# Preface

This book is intended as a reference book for advanced graduate students and research engineers in rock mechanics related to mining, civil engineering, etc. Environmental and human-induced loading acting on manmade works is disturbed in essence. During construction and operation of major engineering projects, e.g., civil engineering, mining engineering, hydraulic engineering, bridge engineering and petroleum engineering, the structures built in or on rock mass not only bear the complex in situ conditions, e.g., stress, seepage, faulting, thermal and chemical coupling, but also often encounter a variety of stress disturbances during engineering construction and operation periods, the stress disturbance acted on rock mass structures can be low-medium strain rate, and also high strain rate. Along with the constructions on rock mass, a lot of disasters, e.g., tunnel rockburst, induced seismicity and sand liquefaction, are cyclic and dynamic processes. Nevertheless, insufficient attentions have been paid to the influences of dynamic disturbances on engineering projects so far. The discrepancy between theoretical prediction (by approximating the dynamic problems as static ones) and actual performance of constructed engineering structures is usually tolerated. As a result, all of those rock disasters highlight the need of a better understanding of the rock behaviour upon stress disturbance in order to ensure the long-term reliability of the built structures.

The book is focusing on the effect of rock structure on its failure pattern under stress disturbance or freeze-thaw conditions. Three kinds of typical rock mass with interbeds, flaws, and natural fractures are deep investigated about the fracture evolution characteristics. The book is divided into three parts. The first part, Chapters One, Two, Three, concerns the fracture evolution of interbedded marble various stress disturbance conditions, e.g., time-lagged unloading paths, constant amplitude cyclic or fatigue loads, multi-level cyclic loading, confining pressure unloading, the rock failure under time-lagged unloading disturbance, rock failure under fatigue loading and confining pressure unloading conditions and the rock failure subjected to freeze-thaw-fatigue loads. The second part, Chapters Four and Five, concerns the mechanical behaviors of pre-flawed granite under freeze-thaw and Ice-driven Mechanical Weathering in Pre-flawed Rocks. Granite failure under freeze-thaw and cyclic loads are deep investigated experimentally. The third part of the book, Chapter Six, concerns the fracture evolution characteristics of naturally fractured granite. The fracture and energy evolution characteristics of granite containing different types of natural fractures are revealed. Effort has been made to include a list of comprehensive literature citations in each chapter. However, it is impractical to list all available literature. I apologize sin-

cerely for any omissions.

I am fortunate for having the opportunity to work with a group of excellent scholars, Prof. C. H. Li, Prof. Z. Y. Song, Z. Q. Hou, Y. G. Xiao, H. J. Wang, H. Liu, W. J. Huo. In fact, most of the materials presented in this book are collections from my published papers. I wish to acknowledge J. Q. Han from the Institute of Acoustics, Chinese Academy of Sciences to help me perform the cyclic mechanical tests. I wish to acknowledge the support and guidance of my friends, Drs. It was Prof. X. Li who introduced me to the rock structural mechanics study when I was a doctoral student when I was in Institute of Geology and Geophysics, Chinese Academy of Sciences.

As mentioned at the beginning, the book is intended as a reference book and not as a text. Thus, the description of phenomena and derivation of equations may not be in depth or in detail as the reader may wish. However, if the reader obtains a clear picture and understanding of the structure deterioration of rock mass subjected to stress disturbance conditions, I would consider the book a success. It is my sincere hope that this book may inspire further research and development into this fascinating subject.

Yu Wang

Jan 15, 2021