

GREATER SAN DIEGO

S&E  
EF

SCIENCE &  
ENGINEERING  
FAIR

# The Science Fair Experience: GSDSEF 2019



"Somewhere, something incredible is waiting to be known."

- Carl Sagan

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## Foreword

What and why is there a Science Fair? “It is many things – or more accurately, many people.”

- 👉 It's **industrious students** who go beyond the classroom assignments to discover, explore, experiment, and build based on their own personal interests and curiosity - who devote weeks, months, and often years to their research.
- 👉 It's **dedicated teachers** who stress scientific inquiry, who emphasize learning and encourage students to apply the results of their learning to science fair projects, who provide hands on learning experiences, and who encourage young minds to wonder, discover, and explore.
- 👉 It's **supportive parents** who allow – even enjoy – strange contraptions in the garage, weird smells coming from the refrigerator, glue and paper scraps on the dining room table, who make special trips to the store to buy materials and help with their student's display boards.
- 👉 And, finally, representing every business, research facility, university, school district, military and professional organization in the area—it's **the hundreds of men and women, who judge, sponsor, donate, mentor, advise**, and, from behind the scenes, **volunteer**, to keep the Science Fair running smoothly.

*(adapted from "Science Fair Handbook – A Guide for Teachers and Students Fourth Edition 1986" prepared by Mary Domb Mikkelson, GSDSEF Management Committee for over 40 years)*

For 65 years, our regional competition has challenged students to go beyond their classroom studies to do independent research – to ask compelling questions, to design and implement innovative solutions, and to present and defend results to judges who are professionals in their fields. The GSDSEF fosters creativity and innovation through inquiry, celebrates students' STEM achievements, and showcases how young minds can make an impact in the present and future. Emphasis goes beyond the “hows” of a project into the “whys” and “what ifs.” There's a lot of hard work involved in this approach, a lot of try, try, try again and that requires self-motivation...and, once started, there is no holding these students back.

Since our first Science Fair in 1955 to today's STEM (Science Technology Engineering and Math) Fair, students' projects have transformed from the simple projects of baking soda volcanoes and toothpick bridges to the current sophisticated projects of today's student exhibitors. From researching “The Role of G-CSF-R in Medulloblastoma Cancer Stem Cells and Pathogenesis” to “Electrothermally Cooling a Pitcher's Arm” to designing “Solar-Powered Desalination” methods, these students' interests and pursuits are defining the next generation of scientific thought, discovery, and innovation.

For those who participate, the Science Fair is more than a one-day or one-week event held in March or just the development of a STEM project. It is a one-year endeavor by students – from the satisfaction of producing a project, to eagerly sharing the results of their hard work to professionals and experts, to the excitement of receiving their Place Award on stage, and for some, the opportunity to participate at the state and international levels. It is an entire year of planning, organizing, and coordinating which doesn't end with Fair Week, but continues with the CSEF in April, ISEF in May, and Broadcom MASTERS in September. It is a year that results in transformative, synergistic, and extraordinary experiences that the student exhibitors remember for a lifetime.

The Science Fair is a **catalyst** – a place where budding scientists, inventors, engineers, doctors have their starts – where young minds are “inventing tomorrow.” It brings together a large number of very talented people to interact, exchange ideas, and to create something greater than their sum. The GSDSEF offers this unique opportunity at a level in which students are able to make new connections and friendships with professionals and peers who have the same optimism and enthusiasm, and which, hopefully, will inspire students into STEM career paths.

This document is the chronicle of this year's highlights – a photo journey of ***The Science Fair Experience – GSDSEF 2019***.

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*“Science and technology revolutionize our lives, but memory, tradition and myth frame our response.”*

