Spring Workshop
Center for Acoustics and Vibrations

The Pennsylvania State University
April 29-30, 2014
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 – *Dean Capone -> Ken Brentner*
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 – *David Bradley*
CAV faculty won some nice awards this year

Andrew Barnard – 2013 PSU/ARL Publication Award

George Lesieutre – 2014 AIAA SDM Lecture

Cliff Lissenden – ASME Fellow

Peter Newman – 2013 GWS Social Science Achievement Award

Marty Trethewey – 2014 Milton S. Eisenhower Award for Distinguished Teaching

Kenji Uchino – IEEE Ferroelectrics Recognition Award

Gordon Warn – NSF CAREER Award
CAV students won some nice awards this year, too

Beth Bimber – NSF Graduate Research Fellowship

Ethan Corle – AHS Vertical Flight Foundation Scholarship

Guillermo Costa – AHS Alfred L. Wolfe Scholarship

Whitney Coyle – NSF Research Fellowship; Best Young Presenter at the San Francisco ASA meeting

Grant Dowell – received 1st place in the student poster competition at the 66th Meeting of the APS Division of Fluid Dynamics

Matthew Krott – AHS Vertical Flight Foundation Scholarship

Adam Lesky – 2nd prize at ESM Today; Aero Technologies E-A-R Acoustics Scholarship

Pierre Thurier – 1st prize at the 2014 Penn State Graduate Exhibition

Kenneth T. Simowitz Memorial Citation: Whitney Coyle, David Dick, Beom Soo Kim, Aaron Lesky, Amanda Lind, Stephen Nichols, Andrew Pyzdek, Rachel Romond

Skudrzyk Award: Jason Bostron, Abe Lee
International Liaisons monitor 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 (Laurent Maxit)
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

Lee Gorny
NIST

Timothy Walsh
Sandia National Laboratories

Ian Tseng
Yuken Wong
US Nuclear Regulatory Agency

Mark McNelis (GRC), Bill Hughes (GRC), Jerry Rouse (LaRC)
NASA

Mingfeng Li
NIOSH/OMSHR
Vendor Liaisons keep us apprised of needs and available new technology

Martin Alexander
*Bruel & Kjaer*

Short course instructor

David Rizzo
*PCB Piezotronics*
Corporate Sponsors focus us on problems that matter

Bechtel Marine Propulsion Corp
(Bettis) - Eric Salesky, Bob Tomko, Werner Hager, Andrew Kojzar
(KAPL) - Steve Dunn, Kevin Mahn, Edward Menard, Daniel Nesti

Boeing – Joseph Wat, Rui Cheng
Bose – Ray Wakeland, Wit Bushko
Electric Boat – Martin Manley
Emerson - Fisher Valves and Instruments – Shawn Anderson, Shannon Jelkin
GE Global Research - Andrew Gorton
Gerard Daniel – Steve Crooks, Darren McClure
Gulfstream – Kristopher Lynch, Joe Salamone
KCF Technologies* – Jacob Loverich, Jeremy Frank, Gary Koopmann
Lord Corporation – Scott Redinger, Jeff Allred, Matt Smith
C.F. Martin Guitars* – Albert Germick, Brenden Hackett
Moog – Eric Anderson, Chris Layer
Newport News Shipbuilding - Kevin Smith, Vincent Nguyen, Frank Tsai
Toyota Technical Center – Yeongching Lin
United Launch Alliance - Edward Heyd
United Technologies Corp. – (UTRC) – Jeff Mendoza; (Carrier) – Jin Liu
(Pratt & Whitney) Richard LaBelle, Lon Preston, Kerwin Low
Volvo Construction Equipment – John Wang
Westinghouse Electric Co. - Larry Corr, Gregory Banyay, Gregory Meyer

* small company
Corporate Guests are potential future CAV sponsors

Ford Motor Co. – Charles Glynn

Harman Int’l – Donald Butts, Heikki Laine, Todd Suko

ITT – Mark Downing, Ryan Evans

Johnson Controls – Paul Bauch

Oeler Industries – Matt Oeler, Dan Denne
CAV Short Courses help keep our sponsors current

- Vibration and Noise Control
  Presented by:
  Marty Alexander of Bruel & Kjaer
  One-day, following CAV Workshop
  May 1, 2014

What would be helpful to you in the future? Let us know!
Research in the Electroactive Materials Characterization Laboratory

Zoubeida Ounaies and Group
We listened to you, and made some changes

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

**What’s New?**

- **New Anechoic Room**
- **Thesis Database**
CAV Thesis Database puts student research at your fingertips

