Spring Workshop
Center for Acoustics and Vibrations

The Pennsylvania State University
May 5-6, 2015
CAV researchers identify and solve problems that matter

The CAV has three core missions:

— To strengthen basic and applied research in related engineering areas
— To provide a base for technology transfer to industry
— To foster graduate education in acoustics and vibration engineering

- Acoustics, Aerospace, Mechanical, Civil, Architectural, Electrical, Meteorology, Physics, Biology
The CAV is organized around communication & technical focus

Focal point for acoustics & vibration technology
- Multi-departmental
- Interest groups
- Lunch seminars
- Visiting scholars
- Foster joint activities

Industry member interactions
- Spring Workshop
- Share tech challenges
- Short course / conference – ACS distance ed
- Informal consultation
- Seminars video-streamed
- Newsletter
- Meet students

Center for Acoustics and Vibration
The CAV is a network of talented and dedicated people

Director – George Lesieutre
Associate Director – Steve Hambric

Technical Groups and Leaders
Acoustics Characterization of Materials - Bernhard Tittmann
Adaptive Structures & Noise Control - George Lesieutre
Flow-Induced Noise – Ken Brentner -> Mike Jonson
Structural and System Health Management – Karl Reichard & Cliff Lissenden

Propagation & Radiation - Victor Sparrow
Rotorcraft Acoustics & Dynamics - Edward Smith
Structural Vibrations & Acoustics – Steve Hambric
Underwater Acoustics – Amanda Hanford
CAV faculty received good recognition this year

Steve Hambric – 2015 conference on Noise and Engineering Emerging Methods

Tony Huang – Fellow, AIMBE and IoP; Technical Achievement Award, IEEE Sensors Council

George Lesieutre – General Chair, AIAA SciTech 2015; PSU 25-year chair

Cliff Lissenden – ASME Fellow

Rick Marboe – completed term as ASME VP, Program & Activities
CAV students won some nice awards this year, too

Andrew Acquaviva – Best Student Paper award in Engineering Acoustics, ASA

Yuchao Chen – Penn State Alumni Association Dissertation Award; Thomas and June Beaver Award

Yuliang Xie – Harold K. Schilling Dean’s Graduate Scholarship

Yanhui Zhao – 1st place Poster Award at the 5th Biophotonics Summer School

AHS Vertical Flight Foundation Scholarship – Nikolai Travis, David Reich

Longenecker Scholarship for nuclear waste management sensors – Brian Reinhardt, Kyle Sinding, Andrew Suprock

Kenneth T. Simowitz Memorial Citation: Whitney Coyle, Martin Lawless, Stephen Nichols, Matthew Shaw

Skudrzyk Award: Philip Feurtado
International Liaisons represent the pulse of global technology

Jeremy Astley (Paul White)
Institute of Sound and Vibration Research, U.K.

Lars Enghardt
DLR-Institut fuer Antriebstechnik, Germany

Antonio Concilio
Centro Italiano Ricerche Aerospaziali, Italy

Jean-Louis Guyader (Nicolas Totaro)
INSA de Lyon, Vibrations and Acoustics Laboratory, France

Yang-Hann Kim (Jeong-Guon Ih)
KAIST, Vibrations and Acoustics Laboratory, Korea

Wim Desmet
Noise and Vibration Research Group, Katholieke University, Leuven, Belgium

Li Cheng*
Consortium for Sound and Vibration Research, Hong Kong Polytechnic University
Government Liaisons keep us apprised of opps and advances

Ryan Schultz
Sandia National Laboratories

Cheng-Ih (John) Wu
US Nuclear Regulatory Agency

J. Shawn Peterson
NIOSH/OMSHR
Corporate Sponsors focus us on problems that matter


**Boeing** – Paul Bent, Cliff Chin, Hao Shen
Bose – Wit Bushko, Andrew Dominijanni, Romain Kirszenblat, Thomas Landemaine, Eric Mitchell

