

# AzSEF

ARIZONA SCIENCE &  
ENGINEERING FAIR

# 2019

ARIZONA SCIENCE CENTER  
Never stop wondering. Never stop imagining.™

**April 3-5, 2019**

**FINAL REPORT**

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## **Mission**

The mission of the Arizona Science and Engineering Fair (AzSEF) is to support and provide guidance to students and teachers throughout Arizona and ensure the continued availability and vitality of this statewide celebration of scientific inquiry for the citizens of Arizona.

## **Summary**

AzSEF is an annual, statewide science and engineering competition for grades 5-12, affiliated with the Society for Science & the Public, which partners with Intel to organize the Intel International Science & Engineering Fair (ISEF), the world's largest international pre-college science competition. Started in 2008, AzSEF combined several existing fairs from Central and Northern Arizona, as well as an American Indian Fair. Arizona Science Center (ASC) has served as the host and lead organizer of AzSEF since 2014.

Arizona Science Center hosted the annual AzSEF on April 3-5, 2019 at the Phoenix Convention Center. A total of 1,015 students in grades 5-12 statewide, participated in the competition with 726 projects. This reflects a 10% increase in student participation from 2018. Awards were presented in various categories with 15 projects from the Senior Division selected to advance to Intel ISEF to be held on May 12-17 in Phoenix, Arizona.

## **Fair Schedule**

Building upon what worked well at AzSEF 2018, the 2019 event maintained the 3-day format. Day 1 consisted of setting up the venue for the projects. Day 2 involved check-in for all participants/projects, and judging for elementary and junior high division projects. Finally, Day 3 included judging for the senior high division projects, the Open House Celebration, and the Awards Ceremony. Slight adjustments to the schedule on day 3 were made to better accommodate senior division students with transportation logistics, and more time was given for judges' orientation and project judging.

The Open House Celebration, held in the main hall from 4:00 - 6:30pm, offered our AzSEF 2019 sponsors an opportunity to host a table and interact with the hundreds of participants and guests to the fair. Participation in the Open House Celebration greatly increased in 2019, with Grand Canyon University, Northern Arizona University, Arizona State University (ASU), and The Rob and Melani Walton Sustainability Solutions Service at Arizona State University, all hosting information tables. In addition, several STEM-aligned high-schools also hosted information tables to engage with students and parents, including Basha High School, and Paradise Valley High School CREST.

## **Eligibility**

In order to be eligible to compete at AzSEF, students in grades 5-12 had to have placed first at a school, homeschool, district, county or regional fair. To ensure the integrity of this rule, schools/fairs are allowed to submit only one project per grade level for each of the 12 categories at the Elementary and Junior Divisions. In the event that a fair does not give place awards, it is at the discretion of the fair director to send the project considered the best representative of the category selected. These strict requirements ensure the caliber of the state science fair is upheld and is truly representative of the "best of the best" in the state of Arizona.

## Scientific Review Committee

The International Rules for Pre-college Science Research: Guidelines for Science and Engineering Fairs is published annually to support students doing independent research safely. They are the official rules of the Intel ISEF and students competing at an SSP-affiliated science fair.

The purpose of these rules is to:

- Protect the rights and welfare of the student researcher;
- Protect the rights and welfare of the human participant;
- Ensure adherence to federal regulations;
- Ensure use of safe laboratory practices;
- Protect the environment; and
- Determine eligibility for competition in the Intel ISEF 2019.

The Scientific Review Committee (SRC) of AzSEF reflects a well-established system for the review of projects involving human subjects, vertebrates, and potentially hazardous biological agents. This year, Senior Division students continued to be required to complete and display all necessary forms to be eligible for judging during AzSEF. AzSEF's SRC Chair, Dr. Timothy Martin, serves on the Intel ISEF SRC and reviews senior level projects from around the world. AzSEF's Display & Safety Chair, Tom Marshall, also serves on the Intel ISEF D&S team and helps to ensure safety for all participants and guests.

## Student Participation Demographics

AzSEF 2019	# of HS (9-12)	# of JH (7-8)	# of Elementary (5-6)	Totals
<b>Students</b>				
Male	225	97	151	473
Female	222	157	163	542
Total	447	254	314	1,015
<b>Projects</b>				
Individual	232	150	169	551
Team	95	39	41	175
Total	327	189	210	726

Registered Participants – 1,015; Projects – 726. This year, AzSEF saw a notable 10% increase in student participation from 2018.

