

Book Reviews

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Rarefied Gas Dynamics

Edited by A. D. Ketsdever and E. P. Muntz, AIP Press, Springer, New York, 2003,
1110 pp., \$295.00

This book is the latest in a series of proceedings of the International Symposia on Rarefied Gas Dynamics that span nearly half a century. The series constitutes an invaluable archive, chronicling the growth of the subject over a period during which spectacular advances have been achieved. A search through earlier volumes reveals that most of the significant developments in rarefied gas dynamics were first publicized at these meetings.

The initial stimulus for staging the symposia was the post-2nd World War interest in building spacecraft and other high-altitude vehicles. The requirement to understand and predict their flows was a strong driving force, but in recent times other subjects involving low-density flows have surfaced, such as semiconductor manufacture, plasma material processing, gas-surface interactions, condensation and evaporation, and micro- and nanomachines that have added to the impetus and broadened the scope of the conferences to a more diverse audience. The most recent symposium was held in Whistler, British Columbia, Canada, in July 2002, and it included contributions in all of these areas. It was the 23rd in the series, continuing the tradition of attracting an excellent participation of scientists and technologists engaged in the subject, many of whom enjoy outstanding international reputations and who are engaged in a variety of different disciplines including mathematics, physics, engineering, and chemistry.

The proceedings are published in a single 1110-page volume containing only those papers from the conference that were accepted after formal refereeing. Topics range from analytical kinetic theory and Boltzmann equation studies to applied engineering investigations relating to hypersonic flight, propulsion, plasmas, semiconductor manufacture, and other practical rarefied flow phenomena. Despite the length of the proceedings, a stringent six-page limitation had been imposed for each paper except the invited papers. Fortunately the book also comes with a very well prepared CD containing the complete collection of the papers and posters. For the CD, authors were permitted to expand their papers with additional

material and enhance them with the use of color, which increases their value.

It is evident from reading this volume that there has been a very clear trend within this subject away from an analytical kinetic theory and Boltzmann approach toward numerical simulation and in particular to use of the direct simulation Monte Carlo method (DSMC). The advent of this very powerful method has revolutionized the analysis of rarefied gas flows, and at this conference very nearly half of the 137 refereed papers related specifically to this subject. This is a remarkable change of emphasis, and the symposium was arguably the most important recent forum at which the developments in DSMC have been comprehensively advanced. Papers included in the conference incorporate some of the most recent developments in the code, for instance the application of significantly faster algorithms and methods to increase the range of applicability and the incorporation of improved molecular modeling. Highlighting these papers is not intended to detract from the remainder of the contributions to the symposium, which for the most part seek solutions based on using more traditional kinetic theory methods and illustrate well the current level of advancement throughout the subject. Less than 10% of the contributions were in any way devoted to physical measurements, reflecting the regrettable trend away from experimental research in this and other subjects.

This volume of the proceedings is a valuable archive and is highly recommended for those wishing to keep abreast of developments in rarefied gas dynamics analysis. As at previous symposia the standard of the papers is extremely high and in many instances authors chronicle the state of the art of advancement and thinking within their area of the subject. It is, of course, an expensive publication, but it is an important record of recent research development in the subject and brings together material that is not readily accessed elsewhere.

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