹ Darell Zeltner ² Mohsen Rezasoltani ² <i>1. Brigham Young University, USA; 2. Solar Turbines, USA</i>	GT2021:59227 Deep Dive Influence of Flow Coefficient on Ingress in Upstream and Downstream Gas Turbine Wheel-spaces Dimitrios Graikos, Gary Lock, Carl Sangan, James Scobie, Mauro Carnevale <i>University of Bath, United Kingdom</i>
2:45	GT2021:60118 Deep Dive Experimental Investigation of Acoustic Characteristic of Shaped Orifices with Bias Flow Jong Guen Lee, Melvin Ikwubuo, Jinkwan Song <i>University of Cincinnati, USA</i>	GT2021:60266 Deep Dive Acoustic Pyrometry Robustness to Time of Flight Estimation Errors Gianluca Caposciutti, <u>Lorenzo Ferrari</u> <i>University of Pisa, Italy</i>	GT2021:59285 Deep Dive Correlating Cavity Sealing Effectiveness to Time-resolved Rim Seal Events in the Presence of Vane Trailing Edge Flow Shawn Siroka ¹ Iván Monge-Concepción ¹ Reid Berdanier ¹ Michael Barringer ¹ Karen Thole ¹ Chris Robak ² <i>1. Pennsylvania State University, USA; 2. Pratt & Whitney, a division of Raytheon Technologies Corporation, USA</i>
3:15	GT2021:60005 Rapid Talk Vortex Breakdown and Recirculation Bubble Formation in Counter Swirl Flows Ravi Bompelly ¹ Sai Phani Keerthan Ponduri ¹ Sriharsha Maddila ² <i>1. Mahindra University, India; 2. Northeastern University, USA</i>	GT2021:59690 Rapid Talk Reconstruction of Temperature Distribution for a Turbulent Free Jet Using Background Oriented Schlieren Benjamin Wahls, Kishore Ranganath Ramakrishnan, Srinath Ekkad <i>North Carolina State University, USA</i>	GT2021:59586 Rapid Talk Correlating Time-resolved Pressure Measurements with Rim Sealing Effectiveness for Real-time Turbine Health Monitoring Eric Deshong ¹ Benjamin Peters ² Reid Berdanier ¹ Karen Thole ¹ Kamran Paynabar ² Nagi Gebraeel ² <i>1. Pennsylvania State University, USA; 2. Georgia Institute of Technology, USA</i>
3:25	GT2021:60121 Rapid Talk Characterization of Dynamics of Unstable Fuel-rich Flame Jong Guen Lee, Matthew Weber, Jinkwan Song <i>University of Cincinnati, USA</i>	GT2021:58621 Rapid Talk Blade Tip Clearance Measurement Systems for High Speed Turbo-machinery Applications and the Potential for Blade Tip Timing Applications Jack Stubbs <i>Rotadata Ltd, United Kingdom</i>	GT2021:59273 Rapid Talk Unsteady Turbine Rim Sealing and Vane Trailing Edge Flow Effects Ivan Monge-Concepcion ¹ Shawn Siroka ¹ Reid A. Berdanier ¹ Michael D. Barringer ¹ Karen A. Thole ¹ Christopher W. Robak ² <i>1. The Pennsylvania State University, USA; 2. Pratt and Whitney, a division of Raytheon Technologies Corporation, USA</i>
3:35	GT2021:58862 Rapid Talk Influence of Acoustically Excited Airflows on a Planar Airblast Prefilmer Thomas Christou, Björn Stelzner, Nikolaos Zarzalis <i>Karlsruhe Institute of Technology, Germany</i>	GT2021:59519 Rapid Talk Minimum Measurable Displacement of an Optical Blade Tip Timing System Jack Stubbs ¹ Peter Russhard ² <i>1. Rotadata Ltd, United Kingdom; 2. EMTD, United Kingdom</i>	GT2021:59076 Rapid Talk On the Extrapolation of Rim Sealing Performance from Test Bench to Real Engine: a Numerical Survey Riccardo Da Soghe ¹ Cosimo Bianchini ¹ Lorenzo Mazzei ¹ Alessio Bonini ² Luca Innocenti ² Daniele Di Benedetto ² Lorenzo Orsini ³ <i>1. Ergon Research, Italy; 2. Baker Hughes, Italy; 3. University of Florence, Italy</i>

MANUFACTURING MATERIALS AND METALLURGY		OIL & GAS APPLICATIONS	STRUCTURES AND DYNAMICS: STRUCTURAL MECHANICS AND VIBRATION
Digitization, Testing and Validation		Oil and Gas Applications for Turbomachinery Tutorial	Computational Techniques
Technical Session • 18-05		Tutorial Session • 21-06	Technical Session • 30-06
Session Organizer: Calvin Stewart , University of Texas at El Paso Session Co-Chairs: Michael Kirka , Oak Ridge National Laboratory; David Welling , Makino Europe GmbH		Session Organizer: Rainer Kurz , Solar Turbines Inc.	Session Organizer: Vsevolod Kharyton , Siemens Industrial Turbomachinery AB Session Co-Chairs: Eric Kurstak , The Ohio State University; Kiran D'Souza , The Ohio State University
2:15	GT2021:59562 Deep Dive Knowledge-based Self-adaption of Product and Process Design in Turbomachinery Manufacturing Philipp Ganzer ¹ Markus Landwehr ¹ Sven Schiller ¹ Christopher Vahl ² Sebastian Mayer ² Thomas Bergs ³ 1. Fraunhofer Institute for Production Technology IPT, Germany; 2. Fraunhofer Institute for Algorithms and Scientific Computing SCAI, Germany; 3. Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Germany	GT2021:59381 Tutorial Oil and Gas Applications for Turbomachinery Rainer Kurz ¹ Klaus Brun ² Bernhard Winkelmann ³ 1. Solar Turbines Inc., USA; 2. Elliott Group, USA; 3. SBWinkelmann, USA ** This tutorial will NOT have a video on demand (VOD). This tutorial will be held "live." **	GT2021:59528 Deep Dive Numerical Analysis of the Impact of Mistuned Underplatforms Dampers on the Vibration of Bladed-Disks Samuel Quaegebeur ¹ Benjamin Chouvion ² Fabrice Thouverez ¹ 1. Ecole Centrale Lyon, France; 2. Centre de recherche Ecole de l'air, France
	GT2021:60347 Deep Dive Accelerated Creep Test (ACT) Qualification of Creep-resistance Using the WCS Constitutive Model and Stepped Isostress Method (SSM) Jaime Cano, Calvin Stewart University of Texas at El Paso, USA		GT2021:59126 Deep Dive Numerical Methods for Calculating Component Modes for Geometric Mistuning Reduced-Order Models Joseph Beck ¹ Jeffrey Brown ² Alex Kaszynski ³ Daniel Gillaugh ² Emily Carper ² 1. Perceptive Engineering Analytics, LLC, USA; 2. U.S. Air Force Research Laboratory, USA; 3. Advanced Engineering Solutions, USA
	GT2021:58796 Rapid Talk 3D Printing of Ceramic Shell Molds for Precision Casting of Turbine Blades Boris Kozlov ¹ Eugene Kratt ² Liubov Magerramova ³ 1. Arcon, LLC, CEO, Russia; 2. LNT, LLC, CEO, Russia; 3. Central Institute of Aviation Motors, Russia		GT2021:58835 Rapid Talk Surrogate Models for the Prediction of Damping Ratios in Coupled Acoustoelastic Rotor-cavity Systems Christoph Rocky Heinrich ¹ Tina Unglaube ² Bernd Beirrow ¹ Dieter Brillert ² Klaus Steff ³ Nico Petry ³ 1. Brandenburg University of Technology (BTU) Cottbus-Senftenberg, Germany; 2. University of Duisburg-Essen, Germany; 3. Siemens Energy, Germany
	GT2021:60028 Rapid Talk Testing and Acceptance of Semi-machined Turbine Rotor Forging Elements Douglas Nagy ¹ Steve Ingistov ² 1. Liburdi Turbine Serv Inc, Canada; 2. Watson Cogeneration, Marathon Petroleum, USA		GT2021:58437 Rapid Talk Calculation of Nonlinear Systems Under Narrow Band Excitation Using Equivalent Linearization and Path Continuation Alwin Förster, Lars Panning-Von Scheidt Leibniz University Hannover, Germany
	GT2021:60200 Rapid Talk Experimental Investigation of the Effects of High Temperature Treatment on Quasi-static Mechanical Characteristics of EMWM Materials Yanhong Ma ¹ Tianyu Liang ² Jie Hong ² 1. Research Institute of Aero-Engine, Beijing University of Aeronautics and Astronautics, China; 2. School of Energy and Power Engineering, Beijing University of Aeronautics and Astronautics, China		GT2021:58747 Rapid Talk Structural Integrity of Serrated Leading Edge Guide Vane Blades for Noise Reduction Cleopatra Cuciumita ¹ Ning Qin ¹ Felix Stanley ² Shahrokh Shahpar ³ 1. University of Sheffield, Department of Mechanical Engineering, United Kingdom; 2. Rolls-Royce plc., Ascend R&T (UltraFan), United Kingdom; 3. Rolls-Royce plc., Innovation Hub – Future Methods, United Kingdom

T
U
T
O
R
I
A
L

	SUPERCRITICAL CO₂	TURBOMACHINERY: AXIAL FLOW FAN AND COMPRESSOR AERODYNAMICS	TURBOMACHINERY: UNSTEADY FLOWS IN TURBOMACHINERY
	Modeling	Fan and Propulsor Design	Unsteady Flows in Turbines
	Technical Session • 33-09	Technical Session • 34-04	Technical Session • 43-01
	Session Organizer: Jayanta Kapat , University of Central Florida Session Co-Organizer: Ladislav Vesely , Czech Technical University In Prague	Session Organizer: Vicente Fidalgo , Notre Dame Turbomachinery Lab Session Co-Organizer: Becky Rose , Pratt & Whitney	Session Organizer: Florian Herbst , Leibniz University Hannover
2:15	GT2021:59331 Deep Dive Design Performance Analysis of Novel Supercritical CO₂ Cycle for CSP Application with Sensible Heat Thermal Storage Dhinesh Thanganadar ¹ Francesco Fornarelli ² Sergio Camporeale ² Jonathon Gillard ¹ Kumar Patchigolla ¹ 1. Cranfield University, United Kingdom; 2. Polytechnic University of Bari, Italy	GT2021:59495 Deep Dive Fan Stability with Leading Edge Damage: Blind Prediction and Validation Ewan Gunn ¹ Tobias Brandvik ¹ Mark Wilson ² Ross Maxwell ² 1. Turbostream Ltd, United Kingdom; 2. Rolls-Royce plc, United Kingdom	GT2021:59598 Deep Dive Impact of Swirling Entropy Waves on a High Pressure Turbine Andrea Notaristefano, Paolo Gaetani Politecnico di Milano, Italy
2:45	GT2021:59177 Deep Dive Design and Analysis of Cooling Structure for Dry Gas Seal Chamber of Supercritical Carbon Dioxide Turbine Shaft End Tao Yuan, Zhigang Li, Jun Li, Qi Yuan Institute of Turbomachinery, Xi'an Jiaotong University, China	GT2021:58941 Deep Dive Composite UHBR Fan for Forced Response and Flutter Investigations Torben Eggers ¹ Jens Friedrichs ¹ Jan Goessling ² Joerg R. Seume ² Nunzio Natale ³ Jan Peter Flüh ⁴ Nicola Paletta ⁴ 1. Institute of Jet Propulsion and Turbomachinery, Technische Universität Braunschweig, Germany; 2. Institute of Turbomachinery and Fluid Dynamics, Leibniz Universität Hannover, Germany; 3. Dream Innovation Srl, Italy; 4. IBK Innovation GmbH & Co. KG, Germany	GT2021:58854 Deep Dive Accurate Inlet Boundary Conditions to Capture Combustion Chamber and Turbine Coupling with Large-Eddy Simulation Benjamin Martin, Laurent Gicquel, Florent Duchaine, Jérôme Dombard, Nicolas Odier CERFACS, France
3:15	GT2021:59195 Rapid Talk Advanced Exergy Analysis of the Supercritical Carbon Dioxide Power Cycle for Waste Heat Recovery of Gas Turbine Bo Li, Shun-Sen Wang, Liming Song Xi'an Jiaotong University, China	GT2021:58812 Rapid Talk Design and Flow Analysis of the Rim-driven Hub-less Axial Flow Fan Hangqing Yang, Yijun Wang, Jinju Sun, Bangyi Wang, Youwei He, Peng Song Xi'an Jiaotong University, China	GT2021:59344 Rapid Talk Modeling of Combustor-turbine Vane Interaction Using Stress-blended Eddy Simulations Ishan Verma ¹ Samir Rida ² Laith Zori ² Jaydeep Basani ³ Benjamin Kamrath ⁴ Dustin Brandt ⁴ 1. Ansys Inc., India; 2. Ansys Inc., USA; 3. Honeywell Technical Solutions, India; 4. Honeywell, USA
3:25	GT2021:59962 Rapid Talk Efficiency Maximization of Allam Cycle at a Given Combustion Temperature Yousef Haseli Central Michigan University, USA	GT2021:59524 Rapid Talk Computational and Experimental Studies of Model Fans for Advanced Turbofan Engines Victor Mileschin, Vladimir Korzhnev, Victor Fateev, Sergey Pankov Central Institute of Aviation Motors, Russia	GT2021:59095 Rapid Talk Improved Prediction of Losses with Large Eddy Simulation in a Low Pressure Turbine Kenji Miki ¹ Ali Ameri ^{1,2} 1. NASA Glenn Research Center, USA; 2. The Ohio State University, USA
3:35	GT2021:59936 Rapid Talk Impact of Dry Cooler Air-side Performance on a sCO₂ Power Cycle for a CSP Application Kelsi Katcher ¹ Dereje Amogne ² 1. Southwest Research Institute, USA; 2. Vacuum Process Engineering, USA		GT2021:60276 Rapid Talk Conjugate Heat Transfer Simulation of an Industrial Gas Turbine Blade with Harmonic Balance Method Justin Hodges ¹ Kim Zwiener ² Cassie Carpenter ¹ 1. Siemens DI SW, USA; 2. Siemens DI SW, Germany