## Judges and Volunteers

Registered Judges – 420, representing 130 different organizations. This year, AzSEF saw a notable 37% increase in registered judges from 2018.

Of the registered judges, 65% were new to AzSEF while 21 judges received their 5-year recognition of service award. Judging teams were assembled to score projects. As in 2018, judges utilized the "ranking" system rather than raw score averaging for the assignment of place awards which further reduces the effect of individual judge's score variations. Thorough discussion is encouraged within judging teams to help mitigate individual variation among judges to a greater degree and provide a more balanced

scoring system. Additionally, Senior Division judges were encouraged to let their Team Lead know if there were any projects they deemed to be in the running for the Grand Awards which equate to a trip to the International Science and Engineering Fair. Once the contending projects were determined, the Team Leads for each division with their group reviewed each project to determine the 15 that would attend ISEF.

Volunteers – 80. Volunteers consisted of those who signed up through the AzSEF website as well as representatives from our sponsors.

## **Awards**

Total Awards Given – 213. Special recognition for all AzSEF participants was given in the form of participation certificates for competition at the state level, plus a free admission ticket to Arizona Science Center upon check-in. In addition, 1<sup>st</sup> – 3<sup>rd</sup> place awards/medals were given in each of the categories using a percentage system to account for division and category size:

- o 52 place awards were given at the Elementary Division level
- o 58 place awards were given at the Junior Division level
- o 87 place awards were given at the Senior Division level

Special Awards were given at all division levels. The awards ranged from national SSP affiliated organizations to local institutions and organizations. Included in these were 16 Special Awards which totaled nearly \$55,000 in cash and scholarships given along with many other prizes.

Organizations presenting special awards and recognition included the following:

- American Meteorological Society
- American Psychological Association
- American Statistical Association
- American Association for Lab Animal Science
- Arizona Hydrological Society & Central Arizona Project
- The Rob and Melani Walton Sustainability Solutions Service at Arizona State University
- ASM Materials Foundation
- Broadcom Foundation
- Intel
- Mu Alpha Theta
- NASA
- NOAA
- Society for In Vitro Biology
- University of Arizona
- US Metric Association
- Water Environment Federation
- Yale Science & Engineering Association

## Intel ISEF Participation

This year, fourteen projects from the AzSEF Senior Division advanced to Intel ISEF in Phoenix, Arizona, May 12-17. At Intel ISEF, senior division winning students had the opportunity to showcase their independent research and compete with more than 1,800 high school students from over 80 countries, regions, and territories for more than \$4 million in prizes and scholarships. The AzSEF Intel ISEF team of winning students is represented by 21 individuals, along with two Junior Observers. These students along with six teacher chaperones comprise our AzSEF Official Party. Projects represent the following categories:

- o Animal Sciences (ANIM) - 1 Project
- o Behavioral and Social Science (BEHA) - 1 Project
- o Computational Biology and Bioinformatics (CBIO) - 1 Project
- o Cellular and Molecular Biology (CELL) – 1 Project
- o Chemistry (CHEM) – 1 Project
- o Earth and Environmental Sciences (EAEV) - 1 Project
- o Embedded Systems (EBED) – 1 Project
- o Environmental Engineering (ENEV) – 1 Project
- o Engineering Mechanics (ENMC) – 1 Project
- o Mathematics (MATH) - 1 Project
- o Materials Science (MATS) – 1 Project
- o Microbiology (MCRO) – 1 Project
- o Physics and Astronomy (PHYS) - 1 Project<sup>1</sup>
- o Plant Sciences -1 Project

## ISEF Pre-Judging Preparations Workshop

Held three weeks prior to ISEF, this special preparation workshop has proven so beneficial that we've seen a 40% increase in awards given to students from Arizona at ISEF. Through this experience, students have the opportunity to present their projects as they would during ISEF, and have high caliber volunteer judges interview them and provide them feedback about their presentation and their board.

## ISEF Documentary Events

This year, Arizona Science Center had the opportunity to present the ISEF documentary film, *Science Fair*, to past participants of AzSEF, and to encourage additional participation from students, teachers, volunteers, and judges. The film was shown on four separate dates, and was very well received.



## ISEF Results

Of the team representing Arizona in ISEF 2019, a total of 21 students and 14 projects secured placements and awards in various categories.

