

Minutes of Research Committee on the Mechanics of Jointed Structures

Meeting Location: IMECE, Washington, D.C., Monday, August 29, 2011.

Attendees:

David Ewins, University of Bristol, Chair

Larry Bergman, University of Illinois – Urbana, Vice-Chair

Michael Starr, Sandia National Laboratories, Secretary

Hugh Goyder, Cranfield University

Dan Brown, AWE

Matt Brake, Sandia National Laboratories

Dan Segalman, Sandia National Laboratories

Laura Jacobs, Sandia National Laboratories

Melih Eriten, University of Illinois – Urbana

Alex Vakakis, University of Illinois – Urbana

David Hills, University of Oxford

Rob Flicek, University of Oxford

Norma Johnston, ASME

Mike Tinkleman, ASME

Dane Quinn, University of Akron

Ed Berger, University of Virginia

Evgeny Petrov, Imperial College, London

The agenda was only loosely organized, but was defined through one general element: What are we as a group? How do we want to define ourselves?

Identity of the Research Committee:

Why do we do this and where does this lead us?

The committee's intent should be active promotion of research interests, this could be defined through the development of a white paper (**Vakakis**).

Move to incorporate joint models into full-scale structural dynamics analysis (**Segalman**).

The group needs to define a big challenge (a la MURI, DARPA in which a meeting of mission agencies is convened and program managers compete with proposals. The winning proposal leads the call.)

How should the next workshop be organized?

The focus of the workshop should be the construction of a white paper as proposed above by **Vakakis**. Funding agencies should be invited to attend conference and workshops.

Theme the workshop around the preparation of the white paper.

Discuss the specific goals of the workshop (**Alex** volunteers to define these goals.)

The Dan's (**Segalman** and **Brown**) will work on acquiring funding for the workshop. The target for UK attendees will be April for funding sources and amounts.

Segalman will talk to Phyllis (ASME) about hotel arrangements. Best to align workshop with IDETC 2012 to "piggy-back" workshop arrangements with those already being pursued by ASME for the general conference.

Updates to Meeting Notes (12/01/2011):

Hugo Festjens and **Nicolas Peyret** have requested inclusion on mailings related to committee activities.

Dan Segalman was tasked with trying to secure some funding from American funding agencies. He is due to visit DC in early January and will talk to contacts at NSF and AFOSR about securing some money to defray workshop costs.

Dan Brown (AWE) was similarly tasked for UK and European attendees. I have contacted Dan about his effort, but have received no update yet.

Dane Quinn, **Matt Brake**, and **Mike Starr** have made contact with ASME (Erin Dolan) about extending hotel arrangements at the conference hotel for workshop attendees. **Matt** has further requested meeting rooms for the workshop after the end of IDETC. **Dane** has established a symposium that is to be held the last day of IDETC that is meant to cater to workshop invitees. The generic ASME call for papers has been sent out, but a targeted call will be sent out in the next few days for workshop invitees. **Matt Brake**, **Dane**, and **Hugh Goyder** are symposium organizers and the call reads as follows:

The study of mechanical joints, contact, and friction are three of the few remaining important unknown quantities in structural mechanics and dynamics. The goal of this symposium is to promote discussion and a better understanding between these three topics and to generate new perspectives on the linkage between friction at a tribological level, contact mechanics, and the responses of built-up assemblies containing joints at a structural level. All papers concerned with the dynamics and mechanics of jointed structures, contact, and friction are invited for this symposium, with particular emphasis on the following challenges:

- Measurements of hysteresis in jointed structures
- Repeatability (measurement to measurement) and variability (unit to unit) in measurements of the response of jointed structures
- Complex loading methods
- Studies of surface chemistry
- Physical theories and studies of friction
- Frameworks for multi-scale modeling
- Measurements and predictions of energy dissipation

- Methods to account for uncertainty and nonlinearity in structures with joints, contact, or friction
- Development and validation of predictive models of contact
- Integration of joints, friction, and contact research with commercial numerical codes
- Application of joints, friction, and contact research to real problems

Participants for this symposium are encouraged to submit abstracts for either papers or presentation only.

Further, **Larry Bergmann** and **Alex Vakakis** at UIUC have proposed a preconference tutorial. **Segalman** and **Starr** have been working with UIUC to develop some test hardware that can be used for a nonlinear system identification technique that Illinois has been pursuing. Among other things, the tutorial will introduce the test hardware (which is meant to be a simple reproducible structure accessible to experimentalists, probably a 2D beam/plate assembly which exhibits stiffness and damping nonlinearities) and sets of calibration test data. The challenge will then be posed of how to construct a predictive structural dynamics model for inputs into the hardware with magnitudes greater than that of the calibration data. In fact, we hope that test data can be collected before May so it would be available for processing well before the workshop. Illinois will present their model, as will Sandia.