Turbo Expo Session Participant Index

A

Abba, Luca	12-05	Allen, Oliver	34-07
Abbott, David	03-02	Allison, Tim	07-01, 07-02, 07-03, 21-01, 21-02, 33-04, 33-05
Abdeh, Hamed	12-05	Alman, David	09-01
AbdElDayem, AbdElRahman	33-02	Almer, Jonathan	02-03
Abdelmaksoud, Ramy	13-01	Almstedt, Henning	28-01
Abdi, Frank	02-02	Alsaleem, Sulaiman M.	12-04
Abdul Jameel, Abdul Gani	04-03	Alvarez-Regueiro, Eva	40-01
Abdulhamitbilal, Erkan	01-03	Alzahrani, Yasser S.	15-02
Accornero, Frank	02-03	Amann, Christian	28-02
Acharya, Vishal	04-08, 04-11	Amato, Alberto	04-13, 04-19
Achilli, Andrea	23-03	Ameri, Ali	12-02, 43-01
Adami, Paolo	37-09	Amerighi, Matteo	04-03
Addepalli, Srinivasa Krishna	04-16	Amogne, Dereje	33-09
Adetola, Veronica	27-05	Anand, Nitish	39-02
Adhikari, Subodh	04-11, 04-20, 09-02	Ancona, Maria Alessandra	17-01, 17-02
Æsøy, Eirik	04-07, 04-13	Anderson, Mark	20-02, 33-01
Agari, Yuki	43-02	Andracher, Lukas	05-04
Agarwal, Shubham	12-06	Andrei, Luca	12-05
Agati, Giuliano	36-01	Andreini, Antonio	01-01, 04-03, 04-07, 04-13, 04-14 04-17, 04-19, 04-20, 11-01, 23-02
Ager, Will	34-02	Andreoli, Valeria	28-01
Agnolucci, Andrea	20-02, 40-03	Andrews, Gordon E.	04-15
Aguilar, José G.	04-07	Andrews, Nathan	21-01, 33-05
Aguilar, Rene	17-02	Angello, Leonard	09-01, 17-03
Ahlfeld, Richard	39-02	Angelucci, Maddalena	13-02
Ahmadi, Mohammad	44-01	Anthony, Richard	12-01
Ahmed, Kareem	03-01, 04-05, 04-16	Antinori, Giulia	39-01
Ahmed, Shoaib	11-01	Aoki, Shigeki	04-18
Ahn, Byeonguk	04-11	Appel, Christoph	09-02
Ai, Toshishige	09-02	Appleby, Craig	21-03
Aigner, Manfred	04-16	Araguas-Rodriguez, Silvia	11-01
Akaki, Tomohiro	30-04	Arai, Keisuke	20-03
Akiki, Michel	03-02, 04-06	Arcangeli, Lorenzo	23-02, 23-05
Akki, Kashinath	25-05	Aretakis, Nikolaos	20-02
Aksoy, Hakan	12-01, 15-05	Arguinizoni, Carlo	04-14
Al-Akam, Aws	01-03	Arnone, Andrea	20-02, 23-05, 40-03
Al-Rifai, Saja	04-14	Arnst, Maarten	34-03
Alavandi, Sandeep	33-05	Asai, Go	20-02
Alberio, Marco	06-04	Aschenbruck, Jens	23-02
Alcantar, Andy	25-03	Asgari, Hamid	20-03
AlDabbagh, Naman	04-15	Asghar, Asad	01-02, 34-02
Aldi, Nicola	10-02	Aslanidou, Ioanna	08-01
Ale, Pablo	37-06	Astolfi, Marco	06-04, 07-01
Alessandro, Giannotta	03-02	Atkinson, Steven	28-01
Alexiou, Emmanouil	06-03	Aus Der Wiesche, Stefan	06-04
Ali, Hessein	05-01, 27-05	Avdeev, Sergey	37-10
Ali, MD Shujan	29-01	Axelsson, Lars-Uno	03-01, 04-18, 05-02
Allan, William	01-02, 34-02	Ayan, Emre	13-03
Allen, Brian	46-02	Aye-Addo, Papa Aye Nyansafo	05-04
Allen, Cody	05-02	Aziaka, Duabari	17-01
Allen, Joe	47-02		

B

Babazzi, Giulia	13-01	Benninghoven, Christoph	11-01
Babin, Cedric	34-09	Benoit, Jeffrey	, 09-03, 46-02
Bacakci, Gökay	40-04	Benra, Friedrich-Karl	24-03
Bacci, Tommaso	13-01	Benson, Claire	03-05
Bache, Martin	02-01, 02-02	Benson, Michael	, 12-04, 15-03
Badger, Dustin	05-03	Berdanier, Catherine G.P.	31-01
Badrieh, Chelesty	37-02	Berdanier, Reid	14-02, 35-03, 35-04, 43-03
Baert, Lieven	, 39-02	Berger, Frederik	04-08
Baghchehsara, Ali	, 09-01	Bergs, Thomas	18-01, 18-02, 18-04, 18-05
Baird, Benjamin	33-05	Bergthorson, Jeffrey M.	04-12
Bakken, Lars E	21-01	Berry, Grey	21-01
Balachandar, Sivaramakrishnan	01-06	Bertini, Francesco	43-03
Balduzzi, Francesco	20-02, 44-01	Bertolotto, Edoardo	04-19
Bang, Minh	15-02	Bertsch, Michael	04-08
Banjac, Milan	34-03	Besem-Cordova, Fanny	10-02
Banuti, Daniel	33-07	Bessette, Didier	04-14
Bao, Zihao	12-01	Beuth, Jan Paul	04-08, 04-17
Barabas, Botond	24-03	Bexten, Thomas	06-01, 07-01
Baratta, Mirko	12-01	Bhansali, Pratik	14-01
Barbieux, Virginie	39-01	Bhaskaran, Rathakrishnan	37-05
Barbosa, Daniel Ferreira Corrêa	37-11	Bhatnagar, Lakshya	05-04
Bardenhagen, Andreas	18-01	Bianchi, Michele	17-01, 17-02
Barhanko, Dikran	37-04	Bianchi, Stefano	, 34-06
Barigozzi, Giovanna	12-05	Bianchini, Alessandro	20-02, 44-01, 44-02
Barnabei, Valerio	10-02	Bianchini, Cosimo	13-02, 13-03, 14-02
Bärow, Enrico	37-03	Bianco, Santino	05-01
Barrera-Medrano, Maria Esperanza	37-06, 40-01	Bibik, Oleksandr	04-20
Barringer, Michael	14-02	Bicalho Civinelli De Almeida, Victor	43-03
Barsi, Dario	40-04, 43-03	Bidkar, Rahul	, 25-05
Bartholet, Jules	34-03	Biedermann, Till	10-03
Bartlett, Michael	04-18	Biela, Christoph	34-10
Bartocci, Pierto	03-05, 03-06	Biermann, Horst	27-02
Barton, Michael	, 37-06, 43-02	Billson, Mattias	38-01
Basak, Amrita	18-01, 27-03, 27-05	Björkqvist, Christer	09-04, 09-05, 46-02
Basani, Jaydeep	37-13, 43-01	Björneld, Frida	09-05
Batailly, Alain	30-01, 30-05	Black, James	15-03, 17-01, 33-02
Batt, Simon	17-01	Blanc, Laurent	, 30-03
Battiato, Giuseppe	, 30-04	Bloxham, Matthew	05-04
Baturin, Oleg	34-01, 39-04	Blumber, Eric	17-02
Bauer, Hans-Jörg	04-19, 13-03, 14-03, 37-03	Blumenthal, Rob	37-11
Baumgärtner, David	06-04	Blümer, Marc	04-15
Baye-Wallace, Lily	37-06	Blust, James	04-06, 09-02
Beamer, Chad	18-03	Boche, Lea	09-01
Bechini, Giovanni	21-02	Böcker, Marco	27-02
Beck, Griffin	21-01, 21-02, 21-05	Bode, Christoph	20-01, 37-02
Beck, Joseph	18-03, 30-02, 30-06	Bodony, Daniel	20-01
Beer, Michael	01-03	Bogard, David	12-03, 12-05, 12-06
Behre, Stephan	35-03	Bohan, Brian T.	04-14
Beirow, Bernd	26-01, 30-01, 30-06, 39-01	Bohan, Kathleen	17-01
Belfiore, Nicola Pio	24-04	Böhle, Martin	12-04
Bellissima, Alessandro	20-02	Bolen, Rachel	25-06
Ben, Yunpeng	15-01	Bompelly, Ravi	04-05
Bender, Beate	25-03	Bonaccorsi, Jean Charles	10-02
Benini, Ernesto	37-13	Bonini, Alessio	14-02
Benjamin, Leroy	37-02	Bonneau, Damien	12-06
		Bons, Jeffrey	36-01
		Bonuso, Sara	04-01

Borello, Domenico	36-01
Bose, Sanjeeb	04-06
Bosu, Sudeep	25-05
Bothien, Mirko R.	04-05, 04-07, 04-09, 04-23
Botta, Fabio	24-04
Bourque, Gilles	04-12
Bouten, Thijs	03-01, 04-18
Bowen, Christopher	36-01
Boxx, Isaac	04-04, 04-06, 04-11
Boyer, Keith	01-02
Bradshaw, Sean	46-02
Brahmeshwarkar, Susheel	37-11
Brailovski, Vladimir	15-03
Branchini, Lisa	17-01, 17-02
Brandes, Tim	36-01
Brandstetter, Christoph	24-03, 24-04
Brandt, Dustin	04-13, 43-01
Brandvik, Tobias	01-02, 34-04
Braun-Unkhoff, Marina	03-01, 03-02, 03-05, 03-06
Braun, James	05-04, 06-03
Bravo, Luis	02-02
Brekke, Olaf	09-04
Brem, Gerrit	03-01
Bretschneider, Stefan	01-01
Brettschneider, Markus	38-02
Bricaud, Cyrille	14-03
Bricteux, Laurent	20-03
Brillert, Dieter	17-01, 23-01, 24-03, 25-05, 30-06
Brilliant, Lisa	34-02
Bringhenti, Cleverson	37-11
Briones, Alejandro	04-16
Broca, Olivier	06-03
Brochu, Mathieu	18-04
Broggi, Matteo	01-03
Bronson, Thomas	04-18
Brown, Jeff	28-01, 28-02, 30-02, 30-06, 30-07
Brun, Klaus	07-01, 07-02, 21-06
Bruni, Giuseppe	24-02
Bu, Hongyan	12-04
Bucciarelli, Federico	23-03, 30-02
Buchwald, Patrick	24-01
Budo, Arnaud	34-03
Buia, Giulio	03-05
Bukkapatna Ananthappa, Rajeevalochanam	26-01
Bullock, Joshua	25-01
Bunkute, Birute	04-15
Buonamici, Gianfranco	19-01
Burd, Steven	11-01
Burke, Robert	03-01, 04-16
Bürkle, Niklas	37-03
Burnes, Daniel	06-01
Burns, Alan D.	04-15

C

Caggiano, Giuseppe	13-02
Cagnac, Albannie	09-04

Cai, Liuxi	18-03
Caminale, Michael	20-04
Campa, Giovanni	04-09, 04-13
Camporeale, Sergio	33-09
Campregher, Rubens	24-02
Canali, Carlo	05-01
Cangioli, Filippo	29-01, 29-02
Cano, Jaime	18-05
Capobianco, Massimo	06-02
Caposciutti, Gianluca	05-03
Cappiello, Alessandro	20-01, 20-03
Carcasci, Carlo	13-02
Carlson, Pher-Ola	27-03
Carnevale, Mauro	12-01, 14-02, 37-09
Carpenter, Cassie	43-01
Carper, Emily	30-02, 30-06
Carrotte, Jon F	37-13
Casari, Nicola	10-02, 21-02, 21-03, 21-04, 37-04, 37-09
Castillo Pardo, Alejandro	34-07
Castillo Sauca, Antonio	05-04
Castillo, Antonio	05-04
Castorri, Alessio	10-02, 44-01
Catalani, Iacopo	20-02
Ceccherini, Gianni	04-07
Celestina, Richard	12-01, 15-05
Celis, Cesar	17-02
Celli, Dino	27-03
Cencioni, Luca	03-05
Cerriteño Sanchez, Angel	23-01
Cerutti, Matteo	04-16
Ceschini, Giuseppe Fabio	21-02
Ceyrowsky, Thomas	40-02
Chai, Jin	39-02
Chai, Pengfei	30-07, 38-01
Chakraborty, Kingshuk	04-16
Chakravarthy, Satyanarayanan R.	04-16
Chan, Anthony	18-04
Chandh, Aravind	04-20
Chang, Sunggho	33-05
Chang, Zhiqiang	38-01
Chapman, Jeffreys	05-01
Chasalevris, Athanasios	29-01
Chatterton, Steven	25-04, 29-01, 29-02
Chattopadhyay, Aditi	02-01
Checcacci, Damaso	23-03, 30-02
Chelebyan, Oganess	04-15
Chen, Andrew	15-02
Chen, Dawei	30-05
Chen, Hongyu	04-02
Chen, Huang	34-02
Chen, I-Lun	15-04
Chen, Jianfei	24-01
Chen, Jinwei	05-02, 06-01
Chen, Junjie	30-04
Chen, Kang	40-03
Chen, Wan	10-03
Chen, Xiangyi	37-09