The top Arizona award, a full, \$200,000 scholarship to Drexel University, went to a student for their project, *Novel Artificial Synthesis of Sugars from Non-Organic Compounds for Renewable Cellular Energy*.

A \$1,000 award went to two students for their project, *The Neural Mechanism Underlying Stimulus Evaluation of the Honeybee Brain*.



Five projects, representing eight students, each received a \$500 award. Their projects included:

- *Retina: A Non-Invasive, Predictive Smartphone Application to Test for Cardiovascular Risk and Diabetic Retinopathy via Analysis of Cardiovascular Risk Factors and Retinal Fundus Images*
- *HemaDrop: A Novel Elemental Composition Technology for Microliter-Size Blood Droplets via Solid State Techniques*
- *Development of a Thin and Inexpensive Open-Air Proton Beam Detector for Characterizing the Beam Profile and Position*
- *Identifying Key Pathways/Mechanisms for the Generation of the Pancreatic Beta Cells by Transdifferentiation of Acinar Cells*
- *A Smartphone-Based, Point-of-Care Iron Sensor Utilizing Colorimetric Techniques*

For his project, *A Novel Approach to Renewable Energy: Light Stimulated Active Cation Transport Membrane via Covalent Modification with a Photoacid*, one student received an Arizona State University Intel ISEF scholarship, a University of Arizona scholarship, and a \$2,000 award from APS.

For her project, *Investigating How Water Vapor Emission Impacts the Temperature of the Troposphere*, one student received a University of Arizona scholarship and a \$1,500 award from NOAA.

Other projects receiving University of Arizona scholarship awards included:

- *Effects of an Instructor's Ideology on a Student's Perspective*
- *A Comparison of the Biofilm Forming Potential of Native Microbiota of Various Leafy Greens on Different Food Contact Surfaces*
- *Chance of Non-Nucleated Light Source Superposition on Ultra-Diffuse Galaxy Centers*
- *Growth Promotion and Yield Enhancement of Crop Seeds with Plant Products: Effects of Extracts, Endophytic Symbionts, and Endosperm*
- *Asguardian Cyber: A Customized Cybersecurity Program to Prevent Intrusions from Hackers*

## Goals for 2020

As Arizona Science Center prepares for its seventh year hosting the fair, goals set for AzSEF 2020 include:

- Enhance website and content to specifically outline rules and regulations for each division;
- Enhance website to increase ease of use and finding information;
- Increase sponsorship for the fair in general as well as professional development;
- Evaluate the restructure for the number of participants/projects that can participate;
- Improve use of social media to engage and inform and;
- Support growing affiliated regional fairs.

## Marketing

Marketing for AzSEF 2019 included:

- Emails to teachers and registered constituents;
- Arizona Science Center website, including homepage slider and custom page;
- Targeted emails to school districts throughout the state of Arizona;
- Targeted emails to Community Supporters;
- Printed flyers and;
- Facebook and Twitter promotion.



The consensus from the AzSEF 2019 Advisory Board was that the overall event communications were much improved from 2018. Specifically noted was the detailed information on the AzSEF website, along with clear registration directions.

## Sponsorship

The success of AzSEF each year is only made possible by the generous support of corporations, foundations, and organizations that support the value and investment in STEM education through AzSEF.

The AzSEF 2019 sponsorship package once again offered various levels at which potential sponsors could support the fair, including benefits such as the opportunity to showcase their company/organization during the Open House Celebration, and recognition on all marketing and promotional collateral including t-shirts, signage, swag bag, website, banners, the awards program and a standing slide during the Awards Ceremony.



## AzSEF 2019 Sponsors

- Intel
- The Burton Family Foundation
- Avnet
- Craig and Barbara Barrett Foundation
- GoDaddy
- The Rob and Melani Walton Sustainability Solutions Service at Arizona State University
- Grand Canyon University
- Broadcom Foundation
- Maricopa Community Colleges
- Northern Arizona University
- Midwestern University

## AzSEF 2019 Sponsors

A graphic listing sponsors for AzSEF 2019, organized into categories with their respective contribution amounts. The categories are: MOLECULAR | \$50,000 (Intel); ATOMIC | \$25,000 (The Burton Family Foundation); NEUTRON | \$10,000 (Avnet, Craig and Barbara Barrett Foundation, GoDaddy); PROTON | \$5,000 (ASU Rob and Melani Walton Sustainability Solutions Service, Broadcom Foundation, Grand Canyon University, Maricopa Community Colleges, NAU Northern Arizona University); and COMMUNITY SPONSOR | \$1,000 (Midwestern University).

