Foreword

To commemorate the 100th anniversary of Ludwig Boltzmann's death in Duino the Erwin Schrödinger International Institute for Mathematical Physics invited eminent scientists to meet in the city where Boltzmann was born and were he spent a good part of his life as a student and scholar. The International Symposium "Boltzmann's Legacy", held from 7 to 9 June, 2006 at a lecture hall devoted to his memory, the Boltzmann Lecture Hall, brought together scholars from all over the world whose scientific achievements bear evidence to Boltzmann's everlasting and fundamental contributions into the development of science.

Legacies can both be a source of delight and a burden and this two-sidedness is particularly apparent in Boltzmann's case. His scientific work is a highlight of the natural sciences at the turn of the 19th century: controversial at his time, and to this day both a delight and burden for the scientists following his steps. Boltzmann was a genuine philosopher-scientist, a superb mathematician as well as a physicist, and in his later life also a philosopher. He was a scholar still deeply rooted in the Newtonian tradition during its final turn. Today his heroic fight for "mechanics" sounds alien to us. As the prophet of the new paradigm of statistical mechanics, his insights deeply influenced his followers. Although Boltzmann's work is formulated in the language of classical physics it reaches into the post-classical era of quantum physics and relativity theory, personalised by Planck and Einstein.

Boltzmann was a bullish fighter with a delicate skin. This deeply troubled man and thinker, fighting against the ailments of his body and soul, finally ended his life tragically in Duino on September 5, 1906. He achieved the deepest insights into some burning problems of physics that were ripe to be tackled by a genius. The invention of the equation that bears his name and deals with the time-development of statistical ensembles is one of his well-known masterpieces. The Boltzmann constant that links the microscopic with the macroscopic is perhaps the most frequently used constant in all of physics. To paraphrase the saying attributed to Newton, one might say that a good part of theoretical physics sits on the shoulders of this giant.[1] The Erwin Schrödinger Institute could be regarded as his youngest Viennese brain child sitting conscientiously on his shoulders watching out.

Clearly, the importance and eminence of Boltzmann's revolutionary achievements have reached far beyond his life time. He is one of the rare species of scholars whose ideas are still as vivid today both in a constructive and controversial way as they had been during his life span. The contributions collected in this volume give a keen picture of the fertility of Boltzmann's legacy.

What made the Symposium "Boltzmann's Legacy" such a delight felt by all participants, were the vivid and often emotional debates signalling the fecundity and omnipresence of Boltzmann's ideas. We hope that reading the articles collected in this

[1] Robert K. Merton, *On the Shoulders of Giants. A Shandean Postscript.* New York: The Free Press 1965.

volume will give a flavour of the spirit which guided the presentations.

The editors are deeply indebted to the contributors of this volume, for their willingness to put in writing their presentations at the Symposium, as well as enduring the subsequent tedious interventions by the editors.

We thank the University of Vienna's Central Library for Physics for providing photos. We are especially grateful to Boltzmann's granddaughter, Mrs. Ilse M. Fasol-Boltzmann, for permission to reproduce photos held in the possession of her family.

The Symposium was generously supported by the Rektor of the University of Vienna, Professor Georg Winckler. The co-operation with the City of Vienna's lecture series "Vienna Lecture" and of Professor Hubert Christian Ehalt in organising a public lecture for Jürgen Renn is gratefully acknowledged.

We owe special thanks to Mrs. Irene Zimmermann for many valuable suggestions and her proofreading of all the papers during the final stage of the preparation of the volume. Finally, we wish to thank Manfred Karbe of the European Mathematical Society Publishing House for his support and constant help in producing this volume.

At various stages during the preparation of this volume the editors observed how difficult it is to easily get access to the original papers of Ludwig Boltzmann. Even the three volumes of the *Wissenschaftliche Abhandlungen*, a collection of 139 of his papers, edited by his pupil and successor Friedrich Hasenöhrl, are missing in some important libraries.[2] It was felt by all participants of the Symposium that the availability and an easy access to his writings would be extremely useful and even a *conditio sine qua non* for a proper understanding of his legacy. Following the encouragement of one us (G. G.) the Erwin Schrödinger Institute – in the spirit of "Boltzmann's Legacy" – intends to produce a freely available and electronically accessible version of the *Wissenschaftliche Abhandlungen* together with the *Populäre Schriften*[3] on the web. This service will be in the honour of the work and memory of Ludwig Boltzmann.

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[2] L. Boltzmann, *Wissenschaftliche Abhandlungen*, (F. Hasenöhrl, ed.). J. A. Barth: Leipzig 1908, 1909, 3 volumes; reprinted Chelsea Publishing Company: New York 1968, 3 volumes, reprinted by the American Mathematical Society in 2001.

[3] Ludwig Boltzmann, *Populäre Schriften*. J. A. Barth: Leipzig 1905.