*- Arthur M. Schlesinger*

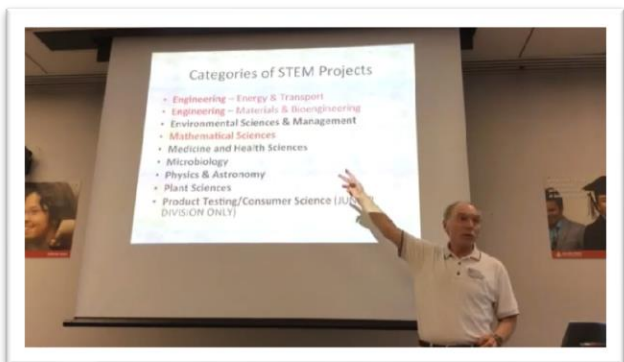
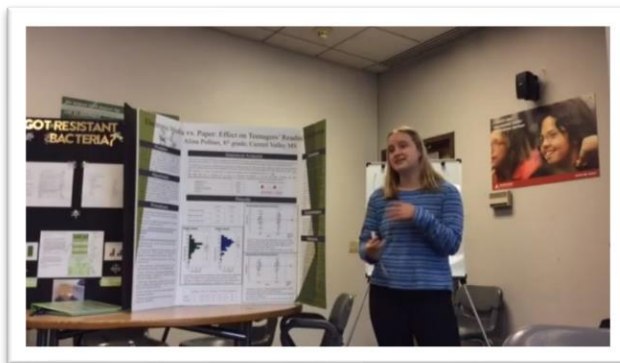
## The Science Fair Experience - GSDSEF 2019

### The 2019 GSDSEF Begins...

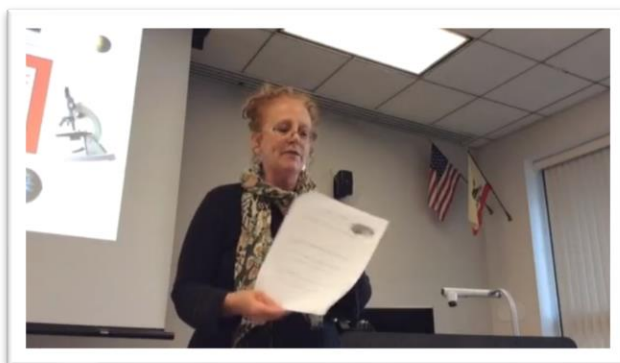
#### Outreach Workshops

The new year of planning and organizing for the 2019 Fair already begins in April, 2018. The Outreach Committee offers workshops at the San Diego County Office of Education and live-streams them on the GSDSEF Facebook page.

The first workshop, an informational overview of the GSDSEF is set for May 23, 2018 for teachers, students, and parents to find out how to participate and the many benefits. Award winning student exhibitors and experienced teachers talk about their projects and what motivated them to participate.



- Categories of STEM Projects
- Engineering – Energy & Transport
  - Engineering – Materials & Biomechanics
  - Environmental Sciences & Management
  - Mathematical Sciences
  - Medicine and Health Sciences
  - Microbiology
  - Physics & Astronomy
  - Plant Sciences
  - Product Testing/Consumer Science (JHS DIVISION ONLY)



*"No problem can stand the assault of sustained thinking."*

*-Voltaire*

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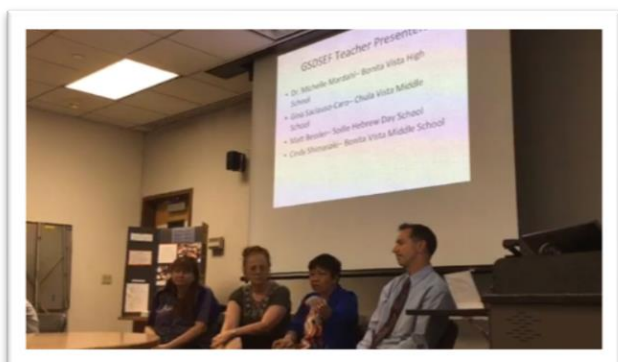
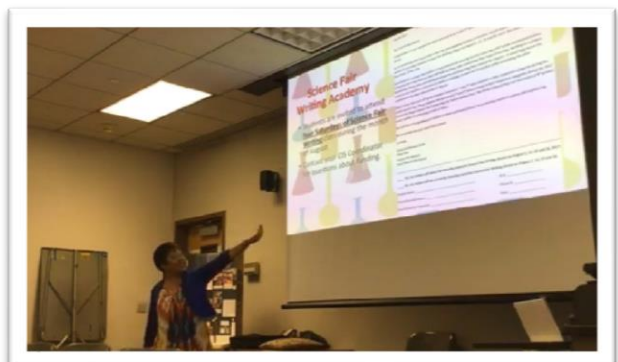
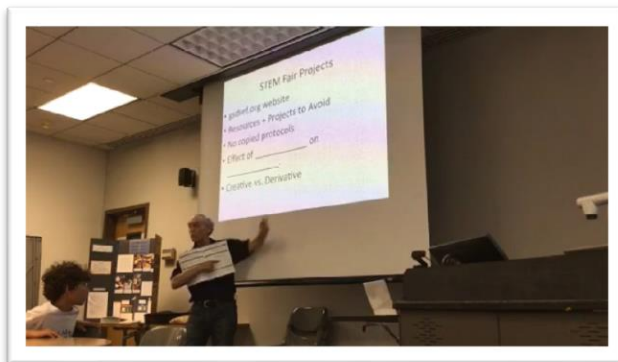
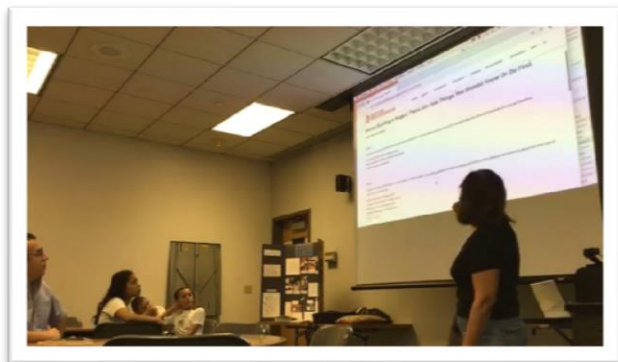
Two more workshops are planned for September to help teachers and students with two of the biggest challenges – how to not go crazy during science fair season and how to come up with ideas that aren't a “been there-done that.”

