# Valerie Rennoll

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## Professional Profile

- Expertise in developing and characterizing technologies that improve disease detection through body sound monitoring
- Detail-oriented & reliable team player with track record for solving problems & completing multiple tasks in fast-paced environments
- Broad range of technical & interpersonal competencies that have resulted in peer-reviewed publications, patents, grants, & awards
- Experiences planning statistically grounded experiments, analyzing scientific data, characterizing materials, & developing acoustic technologies
- Dedicated to increasing diversity in STEM fields by actively organizing mentoring & outreach opportunities

## Education

### Johns Hopkins University (JHU) - Baltimore, MD

*2016 - Present*

Ph.D. Electrical and Computer Engineering (Dr. James West laboratory), expected graduation April 2023

### American University (AU) - Washington, DC

*2012 - 2016*

Bachelor of Science in Audio Technology and Physics with Honors

## Skills

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|---|---|
| **Programming languages** | Matlab, Mathematica, Python, R, Arduino, LaTeX, Java |
| **Software** | JMP, Minitab, SolidWorks, Pro Tools, Logic Pro, Microsoft Office |
| **Material fabrication & characterization** | Electrospinning, corona charging, SEM, XRD, FTIR, electrostatic voltmeter |
| **Design** | Illustrator, Procreate |
| **Other** | Design of experiments, time management, technical writing |

## Relevant Experiences

### Doctoral Researcher

*July 2016 - Present*

Johns Hopkins University - Baltimore, MD

- Optimize electret polymers & flexible electronics for use in flexible, acoustic impedance-matched transducers to improve sound capture from the human body, musical instruments, & underwater
- Generate statistical model that determines the fabrication conditions for a polymer to demonstrate specific acoustic properties
- Design an acoustic phantom for improved characterizations and comparisions of body sound monitoring technology
- Develop signal processing methods to manipulate the perceptual characteristics of electronic stethoscopes
- Characterize the frequency response, reliability, & power output of transducers using various equipment, such as simulators & shakers
- Investigate how biomolecules can be used to enhance the electrical response of polymers
- Communicate technical results to wide audiences via written documents and oral presentations through the preparation of multiple conference presentations, grants, patents, & publications
- Supervise 5 graduate, undergraduate, & high school students completing independent laboratory research projects

### Research Intern

*May 2022 - August 2022*

Sonavi Labs - Baltimore, MD

- Prepared 12-page grant proposal on developing and characterizing new wearable body sound monitoring device
- Collected and analyzed pulse oximeter, electrocardiogram, and stethoscope data to assess viability for including in wearable device

### Lab Technician

*Apr. 2020 - May 2020*

Dipole Materials - Baltimore, MD

- Produced electrospun nanofiber face mask filters for distribution to local hospitals and online retailers during the COVID-19 pandemic
- Developed preliminary formulation of material & solvent combination for robust fiber formation
- Performed quality control checking of filter material & corrected for instrument complications

### Acoustic Consultant Intern

*Sep. 2015 - Dec. 2015*

Shen Milsom & Wilke - Washington, DC

- Composed reports for 5 clients addressing potential acoustic issues & how to mitigate architectural impacts
- Conducted site visits at the National Institutes of Health & National Museum of African American History & Culture to collect acoustic data for the installation of a microscope and construction of a concert hall

### Research Intern

*May 2015 - Aug. 2015*

NOAA Office of Coast Survey - Silver Spring, MD

- Analyzed approximately 2 terabytes of acoustical depth data for ocean floor mapping in the Arctic
- Created new workflow for the Office of Coast Survey to ingest bathymetric data from outside sources
- Utilized sonar for acoustic data collection onboard NOAA Ship *Fairweather*

### Undergraduate Researcher

*Aug. 2014 - May 2016*

American University - Washington, DC

- Measured thermal noise in optical coatings for use in the Laser Interferometer Gravitational-Wave Observatory
- Constructed demonstrations to explain acoustics concepts, such as interference between and diffraction of waves
- Applied delay-sum beamforming to Playstation Kinect and handmade microphone array

### Research Intern

*June 2014 - Aug. 2014*

Applied Research in Acoustics - Culpeper, VA

- Performed subject matter expert playtesting of WaveQuest, an educational underwater acoustics video game
- Developed parametric underwater noise models as part of real-time passive sonar simulation engine
- Literature review & model documentation for inclusion in governmental report

## Teaching Experience

### Adjunct Lecturer - Peabody Institute

*Aug. 2021 - Dec. 2021*

Designed & led an introductory, graduate-level musical acoustics course for 12 students with semester-long research project to characterize impedance-matched acoustic sensor for musical applications