**Bridgestone Americas Tire Technology** – Robert Asper, Hans Dorfi, Paul Zakelj
Emerson - Fisher Valves and Instruments – Shannon Jelken
Gerard Daniel – Darren McClure
Gulfstream – Matt Collmar
**ITT** – Mark Downing, Ryan Evans, Mark Ott
**K-Flex** – Tony Ribaudo
KCF Technologies* – Jeremy Frank, Gary Koopmann, Jacob Loverich
Lord Corporation – Scott Redinger
C.F. Martin Guitars* – Albert Germick, Josh Parker
Moog – Eric Anderson, Chris Layer
HII Newport News Shipbuilding - Joe Santillo, Kevin Tooke
United Launch Alliance - Matthew Bloom

**United Technologies Corp.** – (Pratt & Whitney) Brandon Rapp; **(Carrier)** – Jin Liu
**(UTRC)** – Jeff Mendoza
Volvo Construction Equipment – Hongan Xu
Westinghouse Electric Co. - Larry Corr

* small company
Corporate Guests are potential future CAV sponsors

SABIC – Emile Homsi, Xiaoyu Sun

Babcock & Wilcox Power Generation – Suzana Rufener
CAV Short Courses help keep our sponsors current

- Applications of Cepstrum Analysis to Mechanical Problems
  
  Presented by:
  
  Bob Randall – University of New South Wales, Australia

One-day, following CAV Workshop:

May 7, 2015

What would be helpful to you in the future? Let us know!
CAV group seminars can be enjoyed from your desk.

Research in the Electroactive Materials Characterization Laboratory

Zoubeida Ounaies and Group
We listen to you, and evolve

- **Workshop**
  - Two full days, **travel** (Q&A, networking)
  - More students (and poster competition)
  - Short course topics
- We circulate job postings to students
- We send CAV faculty for consultation
  - **Contact us!**

**What’s New?**
- **50th Anniversary of Acoustics Grad Program**
- Thesis Database
CAV Thesis Database puts student research at your fingertips

<table>
<thead>
<tr>
<th>Thesis Title</th>
<th>Author Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoustic bubble: controlled and selective micropropulsion and chemical waveform generator</td>
<td>Ahmed, Daniel PhD Engineering Science and Mechanics</td>
</tr>
<tr>
<td>Thesis Date: 10/21/2013 PDF Available? Yes</td>
<td></td>
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<tr>
<td>Ultrasonic guided wave bondline evaluation of thick metallic structures with viscoelastic coatings and the demonstration of a novel mode sweep technique</td>
<td>Bostron, Jason PhD Acoustics</td>
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<tr>
<td>Thesis Date: 10/7/2013 PDF Available? Yes</td>
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<tr>
<td>Computation of Interactional Aerodynamics for Noise Prediction of Heavy Lift Rotorcraft</td>
<td>Hennes, Christopher C. PhD Aerospace</td>
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<tr>
<td>Thesis Date: 9/27/2013 PDF Available? Yes</td>
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Penn State is a research powerhouse

- In FY 2014, Penn State researchers performed $813M of research
  - ARL/EO $196M; Engineering $132M; Science $107M; EMS $65M; IST $8M
  - Projects with more than 400 companies
  - $101M with industry

  [http://www.research.psu.edu/industry](http://www.research.psu.edu/industry)

- Unique strengths in engineering and the physical sciences
  - 350 Engineering faculty; 650 ARL researchers
  - Positioned to educate the next generation of engineers and scientists
Example: Penn State is advancing rotorcraft research

- In 2011, Penn State was selected by the U.S. Army and NASA to lead a $12.5M Vertical Lift Research Center of Excellence
- Penn State’s VLRCOE is one of only three in the U.S.
  - In 19th year
  - Major source of talent
Penn State is educating the next generation of citizens and engineers

