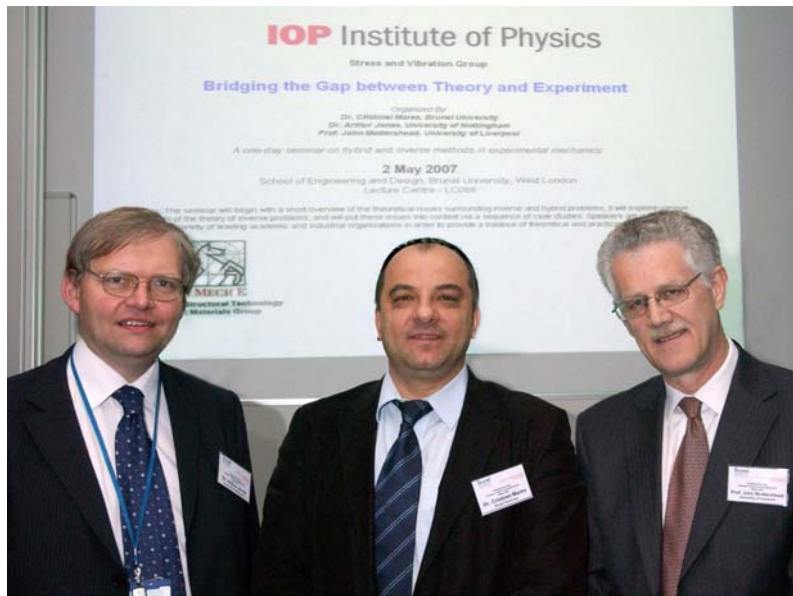


The seminar: 'Bridging the gap between theory and experiment'



On the 2nd of May 2007, a one-day seminar on hybrid and inverse methods in experimental mechanics was organised at Brunel University, School of Engineering and Design. The seminar, 'Bridging the gap between theory and experiment', is the second with the same title and research topic held in recent years and was aiming at bringing together recent results on the theoretical and practical issues surrounding inverse and hybrid problems.

The seminar was organized by Dr. Cristinel Mares (Brunel University), Dr. Arthur Jones (University of Nottingham) and Prof. John Mottershead (University of Liverpool) as one of the specific activities of the Stress and Vibration Group in the Institute of Physics. The event was co-sponsored by IMechE Structural Technology and Materials Group, Engineering Integrity Society and British Society for Strain Measurement.

Engineers investigating the integrity of designs and components, and the dynamic/vibrational behaviour of structures, have a wide range of analytical, numerical and experimental techniques at their disposal.

However, practical problems are not always sufficiently defined to analyse from first principles, and theoretical analyses generally require validation by comparison with experiments. Moreover, experiments generally involve inference of critical quantities (such as stress, natural frequency, damping etc.) from measurements of physical quantities (e.g. thermal emission, response to excitation etc.) rather than direct and unambiguous measurement.

In many cases the inference of these quantities from measured data takes the form of an inverse problem, in which the conventional direction of solving a problem (e.g. determining internal stresses from boundary conditions) is turned inside-out; effectively this involves fitting the input parameters of a conventional theoretical analysis to experimental data, a procedure which is both very powerful and subject to a number of practical and numerical pitfalls.

The speakers Prof. Michael Friswell (University of Bristol), Prof. Bill Lionheart (University of Manchester), Prof. Michael Link (Kassel University), Dr. Liviu Marin (University of Nottingham), Dr. Mark Atherton (Brunel University), Dr. Arthur Jones (University of Nottingham), Prof. John Mottershead (University of Liverpool) and Dr. Cristinel Mares (Brunel University) presented their own experience and recent research results in the field, related to:

- * specific theoretical aspects and methods allowing exploitation of theoretical or numerical models in the interpretation of experimental results;
- * design of experiments to minimise the effects of experimental error and ill-conditioning
- * recovery of quantities such as contact stresses which are difficult or impossible to measure directly;

Industrial case studies from the aerospace and the automotive industries were used to highlight the difficulties and possible solutions used to solve large dimensional complex problems.

A total of 51 researchers attended the seminar, among them a large number of PhD students. The feedback from the attendees allows the organisers to consider this seminar very successful.