### *Workshop 2: How to Start and Maintain a STEM Fair and Keep Your Sanity –*

Four very experienced teachers describe their programs, presenting how they run their science fairs in their schools and classrooms and giving helpful advice and handouts to the 30 participants.

### *Workshop 3: Finding STEM Project Ideas –*

A panel of teachers share how they help their students come up with ideas for projects.



*“Every great advance in science has issued from a new audacity of imagination.”*

*-John Dewey*

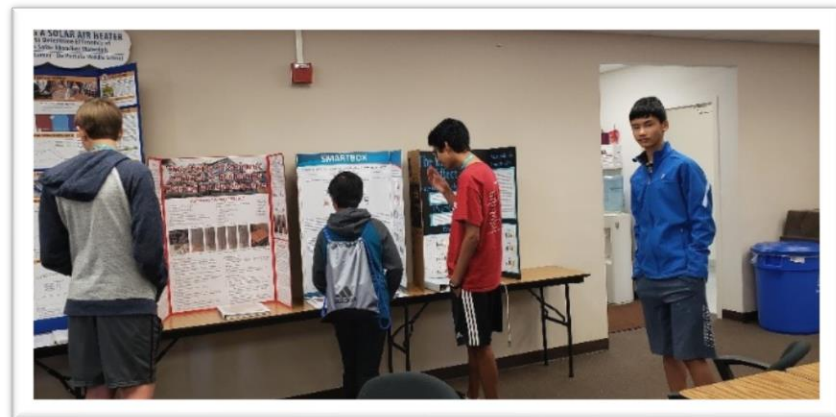
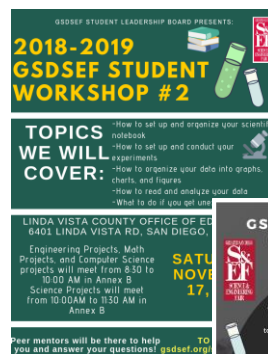
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### SLB Student Workshops

The Student Leadership Board (SLB), the GSDSEF Student Honor Society, is a group of 30 students from all over San Diego who work together with the Management Committee to assist in many aspects of the Fair. Among other Fair activities, we support our fellow students by presenting workshops and providing one-to-one peer mentoring designed so that everyone can achieve a successful science & engineering fair project.



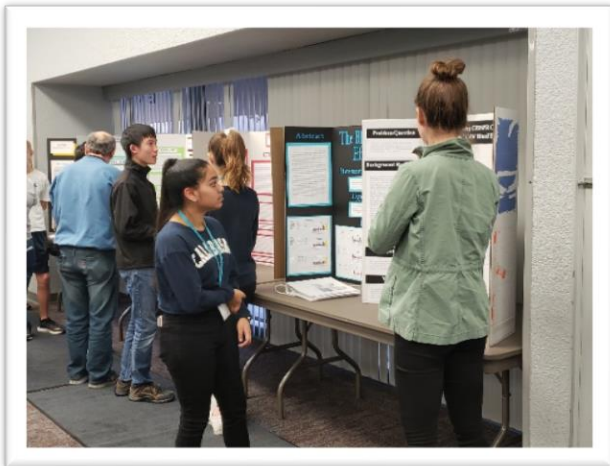
At our first workshop, peer mentors help students come up with a good question and go over the scientific method.