**MOLECULAR | \$50,000**

**ATOMIC | \$25,000**

**NEUTRON | \$10,000**

**PROTON | \$5,000**

**COMMUNITY SPONSOR | \$1,000**

# Collateral and Sponsor Recognition

## AzSEF 2019 Bookmark



## AzSEF 2019 T-Shirt



## AzSEF 2019 Swag Bag



# AzSEF 2019 Signage

WELCOME TO

# AzSEF

ARIZONA SCIENCE & ENGINEERING FAIR

# 2019

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**AWARDS CEREMONY  
EXHIBIT HALL 1**

---

**MOLECULAR | \$50,000**



**ATOMIC | \$25,000**



**NEUTRON | \$10,000**



**CRAIG AND BARBARA BARRETT FOUNDATION**



**PROTON | \$5,000**



**BROADCOM**



**MARICOPA**



**COMMUNITY SPONSOR | \$1,000**



WELCOME

# AzSEF

ARIZONA SCIENCE & ENGINEERING FAIR

# 2019

ARIZONA SCIENCE CENTER  
Never stop wondering. Never stop imagining.

**PARTICIPANTS, SPONSORS & GUESTS**

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**MOLECULAR | \$50,000**



**ATOMIC | \$25,000**



**NEUTRON | \$10,000**



**CRAIG AND BARBARA BARRETT FOUNDATION**



**PROTON | \$5,000**



**BROADCOM**



**MARICOPA**



**COMMUNITY SPONSOR | \$1,000**



WELCOME TO

# AzSEF

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**MOLECULAR | \$50,000**




**ATOMIC | \$25,000**




**NEUTRON | \$10,000**



**CRAIG AND BARBARA BARRETT FOUNDATION**




**PROTON | \$5,000**



**BROADCOM**



**MARICOPA**



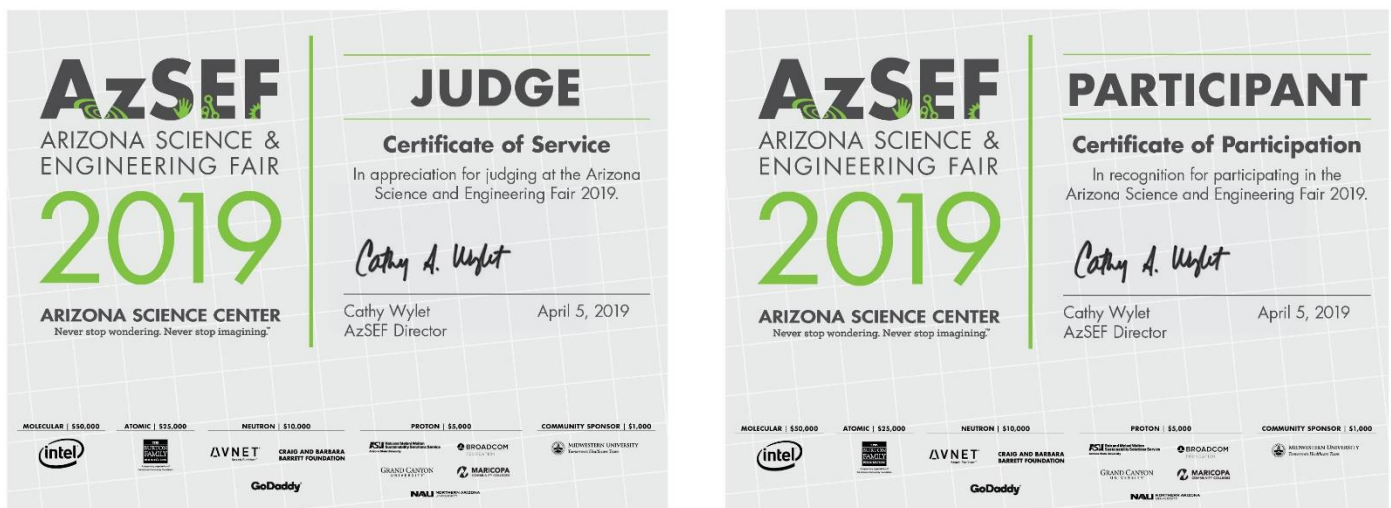
**COMMUNITY SPONSOR | \$1,000**



## AzSEF 2019 Awards Program – Front/Back Cover



## AzSEF 2019 Winner, Participant & Judge Certificates



## AzSEF 2019 Winner, Participant & Judge Certificates



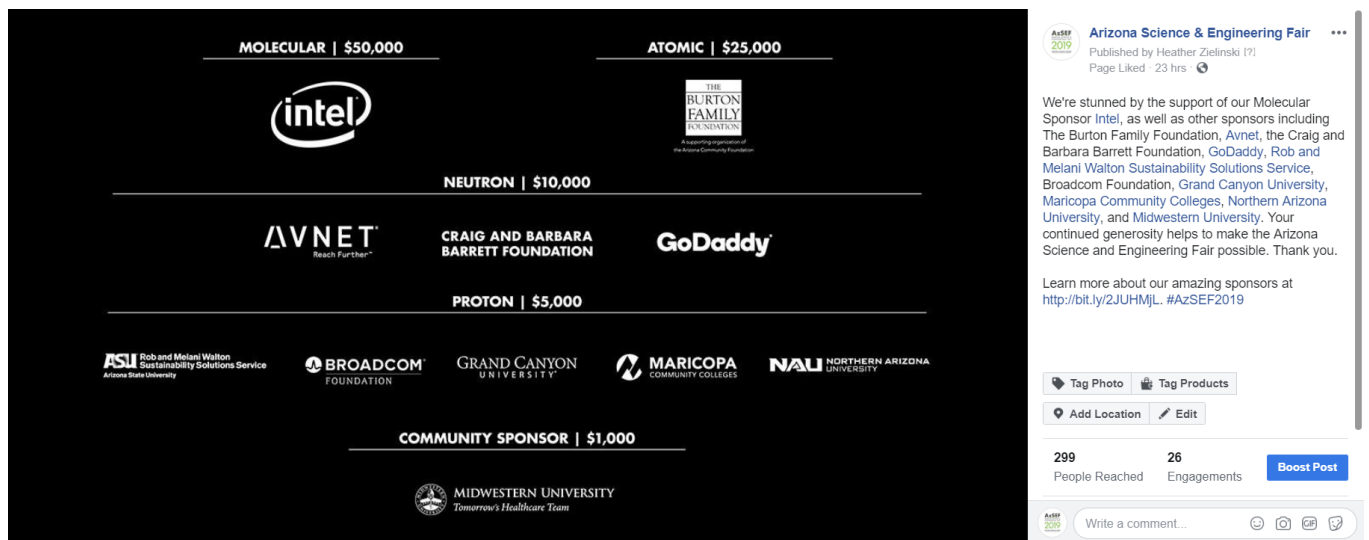