### Course Instructor - JHU

*Aug. 2020 - Dec. 2020*

Developed an introductory course on electret materials for 6 freshman undergraduates with demonstrations on energy harvesting & microphone design

### Guest Lecturer - JHU

*Spring 2020*

Developed and provided guest lectures on the electronic properties of materials for a graduate level course

### Teaching Academy Participant - JHU

*Aug. 2019 - Dec. 2020*

Completed certificate program that provided formal instruction on pedagogy and evidence-based teaching practices

### Physics Teaching Assistant - AU

*Jan. 2013 - May 2016*

Held regular office hours to support students in understanding class content and assessed weekly homework assignments of approximately fifty students

## Publications

Available via Google Scholar Profile.

McLane, I., **Rennoll, V.**, Elhilali, M., West, J. "Body sound monitoring with acoustic impedance-matched sensor." In preparation for submission spring 2023.

**Rennoll, V.**, McLane, I., Eisape, A., Grant, D., Elhilali, M., West, J. "Design of an electrostatic transducer with acoustic impedance matching through an optimal design of experiments." In preparation for submission spring 2023.

Grant, D., McLane, I., **Rennoll, V.**, West, J. "Considerations and challenges for real-world deployment of an acoustic-based COVID-19 screening system." Under review with Sensors.

**Rennoll, V.**, McLane, I., Elhilali, M., West, J. "Optimized acoustic phantom design for characterizing body sound sensors." Sensors, 2022, 22, 9086.

**Rennoll, V.**, et al. "Project-based learning through sensor characterization in a musical acoustics course." The Journal of the Acoustical Society of America, 2022, 152, 1932-1941.

Eisape, A., **Rennoll, V.**, Volkenbug, T.V., Xia, Z., West, J., Kang, S.H. "Soft CNT-Polymer Composites for High Pressure Sensors." Sensors, 2022, 22, 5268.

**Rennoll, V.**, Lee, S., Erturun, U., Fried, S., West, J. "DNA increases the $\beta$–phase content of PVDF films." 2020 IEEE Conference on Electrical Insulation and Dielectric Phenomena (CEIDP), 2020, 431-434.

**Rennoll, V.**, McLane, I., Emmanouilidou, D., West, J., Elhilali, M. "Electronic stethoscope filtering mimics the perceived sound characteristics of acoustic stethoscope." IEEE Journal of Biomedical and Health Informatics, 2021, 25(5), 1542-1549.

Fischl, K.D., Tognetti, G., Mendat, D., Orchard, G., Rattray, J., Sapsanis, C., Campbell, L., Elphage, L., Niebur, T., Pasciaroni, A., **Rennoll, V.**, Romney, H., Walker, S., Pouliquen, P., Andreou, A. "Neuromorphic self-driving robot with retinomorphic vision and spike-based processing/closed-loop control." 2017 51st Annual Conference on Information Sciences and Systems (CISS), 2017, 1-6.

## Patents

Grant, D., McLane, I., **Rennoll, V.**, West, J. Systems and methods for acoustic-based diagnosis. Provisional patent 63/416,298.

**Rennoll, V.**, McLane, I., Eisape, A., Elhilali, M., West, J. Impedance-matched acoustic transducer, PCT/US2021/054088.

McLane, I., West, J., Emmanouilidou, D., Elhilali, M., **Rennoll, V.**, Erturun, U., Orrego, S., Kang, SH. Tunable thin- film acoustic sensor, manufacturing methods, and processing algorithms, Filed JHU Invention Disclosure, D14834, July 7, 2017.

## Presentations

**ASA Acoustics in Focus** *virtual; June 2021*

Evaluating the impact of acoustic impedance matching on the airborne noise rejection and sensitivity of an electrostatic transducer

**Acoustics Virtually Everywhere** *virtual; Dec. 2020*

Characterizing the acoustic impedance and attenuation of biocompatible elastomers: an optimal design of experiments approach

**CEIDP** *virtual; Oct. 2020*

DNA increases the $\beta$–phase content of PVDF films

**MRS Fall Meeting** *Boston, MA; Dec. 2019*

Assessing the individual contributions of dipolar, trapped, and triboelectric charges to electrospun PVDF's electrical response

## Posters

**JMP Discovery Summit** *virtual; Oct. 2021*

Design of experiments to characterize and predict polymer acoustic properties

**Johns Hopkins Dept. of Medicine & Whiting School of Engineering Research Retreat** *virtual; Mar. 2021*

Electrostatic transducer with tuned mechanical properties for improved body sound sensing

