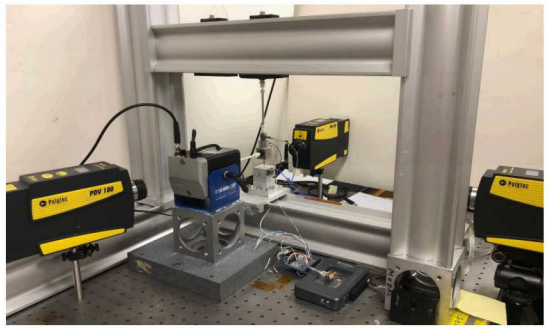
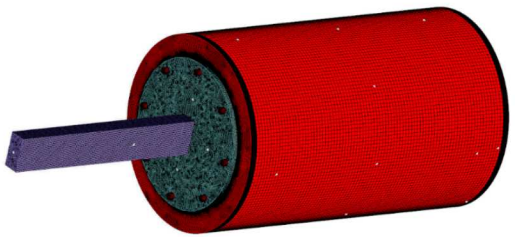
SAND2020-0695PE

# NOMAD
# Mentor Kickoff Meeting 2020





Robert Kuether* ♦ Brooke Allensworth* ♦ Dan Roettgen†

*Component Science and Mechanics, org. 01556

†Structural Dynamics, org. 1522

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# First off….

Thank you!

# What is NOMAD?

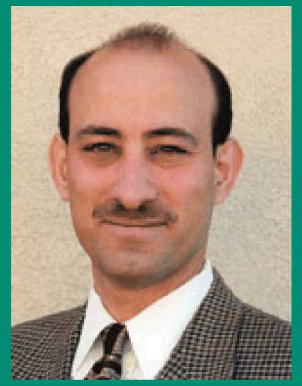
Nonlinear Mechanics and Dynamics (NOMAD) Research Institute seeks to tackle research/technical challenges in the area of nonlinear mechanics and dynamics within Sandia's mission space

- Form research teams (3 students, 3-6 mentors) to work on projects for 7-weeks in summer

Collaborative research opportunity within the greater professional community

- Leverage external technical expertise on foundational R&D
- Pipeline of graduate and highly qualified undergraduate students

Hosted by Sandia National Laboratories in partnership with the Mechanical Engineering Department at the University of New Mexico; held at the UNM ME building from June 15 through July 30, 2020.

| NOMAD Lead | Administrative Lead | UNM Lead | Experimental Lead | Management Lead |
|---|---|---|---|---|
| Robert Kuether | Brooke Allensworth | Tariq Khraishi | Dan Roettgen | Joe Bishop |
| Staff in 1556 | OAA for 1556 | Professor in ME | Staff in 1522 | Manager for 1556 |
|  |  |  |  |  |

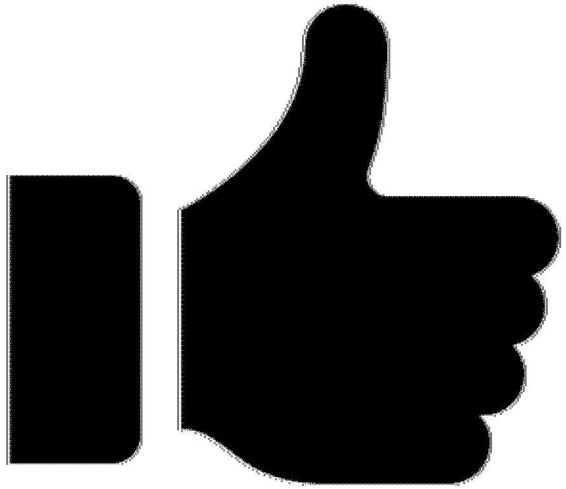
# Successes and Impacts from NOMAD 2019

Highlights from **student** feedback

- "Good opportunity to work outside my normal research"
- "Gained knowledge about Sandia"
- "Met a lot of people and learned valuable skills"
- "As an undergraduate my experience was different trying to keep up with others. Diving straight into the deep end of a field new to me was extremely valuable."