## Social Media

In addition to Arizona Science Center’s AzSEF 2019 web page and event emails, AzSEF 2019 was also widely promoted via the Center’s social media. Social media promotion included: 14 Facebook posts, 7 Twitter posts by the Center and others, and 2 Instagram posts.

AzSEF 2019 Facebook Page

1,188 Followers

Sample Facebook Posts





**AzSEF**  
ARIZONA SCIENCE & ENGINEERING FAIR  
2019  
ARIZONA SCIENCE CENTER  
Where Inspiring Ideas Take Flight

Arizona Science & Engineering Fair  
@azsef

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- Photos
- Posts**
- Community
- Info and Ads

Create a Page

👍 Liked
👤 Following
➦ Share
⋮



**Arizona Science & Engineering Fair**

April 5 at 12:03 PM · 🌐

Thank you to all our a-MAZ-ing judges and volunteers who joined us at #azsef2019 yesterday and today. Next up, the Senior Division projects!

⋮






Learn More

Send Message

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**Visitor Posts**



**Ann Marie Hanson Keen**

June 26, 2018 at 6:14 AM · 🌐

Do you have the dates for AzSEF 2019?

⋮

Like · Comment
👤



**Heather Robertson**

May 12, 2017 at 6:47 AM · 🌐

Does anyone know where to find the list of placings for 2017? I talk... See More

⋮

Like · Comment
👤



**Educational Products, Inc.**

October 21, 2016 at 4:58 PM · 🌐

GIVEAWAY ALERT: We're giving away \$250 in science fair supplies. Ent... See More

⋮

Like · Comment
👤




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👍 Liked
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**Arizona Science & Engineering Fair added an event.**


April 5 at 8:45 AM · 🌐

🏆 And the winner is...

