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Foreword

## Size-Scale Effects

This special issue contains five of the six papers that were presented at the Workshop on Size-Scale Effects during FRAMCOS-4, Cachan, France on 1 June, 2001. This workshop was organised by Carpinteri and Karihaloo. It attracted about 45 participants and generated lively debate. All five papers included here are concerned with size-scale effects observed in the strength and specific fracture energy of heterogeneous materials, such as concrete, and in the strength of structures made of these materials. The sixth paper by Bazant (“Size effects in quasibrittle fracture: survey of new results and consequences for practice”) is not included here because the author had a prior commitment to publishing it elsewhere.

The five papers approach the important size-scale effects from different perspectives. Thus, *Duan et al.* show that the size effect observed in the specific fracture energy of concrete as determined by the work-of-fracture method is a result of the local variations in the fracture energy over the evolving fracture process zone. When these variations are properly considered, they show that the specific fracture energy which is independent of the size of the specimen can indeed be obtained. *Gutierrez and de Borst* explain the size effect in the strength of single-edge-notched tension specimens via a scale factor (i.e. an internal length scale) intrinsic to gradient-enhanced damage models of concrete.

*Van Mier and van Vliet* use the lattice beam model to explain the size effect observed in the nominal strength and specific fracture energy of concrete tensile specimens. They treat the three phases (aggregate, mortar and interfaces) as brittle in their simulations using both regular and random lattices. *Ince et al.* also explain the size effect in the strength of flexural concrete specimens using the regular lattice beam model. However, they allow for the tension softening of the mortar phase and perform displacement-controlled simulations which result in smooth post-peak response.

*Carpinteri et al.* give a thorough overview of the recent developments in the mechanics of quasibrittle materials with a multiscale microstructure. They show how the fractal approach provides a unified explanation of the size effects in the strength and specific fracture energy of heterogeneous materials.

Alberto Carpinteri  
*Torino, Italy*

Bhushan L. Karihaloo  
*Cardiff, UK*