The focus of our second and third workshops is on designing and collecting data, which is what the judges look for the most, and how to put together displays. SLB members show examples of their own projects and work one-on-one with participants to ensure all questions are answered.

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Our final workshop, “Showcase Your Project: Preparing for a Successful Presentation” is held the week before Science Fair Judging Day. We share what judges are looking for in a presentation, what to expect the week of the science fair, and any tips based on personal experiences. Participants go through several mock judging opportunities with SLB members and actual GSDSEF judges. This workshop is the most fun since we get to hear about other students’ projects.



*“The art and science of asking questions is the source of all knowledge.”*

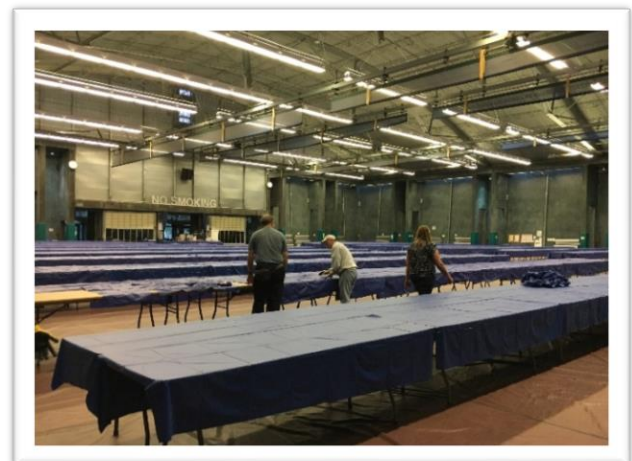
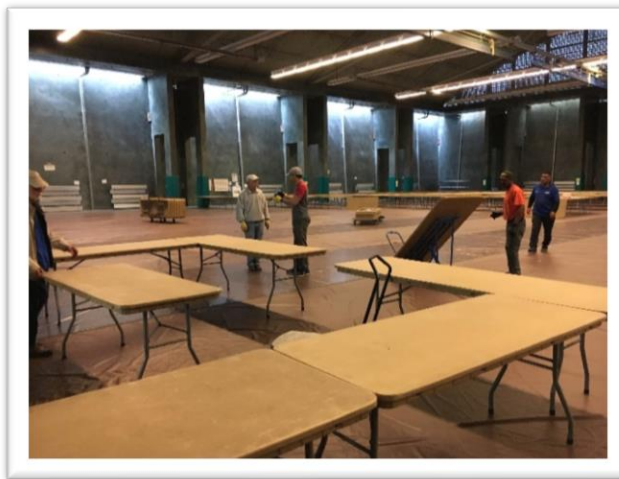
*- Thomas Berger*

## Science Fair Week

### Preparation and Load-in Day – Monday, March 11, 2019

Finally, after a year of planning, preparations begin for Fair week... excitement builds! Volunteers are organized and contracted companies are scheduled for their deliveries. Everyone is eager to get started!

Volunteers load the truck with items from storage and unload them at the Balboa Park Activity Center (BPAC). The floor map is consulted...the tables are set up...tablecloths are laid...the booth cards are placed...the Information Center is set up. Volunteers work late until the BPAC staff signals it's time to quit for the night...



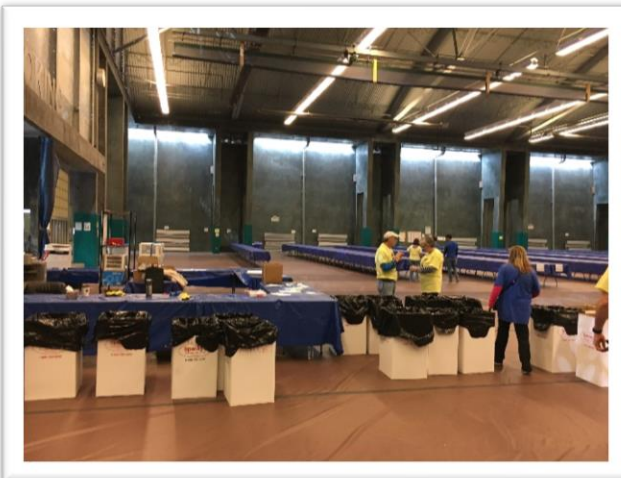


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### Check-In and Project Set-up Day – Tuesday, March 12, 2019

... and for everyone to return early the next morning...bright and shiny...with an even bigger army of volunteers!