🏆 Awards include educational scholarships, cash, summer internships, scientific field trips, and equipment grants.

👤 Students don't need to be present at the ceremony to receive an award (but we sure would love to see you!).... See More

⋮



**FRI, APR 5**

**2019 Awards Ceremony and Winner Announcements**

★ Interested


👤 You like Arizona Science & Engineering Fair

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**Visitor Posts**




**Ann Marie Hanson Keen**

June 26, 2018 at 6:14 AM · 🌐

Do you have the dates for AzSEF 2019?

⋮

Like · Comment
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October 21, 2016 at 4:58 PM · 🌐

GIVEAWAY ALERT: We're giving away \$250 in science fair supplies. Ent... See More

⋮

Like · Comment
👤

# Arizona Science Center Twitter Page

9,815 Followers

## Sample Twitter Posts from Arizona Science Center and others



**ArizonaScienceCenter** @azsciencecenter · Mar 19  
ATTN: First-place winners from school, homeschool, district, county, and regional science fairs across the state, the final countdown to register is on. Compete for prizes and scholarships. Registration closes at midnight tomorrow, Wednesday, March 20. [bit.ly/2FmCLfo](https://bit.ly/2FmCLfo)



**ArizonaScienceCenter** @azsciencecenter · Mar 15  
Let's have a moment of science for all the first-place winners from school, homeschool, district, county, and regional science fairs across the state. Way to go! 🎉 The countdown is on to register for AzSEF. Registration closes at midnight on March 20. [bit.ly/2F8pgHY](https://bit.ly/2F8pgHY)



**PVHS-CREST** @PVHSCREST · Apr 5  
@pvschools @PVTrojanNation CREST students ready for #AZSEF2019. These students all earned their place by winning PVSEF and PVHS SEF.



ArizonaScienceCenter Retweeted



**Interface Inc.** @loadcells · Apr 4

Richard Avila, Miles Hufford, and Ted Larson from Interface were judges at the Arizona Science And Engineering Fair in Phoenix. Look at the inspiring work from our next generation of scientists and engineers! @azsciencecenter #AzSEF #engineers #arizona #futuregeneration

INTERFACE JUDGES PROJECTS AT  
2019 ARIZONA SCIENCE AND  
ENGINEERING FAIR



ArizonaScienceCenter Retweeted



**Broadcom Foundation** @BroadcomSTEM · Apr 9

Meet Mikyla Johnson and Jacelyn Tallsalt our #brcmMASTERS International host delegates from @TubaCityAZ @CoconinoCounty At #ISEF2019! #sciencefair #STEMeducation #STEMed #Congrats #girlsInSTEM

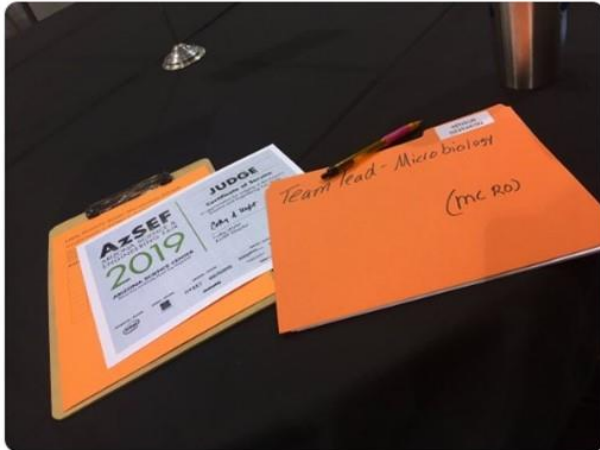


Society for Science, Paula Golden, Tuba City, AZ and 2 others



**Amanda Courtrigh-Lim** @acourtright\_lim · Apr 5

Really excited to be acting as a judge and team lead for the @AzSEF Arizona Science & Engineering Fair today. #Scientist #WomenInSTEM #ScienceFair #AzSEF2019

