Preface

The international conference on Modelling of Casting, Welding and Advanced Solidification Process (MCWASP) traces back to 1980, when the first conference on “Modeling of Casting and Welding Processes” was held in New Hampshire, USA. Since the previous MCWASP XIV, held in Japan 2015, the community has eagerly been awaiting and preparing to celebrate the 40th year anniversary with the 15th edition of MCWASP scheduled for 21-26 June 2020 at the venue Djurönäset in the archipelago of Stockholm, Sweden. The planning was made for a full 5-day conference consisting of presentations of recent scientific findings, and with plenty of time for personal contacts, exciting discussions and unforgettable experiences. However, as the new decade started, the spread of the COVID-19 pandemic led to closed borders and international travel restrictions, and in March 2020 the decision was made to cancel the physical meeting. Nevertheless, the organizing committee continued the process of reviewing and publication of the papers contributed to the conference, and to proceed online. With this in mind, we are very happy to deliver the proceedings of the 40-year anniversary edition of this important conference series, the first MCWASP conference to be held online 22-23 June 2020 hosted from Jönköping, Sweden.

In the proceedings, the first section contains the papers from the four keynote speakers. These speakers were invited to show the diversity in the topics of the conference, to provide a tribute to the history of MCWASP as well as perspectives on the future of scientific and industrial challenges within the scope of the conference. Michel Rappaz provides an exciting recap of the developments within microstructure modelling as well as computational power during the 40-year history of the MCWASP conference, with a keynote entitled “Does MCWASP still follow Moore’s law?”. Damien Tourret continues with a keynote entitled “Comparing mesoscopic models for dendritic growth”, showing a benchmark of different multi-scale modeling approaches for dendritic growth, discussing their relative strengths, limitations, and choices of parameters to achieve quantitative predictions. Patricio Mendez’ paper “Reduced order models for welding and solidification processes” shows that complex problems can indeed be treated with generality, accuracy, and simplicity. Jesper Thorborg completes the Keynote section with a paper entitled “The virtual core – modeling and optimization of core manufacturing and application” showing the details behind modeling the lifecycle of a sand core and its influence on casting quality.

In planning for the physical meeting, the committee wanted to find ways of increasing the presence and significance of the Poster presentations. A new session concept called Teaser sessions was developed. The intention was that ten authors of Poster papers each day would have the opportunity to present their work in a three-minute prerecorded video shown on the big screen in the conference hall. This would enable them to make use of audio and video to attract interest to their work and provide inspiration for vivid discussions at the Poster session later the same day. In order to distribute the contributions between Oral and Poster/Teaser contributions, 45 contributions were assigned Oral presentations and 45 Poster presentations.

In the online version of the conference, the distribution between Oral and Posters was maintained. Now all authors can present their work on Online Presentation pages, containing their contribution in a digital format with creative use of digital communication methods.

In total, the conference contains 94 contributions, of which 73 are accompanied with papers in the current proceedings. Among the contributions, the emerging field of Additive Manufacturing is well
represented. There are many contributions on the more traditional MCWASP topic Structure formation at microscale, demonstrating the significant developments in numerical techniques as well as computational power that has taken place since the previous MCWASP conference in 2015. The other topics represented are Continuous casting, Defects, Electromagnetic coupling, Heat transfer and fluid flow, Ingot and shape casting, Mechanical behaviour, Micro- and macro-segregation, Thermomechanics and thermophysical properties, Ultrasonics and Welding. Authors report advances in aspects such as in-situ experiments and numerical techniques, including machine learning and pattern recognition.

It can be concluded that the traditional MCWASP themes still attract significant research interest. The complexity of these advanced solidification phenomena is still a challenge for the community and although significant progress has been made, many challenges still remain for the future.

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Jakob Olofsson
Chairman MCWASP XV

School of Engineering
Jönköping University
Sweden