Highlights from **mentor** feedback

- "Enjoyed interacting with the students and conducting research through them"
- "Brought new ideas to Sandia"
- "NOMAD helps attract graduate students to potential employment at national lab"
- "Great to collaborate with others on a research topic"



Impact

- Four conference publications and seven technical presentations
- One year-round intern conversion, currently 10 people on staff/postdoc/intern/contract
- Influence of graduate studies and research thrusts:
  - "Obviously, NOMAD had a huge impact on my future. Spending last summer in the program convinced me of the benefit of continuing my education. Besides, it introduced me to the lab I'll be working in through graduate school, and solidified my interest in structural dynamics."

# Lessons Learned from NOMAD 2019

**Pre-institute experimental planning**

- Each experimental project should have an experimental focal on the team to help with preplanning
- Better scoping of hardware for experiments…sizing shakers, sensors, etc.
- Each project should deliver hardware (**and fixtures**) well in advance
- Have staff/interns in 1522 perform pretesting 2-3 weeks in advance

**Pre-Institute Homework**

- Homework provided to interns well before the start of the program
- Include detailed information (blueprint) of the project and what software will be used (Python, LMS, CUBIT, etc.), which might allow time for them to learn some before they arrive

**Mentor Commitment and Objectives**

- More detailed pre-planning on projects, objectives and leadership among team mentors
- Mentors physically at UNM more often
- Team building within each project
- Mentors plan to bring their team to Sandia to be shown work areas and the Labs
- More collaboration, sharing and contribution with other teams
- Mentors give a short seminar on what the staff members work on

# Project List for NOMAD 2020

**Project 1**: Nonlinear Analysis of Mechanical Joints in Finger-Like Mechanism-Based Morphing Wing Devices

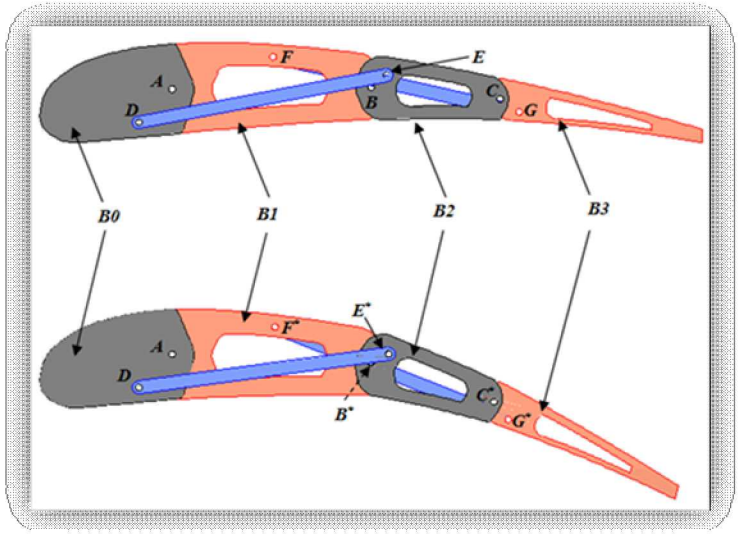
- Ignazio Dimino (CIRA), Matt Allen (UW-Madison), Aabhas Singh (UW-Madison), Rob Kuether (SNL), Dan Roettgen (SNL)

