

Mathematical Aspects in Non-Equilibrium Thermodynamics

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Introduction

Prof. Csaba Asszonyi, D.Sc. (1941–2022): The present Special Issue is dedicated to the memory of our beloved, respected friend, colleague and teacher, the late Professor Csaba Asszonyi.

The research field of professor Asszonyi was continuum mechanics and irreversible thermodynamics. He played a pioneering role in establishing the thermodynamical background of rock rheology and engineering rock mechanics. He was educated as a mechanical engineer, started his career as research engineer, and then performed coordinated mining research in Hungary. Later on, he went into the industry and became a company group leader. Seventeen years ago, he established the Montavid Thermodynamic Research Group.

His thinking focused on thermodynamic concepts, connecting an application-oriented, engineering attitude with deep theoretical ideas. He developed several industrial applications of thermodynamic rheology. His contributions included the extension of linear viscoelasticity with internal variables and the unification of classical rheological bodies in a thermodynamic framework. He was the author of more than two hundred articles, dozens of patents, and ten books. He refused honours and distinctions, and only at the end of his life became the honorary president of the Society for the Unity of Science and Technology.

The Special Issue “Mathematical Aspects in Non-equilibrium Thermodynamics” consists of five original research papers. Although the current topic has a long history, there are still numerous open questions regarding the structure of evolution equations, the corresponding thermodynamically compatible initial and boundary conditions, and also their relation to experimental and practical aspects. These five papers actually cover various recent and relevant topics such as optimization, finite time thermodynamics, the role of the second law in continuum physics, multi-component mixtures, and boundary conditions. We hope that this Special Issue will be able to play a role in further progress to come in the future.

In the paper “The Role of the Second Law of Thermodynamics in Continuum Physics: A Muschik and Ehrentraut Theorem Revisited” by V. A. Cimmelli and P. Rogolino [1], the authors revisited the second law of thermodynamics and how the entropy inequality plays a crucial role in the derivation of evolution equations, also providing local and global formulations of the second law. The classical results of Muschik and Ehrentraut are reformulated in the present modern mathematical context of second law, thus highlighting a few geometric aspects as an outcome. They also emphasized that the non-equilibrium concept of temperature and entropy far from equilibrium is not necessarily identical to the one close to equilibrium, and how these notions need further investigation.

The paper “Integrability of the Multi-Species TASEP with Species-Dependent Rates”, written by Eunghyun Lee [2], is related to totally asymmetrical simple exclusion processes; it



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Some Aspects Of Non Equilibrium Thermody

JL Elias



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