FOREWORD

The conference "The Martensitic Transformation in Science and Technology" has dealt with fundamental and applied aspects of martensitic transformation. This is a particular type of a first order structural phase transformation in crystalline solids.

Some characteristics are its diffusionless nature and a rather large amount of shear displacement associated with the change in crystal structure (Table 1). Consequently, its onset and course is not only determined by thermodynamical equilibrium and nucleation, but also by internal and external shear stresses. It has been found in all types of crystalline materials: ceramics (ZrO_2), polymers (PTFE), and metals (steels, shape memory alloys).

characteristics / transformation	no diffusion $D \approx 0$	no change in chemical comp. $\Delta C \approx 0$	first order transform. 1. Order	large lattice variant shear $\gamma_{\beta\alpha} > > 0$
martensitic	+	+	+	+
pre-martensitic (and similar)	+	+	o	o
bainitic	o	o	+	+
massive	o	+	+	o

Table 1: Definition of martensitic transformation in comparison with some similar solid state reactions

For about 3000 years mankind has been baffled and puzzled by the phenomenon of hardening of steels. About 100 years ago the first successful scientific efforts were made for a scientific clearification of this problem by Sorby (1865) in Sheffield. Adolf Martens (1850–1914), president of the Royal Institute for Testing of Materials, Berlin, gave his name to the field of our interest. As he died 75 years ago we found it appropriate to devote an introductory lecture to his memory. It has been held by the vice president of the present Federal Institution for Testing of Materials (BAM, Bundesanstalt für Materialforschung und -prüfung) in Berlin.

The topics of this book are:

- Fundamentals
- Shape Memory Alloys
- Medical Application
- Iron Base Alloys, Steels
- Transformations in Mn-, Ti-, Zr-Alloys and Ceramics

Five invited lectures summarize matters of actual research interest. Over 60 contributed papers cover a very wide range of more specialized subjects. It is believed that this book may provide a representative cross section of actual research on most aspects of martensitic transformation – a field which is in rapid development in context with solid state physics, materials science, and engineering.

Bochum, October 1989 E. Hornbogen