Today the signs and banners are hung... the souvenir shop is stocked... t-shirts are unboxed... trash cans and lunch containers are prepared...tents are set up for the various activities... judging materials are organized... student science tours table is set... Volunteers are now ready - waiting in breathless anticipation of the 627 student exhibitors from all over San Diego and Imperial Counties to arrive to check in and set up their projects between 1 pm and 7 pm.



## Size and Safety Check

And here they come!

Students begin arriving before 1 pm to check in and set up their projects. Before entering the Balboa Park Activity Center, each project goes through the Size and Safety Check. Project display boards get the “stamp” of approval and any model or apparatus gets a sticker of clearance.

Each year, students bring interesting and unique models, prototypes, and displays they have designed or created to show off to the judges.

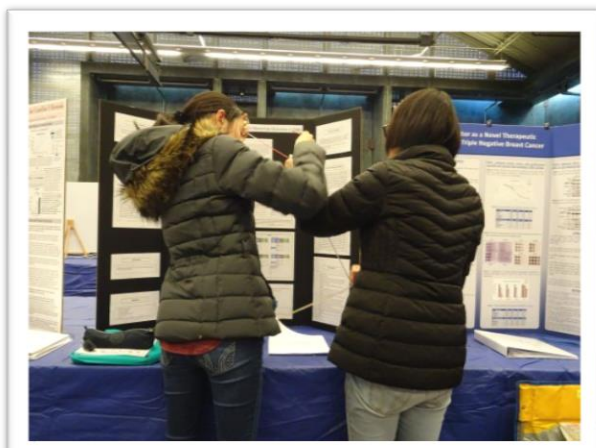
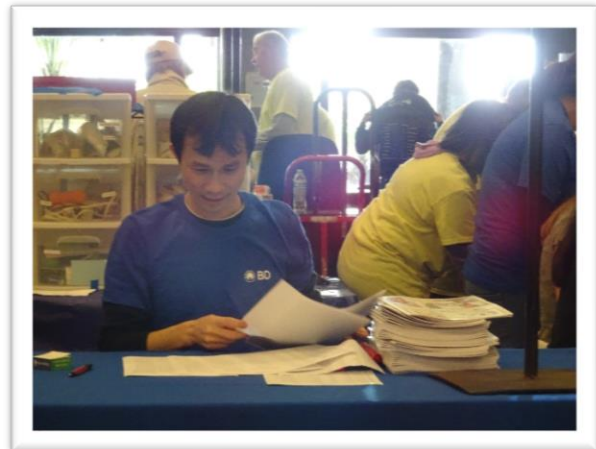


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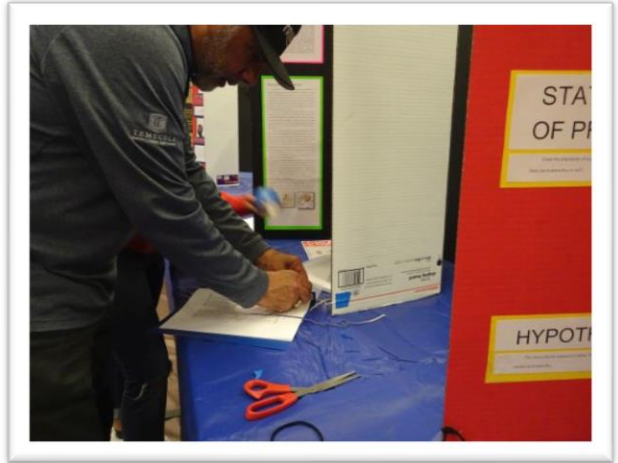
### Check-In and Set-Up

Once inside the BPAC, a lot is happening.

At the Information Desk, students are getting their booth assignments. Some students are putting on the finishing touches on their display board, some are laying out extension cords to plug in computers and models, some are arranging their models and engineering prototypes, some are checking out the other projects...Parents are helping their kids, as well as taking a peek at other projects. SLB members and volunteers are doing secondary checks for those who have finished setting up their display.