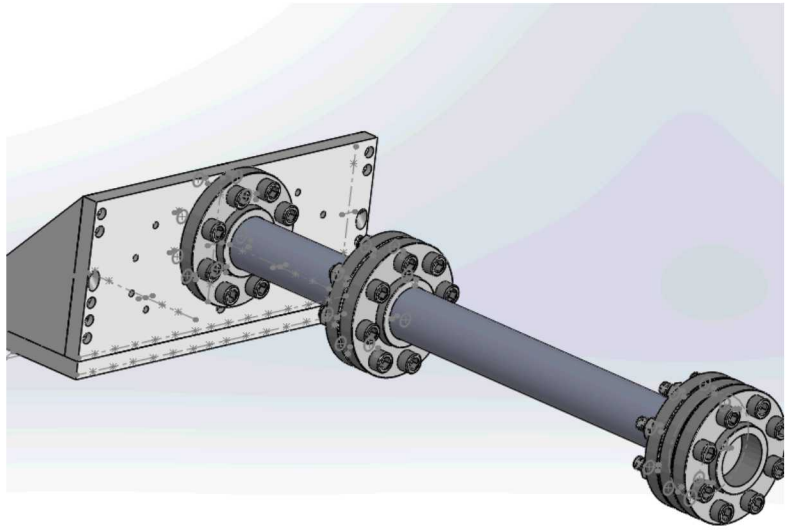
**Project 2**: Neural Network Informed Uncertainty Quantification for Structural Dynamics Reduced Order Models

- Adam Brink (SNL), Carianne Martinez (SNL), D. Dane Quinn (Akron), Eleni Chatzi (ETH Zurich)

**Project 3**: Assessment of Bolted Joint Integrity using Modal Filtering Techniques

- Deborah Fowler (UMass-Lowell), Peter Avitabile (UMass-Lowell), Patrick Logan (UMass-Lowell), Dan Roettgen (SNL), Ben Pacini (SNL), Rob Kuether (SNL)



# Project List for NOMAD 2020 (continued)

**Project 4**: Nonlinear Normal Mode Force Appropriation Techniques to Investigate Wing-Pylon Assembly

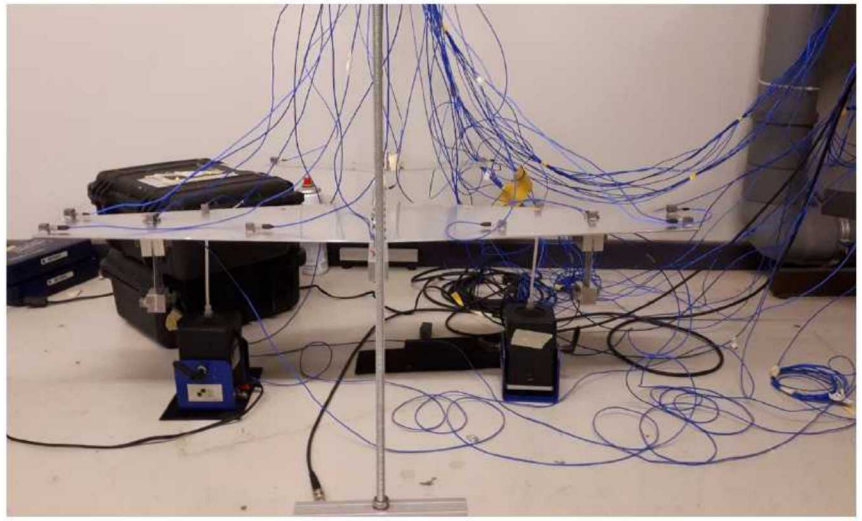
- Dan Roettgen (SNL), Rob Kuether (SNL), Simone Manzato (SISW), Peter Avitabile (UMass-Lowell)

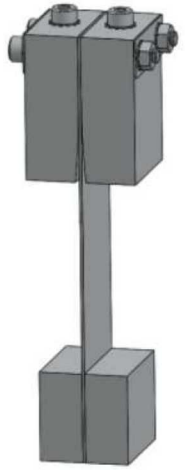
**Project 5**: Using Modal Analysis to Inform the Design of Electrical Switches