Chen, Xiuqi	37-11	Creer, M. Riley	11-01
Chen, Yang	23-01	Crespi, Francesco	33-07
Chen, Yao	05-02	Cruz, Gonalo	34-09
Chen, Yong	24-04, 30-05, 30-07	Cubeda, Simone	12-05, 13-01
Chernoray, Valery	35-07	Cuciumita, Cleopatra	30-06, 34-09, 39-02
Chevalier, Christine	05-01	Cui, Ying	29-01
Chew, John	14-01	Cullis, Andy	19-01
Chhugani, Hitesh	34-06	Cunningham, Mark	38-02
Chi, Zhongran	05-01	Cuquel, Alexis	04-09
Chijioke Okafor, Ekenechukwu	20-03	Curran, Henry	04-12
Childs, Dara	25-01, 25-02	Cusano, David	33-08
Cho, Hyung Hee	15-02		
Choi, Dr. Sung	02-02	D	
Choi, Jaewoo	34-10	D'agostino, Fabrizio	05-01
Choi, Sung	02-01	D'Souza, Kiran	30-06
Choi, Yoon	24-03	Da Soghe, Riccardo	13-02, 13-03, 14-01, 14-02
Chouvion, Benjamin	30-06	Dadouche, Azzedine	25-05
Christensen, Louis	08-01, 12-01, 15-05	Dahl, Anders	34-09
Christophe, Colette	30-07	Dai, Qiyao	29-01
Christou, Thomas	04-05	Dai, Shiran	39-02
Chterev, Ianko	04-04, 04-11	Dai, Yiping	06-02, 40-03
Chu, Jianhua	25-06	Dalshad, Rahand	04-20
Chu, Wuli	34-08, 37-09	Dancelme, Alexis	04-02
Chyu, Minking	13-02	Dang, Phuoc Vinh	25-04
Ciani, Andrea	04-15, 04-19	Danieli, Piero	10-01
Cich, Stefan	07-02, 21-01, 33-02, 33-03, 33-04	Danmoto, Yosuke	20-01
Cinieri, Giacomo	04-19	Danner, Florian	39-01
Clark, Christopher	08-01, 35-01	Darabiha, Nasser	04-14
Clark, Kenneth	34-02	Das, Partha	26-01
Clark, Robert	01-04	Dasgupta, Debolina	04-01
Cleaver, David	35-04	Datta, Anindya	04-11
Clementoni, Eric	33-01, 33-03	Daub, Marco	39-01
Cobb, Anna	09-02	Davis, Dustin	04-20
Cocchi, Lorenzo	12-05, 14-01	Davis, Kevin	21-04
Cocks, Alan	27-02	Davison, Craig	05-02
Cola�tis, Yann	30-05	Dawes, Bill	36-01
Colantoni, Simone	03-05	Dawkins, Ivo	34-01
Cong, Qingfeng	14-03	Dawood, Alaaeldin	06-01
Connolly, Brian	07-02	Dawson, James R.	04-02, 04-07, 04-11, 04-22, 04-23, 46-04
Conti, Simone	30-03	Day, Carolyn	21-01, 21-05
Contino, Francesco	06-02	Day, Robin	18-01, 18-04
Cooper, Sean	04-03, 04-12	Day, William	18-03, 18-06, 18-07, 18-08, 18-09
Coppitters, Diederik	06-02	Day, William David	18-06
Corbett, Nicholas	17-01	De Dominicis, Ilaria	34-05
Corr, Robert	04-11, 04-15	De Giorgi, Maria Grazia	04-01, 04-19
Corral Garcia, Roque	24-04	De Grauw, Max	05-02
Corral, Roque	24-01	De Guillebon, Ludovic	04-20
Corsini, Alessandro	10-01, 10-02, 10-03, 10-04, 44-01	De Jes�s Rivera, Edward	10-02
Cory, Trevor M.	15-03	De Lazzer, Armin	28-01
Cosi, Lorenzo	23-03	De Maesschalck, Cis	35-01
Cosic, Bernhard	04-04, 04-08, 04-15, 04-17	De Oliveira, Mauricio	05-02
Cota, Giuseppe	21-02	De Paepe, Ward	06-02, 06-05, 20-03
Cottingham, Jacqueline R.	28-02	De Pascale, Andrea	17-01, 17-02
Coull, John	35-01	De Weert, Blanca	07-01
Cousins, William	45-01	De Wispelaere, Steven	39-03
Cowell, Luke H.	03-03	Defoy, Benjamin	25-02
Cramb, Donald	04-12		

Dehner, Rick	38-01
Del Vescovo, Giuseppe	30-03
Delgado Sanchez, Giovanni	23-01
Delgado, Adolfo	25-04, 25-06
Delhez, Elise	30-05
Delibra, Giovanni	10-01, 10-03, 10-04
Delimont, Jacob	04-14, 07-02, 33-05
Della Villa, Jr., Salvatore	09-01
Deng, Qinghua	12-02, 15-02
Deniz, Sabri	08-01
Dennis, Richard	09-03, 09-05, 45-02
Dermont, Pieter	42-01
Desai, Avinash D.	03-03
Descamps, Laurent	14-01
Deshong, Eric	14-02, 35-03
Deshpande, Chinmay	37-11
Desideri, Umberto	07-01
Deutsch, Johannes	40-04
Devi, Ravindra	23-01
Dharmadhikari, Susheel	27-03
Di Benedetto, Daniele	14-02
Di Gruttola, Francesca	36-01
Di Mare, Francesca	04-16, 04-17, 37-12
Di Mare, Luca	37-10
Di Sisto, Paolo	30-03
Dick, Jean Sébastien	01-04
Dickens, Tony	34-08
Dielenschneider, Tobias	20-02
Dimond, Timothy	25-03
Ding, Shuiting	13-03, 14-03, 27-02
Dinkelacker, Friedrich	04-01
Ditaranto, Mario	04-17
Diurno, Tommaso	23-02
Doan, Nguyen Anh Khoa	04-14
Doerr, Tobias	17-01
Doleiden, Daniel	04-06
Dolle, Bastian	23-01
Dombard, Jérôme	12-06, 37-05, 37-10, 43-01
Dominguez Mota, Francisco Javier	23-01
Domnick, Clemens	12-04
Dong, Wei	04-02
Dong, Xu	34-06
Dong, Yuan	34-10, 43-02
Donus, Fabian	06-03
Dooley, Stephen	04-12
Drela, Mark	01-02, 34-08
Drost, Sietse	05-02
Du, Qiang	12-03, 14-03
Du, Qiuwan	25-05
Du, Yang	06-02, 40-03
Du, Zhaohui	24-04, 38-01
Dua, Dipankar	30-07
Duan, Jingtian	15-04
Dubois, Patrick K.	02-03, 15-03, 20-03
Duchaine, Florent	12-06, 37-05, 37-10, 43-01
Duddeck, Fabian	39-01
Dudebout, Rudy	04-18

Duesing, K. Michael	04-16
Dufau, Antoine	35-04
Dumstorff, Peter	28-01
Dunlap, Kyle	05-02
Durocher, Antoine	04-12
Durosseau, Willie	19-01
Dutta, Sandip	15-02
Dybe, Simeon	04-18

E

Easterby, Christopher	12-03
Ebel, Thiago	20-02
Ebrahimi, Hossein	02-03, 05-01, 27-05
Eckel, Jannik	34-01
Edelson, Ryan	15-03
Eftekharian, Amirhossein	02-02
Egami, Ryo	23-03
Eggers, Torben	34-04
Egorov, Igor	39-04
Ehehalt, Ulrich	29-02
Eißler, Werner	20-02
Ek, Hanna	04-10
Ekkad, Srinath	05-03, 11-01, 14-01, 15-04
El Rassi, Joseph	02-02
El-Gabry, Lamyaa	12-01, 12-02
Elgamal, Hassan	13-02
Elliott, Matthew	40-01
Elmekawy, Ahmed M. Nagib	13-02
Elmi, Carlo Alberto	01-01
Els, Danie	10-01
Embaye, Mebrahtu	33-18
Emerson, Benjamin	04-02, 04-11, 04-20, 09-02
Emmanuelli, Marc	39-02
Enderle, Benedict	04-16
Engeda, Abraham	10-01
Enright, Michael	28-02
Epureanu, Bogdan	30-02, 30-05
Erasmus, Adrian	10-01
Ercan, Ilgit	23-02
Ercan, Taylan	01-09
Erdem, Erinc	14-03
Erdmann, Timothy	04-16
Ertas, Bugra	25-04
Esker, Barbara	46-04
Etemad, Shahrokh	33-05
Evans, Fred	21-03
Evans, Rich	36-01
Evans, Simon	34-06
Facchini, Bruno	04-03, 11-01, 12-05, 13-01, 14-01, 23-02

F

Fadiga, Ettore	21-04
Fahrman, Michael	18-03
Fan, Gang	06-02, 40-03
Fan, Yong	04-18, 20-03
Fan, Yu	30-03, 30-04

Fang, Zhi	25-01
Fantozzi, Francesco	03-04, 03-05, 03-06
Farisco, Federica	12-04
Faruq, Raja	37-11
Fateev, Victor	34-04
Faucett, D. Calvin	02-01
Fauvell, Kevin	19-01
Favaron, Carlo	37-13
Fedorov, Ilya	37-04
Feiling, Nicole	18-01
Feist, Jörg	11-01
Fellows, David	20-01
Feng, Zhenping	12-02, 12-04, 12-06, 15-02, 15-05, 18-03, 25-01
Ferguson, Donald	06-03
Fernandez, Erik	39-03
Ferrando, Marco	20-04
Ferrara, Giovanni	20-02
Ferrari, Federico	17-01
Ferrari, Lorenzo	05-03, 05-04, 07-01
Ferrari, Mario Luigi	06-02, 06-05
Ficarella, Antonio	01-01, 04-01, 04-19
Fidalgo, Vicente	34-04
Fiebigler, Stephen	24-03, 27-03
Fiedler, Barbara	39-03
Fier, Nathan	12-05
Fietzke, Benjamin	05-01
Figino, Federico	18-04
Findlay, Andrew	21-02
Firrone, Christian M.	30-04
Fischer, André	04-07
Fischer, Lukas	12-01
FitzPatrick, Mary	47-02
Flodman, David	11-01
Flores, Wilmer	04-05
Flüh, Jan Peter	34-04
Fondelli, Tommaso	13-01, 23-02
Fontanarosa, Donato	04-01, 04-19
Fontaneto, Fabrizio	34-09
Fornarelli, Francesco	33-09
Förster, Alwin	30-06
Fouliard, Quentin	02-03, 27-05
Fournier, Guillaume Jean Jacques	04-09
Fox, Dale	12-06
Fox, Michael	15-04
Frach, Agnieszka	24-02
Frank, Roman Gawin	40-02
Franz, Holger	40-01
Franzelli, Benedetta	04-14
Frate, Guido Francesco	07-01
Fredrich, Daniel	04-06
Frekers, Christian	04-15
Fricke, Kilian	18-02
Fridh, Jens	38-01
Friedrichs, Jens	01-03, 20-01, 34-04, 37-02, 39-04
Friso, Riccardo	37-04, 37-09
Fröhlich, Jochen	34-09
Fröhlig, Friedrich	40-02, 40-04

Früchtel, Gerhard	04-15
Fuchs, Thomas	34-06
Fujisawa, Nobumichi	43-02
Funazaki, Ken-Ichi	35-01
Funke, Harald	04-13, 04-18
Furgeson, Michael	12-05
Furi, Marc	04-02
Furukawa, Tatuya	30-07
Furusawa, Takashi	09-01
Furutani, Hirohide	04-18, 20-03
Futamura, Hisao	13-01

G

Gabriel-Ohanu, Emmanuel	33-05
Gabriele, Serena	30-03, 36-01
Gabrielli, Alessio	18-04
Gaetani, Paolo	33-01, 43-01
Gaffuri, Michele	15-01
Gage, Chela	47-02
Gajjar, Mrugesh	28-02
Gale, Louise	02-01
Galeotti, Sofia	04-19
Gallops, William	01-03
Galloway, Lee	37-04
Galvan Gonzalez, Sergio Ricardo	23-01
Gambitta, Marco	39-01
Gampe, Uwe	27-02
Gan, Jiuliang	24-04
Gan, Zhiwen	04-10
Ganiger, Manjush	03-04, 25-02
Ganser, Philipp	18-02, 18-05
Gant, Francesco	04-09
Gao, Feng	14-03
Gao, Jianmin	15-05
Garcia-Cuevas, Luis Miguel	20-02
García-Rodríguez, Lourdes	07-01
Garcia-Valdecasas Santa Isabel, Guillermo	35-07
Garcia, Jose Angel	06-01
Gardner, Ian	14-01
Garmory, Andrew	04-07
Gary, Keith	25-04
Gaskell, Jack	36-01
Gastaldi, Chiara	30-02
Gauthier, Pierre	03-01, 03-02, 03-03, 03-04, 03-06
Gauvin-Verville, Antoine	02-03, 20-03
Gazzah, Rym	15-03
Gebraeel, Nagi	14-02
Geisen, Ole	18-01
Geist, Silvio	21-03
Geng, Teng	33-01
Genin, Franklin	04-15, 04-17
Gentile, Rusty	33-05
George, Tommy	18-03, 26-01
Gerboni, Fabrizio	44-01
Gerken, Patrick	27-05
Geron, Marco	40-01