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*The very nature of science is discoveries, and the best of those discoveries are the ones you don't expect.*

*- Neil deGrasse Tyson*

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When student exhibitors are done setting up their projects, they pick up their name badges and get free goodies from BD, our presenting sponsor. This year BD is giving out highlighters that look like hypodermic needles and cell phone stands.

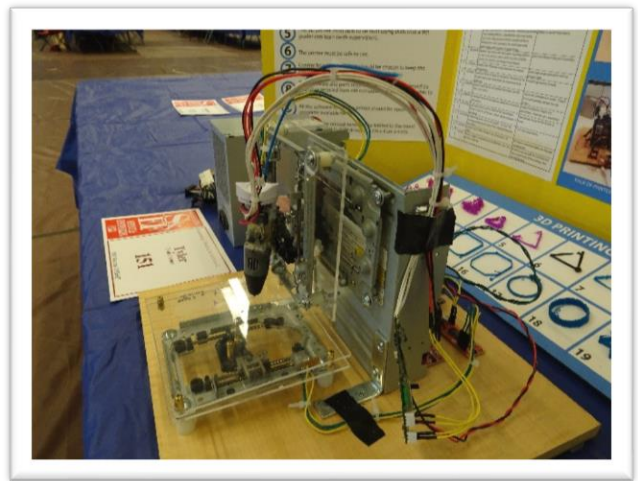


Students sign up for special behind-the-scenes tours at the Fleet Science Center, the San Diego Air & Space Museum, and the San Diego Zoo.

They also can stop by the Souvenir Shop to buy GSDSEF items and the 2019 GSDSEF T-shirts designed by the SLB. This year, new lapel pins and water bottles are available.

