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Editorial: Recent advances in fracture research

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Fracture is a leading subject full of revolutionary and discipline penetration in a diversity of fields, e.g., mechanics, materials science, physics, medicine, mechanical engineering, civil engineering, astronautics and aeronautics. Fracture research concerns various fracture accidents in real life, and provides important theoretical supports for preventing catastrophic accidents. Investigations on damage, fracture, fatigue and structural integrity of materials and structures are of critical significance in the development of human being's civilization and lay the foundation for the improvements in different areas of science and technology. Understandings of the damage and failure mechanisms of materials and structures are closely related with the security of many engineering fields. The fundamental theories and methods of damage, fracture and fatigue under different service conditions have been widely applied in almost all aspects of economics, e.g., aerospace, energy, environment, national defense, architecture, microelectronics, mechanical, petrochemical, biomedical, civil and hydraulic engineering. In recent years, fracture research and its applications have extended from biomedicine to geophysics, from nano/micro to macro scales, and from physical to holistic and system modelling.

International Congress on Fracture (ICF), founded in 1965, is the premier international academic community with the aim to promote industrial, experimental and theoretical research, education and worldwide cooperation among scientists and engineers concerned with mechanics and mechanisms of fracture, fatigue and structural integrity of materials, components, structures and systems. ICF devotes itself in enhancing the intercommunication and corporation among the researchers in fracture all around the world. For this purpose, the quadrennial International Conferences on Fracture have been playing an increasingly significant role. The thirteenth International Conference on Fracture (ICF13) was held during June 16–21, 2013 in Beijing. This is the first time that China hosts this series of highly influential conferences since it joined ICF in 1977. ICF13 was chaired by Shouwen Yu, co-chaired by Wei Yang and Tongyi Zhang. Youshi Hong served as the local academic committee chairman. The secretaries-in-general are Xiqiao Feng and Yazheng Yang.

The ICF13 organizing committee endeavored for four years from 2009 to 2013 to make this conference a successful continuation of the honored tradition and, at the same time, to create a dynamic and leading conference which stretches the boundaries of the exciting disciplines for the rapidly developing new era. This conference was hosted, besides ICF, by the Chinese Society of Theoretical and Applied Mechanics (CSTAM), Fracture Group of Hong Kong of China (FGHKC), Chinese Mechanical Engineering Society (CMES), Chinese Materials Research Society (CMRS), Chinese Society of Corrosion and Protection (CSCP), Chinese Society of Aeronautics and Astronautics (CSAA), China Structural Integrity Consortium (CSIC), and Chinese

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Society for Metals (CSM).

ICF13 received 1 216 abstracts submitted from 46 countries and regions. Its technical program was organized into 54 sessions and 15 mini-symposiums. The contents of these submissions covered almost all active research fields in solid mechanics and probed into the role of fracture research in the most advanced academic achievements, from fundamental theories to engineering applications, from traditional topics to exciting and edge-cutting areas. It can be seen that the study of fracture is expanding from classical areas to new frontiers, e.g., multi-scale and multi-physical mechanisms of damage, fracture, fatigue and failure in engineering, natural and biological materials and systems. The research results have been harnessed to benefit the whole world, to build a safer environment for human being, and to materialize scientific advancements into humanity's happiness and well beings.

ICF13 had 3 honour lectures, 12 plenary lectures, 316 keynote lectures, and 412 regular oral presentations. The opening honour lecture of ICF13 was given by S. Suresh, the president honour lecture was given by Al. Carpinteri, and the closing honour lecture was given by Y. W. Mai. Twelve plenary lectures were delivered by J. R. Rice, J. W. Hutchinson, H. J. Gao, B. L. Karihaloo, W. Yang, Y. V. Petrov, Q. P. Sun, R. Phipps, P. Gumbsch, Y. Murakami, A. Saxena, and J. Sun. In addition, many other famous scientists, e.g., P. C. Paris, also presented at this conference.

In addition, it is worth mentioning that twelve ICF13 Outstanding Paper Awards by Young Researchers were selected by an academic selection committee from all papers presented in the conference by young scholars 35 years or less in age. To partly reflect the contents of ICF13, two consecutive special issues will be published on *Theoretical & Applied Mechanics Letters* (TAML) since now. The recipients of ICF13 outstanding paper awards and some keynote speakers were invited to publish their papers in the special issues. These papers report some most recent advances in the field of theoretical and applied fracture mechanics of nanomaterials, smart materials, biological materials, metals, ceramics, and composites. Some important applications of fracture mechanics are also presented in, for instance, structural integrity and medical engineering.