Geuens, Christophe	37-13	Göttlich, Emil	12-04, 38-02
Ghate, Kushal	01-01	Gout, Clovis	37-05
Ghirardo, Giulio	04-09, 04-13	Gouttière, Alexandre	39-01
Ghisu, Tiziano	34-10	Govindasamy, Rakesh	03-04
Ghoniem, Ahmed	04-11	Gowreesan, Vamadevan	23-04
Ghorpade, Ritesh	03-02	Goyal, Vipul	09-01, 33-05
Ghosh, Ranajay	02-03, 05-01, 27-05	Graff, Joris	05-02
Ghosh, Sayan	28-01, 39-03	Graiff, Mattia	38-02
Ghoshal, Anindya	02-02	Graikos, Dimitrios	14-02
Giachalis, Lambros	06-03	Gravante, Steve	20-02
Giachi, Marco	40-03	Gray, Joshua	04-11, 04-15
Gicquel, Laurent	12-06, 24-02, 37-05, 37-10, 43-01	Greco, Michele	24-01
Giel, Paul	35-04	Green, Steven	21-05
Gier, Jochen	35-07	Gregg III, Robert	46-03
Gierlings, Sascha	18-02, 18-06, 18-07	Grein, Roland G.	23-03, 29-02
Gijbels, Sigrid	09-04	Greitzer, Edward	01-02, 34-08
Gillard, Jonathon	33-09	Greschert, René	18-02
Gillaugh, Daniel	30-02, 30-06	Greving, Johannes	37-12
Gillespie, David	36-01	Griffin, Chris	09-01
Gillespie, John	43-03	Griffin, Dan	23-04
Gillman, Wesley	04-11	Grimaldi, Angelo	40-03
Giovannelli, Ambra	24-04	Grimm, Felix	04-16
Giovannini, Matteo	43-03	Grimshaw, Sam	08-01, 34-07
Gipperich, Marius	18-04	Grönstedt, Tomas	01-03, 34-09
Girezzi, Gabriele	23-03	Grothe, Patrick	37-09
Giuliani, Fabrice	04-11, 05-04	Gruber, Andrea	04-06, 04-22
Giusti, Andrea	04-01	Gryllias, Konstantinos	44-01
Giusti, Enrico	30-02	Gu, Chunwei	34-10
Gjika, Kostandin	20-04	Guarnone, Paola	18-04
Gladin, Jonathan	01-04	Guedez Mata, Rafael Eduardo	06-01
Glasenapp, Tobias	12-04	Guemmer, Volker	34-05
Glozier, Mark	35-04	Gulen, John	06-05, 45-02
Goenaga, Frederic	37-02	Gümmer, Volker	05-04, 34-01, 34-05, 39-04
Goessling, Jan	34-04	Gunn, Ewan	01-02, 34-04
Gohl, Jesse	01-01	Guo, Ding	23-04
Göing, Jan	01-03	Guo, Shuai	04-10
Gokaltun, Seckin	25-03	Guo, Tao	05-04, 15-01
Gokhale, Anubhav	37-02	Guo, Tao	23-05
Gokulakrishnan, Ponnuthurai	04-03	Guo, Zhengtao	34-08
Goldin, Graham	04-13	Gupta, Abhay	24-03
Goldmann, Andreas	04-01	Gupta, Bipin	20-01
Goldmeer, Jeffrey	04-18	Gupta, Saarthak	04-11
Golinval, Jean-Claude	30-05	Gütthe, Felix	04-18
Gomez-Gomez, Mateo	05-04	Guthrey, Aaron	09-04
Gong, Yifang	37-09, 37-10	Gutierrez, Nobel	04-03
Gong, Yu	04-06	Gwynn, Daniel	18-01
Gontcharov, Alexandre	18-04		
Gonzalez Cuadrado, David	05-04	H	
Gonzalez, David Cuadrado	05-04	Habisreuther, Peter	04-01
Gopalakrishnan, Harish Subramanian	04-06	Hafizovic, Asim	38-02
Gordon, Ali	27-03	Hah, Chunill	10-04, 34-06, 37-05
Gordon, Robert	04-16	Hain, Rainer	34-06
Gorelik, Michael	18-07, 28-03	Hajiloo, Azardokht	04-06
Gori, Stefano	04-17	Hake, Leander	06-04
Goriachkin, Evgenii	39-04	Hala, Jindrich	34-10
Goßrau, Christian	06-01	Halcoussis, Alexander	34-06
Goswami, Shraman	37-02		

Haldeman, Charles	14-01	Hildebrandt, Andre	40-02
Hall, Cesare	34-02, 34-07	Hillewaert, Koen	34-03, 37-05, 37-06
Hall, Chris	34-08, 37-13, 38-02	Himeno, Takehiro	24-04
Hall, David	01-02	Hiraguchi, Hideo	27-02
Hall, David	34-07	Hirsch, Charles	39-01
Hall, Kenneth	37-12	Hirsch, Christoph	04-04, 04-06
Hallberg, Magnus	37-04	Ho, Chi	06-01
Ham, Frank	04-06	Ho, Yin-Hsiang	11-01
Hammer, Steffen	38-01	Hodges, Justin	43-01
Han, Bo	12-01	Hoesgen, Christian	35-03
Han, Fei	04-05	Hofer, Andrea	04-11
Han, Je-Chin	12-04, 15-02, 15-04, 15-05	Hofer, Douglas	33-03
Han, Meng	04-16	Hofer, Douglas	33-04
Han, Xiao	04-15	Hoffman, Donald	19-01
Hancu, Dan	09-03	Hoffmann, Sven	04-19, 37-03
Hanson, David	15-03	Hofmeister, Thomas	04-06, 04-08
Harbeck, Janneck	21-03	Hohloch, Martina	06-02
Hardalupas, Yannis	04-01	Holcomb, Chad	05-02
Harley, Peter	40-03	Holladay, Ken	01-06
Harris, Kurt	33-05	Hollenbach, Richard	37-12
Harth, Stefan Raphael	04-19	Holycross, Casey	18-06
Haseli, Yousef	33-09	Holz, Simon	37-03
Hastie, Scott	18-04	Hombo, Ryokichi	23-04
Hawkins, Lawrence	29-01	Hong, Jie	18-05, 29-01, 29-02, 30-03
Hayakawa, Akihiro	20-03	Hoode, Michel	17-01
Hayden, Andrew	43-03	Hopfinger, Michael	34-05
Haydt, Shane	15-03	Horikawa, Atsushi	04-13, 04-18
He, Juan	12-02, 15-02	Horner, Matthew	12-05
He, Kun	12-02	Horvath, Jan	19-01
He, Li	24-03	Hosomi, Shoichiro	26-01
He, Qingfu	05-01	Hossain, Md Abir	28-02
He, Xiao	37-05	Houck, Lonnie	18-02, 26-01
He, Youwei	34-04	Howard, Jonathon	10-01
Hefner, Cole	43-03	Hoznedl, Michal	23-02
Hegde, Shreyas	24-02, 24-04	Hsu, Paul	04-20
Heidemanns, Lukas	18-02	Hu, Ping	24-04
Heidmann, James	46-03	Hua, Ouyang	33-01
Heilmann, Gerrit	04-06	Huang, Dade	02-02
Heinrich, Christoph Rocky	30-06	Huang, Huang	37-12
Heitmann, Timo	18-01	Huang, Ming	39-03
Hemchandra, Santosh	04-06, 04-11	Huang, Xiao	18-08
Hendry, Morgan	19-01	Huang, Xiuquan	37-12, 37-13
Henke, Martin	06-02	Huang, Yong	01-01
Henkel, Sebastian	27-02	Huang, Yuefeng	12-02
Henriksson, Björn	27-03	Huang, Yuxi	29-01
Henze, Marc	09-02, 15-01	Hühn, Lisa	18-01
Herbst, Florian	43-01	Hui, Xin	04-19
Hermann, Daniel	40-02	Hunt, David	14-01
Hernández Martin, Daniel	35-07	Hunt, Matt	36-01
Hernandez, Candy	04-14	Hussain, Sadam	12-02
Hernandez, Johnathan	02-03	Hutchings, Jack	34-07
Herrera, Megan	33-02	Hyrka, Yuriy	01-04
Herrig, Tim	18-01		
Hertwig, Tim	20-01		
Hickey, Fassett	07-02	Iannone, Matteo	12-05
Hiernaux, Stéphane	34-07, 39-04	Ibaraki, Seiichi	37-06
Higashimori, Hirotaka	40-02		

Ibrahim, Alaa A.	13-02
Igbong, Dodeye	17-01
Iguchi, Junichi	13-01
Iki, Norihiko	04-18, 20-03
Ikwubuo, Melvin	04-05
Indlekofer, Thomas	04-11
Ingistov, Steve	18-05
Ingram, Grant	01-02
Ingrasciotta, Filippo	23-03
Inhestern, Lukas Benjamin	20-01
Innocenti, Alice	29-01
Innocenti, Luca	12-05, 14-02
Inoue, Takahiko	25-04
Inoue, Takahiro	20-03
Inoue, Tsuyoshi	25-04
Irmak, Firat	18-03, 27-03
Iseli, Elia	20-04
Ishida, Tomohiro	26-01
Ishikawa, Yoshihiro	40-02
Ishimaru, Hidetsugu	25-04
Ishizaka, Koichi	09-05
Ito, Hiroshi	26-01
Iwakiri, Kenichiro	40-02
Iwamoto, Yuma	37-05
Iwasaki, Makoto	23-04, 25-02
Iwrey, Benjamin	34-03
Izadi, Saeed	04-16

J

Jackson, Chris	09-01
Jackson, Richard	14-01
Jafari, Soheil	13-01
Jafarov, Elbrous	01-03
Jäger, Florian	30-04
Jagerhofer, Patrick	12-04
Jakoby, Ralf	09-02
Jani, Hardik	25-03
Jansen, Diethard	04-18
Janssen, Johannes	34-06
Jariwala, Vishal	21-04, 37-06, 40-03
Javaherchi, Teymour	37-11
Javareshkian, Alireza	04-02
Jayaraj, Balaji	18-02
Jefferies, Mark	46-04
Jeffs, Spencer	02-01
Jemcov, Aleksander	34-02
Jena, Ashutosh	18-04
Jenny, Philipp	40-02, 40-04
Jeong, Heechan	35-04
Jeong, Seongyong	27-03
Jeschke, Peter	34-06, 35-03, 40-04
Ji, Min	21-02
Ji, Tianyuan	34-08
Jian, Menghua	04-02
Jiménez-Espadafor, Francisco José	33-07
Jin, Yuan	39-02

Jin, Yui	33-05
Jing, Qi	15-04
Jinguang, Yang	39-03
Johannesdahl, Harri	37-04
John, Alistair	39-02
John, Chew	14-03
John, Tony	04-11
Johnston, Travis	09-01
Joly, Clement	17-01
Jones, Fraser	12-06
Jones, Gavin	28-03
Jones, Scott	13-02
Jones, William	04-06
Jonsson, Isak	34-09
Jordan, Steven	02-01
Jou, Bin	09-03, 09-04, 09-05
Joy, Midhun	42-01
Juangphanich, Paht	13-02
Juarez, Raquel	04-03
Jung, Eui Yeop	15-02
Jung, Olivier	39-02
Juniper, Matthew	04-10
Jurke, Keith-Noah	39-04
Jyoth, Shine	26-01

K

Kabiraj, Lipika	04-08, 04-17
Kadau, Kai	28-02
Kafedzhiyski, Nikola	24-02
Kaiser, Thomas Ludwig	04-07, 04-08, 04-17
Kaizar, Hussain	25-03
Kajita, Hiroshi	21-01
Kamdar, Nitya	34-05
Kameier, Frank	10-03
Kamrath, Benjamin	43-01
Kanazawa, Naoki	24-01, 24-02
Kancherla, R V Manikantachari	04-16
Kane, Kenneth	02-03
Kane, Sean	02-01
Kaneko, Yasutomo	30-07
Kang, Sangkeun	06-03
Kangwang, Haotai	15-02
Kannan, Ashwin	37-03
Kanzaka, Tadashi	37-06
Kapat, Jayanta	03-05, 09-01, 33-05, 33-09, 39-03
Kapilavai, Dheeraj	37-05
Kaptan, Ferhat	30-04
Karagiannopoulos, Solon	11-01
Karalus, Megan	04-13
Karges, Florian	18-01
Karim, Hasan	04-06
Karl, Maximilian	34-10
Karlis, Efsthathios	04-01
Karlsson, Henrik	27-03
Karmarkar, Ashwini	04-04
Kasthuri, Praveen	04-04

Kaszynski, Alex.	30-02, 30-06	Koley, Subhra Shankha.	34-02
Kataoka, Masahito	09-02	Komatsu, Kazuhiko.	09-01
Katcher, Kelsi.	33-04, 33-05, 33-09	Konishi, Eiji.	23-05
Kathrotia, Trupti.	03-01	Konle, Marco.	04-20
Katz, Joseph.	34-02	Kontermann, Christian.	23-04
Kaushik, Tanvi.	37-13	Koomen, Joris.	04-18
Kavvalos, Mavroudis.	31-01	Koos, Bernd.	39-03
Kawano, Masato.	20-03	Koosha, Rasool.	25-03
Keiser, James.	33-03	Koppe, Björn.	34-09, 37-09
Kelecyc, Franklyn.	37-11	Kormanik III, Nicholas J.	34-01
Keller, Marc.	13-03	Korzhnev, Vladimir.	34-04
Kellerer, Rudolf.	18-04	Kothe, Douglas B. (Doug).	46-03
Kelly, Mark.	04-12	Kou, Zhihai.	12-01
Kelly, Sean.	30-02	Koul, Ashok.	18-06, 18-08
Kerr, Thomas.	25-04	Kovalov, Artem.	01-04
Kerrouche, Rami.	25-05	Kowshik, Suhas.	04-10
Keshava Bhattu, Ramesh Chandra Raju.	18-04	Kozlov, Boris.	18-05
Keskin, Akin.	37-03	Kozuka, Mitsuru.	21-01
Kessler, Daniel.	37-02	Kožulović, Dragan.	35-03
Key, Nicole.	34-01, 34-05, 37-06	Kraemer, Karl Michael.	27-02
Khadse, Akshay.	33-05	Kratt, Eugene.	18-05
Khalidi, Abdurrahman.	06-01	Kratz, Jonathan.	05-01
Khandrymailov, Andrii.	01-04	Kraus, Cedric.	04-16
Kharyton, Vsevolod.	30-02, 30-06	Krewinkel, Robert.	11-01, 12-04, 13-01, 15-04, 37-12
Khatri, Rasish.	17-02, 21-01, 29-01, 29-02	Krishnababu, Senthil.	24-02, 34-09, 39-04
Khattar, Rohit.	25-05	Kritioti, Loukia.	40-04
Kidikian, John.	37-02	Kromer, Christian.	13-03
Kielb, Robert.	24-02, 24-04, 37-12	Kroniger, Daniel.	04-13
Kill, Norbert.	29-02	Krouse, Charles.	01-03, 01-06, 27-03
Kim, Baik Jin.	29-02	Krumencker, Erin.	04-06
Kim, Gihun.	03-02	Krummrein, Thomas.	06-02
Kim, Jeongwon.	04-11	Kubo, Kosuke.	40-02
Kim, Jongsoo.	29-01	Kuestner, Christoph.	39-04
Kim, Sung In.	27-02, 37-04, 40-01	Kühhorn, Arnold.	39-01
Kim, Taehyun.	15-02	Kulhanek, Chris.	33-04
Kim, Taewoan.	27-03	Kulkarni, Davendu.	37-10
Kim, Youn-Jea.	01-02, 03-04	Kulkarni, Sagar.	04-10
King, Rudibert.	05-01	Kulkarni, Sameer.	34-10
Kipouros, Timos.	39-02	Kumar, Amit.	34-06
Kiracofe, Daniel.	26-01	Kumar, Madhan.	35-03
Kirka, Michael.	18-05	Kumar, Rajesh.	02-01, 02-02, 02-03
Kishimoto, Tsuyoshi.	04-13	Kumar, Sanju.	26-01
Kislat, Oliver.	04-16	Kung, Steven.	33-14
Kitada, Hiroki.	30-04	Kunkel, Christian.	34-10
Kiyici, Firat.	04-02	Kunz, Robert.	15-03
Klaerner, John.	21-01	Küpper (Tombul), Ugur.	18-02
Klassen, Mike.	04-12, 17-03	Kurata, Osamu.	04-18, 20-03
Klaus, Klaus.	21-04	Kurimura, Takayuki.	23-01
Klausmann, Jan.	40-02	Kurstak, Eric.	30-06
Klein, Manfred.	17-03	Kurths, Juergen.	04-10
Kluß, David.	11-01	Kurz, Rainer.	08-01, 21-01, 21-02, 21-03, 21-04, 21-05, 21-06
Kobayashi, Hiroaki.	09-01, 20-03	Kushwaha, Abhishek.	04-04
Koch, Christian.	36-01	Kusterer, Karsten.	04-18
Koch, Rainer.	04-19, 37-03	Kutkan, Halit.	04-13
Kodama, Hidekazu.	35-01	Kutne, Peter.	04-16, 06-02
Koerber, Kai Willem.	37-09, 39-04	Kwon, Hyungkuk.	04-06
Köhler, Markus.	03-01	Kwon, Seong.	27-02, 37-04

