Dedication

This Monograph is dedicated to the 20th anniversary of the State Key Laboratory of Tribology.

Jianbin Luo
Yuanzhong Hu
Shizhu Wen
Acknowledgment

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Jianbin Luo
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Foreword

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Preface

The roots of micro/nanotribology can be found deep in conventional concepts of tribology. The recognition in the last century of elasto-hydrodynamic lubrication (EHL) as the principal mode of fluid-film lubrication in many machine components enabled reliable design procedures to be developed for both highly stressed and low elastic modulus machine elements. Towards the end of the last century submicron film thicknesses were recognized in many EHL applications. It is now being asked how EHL concepts can contribute to understanding the behavior of even thinner lubricating films. The answer is to be found in the subject widely known as micro/nanotribology.

As early as 1929 Tomlinson considered the origin of friction and the mechanism of energy dissipation in terms of an independent oscillator model. This important approach provided the foundation for many present studies of atomic scale friction. The rapid development of micro/nanotribology in recent decades is certainly a significant and fascinating aspect of modern tribology. New scientific instruments, impressive modeling, and computer simulations have contributed to the current fascination with nanotechnology.

A remarkable indication of these developments is evident in the boom of publications. Nevertheless, the knowledge and understanding of micro/nanotribology remains incomplete, although several books related to the subject have now been published. The interdisciplinary nature of tribology persists in studies of microscopic scale tribology. Individual investigators contribute to specific aspects of the field as they help to develop a general picture of the new field of micro/nanotribology, thus adding additional bricks to the house of truth.

The present book is written by authors whose backgrounds are mainly in mechanical engineering. They present individual contributions to the development of microscopic tribology, with significant effort being made to form a bridge between fundamental studies and applications.

I am confident that readers in both academic and industrial sectors will find the text interesting and beneficial to their understanding of an exciting aspect of modern tribology.

Duncan Dowson
Leeds, U.K. June 2008
DR. JIANBIN LUO, a professor at Tsinghua University and the director of the State Key Laboratory of Tribology (SKLT), China, received his Ph.D. degree from Tsinghua University in 1994. Since 1991, he has been working on nanotribology, especially thin film lubrication. He developed an interferometry technology in 1992 for measuring oil films with a resolution of 0.5 nm in vertical direction. He also has been working on Chemical Mechanical Planarization (CMP) since 2000. He has contributed to over 140 papers in the fields of tribology, and won the Chinese National Natural Science Prize (2001) and Chinese National Invention Prize (1996). Professor Luo is now vice president of the International Tribology Council and chairman of the Tribology Institution of the Chinese Mechanical Engineering Society. He is also an editorial board member of five journals, including *Surface & Coatings Technology, Surface Science and Engineering, and Chinese Science Bulletin.*

PROFESSOR YUANZHONG HU received his Ph.D. in 1985 and later joined the SKLT Tsinghua University as a professor. From 1989 to 1992, he worked in the Norwegian Technical University, Norway, and in Northwestern University, USA, as a postdoctoral fellow. He lived in the United States again (1997-1998) as a visiting scholar. His research interests include EHL, mixed lubrication, nanotribology, thin film rheology, molecular dynamics simulations, etc., and he has more than 70 papers published in international journals. Professor Hu received the Edmond E. Bisson Award from STLE in 2003. He is now an Associate Editor of the *Proceedings of IMechE, Part J, Journal of Engineering Tribology.*

PROFESSOR SHIZHU WEN graduated from the Department of Mechanical Manufacture of Tsinghua University in 1955, and then joined the faculty of Tsinghua University. In 1979, Professor Wen attended the Imperial College of Science and Technology, London University, as a visiting scholar majoring in tribology. He is a professor in the Department of Precision Instrument and Mechnology of Tsinghua University and was the director of the Tribology Institute of Tsinghua University and the director of the State Key Laboratory of Tribology from 1981 to 1996. Professor Wen has mainly devoted himself to basic research in tribology. He has conducted and directed more than 20 research projects, covering research fields of lubrication theory, friction and wear, and micromechanology. Professor Wen has published five monographs and more than 480 research papers. He and his colleagues have been honored with 19 awards, including the National Award in Natural Science, the National Invention Award, the National Excellent Book Award, and the Ho Leung Ho Lee Prize (Technological Science). In 1999, Professor Wen was elected as a member of the Chinese Academy of Sciences.

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