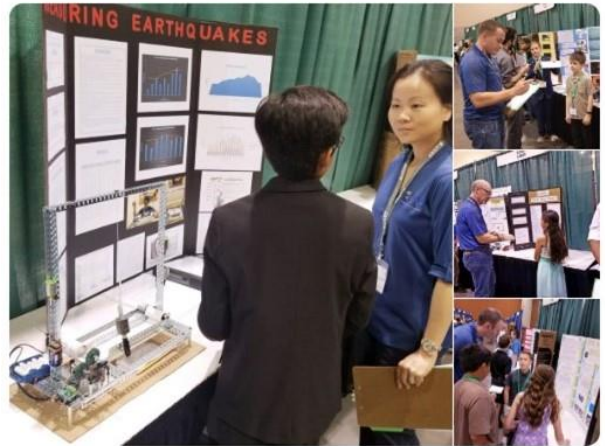


ArizonaScienceCenter Retweeted



**Central AZ Project** @CAPArizona · Apr 4

CAP on hand today judging experiments and projects for the Arizona Science Center's Arizona Science & Engineering Fair @azsciencecenter #CAPArizona





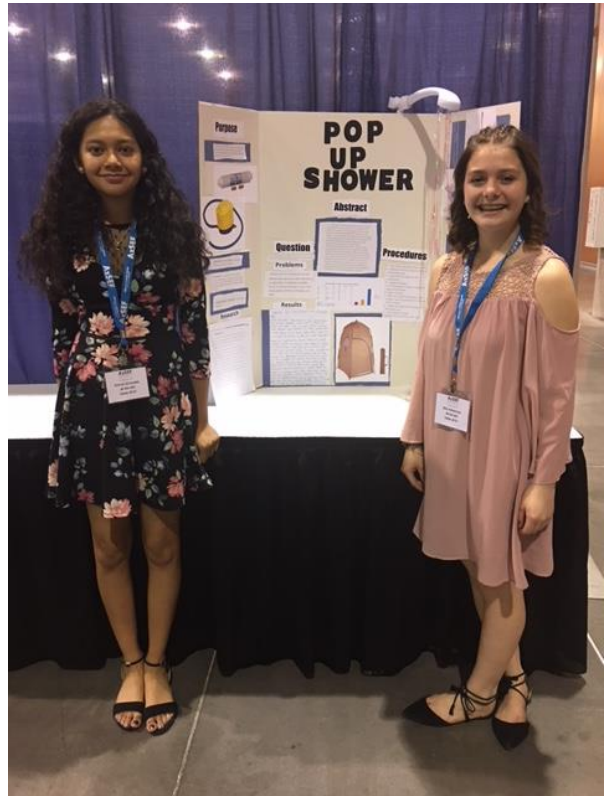
# Arizona Science Center Instagram Page

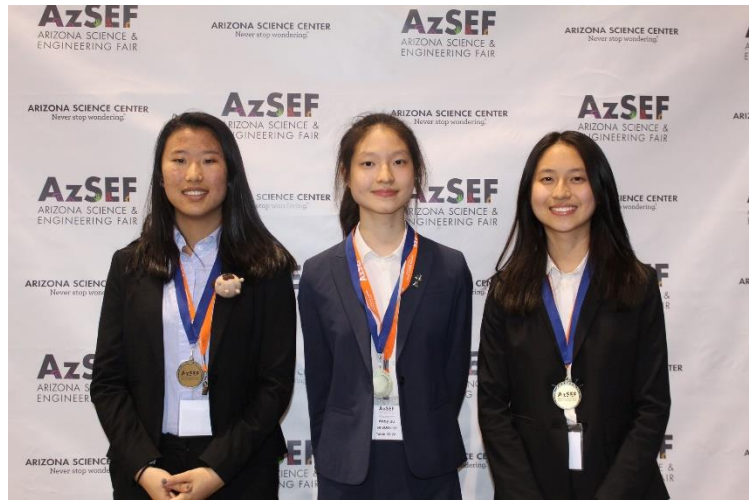
4,832 Followers

Sample Instagram Posts



# Photos







## Conclusion

The mission of Arizona Science Center is to inspire, educate and engage curious minds through science. We strive to be part of the very foundation of what makes Arizona a great community for people of all ages to maximize their lifelong learning. Ultimately, we want to be good citizens through our work and exploration of science, technology, engineering and mathematics programming.

In this way, we hope to make a positive impact on current and future Arizonans. Together, Arizona Science Center, with its generous partners and supporters, can make a measurable difference in our communities, inspiring the next generation of innovators, scientists, engaged citizens and engineers. Thank you for being a part of the journey!

For additional information, please contact:

Laine Seaton, CFRE

Director of Corporate & Foundation Relations

Arizona Science Center

P: 602-716-2000, ext. 295

[seatonl@azscience.org](mailto:seatonl@azscience.org)

[www.azscience.org](http://www.azscience.org)