Kwon, Sunyong	18-04
Kyprianidis, Konstantinos	01-01, 01-09
Kyte, Simon	21-03

L

Laagland, Geert	46-02
Lachenmaier, Nicolas	40-01
Lacoste, Deanna	07-01
Laera, Davide	04-08
Lahiri, Claus	04-07
Laijie, Chen	33-01
Lakner, Thomas	18-02
Landfester, Christian	12-04
Landry-Blais, Alexandre	15-03, 20-03
Landwehr, Markus	18-05
Laney, Scot	34-08
Lange, Martin	34-09, 37-09
Langella, Ivan	04-17
Langone, Leonardo	04-19
Larfeld, Jenny	04-23
Larfeldt, Jenny	04-17, 04-22
Lariviere, Brian	33-03
Larosiliere, Louis	21-04, 37-06
Larsson, Jonas	35-07
Laskaridis, Panagiotis	06-05
Laskowski, Greg	12-06, 46-03
Lavagnoli, Sergio	35-01
Lavrentyev, Yury	25-05
Lawson, Seth	12-04, 33-07
Lazovik, Elena	05-02
Lazzaretto, Andrea	10-01
Le, Quang	30-07
Lebret, Yann	39-02
Lee, Byung Joon	34-03
Lee, Changyong	15-02
Lee, Hanjie	11-01
Lee, Jaehyoung	34-05
Lee, Jinwook	34-08
Lee, Jong Guen	04-02, 04-05
Lee, Muhyoung	27-03
Lee, Sangkeun (Matt)	09-01
Lee, Seungmin	27-03
Lee, Sungryong	34-05, 34-10
Leggett, John	34-03, 37-09
Lei, Jiang	15-04
Leichtfuß, Sebastian	20-02
Lejons, Marcus	34-09
Lengani, Davide	43-03
Lenzi, Tommaso	11-01, 13-01
Leonard, Thomas	40-01
Lepicovsky, Jan	34-10
Leren, Eystein	04-22
Leung, Ho Yin	04-01
Li, Bo	33-09
Li, Fang	12-04, 18-03
Li, Guangchao	12-01

Li, Guo	27-02
Li, Jia	34-06
Li, Jihang	04-06
Li, Jun	12-04, 12-06, 13-02, 14-03, 5-01, 23-01, 25-01, 33-09, 39-03
Li, Lin	30-03, 30-04
Li, Longbiao	02-01
Li, Quankun	27-05
Li, Tielei	19-01
Li, Xuesong	34-10
Li, Xueying	15-01
Li, Yan Sheng	35-04
Li, Yifei	37-11
Li, Yiguang	05-04
Li, Yiqing	04-02
Li, Yuanfu	06-01
Li, Yuefeng	15-05
Li, Yunzhu	24-04
Li, Yurun	43-02
Li, Zhigang	13-02, 14-03, 15-01, 23-01, 25-01, 33-09, 39-03
Li, Zhiyu	13-02
Lian, Bo	24-04
Lian, Zengyan	14-03
Liang, Tianyu	18-05
Liao, Mingfu	27-05
Lieuwen, Timothy	04-00, 04-08, 04-11, 04-20, 09-01, 09-02
Lim, Chansun	33-05
Lim, Jamie	09-01
Lim, Jay	09-04
Lim, Shyang Maw	43-03
Lim, Sungkyung	34-05
Lin, Cheng-xian	04-14
Lin, Yuzhen	04-15, 04-16
Lindbaeck, Martin	37-04
Lingstädt, Timo	06-02
Lionis, Ioannis	06-03
Liśkiewicz, Grzegorz	38-01
Litrice, Giuliana	04-03
Litt, Jonathan	05-01
Liu, Chuankai	13-03
Liu, Cunliang	15-01
Liu, Guang	14-03
Liu, Jeremy	17-02, 21-01
Liu, Jiahua	01-04
Liu, Jong	12-01, 15-05
Liu, Jong-shang	37-04
Liu, Jun	12-03
Liu, Ming-Hou	12-03
Liu, Qiang	34-02
Liu, Tangzhu	37-11
Liu, Tianyuan	23-03, 23-04, 24-04, 33-02
Liu, Tingting	06-02
Liu, Weijie	04-04
Liu, Weitao	04-19
Liu, Xuebin	12-06
Liu, Yao-Hsien	15-05
Liu, Yingzheng	12-02

Liu, Yong	09-01	Magin, Philip	39-01
Liu, Yuchao	15-01	Magina, Nicholas	04-10
Liu, Yunfeng	01-01	Magri, Luca	04-09, 04-14
Liu, Zhao	12-04	Magrini, Andrea	37-13
Liu, Zhenxia	04-19	Mahdi, Tanjheel	18-01
Liu, Zhufeng	15-04, 25-05	Mailach, Ronald	28-01, 34-09, 37-09, 39-01, 39-03
Lo Presti, Federico	37-12	Maiorova, Anna	04-15
Loboda, Igor	05-01, 05-02, 05-03, 05-04	Makhija, Amit	04-20
Lock, Gary	14-01, 14-02	Malarco, Martina	03-05
Loftus, Peter	05-03	Malavasi, Massimo	03-04
Lopez, Diego	34-10	Maley, Susan	09-01
Lorence, Christopher	46-03	Man, Daniel	35-04
Losi, Enzo	21-02	Manfredi, Marco	06-04
Lou, Fangyuan	34-01, 34-05, 37-06	Manganelli, Matteo	21-04
Louw, Francois	10-01	Mann, Sebastian	37-13
Lowden, Paul	18-04, 18-08	Manservigi, Lucrezia	21-02
Lowe, Todd	43-03	Mansour, Mahmoud	37-10, 37-11
Lozano, Francisco	05-04	Mantelli, Luca	06-02
Lu, Gan	37-10	Mantilla, Weimar	06-01
Lu, Hai-Ying	12-03	Marc, Dijoud	30-07
Lu, Xueliang	25-01	March, Martin	04-04
Luan, Wenlin	25-06	Marconcini, Michele	40-03
Luan, Xiaochi	24-01	Marelli, Silvia	06-02, 20-04
Lück, Sebastian	01-03, 20-01	Mariah, Ian	38-02
Lückoff, Finn	04-07	Marin, Flavio	21-04
Ludwig, Norbert	39-01	Marini, Alessandro	04-07
Luebbe, Bertold	23-02	Marinovici, Laurentiu	27-05
Luessen, Peter	09-03	Marion, John	33-03
Lundgreen, Ryan	36-01	Marquis, Andrew	04-06
Luo, Jian	02-02	Marragou, Sylvain	04-23
Luo, Jingjing	25-05	Marshall, Michael	33-02, 33-05, 33-18
Luo, Xiang	01-04	Martelli, Emanuele	33-08
Luo, Zhusan	29-02	Martin, Benjamin	43-01
Lupini, Andrea	30-02	Martinelli, Giulio	05-02
Luque Martinez, Salvador	35-07	Martinez-Botas, Ricardo	37-06, 40-01
Luxa, Martin	34-10	Martínez, Gonzalo S.	33-07
Lynch, Stephen	12-05, 35-03	Martorana, Gianfranco	05-01
Lysytsia, Oleksii	01-04	Marty, Julien	35-04
M		Marwan, Norbert	04-10
Ma, Haoye	30-03	Mashuga, Chad	04-03
Ma, Hongwei	34-09	Masi, Massimo	10-01, 10-02
Ma, Jiayi	19-01	Mason, John	46-02
Ma, Yanhong	18-05, 29-01, 29-02, 30-03	Mastropierro, Francesco Saverio	01-04
Maccarini, Simone	33-07	Mathieu, Herran	30-07
Macchi, Ennio	07-01	Mathieu, Olivier	04-03
Maceli, Nicola	23-05	Mathioudakis, Konstantinos	20-02
Macmanus, David	01-03	Mathison, Randall	08-01, 12-01, 12-03, 15-04, 15-05
Macoretta, Giuseppe	30-02	Matsumoto, Kazuyuki	23-04
Madasseri Payyappalli, Manas	43-02	Matsunuma, Takayuki	20-03
Madden, Andrew	24-04	Matthews, Austin	09-02
Maddila, Sriharsha	04-05	Matthews, Douglas	34-01
Madhavan, Srivatsan	15-04	Maurer, Michael	04-15
Mæland, Dagfinn	21-01	Mauricio, Alexandre	44-01
Magerramova, Liubov	18-05	Mavris, Dimitri	01-04
Maggi, Andrea	23-03	Maxwell, Ross	34-04
		Mayer, Sebastian	18-05
		Mayer, Thomas	23-04

Mayorca, Maria	24-02	Misul, Daniela Anna	12-01
Mazzali, Carlo	25-02	Mito, Ryosuke	34-09
Mazzei, Lorenzo	04-14, 11-01, 13-01, 13-02, 13-03, 14-01, 14-02	Mitra, Mainak	30-05
Mc Donell, Vincent	04-01, 04-05, 04-14, 04-17	Mitsunori, Isono	04-11
McAuley, Greg	18-04	Miura, Toshimasa	24-01, 24-02
McBain, Marybeth	21-01	Miyauchi, Kotaro	09-02
Mcbean, Ivan	23-03	Miyazawa, Hironori	09-01
McCartney, Michael	04-10	Moazari Sukeri, Syafeq	21-04
Mccay, Mary	02-03	Mock, Clara	02-02
McClain, Stephen	15-03	Moeck, Jonas	04-06, 04-09
Mccleney, Amy	21-01	Moffat, Andrew	27-02
McClintic, John	12-01, 12-05	Mogullapally, Venkateshwarlu	26-01
Mcclung, Aaron	07-03, 33-03	Mohamed, Ahmed	04-12
McClure, Jonathan	04-08	Mohamed, Rasidi	21-04
Mcgilvray, Matthew	36-01	Mohankumar, Ben	34-07
Mcgowan, Ryan	20-01, 25-05, 25-06	Mollahosseini, Khosro	12-05
McLaughlin, Laura	40-04	Mondal, Sudeepta	39-03
McManus, Keith	04-15	Monelli, Bernardo Disma	30-02
McNichols, Ezra	13-02, 37-04	Monge-Concepcion, Ivan	14-02
Medic, Gorazd	37-10	Mongillo, Dominic	12-05, 15-03
Meeks, Ellen	04-03	Montero Carrero, Marina	06-02
Mehdi, Ghazanfar	04-01	Montes-Sánchez, Jesús	07-01
Meindl, Maximilian	04-09	Montomoli, F.	39-02
Mela, Elisa	18-04	Montomoli, Francesco	37-04
Melani, Pier Francesco	44-01	Moon, Hee Koo	15-02
Melino, Francesco	17-01, 17-02	Moore, Jacob	12-03
Meloni, Roberto	04-13, 04-17	Moore, Jeffrey	33-03, 33-04, 33-08
Mendoza, Robert	21-04	Moore, Kenneth	13-03
Menegozzo, Luca	37-13	Morales, Javier	19-01
Menon, Nandana	18-01	More, Shubhali	34-06
Menon, Suresh	03-02	Moretto, Mauro	09-05
Merli, Filippo	38-02	Morini, Mirko	21-04
Mesny, Alex	35-04	Moroz, Leonid	01-04
Methling, Torsten	03-01	Morreale, Bryan D.	46-04
Metz, Kolja Andrej	40-02	Morris, Scott C.	34-02
Meyer, C. J.	10-01, 10-02	Morrison, Gerald	37-11
Meyer, Marcus	37-13, 39-01, 39-03	Morrison, Richard	40-01
Meyer, Terry	05-04	Morscher, Dr. Gregory N.	02-02
Meyer, Thomas	10-02	Morscher, Gregory	02-02
Michelassi, Vittorio	23-01	Mortazavi, Farzam	29-01
Miduturi, Krishna	04-19	Mortzheim, Jason	33-02, 33-03, 33-04
Mihaescu, Mihai	43-03	Mosca, Roberto	43-03
Mihalyovics, Jan	05-01	Mouriaux, Sophie	34-03
Miheev, Maxim	34-01	Moutamassik, Youssef	10-03
Miki, Kenji	43-01	Mu, Yong	04-03
Mileshin, Victor	34-04	Mühlenbrock, Stefan	40-01
Miller, Rob	34-01, 34-08, 37-02	Müller, Gunther	12-04
Milliken, Andrew	28-01, 28-03	Müller, Jens S.	04-07
Milton, Joseph	09-01	Müller, Ulf Christian	08-01
Min, Zhang	39-03	Muller, Yannick	39-03
Min, Zheng	13-02	Munz, Oliver	18-01
Minamino, Ryota	20-02	Murat, Oguzhan	23-03
Mirhashemi, Arman	13-02	Murata, Kenichi	23-04
Mirzamoghadam, Alexander	13-01, 14-02, 23-01	Murugan, Muthuvel	02-02
Mischo, Bob	40-01	Musacchio, Alessandro	03-05, 03-06
Misirlis, Dimitrios	06-03	Musgrove, Grant	20-01, 20-03, 27-03
Mistry, Chetankumar	34-06	33-08, 33-14, 33-18, 37-06

