

## Preface

The 2023 Joint Cryogenic Engineering Conference (CEC) and International Cryogenic Materials Conference (ICMC) were held from July 9 through July 13 at the Hawaii Convention Center in Honolulu, Hawaii. As at past conferences, the international scope of these meetings was strongly maintained with 19 countries being represented by 555 attendees who gathered to enjoy the joint technical programs and industrial exhibits. In total, 213 papers were submitted for publication of which 207 are published in these conference proceedings.

The program for the joint conferences included a total of 494 presentations organized into 110 sessions - plenary, oral and posters, as well as awards presentations. Five plenary talks gave interesting in-depth updates and overviews on exciting topics: Amanda Simpson (Airbus Americas) discussed the Airbus hydrogen aircraft development plans in *"Airbus: A Discussion About the Use of Cryogenic Hydrogen for Aviation Propulsion"*, An overview of the history and recent developments in high temperature superconductors was given by Paul C. W. Chu (University of Houston) in *"From High-temperature Superconductivity to Room-temperature Superconductivity: From Ambient Pressure to Very High Pressure"*, Suhas Bhandarkar (Lawrence Livermore National Laboratory) presented an overview of Lawrence Livermore National Lab's net positive energy fusion demonstration and the detailed development and operations of the hydrogen fuel in *"Overview of the Fabrication of Cryogenic Hydrogen Fuel Ice Layer for Nuclear Fusion Ignition Experiments"*, an overview of the developments ongoing at Robinson Research Institute for the development of electric aircraft was given by Rodney Badcock (Robinson Research Institute) in *"Electric Aircraft: Solving the Key Materials and Engineering Challenges to Manufacture a Complete Electrical Propulsion System"*, and a discussion on the cryogenic requirements and needs for the development of quantum computers was given by Nicholas Masluk (IBM) in *"Cryogenic Infrastructure for 400 Qubits and Beyond"*. The attendees also convened for two special Joint CEC-ICMC sessions organized: i) *Liquid Hydrogen for Large-Scale Vehicles* and ii) *Superconducting Quantum Systems*. Special sessions, two of them with panel discussions, were included in the programming emphasizing high-quality invited talks on seven different topics: *Electromechanical Behaviors of HTS Coated Conductors for Applications*, *Topological Materials for Electronics*, *High Strength Materials*, *High Field Superconducting Materials for Accelerator Magnets*, *Low Temperature Materials Database A - Superconductors*, *Low Temperature Materials Database B - Functional & Structural Materials*, *Cryogenic Clean Energy and Mobility*, and *Orbital Flight Demonstrations of Cryogenic Fluid Management*. A large *Transportation Symposium* consisting of 5 sessions and 26 talks with topics ranging from government funding perspectives, power electronics, cables, motors, and generators to system level studies was also held at CEC/ICMC'23. Contributed papers covered a wide range of topics including many aspects and advances in cryogenics and superconductors, along with their applications.

Both CEC and ICMC boards are encouraging student participation, education, and career growth. It was very exciting and rewarding to have 77 students register for the conference this year. And 36 of the students received sponsorship of the registration fees. The strong session attendance was exciting and very positive and made the conference a more rewarding experience for the presenters and attendees.

The CEC/ICMC Cryo Industrial Expo displayed the products and services of 31 industrial exhibitors and provided a congenial venue for a reception and refreshments throughout the week as well as for the conference poster sessions.

Conference Chairs for 2023 were Wesley Johnson from the NASA Glenn Research Center for CEC and Sonja Schlachter from the Karlsruhe Institute of Technology for ICMC. The CEC Program Chair was Jacob Leachman from the Washington State University with CEC Program Vice Chair, Ram Dhuley, from the Fermi National Accelerator Laboratory and the ICMC Program co-chairs were Klaus-



Peter Weiss from the Karlsruhe Institute of Technology and Judy Wu from the University of Kansas. The Exhibit Chair was Austin Capers of Scientific Instruments, Inc. who also served as Publicity and Sponsorship Chair. Finally, the Awards Chairs were Peter Kittel, Consultant, for CEC and Eric Hellstrom from the National High Magnetic Field Laboratory at Florida State University for ICMC. Michael Sumption, ICMC Board President and Peter Bradley, CEC Board President greatly participated in the conference development as part of the leadership team.

On July 9, 2023, Ignacio Aviles Santillana and Robert Walsh presented the ICMC short course *Cryogenic Materials and Mechanical Testing: Equipment and Methods* which was well attended with 27 scientists and students and was well received and appreciated. The ICMC organizers were very pleased by the high interest in this topic and a strong attendance, which catered to both seasoned professionals and newcomers to cryogenics in engineering and materials.

Also on July 9, the Cryogenic Society of America presented five short courses: *Cryocooler Fundamentals – Applications, Operating Principles and Design*, a full day course given by R. Radebaugh; *Aspects of Cryostat Design*, a half-day course given by J. Weisend II; *Cool Fuel – The Science and Engineering of Cryogenic Hydrogen*, a half-day course given by J. Leachman and K. Matveev; *Introduction to Dilution Refrigeration*, a half day course given by F. de Waele; and *Practical Cryogenic Thermometry and Instrumentation*, a half day course given by S. Courts. The courses were well attended and catered to both seasoned professionals and newcomers to cryogenics in engineering and materials.

The able leadership of Paula Pair, Annett Cady, Carrie Lian and all the hardworking, enthusiastic, and efficient staff from Centennial Conferences provided outstanding conference management and operations. Thank you, Centennial Conferences, for a truly outstanding and memorable conference experience!

The conference and proceedings were the result of significant volunteer efforts from many people, especially the conference attendees, Centennial Conferences, session and special session chairs, paper peer reviewers, and editors who all contributed greatly to the success of the conference. In the six-month run-up, leadership from CEC, ICMC, and Centennial met weekly in a virtual format. A program meeting was held in Denver in March to make a first draft of the conference program. Due to a difficult visa situation, many adjustments had to be made until the last minute before the conference.

We very much look forward to the next CEC/ICMC in Reno, Nevada, May 18-23, 2025. Reno, calling itself “The Biggest Little City in The World”, is located close to the California border at the northern end of the Sierra Nevada mountains. Besides museums and cultural events, the city offers shopping malls and 24-hour gaming opportunities. The Reno area has a dry and mild climate with more than 300 days of sunshine per year. Being close to Pyramid Lake and Lake Tahoe, the Reno area is one of the country’s top recreation areas, offering a vast variety of outdoor adventures.

The CEC/ICMC 2025 conference will be held at the eco-conscious Peppermill Reno Resort with large meeting space, spas, casinos, cafés, and restaurants, giving many opportunities for meetings and discussions in a relaxed atmosphere.

In addition to the rich spectrum of research, development, and industrial cryogenic topics making up the conference, we hope you will enjoy the comforts and attractions of Reno and the surrounding area when you attend. We hope you are able and plan to join us, and we extend you a very warm welcome to Reno!

Wesley Johnson  
2023 CEC Conference Chair

Sonja Schlachter  
2023 ICMC Conference Chair