The Science Fair Experience - GSDSEF 2019

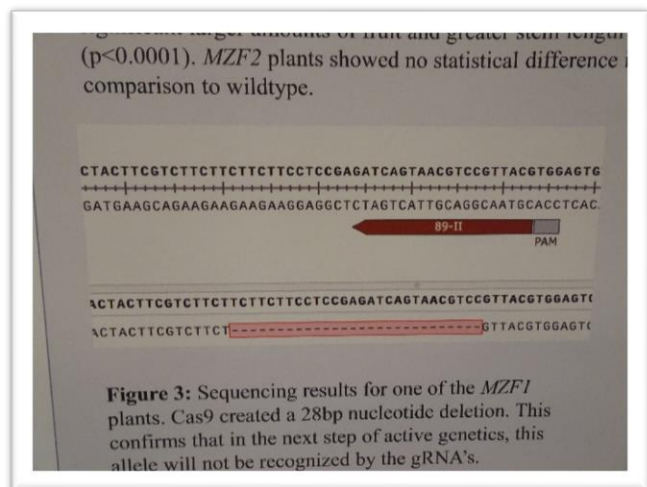
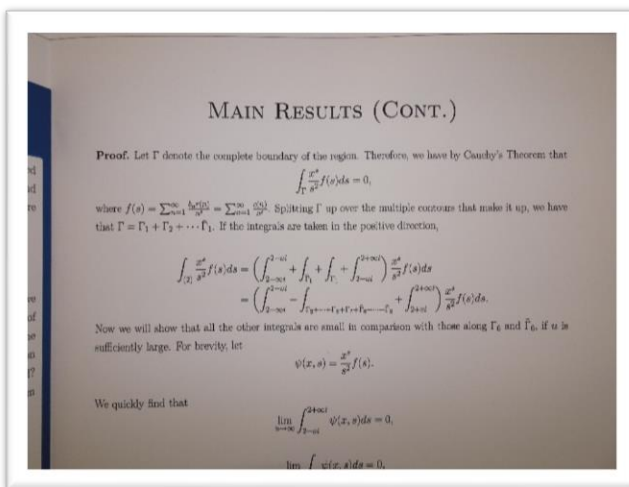
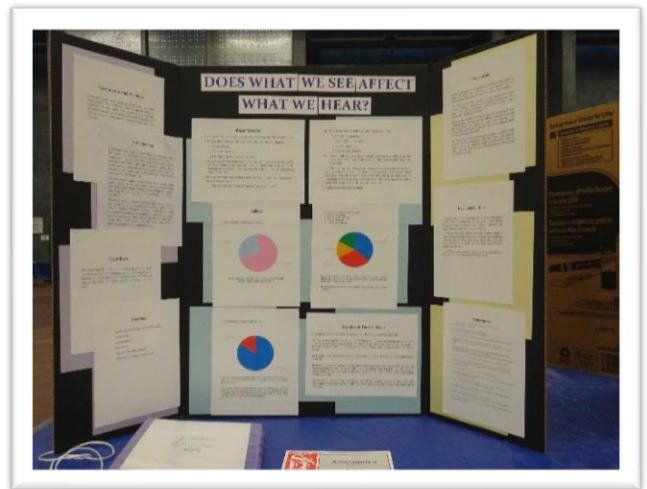
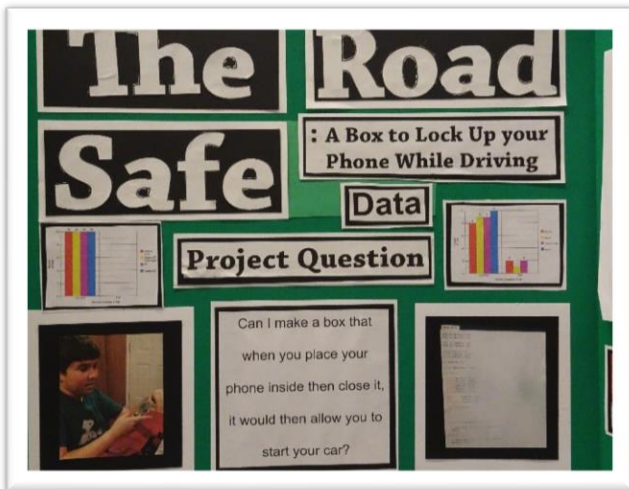
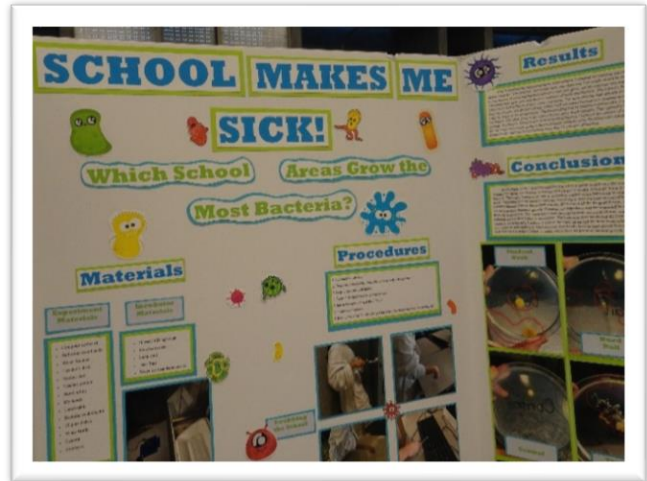
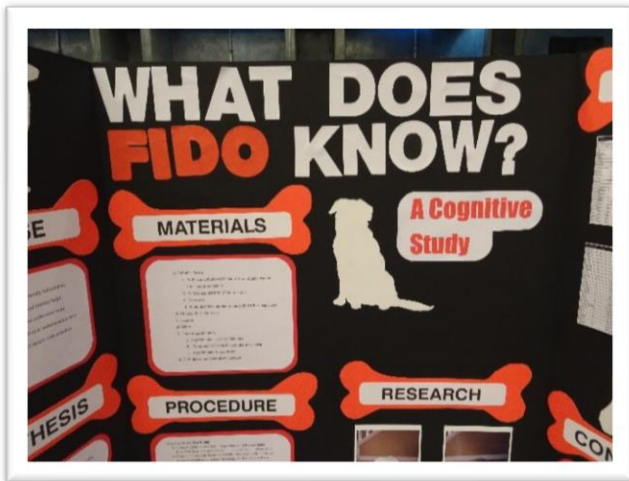
As usual, there are many creative demonstration models and engineering prototypes ...