Mütschard, Silas	34-10
Myers, Geoffrey	04-15
Mykhailenko, Taras	01-04

N

Nag, Pratyush	09-01, 09-03
Nagata, Nobuhiro	23-04
Nagel, Marc	39-01, 39-03
Nageswara Reddy, Pereddy	06-03
Nagy, Douglas	18-04, 18-05, 18-08
Naik, Chitralkumar	04-03
Naik, Shailendra	09-02, 13-02, 15-01
Najeeb, Ovais	21-01
Nakajima, Tsutomu	25-02
Nakakita, Kazuyuki	25-02
Nakamura, Sosuke	09-02
Nakayama, Kentaro	24-01, 24-02
Nakod, Pravin	04-13, 04-14
Nakos, Alex	30-01
Nalianda, Devaiah	03-05
Nallamothe, Sravan Kumar	01-04
Narra, Venkat	04-06
Narzary, Diganta	23-04
Nassini, Pier Carlo	04-17
Natale, Nunzio	34-04
Naumann, Clemens	03-01
Navarro, Roberto	20-02
Nazik, Onur	18-01
Neri, Paolo	30-02
Nettis, Leonardo	23-02
Neu, Richard	27-05
Neveu, Joshua	07-02, 33-03
Newton, Christopher	02-01
Ngugi, John Mburu	03-01
Ni, Siliang	04-04
Nicchiotti, Gianluca	05-04
Nichols, Bradley	25-03
Nicholson, Pascual	02-01
Nickol, Jeremy	12-01, 15-05
Nicolosi, Francesco	20-03
Niehuis, Reinhard	35-01, 37-04, 40-02
Nielson, Jordan	33-04
Nieto, Andy	02-02
Niewöhner, Jens	40-01
Nigro, Rémy	39-01
Nikolaidis, Theoklis	01-01, 01-03, 13-01
Nikpey Somehsaraei, Homam	06-02
Nirmalan, Nirm	12-02
Nishida, Shingo	25-02
Nishiimi, Takashi	09-02
Nix, Andrew	01-01, 11-01, 16-01
Noble, Bobby	01-06
Noble, David	04-18, 09-01
Noiray, Nicolas	04-04
Nolcheff, Nick	34-01
Nollet, Michel	01-03

Nor, Azman	21-02
Notaristefano, Andrea	43-01
Noun, Mark	24-02
Nozhnitsky, Yury	25-05
Ntonas, Konstantinos	20-02
Nürnberg, Dirk	46-03
Nylander, Pär	35-07
Nyssen, Florence	30-02, 30-05

O

O'Connor, Jacqueline	04-00, 04-04, 04-06, 46-04
O'neal, Devin	27-03
O'nora, Nathan	27-03
Oberleithner, Kilian	04-04, 04-07, 04-08, 04-17
Obhuo, Ibirabo	17-01
Obhuo, Mafel	17-01
Odemondo, Vittorio	12-05
Odenbach, Stefan	23-03
Odier, Nicolas	12-06, 37-05, 37-10, 43-01
Ogawa, Shinji	20-01
Oh, Joseph	29-02
Ohara, Hirofumi	09-02
Ohta, Yutaka	43-02
Okada, Koichi	04-13
Okada, Kunio	04-18
Okamoto, Koji	37-05
Okita, Yoji	13-01
Oliani, Stefano	37-04, 37-09
Oliva, Andrew	34-02
Oliver, Todd	12-05, 12-06
Omura, Naoto	25-02
Orchini, Alessandro	04-02, 04-08, 04-09
Orsini, Lorenzo	14-02
Orsino, Stefano	04-13, 04-14, 37-03
Ory, Emmanuel	20-03
Osako, Masaki	23-05
Oskam, Gareth	04-14
Osusky, Michal	37-05
Otero, Michelle	04-05
Ott, Peter	15-01
Ottavy, Xavier	34-01, 34-09
Otter, John	06-04
Otto, Marcel	03-05, 33-05
Ouyang, Hua	30-07, 38-01
Owen, John Michael	14-01
Oztarlik, Gorkem	04-23

P

Paccati, Simone	04-14, 11-01
Pachidis, Vassilios	01-01, 01-09, 05-03, 06-03
Padmanabha, Govinda A.	28-01
Page, Gary	04-07
Page, Stephane A.	05-04
Pähr, Judith	04-15
Palanti, Lorenzo	04-03
Palazzolo, Alan	29-01, 29-02

Paletta, Nicola	34-04	Perrone, Andrea	40-04
Pampaloni, Daniele	04-07	Persico, Giacomo	33-01, 35-03, 44-01
Pan, Tianyu	34-02, 43-02	Perullo, Christopher	09-01
Panakarajupally, Ragav P	02-02	Pesatori, Emanuel	33-07
Panda, Satyajit	24-03	Peters, Andreas	42-01
Pandey, Maneesh	03-04	Peters, Benjamin	14-02
Pandita, Piyush	28-01	Petersen, Eric	04-03, 04-12
Pandya, Parth	20-02	Petersen, Nils	06-01
Pandya, Shishir	01-02	Petersen, Timm	18-02
Paniagua, Guillermo	05-04, 06-03, 45-03	Petit, Blanca	07-01
Panigrahy, Snehasish	04-12	Petkovic, Djordje	34-03
Pankov, Sergey	34-04	Petronello, Phyllis	19-01
Panning-Von Scheidt, Lars	30-04, 30-06	Petrov, Evgeny	30-02, 30-04, 30-07
Paone, Fabrizio	12-05	Petrov, Nikolay	25-05
Papadogiannis, Dimitrios	34-07, 37-05	Petrovic, Milan	34-03
Pappa, Alessio	06-02, 20-03	Petry, Nico	24-03, 30-06
Parbat, Sarwesh	13-02	Pettinato, Brian	21-02, 21-04
Park, Jongyoon	27-02, 37-04	Petukhov, Illia	01-04
Park, Jun-Sang	02-03	Pfaeffle, Franziska	04-13
Pascenti, Matteo	06-04	Pfitzner, Michael	04-20, 12-01
Paschereit, Christian Oliver	04-02, 04-07, 04-08, 04-17, 04-18	Phan, Hien	24-03
Paspulati, Amit	25-05	Picard, Benoit	02-03, 20-03
Passmann, Max	06-04	Picard, Mathieu	02-03, 15-03, 20-03
Patchigolla, Kumar	33-09	Picchi, Alessio	11-01, 12-05, 13-01, 14-01
Patel, Himanshu	26-01	Pidaparti, Sandeep R	33-07
Patel, Shivam	04-20	Pignone, Enrico	05-01
Paternostro, Luigia	07-01	Pileggi, Paolo	05-02
Patil, Abhay	21-05, 37-11	Pillai, Rishi	33-03
Patil, Sunil	04-14, 37-12	Pimentel, Rogerio	01-02
Patinios, Marios	12-04	Pineda Molina, Victor Manuel	05-02
Patinios, Marios	38-02	Pinelli, Lorenzo	24-03
Patterson, Jeffrey	19-01	Pinelli, Michele	10-02, 21-01, 21-02, 21-03, 21-04, 37-04, 37-09
Patwardhan, Sourabh	04-13	Pini, Matteo	23-01, 39-02
Paul, Dominik	20-02	Pint, Bruce A	02-03, 33-03
Paulitsch, Nina	04-11, 05-04	Piot, Estelle	35-04
Pavithran, Induja	04-10	Piras, Fabrizio	23-03
Pawar, Samadhan A	04-04	Pistone, Alessandro	05-01
Paynabar, Kamran	14-02	Plante, Jean-Sébastien	02-03, 20-03
Peitsch, Dieter	05-01, 43-03	Podeur, Maxime	40-03
Pellegrini, Alvis	01-03	Pohl, Daniel	34-06
Peltier, Vincent	14-03	Polanka, Marc D	04-14
Pelton, Robert	33-01	Polifke, Wolfgang	04-09, 04-10, 04-23
Peng, Cheng	28-01	Polklas, Thomas	23-03
Peng, Di	12-02	Poncet, Sébastien	01-04
Peng, Zhigang	38-01	Ponduri, Sai Phani Keerthan	04-05
Penin, Loic	39-02	Pongetti, Julie	39-02
Pennacchi, Paolo	25-04, 29-01	Ponnuraj, Balakrishnan	37-10
Pennell, Douglas	04-15	Pope, Aaron	34-02
Pepi, Marc	02-02	Popov, Grigorii	34-01, 39-04
Peral, David	11-01	Porro, Emanuele	18-04
Perchanok, Mat	20-02	Portnoff, Marc	33-08
Percin, Mustafa	04-02	Post, Pascal	37-12
Perejon, Antonio	07-03	Postell, Matthew	26-01
Peretto, Antonio	17-01, 17-02	Pountney, Oliver	14-01, 35-04
Pérez Arroyo, Carlos	37-10	Pozarliik, Artur	03-01
Perez Rubio, Luis David	23-01	Prabakar Sargunaraj, Manoj	03-05
Pérez Ruiz, Juan Luis	05-02	Prabhudharwadkar, Deoras	07-01

Pradeep, A M	06-04, 34-06, 43-02
Preibisch, Stefan	23-01
Presby, Michael	02-01, 02-02, 02-03
Pretorius, Johannes	10-01
Priebe, Stephan	33-03
Proctor, Robert	13-03
Prots, Andriy	39-01
Przytarski, Pawel	37-09
Pu, Jian	12-03
Puente Morales, Andoni	35-07
Puetz, Oliver	23-02
Purwar, Naman	04-09
Putra, Bima	03-01

Q

Qi, Junyu	44-01
Qin, Ning	30-06, 39-02
Qiu, Tian	14-03
Quach, San	12-05, 15-03
Quaegebeur, Samuel	30-06
Quiñonez Arce, José Ramón	04-15

R

Raddatz, Mario	27-02
Radnic, Tomas	34-10
Raghavan, Seetha	02-03, 27-05
Rajan, Yash	06-04
Rajasekaran, Ramesh	27-05
Rajendran, David John	01-01
Rajidi, Shashidhar Reddy	24-03
Rajoo, Srithar	40-01
Raju, Nandhini	33-05
Ramaglia, Alessandro	06-05
Ramakrishnan, Kishore Ranganath	05-03, 14-01
Ramaswamy, Vaishnavi	34-08
Ramesh Babu, Harish	27-02
Ramesh, Sridharan	15-03, 33-02
Ramey, Brock	09-02
Ramirez Hernandez, Astrid	03-01
Ramotowski, Michael	04-12, 04-14
Rankin, Brent	04-16
Rao, Nikhil	23-04
Rao, Rashmi	26-01
Rattigan, Wayne	03-02
Ratto, Luca	40-04
Ratz, Johannes	20-02
Ravelli, Silvia	03-03, 12-01
Ray, Asok	39-03
Reale, Fabrizio	20-03
Reese, Hauke	01-01
Reggio, Federico	06-04, 20-04
Reggio, Marcelo	37-02
Reichel, Thoralf G.	04-08, 04-17
Reichert, Arnd	14-03
Reinker, Felix	06-04
Reiß, Frank	04-15

Ren, Jing	15-01
Ren, Min	15-01
Ren, Ran	14-03
Ren, Xiaodong	34-10
Renner, Julian	04-04
Renuke, Avinash	06-04
Renzi, Massimiliano	20-03
Reumschüssel, Johann Moritz	04-02, 04-17
Rezasoltani, Mohsen	05-03
Rezvani, Reza	04-20
Rezzag, Taha	03-01, 04-16
Riahi, Adil	03-05
Riazantsev, Sergei	04-15
Ricci, Gianluca	40-04
Riccio, Giovanni	04-07
Richardson, Edward	37-09
Richter, Christoph H.	27-05
Richter, Sandra	03-01
Rida, Samir	04-03, 04-20, 43-01
Rider, Courtney	01-02
Riebl, Sebastian F.	37-04
Riedel, Uwe	03-01
Riepe, Jan	18-04
Riguzzi, Fabrizio	21-02
Rimpel, Aaron	07-03, 33-04
Rinn, Jörg	09-02
Rispoli, Franco	10-02, 36-01, 44-01
Rizzi, Dario	07-01
Robak, Chris	14-02
Robens, Sebastian	34-05, 34-10
Roberts, William	07-01
Robinson, Douglas	40-02
Rodríguez De Arriba, Pablo	33-07
Rodriguez, Benoit	34-03
Rodríguez, Bryan	25-04
Rognø, Hege	04-22
Rolt, Andrew	03-05
Romei, Alessandro	33-01
Römer, Ulrich	39-04
Romero Vega, Pedro	04-06
Rompokos, Pavlos	03-05
Rootliep, Tim	01-03
Rop, Peter	39-03
Rosafio, Nicola	12-01
Rose, Becky	34-04
Rosic, Budimir	23-03, 37-04
Rossi, Andrea	24-04
Rotenberg, Maxime	14-01
Rouina, Samaneh	12-05
Roumeliotis, Ioannis	01-04, 06-03
Roy, Arnab	15-03, 33-02
Roy, Sukesh	04-20
Roychowdhury, Sushovan	27-03
Rozendaal, Alexander	24-03
Ruan, Yougang	15-05
Rubechini, Filippo	43-03
Rubini, Dylan	37-04