**APS March Meeting** *Baltimore, MD; Mar. 2016*

Visualizing Sound: Demonstrations to Teach Acoustic Concepts

**Ocean Sciences Meeting** *New Orleans, LA; Feb. 2016*

Data Mining to Chart the Arctic: Analysis of Approaches to Incorporate Outside Source Data into NOAA Office of Coast Survey Workflow

## Honors

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|---|---|
| **Johns Hopkins University Electrical and Computer Engineering Community Builder Award** | *May 2022* |
| **Acoustical Society of America, DC Chapter, Oral Presentation Award** | *May 2021* |
| **Collegiate Inventors Competition Runner Up Award** | *Oct. 2020* |
| **Maryland State Three Minute Thesis Competition, Audience's Choice** | *May 2019* |
| **Johns Hopkins University Three Minute Thesis Competition, 2nd Place** | *Apr. 2019* |
| **Phi Beta Kappa Member** | *Spring 2016* |
| **Outstanding Academics in Audio Technology, American University** | *Spring 2014-2016* |
| **Honors and Scholars Program Outstanding Senior, American University** | *Spring 2016* |
| **Outstanding Physics Academics, American University** | *Spring 2013-2014, 2016* |
| **Honors Capstone Research Grant, American University** | *Fall 2015* |
| **Acoustical Society of America, DC Chapter, Oral Presentation Award** | *May 2015* |
| **Barry Goldwater Scholarship Honorable Mention** | *Spring 2015* |
| **Honors Scholars and Artists Award, American University** | *Spring 2015* |
| **Physics Teaching Assistant Award, American University** | *Spring 2015* |
| **NOAA Hollings Scholar** | *2014-2016* |
| **Dean's List, American University** | *2012-2016* |
| **Dean's Scholarship, American University** | *2012-2016* |
| **Girl Scout Gold Award** | *2012* |

## Grants

**Johns Hopkins University Discovery Award** *June 2022*
Contact Sensor Design and Processing for Improved Perceptual Sound Pickup of the Double Bass

**IEEE Dielectrics & Electrical Insulation Society Graduate Student Fellowship** *Dec. 2019*
Nucleic Acid - Polymer Hybrid Materials for Biocompatible Piezoelectric Devices

**Johns Hopkins University Discovery Award** *July 2019*
Creating Biomolecule-Polymer Hybrid Materials for Biocompatible Piezoelectric Devices

## Leadership

**Revision, Editor - JHU** *May 2021 - Present*
Edit 1 document every 2 months, including manuscripts, grant applications, & personal statements, for clarity, grammar, & content

**Electrical & Computer Engineering Graduate Student Association, President - JHU** *Sept. 2021 - July 2022*
Led & organized at least 1 event per month, including lunch & learns, outreach opportunities, & study breaks, to build graduate community

**Womxn Mentoring Whiting, Mentor - JHU** *Jan. 2021 - June 2022*
Mentored undergraduate engineering students to provide support with internship & graduate school applications

**STEM Achievement in Baltimore Elementary Schools, Mentor - JHU** *Fall 2019*
Assisted students in completing student-driven STEM projects during afterschool program

**Expanding Your Horizons: STEM Discovery Day, Volunteer - Stevenson University** *Sept. 2017 - 2019*
Designed & led workshops introducing roughly 100 participants to the science of sound & construction of a speaker

**Southern Elementary School Science Friday, Organizer - Glen Rock, PA** *Apr. 2018*
Co-organized event & coordinated over 20 volunteers to introduce elementary students to STEM fields

**Expanding Your Horizons: STEM Discovery Day, Activity Leader - Stevenson University** *Sept. 2017-2019*
Designed and led workshops introducing participants to the science of sound and construction of a speaker

**Girl Scout GENIUS Day, Organizer - New Freedom, PA** *Apr. 2017*
Co-organized event to introduce 130 girls to variety of STEM fields through hands-on workshops

**Women in Science, President - AU** *June 2015*
Coordinated & led multiple events including a Girl Scout outreach day, Professor Potluck, Fall Social, Alumni Panel, & luncheon with Associate Director for Science at the White House

**Sound Foundation, Intern - Culpeper, VA** *June 2014 - Aug. 2014*
Gathered research to form case of support for the nonprofit, which introduces disadvantaged high school students to STEM & business fields through real-world acoustics projects

**Search Committee, Student Representative - AU** *Fall 2015*
Interviewed potential candidates and provided feedback on potential audio technology professors

**National Maker Faire, Volunteer - Washington, DC** *June 2015*
Showed and explained audio spectrum analyzer project to the public at American University's booth

**USA Science and Engineering Festival, Volunteer - Washington, DC** *Apr. 2014 & 2016*
Interacted with the public to explain the science of sports and sound at American University's booth