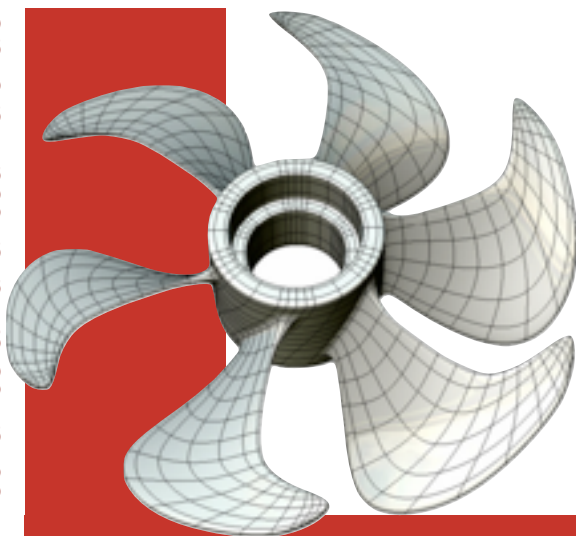


IMAM

SEASON'S GREETINGS 2012



- ▶ An Isogeometric Boundary Element Method is introduced for the first time.
- ▶ Mesh generation is completely suppressed and stress analysis can be performed directly from the CAD data.
- ▶ NURBS functions are used to approximate geometry, displacement and traction fields.
- ▶ Collocation is used to for a system of equations at the Greville abscissae.

Linear elastic analysis directly from CAD

Robert N. Simpson et al. *CMAME*, 2012, (209-212), p87 - 100
 isogeometric boundary element methods

From nanotribology to surgical simulation through honeybee combs [\[mission\]](#)

2011 was a prolific year with more than [35 International journal papers](#), 5 new PhD graduates, and competitive funding for [approximately £2,000,000](#).

Research on multiscale fracture, led by Dr. Pierre Kerfriden and Prof. Stéphane Bordas progressed with new results on model reduction for damage mechanics [[CMAME](#), [IJNME](#)] and the thesis of Mr. Sundararajan Natarajan on "[Enriched finite element methods: advances and applications](#)."

Amongst many other scientific contributions, Prof. Karihaloo's work, with colleagues at Peking University, and published in the [Proceedings of the National Academy of Science of the USA \(PNAS\)](#), showed that the "Hierarchical, multilayered cell walls reinforced by recycled silk cocoons

enhance the structural integrity of honeybee combs."

Prof. Bordas was awarded a [European Research Council Starting Independent Research Grant](#). With his close collaborator Dr. Kerfriden and in collaboration with, among others, Prof. Karol Miller (University of Western Australia), François Faure (INRIA, France), Prof. Audette (USA) and Prof. Pierre Robe, neurosurgeon (Utrecht, Netherlands). They will target the problem of simulating cutting in real time over multiple scales.

iMAM's close collaborator, Professor Rabczuk (Weimar) was awarded a Marie Curie Initial Training Network where 11 partners, including the Institute and the School of Computer Science at Cardiff, will be working towards "[Integrating Numerical Simulation and Geometric Design Technology \(INSIST\)](#)"

2011 was also the year of the Second ECCOMAS Thematic Conference on the eXtended Finite Element Method ([XFEM2011](#)) organised by the Institute. The next event will be organised by the Professors [Gravouil](#) and [Renard \(11-13 Sep 2013\)](#) in Villeurbanne, close to Lyon, France.

Nihal El-kabaazi, who completed her PhD under the direction of Prof. Kennedy, returned to Libya just before the uprising, but has now returned to her academic post at Tripoli University.

Last but not least, the Tribology and Contact Mechanics Research Group was awarded an AC2T Research GmbH grant on "Xtribology: Multiscale modelling and simulation of friction and wear processes."

Happy New Year 2012

Theoretical and Computational Mechanics



[Prof. Stéphane Bordas, Director.](#)



Dr. Pierre Kerfriden



Dr. Robert Simpson



Dr. Siva Kulasegaram



Prof. Bhushan Karihaloo



Dr. Hanxing Zhu



Prof. Fred Williams



Prof. David Kennedy



Dr. Paul Howson

Tribology and Contact Mechanics



Prof. Ray Snidle



Prof. Pwt Evans



Prof. Feodor Borodich

NEWS



Professor Fred Williams
retires from the University on
31 December 2011, after 36
years as a Professor.

Research Staff

Dr I. Berinskii
Mr M. Carli
Dr O. Gonzalez Estrada
Mr A. V. Manoylov
Mr D. Paladim
Dr Y. M. Shabana
Dr K. J. Sharif

RealTCut ERC Starting Grant. Bordas & Kerfriden 2012-2016 - "Towards real time multiscale simulation of cutting in non-linear materials with applications to surgical simulation and computer guided surgery."

Challenges:

- ▶ Handle cutting over multiple scales
- ▶ Deal with complex geometries
- ▶ Control model and discretisation error
- ▶ Obtain realistic haptic feedback in quasi-real-time