Rudrapatna, Nagaraja	04-18, 11-01
Ruggiero, Eric	, 12-01, 12-02, 16-01, 47-02
Ruiz, Sebastian	17-02
Rule, David	18-01
Runyon, Brian	18-03, 26-01
Runyon, Jon	, 04-16
Russhard, Peter	05-03
Russom, Dennis	19-01
Rusted, Alexander	35-03
Rutledge, James	, 12-01, 12-02, 15-04

S

Saanum, Inge	04-17
Saari, Henry	33-14
Saccenti, Paolo	10-02
Sadees, P	35-03
Saha, Abhishek	04-10
Sahin, Izzet	15-04
Sahu, Amrit Bikram	04-12
Sakai, Naoto	24-01, 24-02
Sakakibara, Noriyuki	23-01
Sal, Sinan	01-03
Saladino, Anthony	30-07
Salaudhin, Sheikh	04-05
Salave, Harshal S.	03-03
Salnikov, Anton	39-04
Salomon, Julian	01-03
Salpingidou, Christina	06-03
Salvadori, Simone	06-03, 12-01
Samad, Abdus.	35-03
Samarasinghe, Janith	, 04-11
Sammak, Majed	06-01
San Andrés, Luis	25-01, 25-02, 25-03, 25-04, 25-06
Sanchez, David	06-04, 07-01, 07-02, 07-03, 33-07, 33-18
Sanchez, Luis	02-01
Sandberg, Richard	34-03, 35-01, 37-09
Sander, Tobias	04-20
Sangan, Carl	14-01, 14-02, 35-04
Sanghera, Bhupinder Singh	39-02
Sanguineti, Marco	40-04
Sani, Alessandro	23-03
Sannino, Raniero	20-03
Saraswat, Ayush	34-02
Sarawate, Neelesh	13-03
Sarhan, Freddie	17-02, 21-01
Sasao, Yasuhiro	23-05
Sato, Hideaki	23-05
Sato, Kenji	04-22
Sato, Masayuki	09-01
Sattelmayer, Thomas	04-02, 04-04, 04-06, 04-08
Saumweber, Christian	12-01
Saurabh, Aditya	04-08, 04-17
Savanovic, Teodora	34-03
Saxena, Priyank	03-02, 03-03, 04-17, 06-01
Saxena, Saumitra	07-01
Sayma, Abdulnaser I.	33-02

Scarso, Stefano	36-01
Schaefer, Herbert T.	27-05
Schaefer, Felicitas	04-09
Schaefflein, Lukas	04-20
Schäffer, Christian	05-04
Schatz, Markus	21-03
Schiffer, Heinz-Peter	20-02, 34-10
Schiffmann, Jürg	20-04, 25-06
Schiller, Sven	18-05
Schmitt, Joshua	03-04, 33-04
Schraknepper, Daniel	18-02
Schraper, Sven	39-01
Schubert, Tobias	35-01
Schubring, Scott	21-01
Schuchard, Lukas	28-01
Schuermans, Bruno	04-08
Schuller, Thierry	04-04, 04-07, 04-23
Schultz, Julius	39-04
Schulz, Oliver	14-03
Schuster, Sebastian	17-01
Schwagerus, Alexander	04-01
Schwarz, Carl	29-02
Schwitzke, Corina	13-03, 14-03
Scobie, James	14-01, 14-02, 14-03, 35-04
Scott-Emuakpor, Onome	18-03, 18-06, 26-01
Seachman, Steven	09-01
Searle, Matthew	15-03, 33-02
Seelbach, Tobias	18-02
Segawa, Kiyoshi	23-05
Seiler, Martin	40-01
Seimann, Martin	18-02
Seki, Ryosuke	34-09
Sekrani, Ghofrane	01-04
Seksinsky, Drue	04-06
Selivanov, Alexander	30-01
Selle, Laurent	04-23
Sembritzky, Marwick	37-12
Sengupta, Ushnish	04-10
Senoo, Shigeki	, 23-02
Seo, Junhyuk	34-10
Serebriakov, Nikolay	30-01
Sergi, Thomas	08-01
Serra, Angela	03-02, 03-03, 03-05, 03-06
Sesha Giri, Krishna	04-20
Seshadri, Satyanarayanan	23-01
Sethi, Bobby	03-02
Seume, Joerg R.	34-04, 39-04
Sforzo, Brandon	, 04-01, 04-05
Sha, Yundong	24-01
Shah, Parthiv	, 01-09
Shahpar, Shahrokh	30-06, 34-10, 39-02
Shalash, Karim	, 25-04
Shamma, Mohamed	04-19
Shanbhogue, Santosh	04-11
Shankaran, Sriram	37-05
Shao, Hongyi	12-02
Shao, Zengde	27-05

Sharkey, Patrick	04-13	Somu, Srinath	07-01
Sharma, Himanshu	27-05	Song, Jaewook	34-10
Sharma, Om	16-01	Song, Jinkwan	04-02, 04-05
Sheridan, Luke	18-03	Song, Liming	12-04, 12-06, 33-09, 39-03
Shi, Chenglong	29-02	Song, Peng	34-04
Shi, Mingxuan	01-04	Song, Seung Jin	34-05, 35-04
Shi, Xin	43-02	Song, Wei	15-05
Shiau, Chao-Cheng	12-04	Song, Zhihang	10-03
Shifler, David	19-01	Sorce, Alessandro	06-01
Shimura, Masayasu	04-11	Sous, Florian	18-01
Shin, Dongwon	09-01	Souverein, Louis	39-02
Shin, Hyoun-Woo	34-05	Spadacini, Claudio	07-01
Shinde, Sachin	27-03	Spakovszky, Zoltán	34-08, 45-01
Shridhar, Sumukha	04-10	Sparks, Lawrence	09-04
Shrivastava, Sourabh	04-14	Spataro, Giuseppe	04-19
Shuai, Yang	39-03	Spataro, Rosario	08-01
Shun, Lee	04-06	Speck, Konstantin	05-04
Shyam, Vikram	13-02	Spence, Stephen	40-01
Sibilli, Thierry	03-05	Spencer, Robert	37-09
Sidhu, Satpreet	01-02, 34-02	Sperling, Spencer	12-01, 15-05
Sieker, Tobias	07-01	Spinelli, Andrea	06-04
Sielemann, Michael	01-01, 42-01	Spoor, Philip	07-01
Siewert, Christian	23-04, 29-02	Sridharan, Arunkumar	06-04
Sikorski, Ruth	04-20	Stack, Pdraig	02-03
Silva, Camilo F.	04-09, 04-10	Staempfli, Matthias	18-04
Silvestri, Paolo	06-02, 20-04	Staffelbach, Gabriel	24-02
Simon, Donald	05-01, 05-02	Stafford, Gabriel	15-03
Simone, Domenico	36-01	Staggl, Marian	38-02
Simoni, Daniele	43-03	Stanley, Ashlynn	02-01
Simpson, Alistair	27-02	Stanley, Felix	30-06
Simpson, Harry	37-13, 38-02	Stapelfeldt, Sina	24-03
Simpson, Timothy W.	18-01	Starke, Andre	40-01
Simurda, David	34-10	Stasenko, David	23-04
Singh Tanwar, Bhanu Pratap	34-06	Stathopoulos, Panagiotis	04-18
Singh, Ajey	34-06	Staudacher, Stephan	36-01
Singh, Deepanshu	31-01	Staufer, Max	04-07
Singh, Jaskirat	30-07	Steele, Robert	09-01, 09-04
Singh, Prashant	12-02, 12-06, 15-01, 15-02, 15-04, 15-05	Steele, Robert	09-04
Sinha, Alok	26-01	Steele, William C.	03-03
Siroka, Shawn	14-02, 31-01, 35-03	Steff, Klaus	30-06
Sivić, Sani	15-03	Stein, Alex	23-01, 35-01
Sjögren, Oliver	01-03	Stein, Zachary	27-05
Skamniotis, Christos	27-02	Steiner, Ivo	08-01
Skinner, Travis	02-01	Stelzner, Björn	04-05
Slottner, Pontus	18-03	Stephan, Bruno	09-02
Slusarz, Michel	12-06	Stephens, Mark	34-02
Sluyter, Greg	37-05	Stewart, Calvin M.	18-05, 18-06, 27-03, 28-02
Smith, Ellen	20-01	Stopford, Phil	04-13
Smith, January	20-01	Stottrop, Michael	25-03
Smith, Joshua	05-01	Stowe, Robert	01-02
Smith, Natalie	07-03	Straccia, Mattia	39-04
Smith, Paul	23-04	Strakey, Pete	33-08
Smith, Raub	09-02	Straub, Douglas	15-03, 17-01, 33-02
Smyth, Jonathan M.	37-02	Strauch, Matthias	23-01
Snijders, Ron	05-02	Straußwald, Michael	12-01
Solinski, Krzysztof	05-04	Streit, Anton	34-01
Solovieva, Anastasia	39-04	Stuart, Charles	40-01

Stubbs, Jack	05-03, 20-04	Teitge, David	04-03
Studerus, Adrien	09-02	Tejedor, Tomas Alvarez	09-04
Stuhldreier, Lukas	40-04	Templalexis, Ioannis	06-03
Stuttaford, Peter	04-18, 09-03	Teramoto, Susumu	37-05
Su, Botai	43-02	Terrapon, Vincent E.	34-03
Su, Tong	04-15	Tezuka, Norikazu	26-01
Subbaraman, Ganesan	33-14	Thada, Shantanu	06-04
Subramanian, Ramesh	18-01, 39-03	Thakre, Piyush	04-13
Sujith, R. I.	04-04, 04-10	Thanganadar, Dhinesh	33-09
Suman, Alessio	10-02, 21-02, 21-03, 21-04, 37-04, 37-09	Theidel, Mira	23-02
Sumsurooah, Sharmila	01-01	Thewlis, Jonathan	37-03
Sun, Bo	29-02	Thiele, Marcus	27-03
Sun, Dakun	34-06	Thirumurthy, Deepak	30-07
Sun, Fujun	04-19	Thole, Karen A.	08-01, 11-01, 12-05, 14-02, 15-03, 35-03, 47-02
Sun, Jinju	34-04	Thomas, James	04-03
Sun, Lei	01-01, 23-03	Thomas, Randy	05-02
Sun, Mingshan	04-10	Thorat, Manish	25-03
Sun, Wei	37-02	Thouvez, Fabrice	30-03, 30-06
Sun, Xiaofeng	34-06	Thulin, Oskar	35-07
Sun, Xiaoxiao	03-02	Tian, Jie	30-07, 38-01
Sun, Zonghan	38-01	Tian, Kaiyuan	30-03
Suo, Jianqin	04-19	Tieghi, Lorenzo	10-01, 10-02, 10-03, 10-04
Sureddi, Roopesh Chowdary	13-01	Tiney, Nick	20-02
Suzuki, Fumiuyuki	23-01	Tiscar, Jorge Garcia	20-01
Suzuki, Masaya	13-01	Tkachenko, Andrey	37-10
Syed, Khawar	04-19	Tochitani, Naoto	23-05
T		Tolksdorf, Vera	37-02
Tabata, Soichiro	23-05	Tollett, Robert	18-04
Tacconi, Jacopo	01-01, 01-06	Tomasello, Stella Grazia	23-02
Taher, Matt	21-03	Tomita, Isao	37-06
Takata, Ryo	23-05	Tomita, Jesuino Takachi	37-11
Takei, Sotaro	30-04	Tomlinson, Rick	09-02
Takeuchi, Ryota	25-04	Toner, Jonathan	25-03
Talbotec, Jérôme	34-08	Tong, Jing	30-02
Tallman, Jim	01-06	Toni, Lorenzo	40-03
Tamaki, Hideaki	40-02	Tonon, Daniel Da Silva	37-11
Tamayo Soto, Miguel Angel	23-01	Torkaman, Alex	24-03, 26-01, 27-03
Tanaka, Nozomi	13-01	Torre Ruiz, Diego	35-07
Tang, Hui	14-01	Torricelli, Noemi	17-02
Tang, Liang	05-02	Toshihiko, Saitoh	04-11
Tang, Tsz Ling Elaine	39-03	Towler, Meera	33-04
Tang, Xiangxin	30-03	Tracy, Nathaniel	15-05
Tang, Yonghong	40-03	Traverso, Alberto	06-02, 06-04, 06-05, 33-07
Tanimitsu, Haruyuki	13-01	Tree, Dale	05-03
Tanimoto, Koichi	23-03	Treleaven, Nicholas	04-07, 04-10
Tanuma, Tadashi	23-05	Trimis, Dimosthenis	04-19
Tao, Yujiao	29-01, 29-02	Trivedi, Deepak	13-03
Tarasenko, Anton	04-15	Tsai, Alex	05-01
Tarasov, Dmitriy	04-15	Tsakmakidou, Dimitra	38-02
Tarchi, Lorenzo	14-01	Tsifourdaris, Panagioti	38-02
Tardelli, Livia	04-14	Tsirikoglou, Panagiotis	06-02
Tarver, Terry R.	03-02	Tsujimura, Taku	04-18, 20-03
Tay Wo Chong, Luis	04-13, 04-19	Tucci, Francesco Aldo	10-03, 10-04
Taylor, James	08-01, 34-01, 34-08	Tuccillo, Raffaele	20-01, 20-03
		Turner, Mark	33-01

U

Uffrecht, Wieland	23-03
Ugarte-Almeyda, Orlando	03-02
Ullah, Izhar	12-04
Umehara, Ryuichi	30-04
Unglaube, Tina	30-06
Unni, Vishnu R.	04-10
Untaroiu, Alexandrina	43-03, 44-02
Uranga, Alejandra	01-02
Uysal, Selcuk Can	17-01