- **Penn State**
  - 40,540 undergrads at UP (62% PA) (85,200 total residence)
    - 4060 international
  - 6,100 graduate students at UP (25% PA) (9,000 total)
    - 2510 international
  - 10,800 World Campus students (4,560 grad students)

> 600,000 living and loyal graduates

- **College of Engineering**
  - 7640 undergraduates (+~1800 non-UP; 1106 int’l) (2nd/350)
    - 3rd/361 in B.S. degrees (1580)
    - Highest math and overall SAT scores (sometimes verbal!)
  - 1390 graduate students (+~500 w/PT, non-UP; 860 int’ l)
    - 54th/283 in M.S. degrees (318)
    - 15th/221 in Ph.D. degrees (157)
Vision: Develop World-Class Engineers

- **World Class Engineer**
  - Aware of the world
  - Solidly grounded
  - Technically broad
  - Ethical
  - Innovative
  - Effective in teams
  - Successful as leaders
Penn State engineering grads are highly sought after

A&D industry ranked Penn State as the #1 university from which they like to hire engineers (AW&ST 26AUG13)

The Wall Street Journal’s poll of corporate recruiters ranked Penn State as the #1 university from which they like to hire students — For producing the best-prepared, most well-rounded graduates who are equipped to succeed
Your companies can have an impact at Penn State

- **Visit us (Seminars)**
- **Hire our students**
  - Co-ops, internships, undergrads, grads
  - Several CAV students have resumes today
- **Advise us (CAV, IPACs, design teams)**
  - ABET feedback
- **Sponsor student activities**
  - Undergraduate design projects; society meetings
  - Graduate research; joint proposals
- **Provide financial support**
  - Scholarships and fellowships
  - Program funds
    - Laboratory facilities and projects; Lecture series
    - Faculty Chairs & Professorships
      - Visiting positions from industry
Penn State can help you shape your future and meet objectives

- **Maximize Your Research Investment**
  - Leverage PSU cutting-edge research, and capitalize on outstanding faculty and students and on a novel, flexible IP policy

- **Strengthen Your Brand Recognition**
  - Put PSU institutional loyalty to work at boosting visibility across customers, policy makers and future employees

- **Globalize Your Business**
  - Gain know-how navigating geopolitical and cultural complexities to expand opportunities, improve profitability and maximize success

- **Transform Your Workforce**
  - Exploit PSU executive / professional education opportunities as well as partner-tailored and jointly-developed training programs

- **Acquire Talent to Enhance Your Operations**
  - Establish a conduit to versatile and innovative graduates with fresh ideas on driving operational effectiveness and competitive advantage

- **Demonstrate Your Corporate Responsibility**
  - Be pro-active in tackling social, political and environmental challenges
  - Meet and exceed customer and business-partner expectations
Partnersing with Penn State CAV makes good business sense

- **Interdisciplinary Research**
  - Facilitated through University-wide initiatives and fostered by a unique intellectual climate that crosses traditional academic boundaries

- **Well-Prepared Students**
  - Abundant opportunities to put learning into practice and build time-management, organizational and collaborative skills

- **Global Reach, Global Impact**
  - Extensive online World Campus; alumni in leadership positions at major global enterprises

- **Industry-Friendly Partnering**
  - Streamlined contracting procedure, complemented by a staff of experienced professionals

- **Revolutionary IP Posture**
  - Flexible approach to IP management in industry-sponsored research, leading to simplified negotiations and faster time-to-market

