

Editorial*

The present volume of the International Journal of Fracture* presents the contents of the Honour, Opening, Closing and Plenary Lectures given at the 11th International Conference on Fracture (ICF11), Torino, Italy, March 20–25, 2005, the leading international forum on fracture, fatigue, material strength, structural damage and integrity, which every four years is organised in different parts of the world. The related International Society – International Congress on Fracture (ICF) – was founded by Professor Takeo Yokobori in 1965, exactly 40 years ago, and is today – under the actual Presidency of the Editor-in-Chief of this Journal, Professor K. Ravi-Chandar – the premier international body for promoting world-wide cooperation among scientists and engineers on the above mentioned topics. ICF11 has been organised under the High Patronage of the President of the Republic of Italy, under the auspices of the Ministry of Infrastructures and Transportation of the Italian Government, and of the National Science Foundation of Italy (CNR), with the scientific support of the leading continental institutions on the subject of the conference: the European Structural Integrity Society (ESIS), and the American Society for Testing and Materials (ASTM). The Italian Group of Fracture (IGF), the Politecnico di Torino and the Turin Academy of Sciences have taken the role of host organisations.

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 I. Barenblatt by the Rector of the Politecnico di Torino, Professor Giovanni Del Tin, and by the Dean of the first Faculty of Engineering of the Politecnico di Torino, Professor Francesco Profumo. The texts of these speeches are reported in the following, 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 ICF Founder President, offers an historical picture of the scientific activities of the International Congress on Fracture and indicates Complexity Science as

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2 Editorial

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 10–1000 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. Abé 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.

The guest editors of the present volume would like to thank all the authors of the papers for their outstanding scientific contributions. Special thanks are also due to Dr. Giuseppe Lacidogna, Dr. Marco Paggi, and Dr. Simone Puzzi, for their effective cooperation in the assemblage of the final ICF11 scientific programme, in the organization of the Opening Ceremony, and in the production of the present volume.

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Volume Guest Editors