V

Vahdat, Vahid	33-18
Vahdati, Mehdi	37-05
Vahl, Christopher	18-05
Valente, Giorgio	01-01
Valera Medina, Agustin	04-17
Valero, Omar	39-04
Van Beurden, Eva	03-01
Van Der Spuy, Sybrand Johannes	10-01, 10-02, 10-04
Van Zante, Dale	37-11
Vandeputte, Thomas	28-01, 33-02
Vania, Andrea	25-04, 29-01
Vannini, Giuseppe	25-01, 25-02, 29-01
Vannoni, Alberto	06-01
Vanpouille, David	34-07
Varghese, Alan J.	04-10
Varney, Bruce	36-01
Vasilyev, Alexander	04-15
Vasu, Subith	03-02, 33-05, 33-08, 33-18
Vedder, Curtis	01-02
Vega, Almudena	24-01, 24-02, 29-01
Ventosa-Molina, Jordi	34-09
Venturini, Mauro	21-02
Venturini, Paolo	36-01, 44-01
Venturino, Giulio	43-03
Verhaeghe, Antoine	20-03
Verma, Ishan	04-13, 04-14, 43-01
Verma, Rajeev	27-05
Verma, Vishwas	04-13
Verstraete, Tom	37-13
Vesely, Ladislav	09-01, 33-05
Vesely, Ladislav	33-09
Veynante, Denis	04-14
Veyrat, Alan	37-13
Vichi, Giovanni	20-02
Vikhorev, Valentin	35-07
Vincent, Tyler	12-05, 15-03
Vir Singh, Abhay	03-02
Visentin, Alessandro	37-13
Vishnoi, Neha	04-08, 04-17
Visser, Wilfried	01-03, 45-03
Vitale, Ignazio	01-01
Vlachosterios, Zinon	06-03
Vo, Khanh	02-03
Vogel, Gregory	26-01

Vogt, Damian	23-02, 40-03
Voigt, Jonas	39-04
Voigt, Matthias	28-01, 39-01, 39-03
Von Plehwe, Felix	13-03
Von Saldern, Jakob Georg Raimund	04-02, 04-08, 04-09, 04-17
Vorobyev, Alexey	34-01
Voss, David	08-01
Vrana, Johannes	18-07
Vulpio, Alessandro	10-02, 21-02, 21-03

W

Wacker, Christian	40-02
Wagh, Rahul	03-04
Wagner, Robert	06-04
Wahi, Pankaj	04-08
Wahl, Jacqueline	18-08
Wahls, Benjamin	05-03, 11-01
Wakelam, Christian	37-04, 38-02
Waki, Yuichiro	23-04
Walker, A Duncan	37-13, 38-02
Wallaschek, Jörg	30-04
Wallat, Stefan	23-01
Walock, Michael	02-02
Wang, Bangyi	34-04
Wang, Chongyu	23-04
Wang, Chun-Hua	12-03
Wang, Dingxi	37-12, 37-13
Wang, Donghui	01-01
Wang, Feng	37-10
Wang, Hai	12-03
Wang, Huiru	04-04
Wang, Jianchen	04-16
Wang, Jiangfeng	06-02, 40-03
Wang, Jianhua	12-03, 15-05
Wang, Jiayi	04-12
Wang, Jie	13-03
Wang, Jie	12-06
Wang, Kechen	12-02
Wang, Liangyu	37-13
Wang, Liping	28-01, 28-03
Wang, Mingyi	43-02
Wang, Pei	12-03
Wang, Peng	40-04
Wang, Qing-Ming	13-02
Wang, Shun-Sen	18-03, 33-09
Wang, Tianhao	15-01
Wang, Ting	13-01
Wang, Wenli	43-02
Wang, Xiaochen	34-10
Wang, Xiwei	01-01
Wang, Xu	15-05
Wang, Yexin	04-16
Wang, Yijun	34-04
Wang, Yintao	37-11
Wang, Yongliang	29-01
Wang, Yuexin	05-04

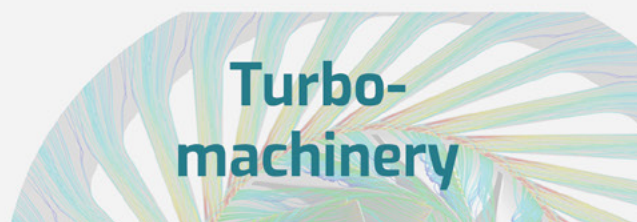
Wang, Yulan	04-03	Wu, Yadongw.	38-01
Wang, Yuqi	33-02	Wu, Yaguang	30-03, 30-04
Wang, Zhichao	04-16	Wu, Yanhui	43-02
Wang, Zhiheng	40-03, 43-02	Wu, Zeyu	01-04
Wang, Zhiping	10-03, 10-04	Wunsch, Dirk	39-01
Wang, Zhitao	19-01		
Wardell, Ryan	39-03	X	
Warren, Peter	05-01, 27-05	Xi, Guang	40-03, 43-02
Waßmer, Dominik	04-15	Xi, Lei	15-05
Watanabe, Toshinori	24-01, 24-04	Xi, Yueyun	05-02, 06-01
Watanabe, Toshio	30-07	Xia, Huang	04-01
Watkins, Richard	37-10	Xia, Songtao	39-03
Webber, Michael E.	46-01	Xia, Xinlei	23-03
Weber, Matthew	04-05	Xia, Yu	04-13
Wei, Fan	33-01	Xian, Yingxian	40-01
Wei, Wei	37-11	Xiao, Jianguangyi	30-05
Weigel, Bernhard Valerian	23-03	Xiao, Kun	12-02
Weijie, Liu	04-01	Xiao, Xiangtao	12-03
Weiland, Nathan T.	33-07	Xie, Lei	14-03
Welling, David	18-05	Xie, Wenhao	37-11
Wells, Kaden	33-01	Xie, Yonghui	15-04, 23-03, 23-04, 24-04, 25-05
Wells, Roger	39-04	Xin, Shen	33-01
Wen, Youhai	09-01	Xisto, Carlos	01-03, 34-09
Werner, Jan	34-10	Xu, Fang	04-13, 37-13
Wetherby, Jeremee	09-05	Xu, Fangcheng	25-06
Wettstein, Hans	08-01	Xu, Gang	04-03
Wheeler, Andrew	06-04, 34-02, 37-09	Xu, Haosen	37-06
Whitacker, Luiz Henrique Lindquist	37-11	Xu, Hongzhou	12-03, 15-02, 15-04
Whitacre, Rachel	09-01	Xu, Huazhao	15-05
White, Charles W.	33-07	Xu, Jin	15-04
White, Martin T.	33-02	Xu, Kewei	44-01
White, Steve	20-01, 25-06, 33-05	Xu, Liang	15-05
Wiedermann, Alexander	37-12	Xu, Liping	37-04
Wiens, Kevin	18-04	Xu, Mengyu	09-01
Wijeyeratne, Navindra	27-03	Xu, Qingzong	12-03
Wilkes, Jason	21-03, 21-04, 25-06, 33-01, 33-04, 33-18	Xu, Shenren	37-13
Wilkin II, Daniel	34-08	Xu, Tongge	27-02
Wilkins, Peter	12-05	Xuan, Yuan	04-06
Wilson, Johnathan	04-02	Xuanen, Kan	30-01
Wilson, Mark	01-02, 34-04, 34-07	Xue, Ranran	04-04
Winhart, Benjamin	37-12	Xue, Wensong	23-01
Winkelmann, Bernhard	08-01, 21-06	Xue, Xin	04-19
Winstanley, Paul	03-02		
Wirsum, Manfred	04-18, 06-01, 07-01, 40-02	Y	
Withag, Jan	03-01, 04-18	Yabui, Shota	25-04
Wittmann, Tim	20-01	Yadav, Rakesh	04-13, 04-14
Wood, John	04-15	Yakinthos, Kyros	06-03
Wood, Trevor	38-01	Yamada, Kazutoyo	40-02
Worth, Nicholas A.	04-07, 04-11	Yamaguchi, Masato	04-18
Wright, Andrew	02-02	Yamamoto, Satoru	09-01
Wright, Lesley M.	11-01, 12-04, 15-02, 15-04, 15-05	Yamane, Takashi	13-01
Wu, David	04-11, 04-20, 09-02	Yamao, Yoshifumi	43-02
Wu, Fayong	29-01	Yamashita, Hideaki	25-04
Wu, Hangkong	37-13	Yamashita, Satoshi	34-09
Wu, Hong	34-10	Yan, Liu	39-03
Wu, Junmei	15-04	Yan, Qindong	37-11
Wu, Tingcheng	25-01, 25-02, 25-04		

Yan, Xin.....	12-02	Zeltner, Darell	05-03
Yandt, Scott	18-06	Zha, Gecheng	44-01
Yang, Bijie	40-01	Zhang, Chao	12-06
Yang, Ce.....	43-02	Zhang, Chi.....	04-15
Yang, Changmao.....	43-02	Zhang, Di.....	15-04, 23-04, 25-05, 33-02
Yang, Fan.....	43-02	Zhang, Han.....	29-01
Yang, Guogang.....	29-01	Zhang, Hanzhi.....	43-02
Yang, Hanqing.....	34-04	Zhang, Huisheng.....	05-02, 06-01
Yang, Jibo	34-08	Zhang, Jiangnan	40-04
Yang, Jing	25-01, 25-02, 25-06	Zhang, Jiguo	30-05
Yang, Jinhu	04-03	Zhang, Jinning	06-03
Yang, Mingsui	24-01	Zhang, Kaiyuan.....	13-02
Yang, Mingyang	40-01	Zhang, Ke	15-04
Yang, Qian.....	04-04	Zhang, Liang	04-04
Yang, Siheng	04-16	Zhang, Luying.....	40-04
Yang, Xiang.....	37-06	Zhang, Min	25-01, 25-02, 37-11
Yang, Xuesen.....	04-02	Zhang, Ming.....	34-06
Yang, Yang	01-04	Zhang, Sen.....	37-12
Yang, Yi.....	34-09	Zhang, Shenghui.....	13-03, 14-03
Yang, Yufeng	12-04	Zhang, Xu	12-02
Yang, Zeyuan.....	38-01	Zhang, Yiming.....	28-01
Yang, Zheyi.....	39-02	Zhang, Zhiwei.....	30-07
Yang, Zhiyin	44-01	Zhang, Zihan	12-02
Yerram, Ravinder	37-10, 37-11	Zhao, Chenxi	40-03
Yevlakhov, Viktor	01-04	Zhao, Dan	04-04
Yin, Feijia	01-01	Zhao, Fanzhou	37-05
Yiran, Cheng	09-01	Zhao, Fengtong	24-01
Yokoyama, Takashi.....	23-01	Zhao, Gang.....	13-03, 14-03
Yoo, Sejong.....	27-02, 37-04	Zhao, Guang	25-06
Yoon, Christopher.....	12-05	Zhao, Pan	06-02, 40-03
Yoon, Sungho	34-05	Zhao, Qianpeng	04-03
Yoshida, Toyotaka.....	20-01	Zhao, Xin	01-01
Yoshimoto, Takashi.....	20-01	Zhao, Yaomin.....	35-01
You, Jiarui	24-04	Zhao, Yaomin.....	37-09
Youming, Yuan	14-01	Zhao, Zhen	15-05
Youn, Min-Sik.....	01-02	Zhao, Zhimei	30-03, 30-04
Yu, Haichao	19-01	Zheng, Dongsheng.....	04-19
Yuan, Qi	33-09	Zheng, Shaoxiong.....	40-03
Yuan, Tao.....	33-09	Zhigang, Liu.....	33-01
Yubo, Zhu	33-01	Zhong, Wan	29-01
Yun, Seok Beom.....	03-04	Zhong, Yafei.....	34-09
Z		Zhou, Biao.....	30-04
Zabaras, Nicholas.....	28-01	Zhou, Huimin	27-02
Zaccaria, Valentina.....	06-02	Zhou, Wenwu	12-02
Zachariah, Dave.....	30-02	Zhu, Fahui	15-04
Zachert, Christoph	18-02	Zhu, Hui ren.....	05-04, 15-01, 15-02
Zaid, Ahmed.....	11-01	Zhu, Jianqin	01-04
Zakharov, Vladimir.....	04-15	Zhu, Xiaocheng	24-04
Zang, Chaoping	30-02, 30-04	Zhu, Xin-Dang.....	12-03
Zang, Shusheng.....	05-01	Zhurenkov, Yurii	39-04
Zangeneh, Mehrdad.....	40-04	Zierer, Thomas	14-03
Zanger, Jan.....	04-16	Zink, Andrew	04-17
Zapke, Albert.....	10-01	Zobel, Arthur	30-01
Zarzalís, Nikolaos.....	04-01, 04-05, 04-19	Zori, Laith	24-02, 43-01
Zeis, Markus.....	18-01, 18-02	Zubakov, Vasilii.....	34-01
		Zwiener, Kim	43-01



Boost your performance in Design - Analysis - Optimization

OMNIS™ /Turbo - From design to analysis
within one collaborative environment



**Turbo-
machinery**



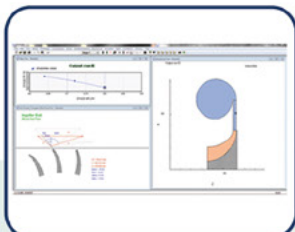
**Multiphysics
& External Aero**



Meshing



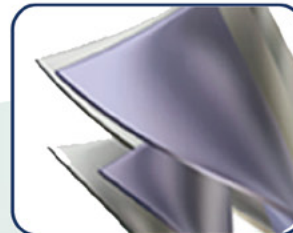
Marine



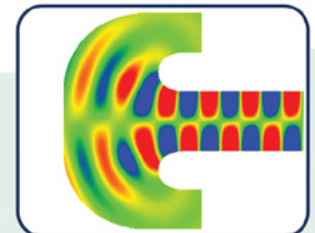
Preliminary and
detailed 3D design



Full engine CFD
simulation with NLH



Robust Design
Optimization with
Uncertainty Quantification



Fully coupled aero-
vibro-acoustics suite
with wizard-based
automation

Register here for our **Lunch & Learn session**
Monday June 7th - 11:15am EST

www.numeca.com/ASME-turbo-expo2021

NUMECA

Advanced developments for better products