**Rated #1 online institution; Presence in > 150 countries; Global Engagement Partners**

**PSU does not seek to retain ownership of IP developed from research programs funded by industry**
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
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<tbody>
<tr>
<td>8:15 AM</td>
<td>Welcome &amp; Intro</td>
<td>T. Mayer / G. Lesieutre</td>
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<tr>
<td>8:45 AM</td>
<td>Structural Vibration and Acoustics</td>
<td>Steve Hambrick / A. Sinha</td>
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<tr>
<td>9:15 AM</td>
<td>CAV sponsor: Bechtel Marine Propulsion</td>
<td>Kristin Cody</td>
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<tr>
<td>9:30 AM</td>
<td>Graduate Program in Acoustics – 50 years!</td>
<td>Vic Sparrow</td>
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<tr>
<td>10:00 AM</td>
<td>Break</td>
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<tr>
<td>10:30 AM</td>
<td>Int’l Liaison: KU-Leuven</td>
<td>Wim Desmit</td>
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<tr>
<td>11:00 AM</td>
<td>Propagation and Radiation</td>
<td>Vic Sparrow</td>
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<tr>
<td>11:30 AM</td>
<td>Int’l Liaison: INSA de Lyon</td>
<td>Nicolas Totaro</td>
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<tr>
<td>12:00 PM</td>
<td>Lunch</td>
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<tr>
<td>1:15 PM</td>
<td>Student poster 2-minute overviews</td>
<td>Students</td>
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<tr>
<td>1:45 PM</td>
<td>Int’l Liaison: Univ New South Wales</td>
<td>Bob Randall</td>
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<tr>
<td>2:15 PM</td>
<td>Acoustic Characterization of Materials</td>
<td>B. Tittmann / K. Ledford</td>
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<td>2:45 PM</td>
<td>Int’l Liaison: KAIST</td>
<td>Jeong-Guon Ih</td>
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<tr>
<td>3:15 PM</td>
<td>Break</td>
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<tr>
<td>3:45 PM</td>
<td>CAV sponsor: ITT</td>
<td>Mark Downing</td>
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<tr>
<td>4:00 PM</td>
<td>Rotorcraft Acoustics and Dynamics</td>
<td>Ed Smith / Steve Hambrick</td>
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<td>4:30-6:00 PM</td>
<td>open</td>
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<tr>
<td>6:00-9:00 PM</td>
<td>Reception and student posters (6:45-8:00)</td>
<td>Cafe Laura, Mateer Bldg.</td>
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<tr>
<td>8:15 AM</td>
<td>Adaptive Structures and Noise Control</td>
<td>George Lesieutre</td>
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<td>8:45 AM</td>
<td>Int’l Liaison: ISVR</td>
<td>Paul White</td>
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<tr>
<td>9:15 AM</td>
<td>System &amp; Structures Health Mgt</td>
<td>Reichard, Lissenden</td>
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<td>9:45 AM</td>
<td>CAV sponsor: KCF Technologies</td>
<td>Jacob Loverich</td>
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<tr>
<td>10:00 AM</td>
<td>Break (poster award recognition)</td>
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<td>Int’l Liaison: CIRA</td>
<td>Antonio Concilio</td>
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<td>11:00 AM</td>
<td>Underwater Acoustics</td>
<td>A. Hanford / D. Olson</td>
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<tr>
<td>11:30 AM</td>
<td>CAV Sponsor: Bridgestone Tires</td>
<td>Robert Asper</td>
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<tr>
<td>11:45 AM</td>
<td>Visitor feedback</td>
<td>Lesieutre, Hambrick</td>
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<tr>
<td>12:00 PM</td>
<td>Lunch</td>
<td>NLI Faculty/Staff Club</td>
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<tr>
<td>1:15 PM</td>
<td>Int’l Liaison: DLR-Berlin</td>
<td>Lars Enghardt</td>
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<tr>
<td>1:45 PM</td>
<td>CAV Sponsor: ULA</td>
<td>Matt Bloom</td>
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<tr>
<td>2:00 PM</td>
<td>Flow-Induced Noise</td>
<td>Mike Jonson / R. Powers</td>
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<tr>
<td>2:30 PM</td>
<td>CAV Sponsor: UTC BIS</td>
<td>Jin Liu</td>
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<tr>
<td>2:45 PM</td>
<td>Break</td>
<td>All</td>
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<tr>
<td>3:15-4:15</td>
<td>Lab tours</td>
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