
Preface

Over the past eleven years I had the privilege to form a group of scientists and technicians at the Ernst-Mach-Institute (EMI) in Freiburg focused on the description of structures under dynamic loading conditions. The scientific background of the group covers both the field of experimental material characterization as well as the development and application of numerical methods. That diversity of competences engaged in working with highly sophisticated hardware and/or in the virtual world of mathematical modelling reflects the intended mutual benefit of experimental and theoretical investigations of dynamic deformation processes. Encouraged by the continuous support from the institute director Klaus Thoma and further enabled by positive feedback from industry, the concept of a combined experimental-numerical approach could be followed and refined over the years. And the group could grow to a department of now more than fifty persons.

With this book I tried to collect the scientific corner stones for a combined approach to analyzing structures under crash and impact loads. The related theories on continuum mechanics, numerical discretization and experimental material characterization range over a wide spectrum. Consequently, each topic could only be covered selectively. At the same time, this book has been influenced by the research work of many colleagues which I hope to have reproduced in an adequate and correct way. Specifically the many achievements documented in doctoral thesis of Werner Riedel, Martin Sauer, Ingmar Rohr, Michael Junginger, John Corley, Jochen Peter, Markus Wicklein, Harald Schuler, Jan Jansen, Shannon Ryan and Thomas Meenken are indispensable sources for this book and would have each deserved deeper attention.

I greatly appreciated the many discussions of the various topics concerning numerical simulation in general with Arno Klomfass and Heinz Werner and the specific area of shock loaded composites with Rade Vignjevic and Richard Clegg. To Hartwig Nahme I owe a lot of his time that he spent for the manifold introductions and discussions on dynamic material testing.

Since the days of my first own programming of meshfree methods I gained understanding and attraction to the method from the intense exchange with Colin Hayhurst, Chuck Wingate and Larry Libersky. I won't forget the unbreakable enthusiasm of Larry towards SPH which finally lead to a stabilized and well established numerical methodology. It was Larry's endurance and his sharp mind that inspired and guided many other researchers around the world in the field of meshfree methods.

To my academic mentor, Diethard Könke, I owe the fascination in teaching and describing the theoretical basics of numerical methods. The idea to actually write the book emerged during a three months stay as visiting scientist at M.I.T.. Working in the Impact and Crashworthiness Laboratory of Tomasz Wierzbicki was an exceptional experience. During that time and motivated by Tom's fascinating verve in conceiving ever new scientific projects, the vague idea of a book became a concept. Elaine Tham of Springer finally set the spark to actually launch the book project.

Writing this book was a welcome opportunity for me to collect the basics in one of the fundamental research areas of EMI. I want to express my earnest gratitude to Klaus Thoma who not only sent me to M.I.T. but also gave me the necessary time and support to compile the book.

Last, not least, I want to thank my love Claudia and my daughter Paula Lou for their persistent understanding and support over the last eighteen months. I know that it was anything but amusing to live with somebody who was either writing or pondering how to write what he had in mind. Thank you!

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