

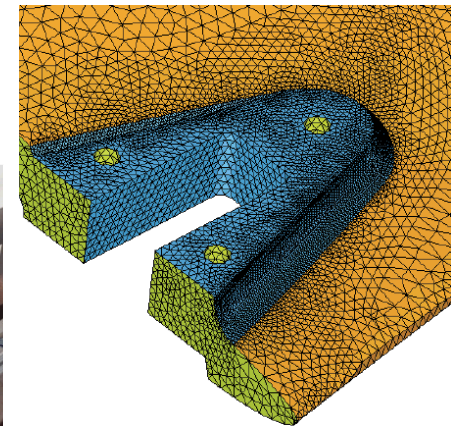
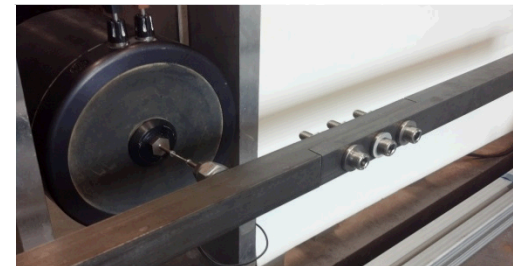
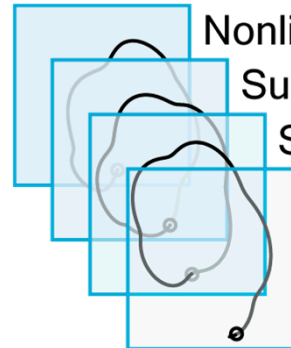
The Nonlinear Mechanics and Dynamics (NOMAD) Research Institute

Matthew Brake

*Exceptional service
in the national interest*



Nonlinear Mechanics & Dynamics
Summer Research Institute
Sandia National Labs



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Institute Overview

- **Purpose:** To bring together participants with diverse technical backgrounds from around the world to work in small teams on projects germane to nonlinear dynamics and mechanics.
- **Expectation:** To form long-lasting collaborations and make significant progress towards solving a number of major challenges in areas of classical mechanical engineering.
- **Dissemination:** Results are disseminated through an internal poster session at the end of the Institute, posters at the ASME/IDETC conference, papers at the SEM/IMAC conference, and collaborative journal papers.
- **History:** First held in 2014 by SNL with 12 participants from 9 institutions representing 6 countries, with 4 mentors overseeing 4 technical projects. Collaborative outcome: 5 presentations at ASME/IDETC meeting, 3 papers at SEM/IMAC meeting, and a SAND report. Two thirds of the participants in 2014 returned for the 2015 institute.

2015 Institute Details – 6/23 to 7/31/15

- **Participation:** 24 graduate student/postdoctoral participants and 14 staff/faculty mentors from 10 countries and 17 institutions.
- **Sponsorship:** 3 corporate sponsors providing software and hardware (Siemens/LMS, Simulia/Abaqus, and Altair/Hyperworks).
- **Research:** 7 research projects collaboratively worked on during the 6 weeks of the institute:
 - Quantification of uncertainty in lap joints
 - Structural design with joints for maximum (or minimum) dissipation
 - Effects of experimental methods on the measurements of damping parameters
 - Round robin of numerical techniques for structural dynamics with nonlinearities
 - Stress waves propagating through jointed connections
 - Assessment of different techniques for formulating reduced order models
 - Nonlinear dynamics and controls of micro- and nano- systems
- **Dissemination:** Results presented as posters at the ASME/ IDETC 2015 conference (outside at this moment!), and as papers at the SEM/IMAC 2016 conference (January 25-28 in Orlando, FL), in addition to expected journal papers. An internal poster session was also held at SNL at the conclusion of the Institute.

Tentative Plan for 2016

- Will be cohosted with the University of New Mexico again
 - Space for more experimental projects and more project teams secured already
 - Planning on 10-12 projects
 - Access to computer clusters, HPC resources, 6200 ft² clean room, lecture halls, experimental resources at UNM and SNL, etc.
- Theme: Friction, Fatigue, Failure.
 - Goal is to span the major challenges in both structural dynamics/vibrations and solid mechanics
 - Will involve SNL experts in ductile fracture (Edmundo Corona, Brad Boyce)
 - Some projects will potentially span all three themes (system identification, uncertainty quantification)
- Looking to engage new faculty mentors from TCVS
 - To join existing steering committee of C. Schwingshackl (Imperial), P. Reuss (Stuttgart) M. Allen (Wisconsin), M. Mignolet (ASU), T. Truster (Tennessee), Z. Leseman (New Mexico), and M. Brake (Sandia)
 - Potential for faculty travel support for those that visit