# High-School Students Win ASA Awards at the International Science and Engineering Fair

Laurie M. Heller

Annually, the Acoustical Society of America (ASA) is one of the sponsors of the Regeneron International Science and Engineering Fair (see bit.ly/3ykRalG). This year's meeting took place in Atlanta, Georgia from May 8-13, 2022, and included 1,750 projects. The ASA reviewed all the acoustics projects and is delighted to share with members the work of the four exceptional high-school students who were awarded prizes by the Society.
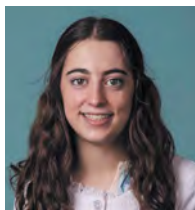
High-school student **Amara Orth** (Lewis Central High School, Council Bluffs, Iowa) used her family's honeybee farm as her pandemic science lab. Her scientific curiosity was piqued when her grandfather claimed that he could discern the health of a beehive by its sound. This culminated in her award-winning science fair project that showed that vibroacoustics are indicators of bee health and that hidden Markov models can accurately characterize the important health states of honeybee colonies. New to both acoustics and machine learning at the start of her project, Amara began her research by searching for appropriate piezoelectric microphones to record the beehives' vibroacoustic signals. She recorded dozens of hives over a three-month period and utilized her beekeeping expertise to classify each hive into one of nine possible health states (e.g., the loss of a queen or volatile chemical exposure). After examining spectral features of the recordings, she trained a hidden Markov model to classify new waveforms into the correct health states with 92% accuracy. Amara's discovery could help beekeepers use remote monitoring and intervene early to prevent colony collapse. The ASA awarded her a First Prize of $1,500 (plus $200 for her school and $500 for her mentor, Mrs. Shannon).

The ASA awarded Second Prize to **Chinmayi Ramasubramanian** (Sri Kumaran Children's Home, Bangalore, India) for her application of acoustic analysis to elephant vocalizations to create an early detection system for elephants near human populations to reduce human-elephant conflict. Her unique signal processing was used in a machine-learning model that could classify recordings of elephant vocalizations as a chirp, roar, rumble, or trumpet. She installed a small alarm system containing her neural network model implemented in real time on a Raspberry Pi microcomputer along with a unidirectional microphone and a system that sends a telegram when nearby elephants are identified. The Second Prize was $1,000 (plus $100 for her school and $250 for her mentor).

The Third Prize was awarded by the ASA to **Gwyneth Liu** (Mills E. Godwin High School, Henrico, Virginia) for finding ways to improve the efficiency of a wave energy converter via her model of adaptive control. Her adaptive model consisted of a spectral analysis-based sea-state classification algorithm that found that the swash plate angle ratio was an important parameter. The goal is to convert the kinetic energy of hydraulic wave movement into usable electric energy. The Third Prize was $600 (plus $150 for her mentor).

Honorable Mention went to **Anu Iyer** (Little Rock Central High School, Little Rock, Arkansas) for using the acoustics of brief vocalizations to classify patients with Parkinson's disease. Her approach

used very short utterances that were recorded on voice mail.

In addition to cash prizes, all awardees were invited to attend an ASA meeting, with a waived registration fee (for the student plus a mentor) and a partial contribution toward travel costs. The awardees' abstracts can be viewed at exploresound.org/isef-asa-winners.

The ASA judging team was led by Laurie Heller (Carnegie Mellon University, Pittsburgh, Pennsylvania) and included Jeffrey Vipperman (University of Pittsburgh, Pittsburgh, Pennsylvania), Robert Smith (Penn State University, University Park, Pennsylvania), and Andy Chen (Matters Academy, London, United Kingdom). The judges commend the accomplishments of the many talented youth who participated in the Regeneron International Science and Engineering Fair!

Contact Information

Laurie M. Heller laurieheller@cmu.edu

Carnegie Mellon University
Pittsburgh, Pennsylvania 15217, USA

The Journal of the Acoustical Society of America

JASA Call For Submissions:

JASA is currently accepting manuscripts for the following Special Issues:

- Perception and Production of Sounds in the High-Frequency Range of Human Speech
- Fish Bioacoustics: Hearing and Sound Communication

Special Issue articles are free to read for one year after publication and don't incur any mandatory page charges.

Find out more at
asa.scitation.org/jas/info/specialissues

POMA Student Paper Competition

ATTENTION STUDENTS ATTENDING THE NASHVILLE MEETING!!

Proceedings of Meetings on Acoustics (*POMA*) will once agin be holding a society-wide student paper competition for a *POMA* submission based on a presentation or poster from the ASA meeting in Nashville this spring.

Award Amounts: Up to five student papers will receive an award of USD $300.

For qualification requirements, submission window, and additional information, please visit:
acousticalsociety.org/asa-meeting
or contact the POMA Office at
poma@acousticalsociety.org

FOLLOW THE ASA ON SOCIAL MEDIA!

. . . .

 @acousticsorg

 @acousticsorg

 The Acoustical Society of America

 AcousticalSociety

 AcousticalSocietyofAmerica

 acousticstoday.org/youtube