

Advances In Fracture Research

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The present volume is a spin-off from the International Journal of Fracture and presents the contents of the Honour, Opening, Closing and Plenary Lectures given at the 11th International Conference on Fracture (ICF11), held at Torino, Italy, March 20-25, 2005. The Opening Ceremony, introduced and presented by the ICF11 Chairman, Professor Alberto Carpinteri, started with different opening addresses from the ICF President, Professor Yiu-Wing Mai, the Deputy President of the Turin Academy of Sciences, Professor Sigfrido Leschiutta, and the Deputy Minister for Infrastructures and Transportation of the Italian Government, On. Ugo Martinat. The Opening Ceremony then continued with the presentation of the Doctorate H.C. in Civil Engineering to Professor Benoit B. Mandelbrot and to Professor Grigory L. Barenblatt by the Rector of the Politecnico di Torino, Professor Giovanni Del Tin, and by the Dean of the 1st Faculty of Engineering of the Politecnico di Torino, Professor Francesco Profumo. The texts of these speeches are published, as well as that of the closing address by the new ICF President, Professor K. Ravi-Chandar. The paper by B.B. Mandelbrot proposes an interpretation of roughness based on fractal geometry and describes the implications of such conjecture on fracture and other physical or financial phenomena. G.I. Barenblatt presents the general classification of scaling laws and the basic concepts of physical similarity. The Paris law of fatigue is discussed as an instructive example of incomplete similarity, where the noninteger power is not a material constant. Takeo Yokobori, the ICE Founder President, offers an historical picture of the scientific activities of the International Congress on Fracture and indicates Complexity Science as the cutting edge of advanced research in fracture. G. Maier et al. write a survey on engineering oriented results obtained from inverse analysis applied to fracture mechanics. W.W. Gerberich and co-workers emphasize how measured elastic and plastic properties in volumes having at least one dimension on the order of 10 to 1 000 nm are length scale dependent up to a factor of three. H. Gao applies fracture mechanics concepts to hierarchical biomechanics of bone-like materials. He answers some questions related to the optimization of strength, toughness and stiffness. A. Pineau illustrates the local approaches to fracture for the prediction of the fracture toughness of structural steel. It is shown that the ductile-to- brittle transition curve can be well predicted by these approaches. Y.

Murakami investigates on the effect of hydrogen on fatigue properties of metals used for fuel cell systems. J.G. Williams et al. review previous studies on impact loaded bi-material strip in shear. A global energy balance solution is given to include a cohesive zone. A.J. Rosakis and co-workers report on the experimental observation of supershear rupture in frictionally-held interfaces. The results suggest that under certain conditions supershear rupture propagation can be facilitated during large earthquakes. H. Abe and co-workers make a survey of some recent achievements for realizing a reliable circuit design against electromigration failure. The growth of voids in the metal lines ultimately results in electrical discontinuity. R. de Borst presents an overview of novel discretization techniques for capturing propagating discontinuities: meshless methods, partition-of-unity property based shape functions, and discontinuous Galerkin methods. This book is a spin-off from the International Journal of Fracture and collects lectures and papers presented at the 11th International Conference on Fracture (ICF11), March 20-25, 2005. Included in this volume are introductory addresses, as well as remarks on the presentation of honorary degrees. A collection of papers follows, including presentations by such eminent scientists as B.B. Mandelbrot, G.I. Barenblatt, and numerous others, reviewing advanced research in fracture.

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