<table>
<thead>
<tr>
<th>Thesis Title</th>
<th>Author Name</th>
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<tbody>
<tr>
<td><strong>Acoustic bubble: controlled and selective micropropulsion and chemical wave</strong></td>
<td>Ahmed, Daniel, PhD Engineering Science and Mechanics</td>
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<td>Thesis Date: 10/21/2013, PDF Available? Yes</td>
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<td><strong>Ultrasonic guided wave bondline evaluation of thick metallic structures</strong></td>
<td>Bostron, Jason, PhD Acoustics</td>
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<td>with viscoelastic coatings and the demonstration of a novel mode sweep technique</td>
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<td><strong>Computation of Interactional Aerodynamics for Noise Prediction of Heavy</strong></td>
<td>Hennes, Christopher C., PhD Aerospace</td>
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<td><strong>Lift Rotorcraft</strong></td>
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<td>Thesis Date: 9/27/2013, PDF Available? Yes</td>
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**Quick Links**
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- Workshops, Seminars, Short Courses, and Conferences
- Newsletters
- Corporate Sponsorship
- Government and Vendor Liaisons
- International Liaisons and Visitors
Penn State is a research powerhouse

- In FY 2012, Penn State researchers performed $808M of research ($848M 2013)
  - ARL/EO $173M; Engineering $130M;
  - Science $97M; EMS $70M; IST $9M
- Projects with more than 400 companies
- $110M with industry (~$30M?) (4th in the U.S.)
  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 18th year
  - Major source of talent
Penn State is educating the next generation of citizens and engineers

- **Penn State**
  - 40,100 undergrads at UP (63% PA) (84,800 total residence)
    - 3630 international
  - 6,100 graduate students at UP (27% PA) 9,000 total
    - 2450 international
  - 13,300 World Campus students (5,900 grad students)
> 600,000 living and loyal graduates

- **College of Engineering**
  - 7220 undergraduates (+1790 non-COE/UP; 975 int’l)
    (2nd/350)
    - 2nd in B.S. degrees (1510)
    - Highest math and overall SAT scores (sometimes verbal!)
  - 1365 graduate students (+500 w/PT, non-COE/UP; 825 int’l)
    - 40th/265 in M.S. degrees (384)
    - 12th/200 in Ph.D. degrees (165)
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
Partnering 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

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

- Don Mothersbaugh

**PSU does not seek to retain ownership of IP developed from research programs funded by industry**
CAV Workshop Agenda – Tuesday

8:15 AM  Welcome  George Lesieutre
8:45 AM  Refurbished Anechoic Room  Michelle Vigeant
          New Penn State IP Policies  Don Mothersbaugh
          Propagation and Radiation  Vic Sparrow
          Online animations  Dan Russell
9:00 AM  Underwater Acoustics  David Bradley
9:30 AM  Break
10:00 AM CAV sponsor: KCF Technologies  Jeremy Frank
10:30 AM Int’l Liaison: KU-Leuven  Wim Desmit
11:15 AM Panel: Sound Propagation in Air and Water  Sparrow, Bradley, Hanford
          NLI room TBA
12:00 PM Lunch  Students
1:15 PM  Student poster 2-minute overviews  Bernie Tittmann
1:45 PM  Acoustic Characterization of Materials  Li Cheng
2:15 PM  Int’l Liaison: Hong Kong Poly  Jose Palacios
2:45 PM  Rotorcraft Acoustics and Dynamics
3:15 PM  Break
3:45 PM  CAV sponsor: Gerard Daniel  Steve Crooks
4:00 PM  Int’l Liaison: KAIST  Jeong-Guon Ih
4:30-5:00 PM Structural Vibration and Acoustics  Steve Hambric
          Acoustic black holes  Wim Desmit
          NLI room TBA
6:00-9:00 PM Reception and student posters (6:45-8:00)  Steve Conlon
          Keller Bldg. Foyer  Center for Acoustics and Vibration
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>8:15 AM</td>
<td>Adaptive Structures and Noise Control</td>
<td>George Lesieutre, Paul White</td>
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<td>8:45 AM</td>
<td>Int’l Liaison: ISVR</td>
<td>Reichard, Lissenden, Greg Meyer</td>
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<td>9:45 AM</td>
<td>CAV Sponsor: Westinghouse</td>
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<tr>
<td>10:00 AM</td>
<td>Break (poster awards)</td>
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<td>10:30 AM</td>
<td>Special: Effects of sound on humans</td>
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<td>11:00 AM</td>
<td>Vendor Liaison: Bruel &amp; Kjaer</td>
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<tr>
<td>11:15 AM</td>
<td>Panel: Effects of vibration and sound on humans and animals</td>
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<td>12:00 PM</td>
<td>Lunch</td>
<td>NLI room TBA</td>
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<tr>
<td>1:15 PM</td>
<td>Int’l Liaison: DLR-Berlin</td>
<td>Lars Enghardt, Dean Capone, Brentner</td>
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<td>1:45 PM</td>
<td>Flow-Induced Noise</td>
<td>Laurent Maxit, Vic Sparrow</td>
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<td>2:15 PM</td>
<td>Int’l Liaison: INSA de Lyon</td>
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<tr>
<td>2:45 PM</td>
<td>Graduate Program in Acoustics</td>
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<td>3:00 PM</td>
<td>Break</td>
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<td>3:30-4:00</td>
<td>Wrap-up and feedback</td>
<td>All</td>
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<tr>
<td>4:00-5:00</td>
<td>Lab tours, Ribbon-Cutting of new CAV Anechoic Room</td>
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