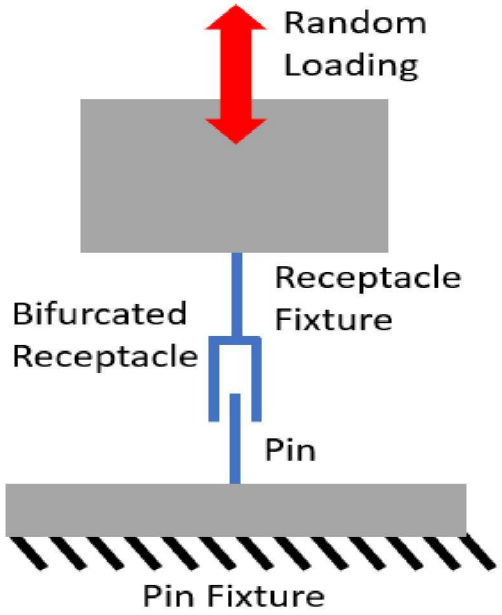
- Rob Flicek (SNL), Kelsey Johnson (SNL), Karl Walczak (SNL), Ben Zastrow (ATA Engineering), Ben Pacini (SNL)

**Project 6**: Correlation of Reduced-Order Model of Threaded Fastener

- Neal Hubbard (SNL), Emily Miller (SNL), John Mersch (SNL), Jeff Smith (SNL), Tariq Khraishi (UNM)







# Timeline of Events

| Date | Activity |
|---|---|
| March 1st, 2020 | • Last day for students to apply |
| March 12th, 2020 | • Last day to make hiring selections |
| March 15th, 2020 | • **Project plan and pre-institute homework completed by mentors and submitted to Rob**<br>• List of equipment needs for experiments to Dan |
| April 1st, 2020 | • Finalize project teams and introduce students/mentors via e-mail<br>• E-mail project plan and pre-institute homework to students |
| April 15th, 2020 | • **Deliver all hardware to Dan Roettgen, 1522, for pre-institute test evaluation (instrumentation, excitation, etc..)** |
| May 15th, 2020 | • **Complete & submit Mentor/Mentee Agreements to Rob or Brooke** |
| June 1st, 2020 | • Complete all pre-institute test evaluations |
| June 16th, 2020 | • NOMAD kickoff! |

# Project Description (due March 15, 2020)

**Identify a PI mentor for the project**

**Background and Motivation**

- Describe the motivation behind the research with citations to key references

**Project Overview**

- What are we trying to accomplish with this project?
- Describe modeling and simulation tasks, experimental approach, etc..

**Experimental Setup (if needed)**

- What equipment is needed to make measurements

**Summary of Tasks**

- Outline of tasks for the students to work towards during the summer (initial trajectory, may change)

**Preparation Tasks**

- Pre-institute homework, suggested reading, software list for students to familiarize, schedule for pre-institute meetings, etc..

**References**

- List of relevant papers/books

*We will distribute examples from past projects and a template

# Mentor/Mentee Agreement 2020

New!

Implemented for transparency, managing expectations and accountability.

Please choose a PI/Lead Mentor for your project. This will be the main coordinator of the project and will be the final decision maker when there are issues.

Mentor engagement is the key to success!

## Benefits of being a mentor:

- Improve communication and personal skills
- Develop leadership and management qualities
- Reinforce your own study skills and knowledge of your subject(s)
- Engage in a volunteering opportunity, **valued by employers**
- Enhance your CV and PMF
- Gain recognition for your skills and experience
- Benefit from a sense of fulfilment and personal growth

# Any questions?

POCs:


- Rob Kuether, Component Science & Mechanics (1556), rjkueth@sandia.gov
- Brooke Allensworth, Component Science & Mechanics (1556), ballens@sandia.gov
- Dan Roettgen, Structural Dynamics (1522), drroett@sandia.gov
- Tariq Khraishi, UNM, khraishi@unm.edu
- Joe Bishop, Component Science & Mechanics (1556), jebisho@sandia.gov