*"The science of today is the technology of tomorrow."*

*- Edward Teller*

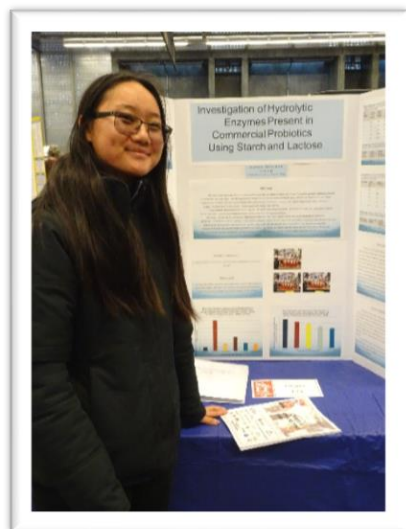
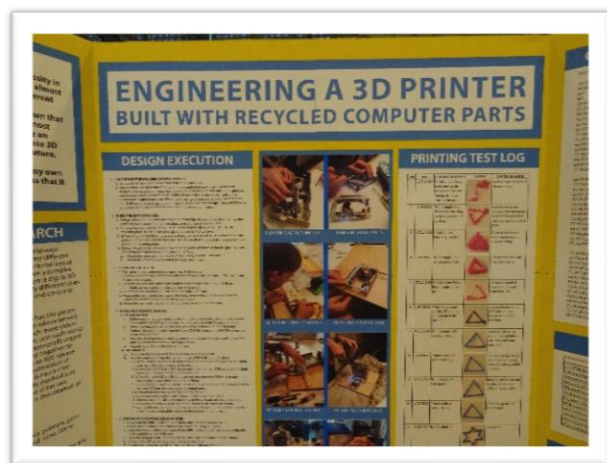
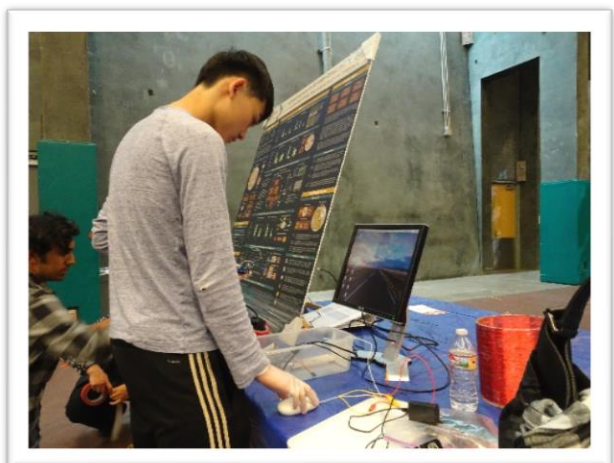
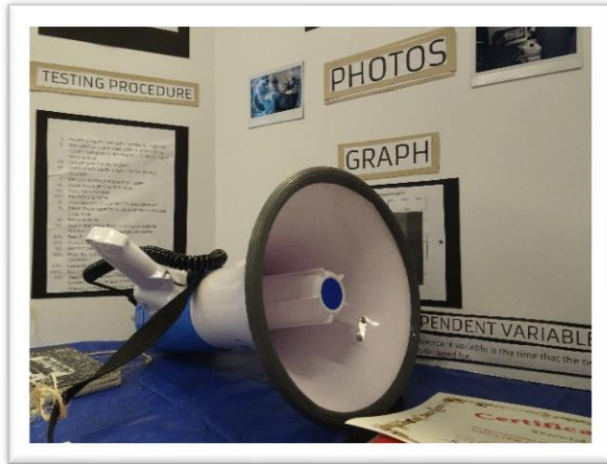
... projects with interesting questions ... projects with complicated symbols...



"We will always have STEM with us. Some things will drop out of the public eye and will go away, but there will always be science, engineering, and technology. And there will always, always be mathematics."  
 - Katherine Johnson

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... auditory projects ... visual projects... and “how did they do that???” projects.....



*“Equipped with his five senses, man explores the universe around him and calls the adventure Science.”*  
— Edwin Powell



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Project Set-up Time Lapse

From early afternoon to evening, projects fill in the empty space on the tables...



1 p.m.



2 p.m.



3 p.m.



4 p.m.



5 p.m.



6 p.m.

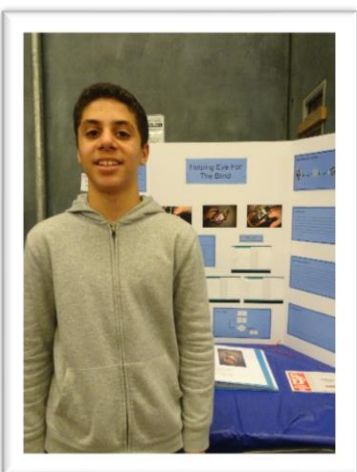
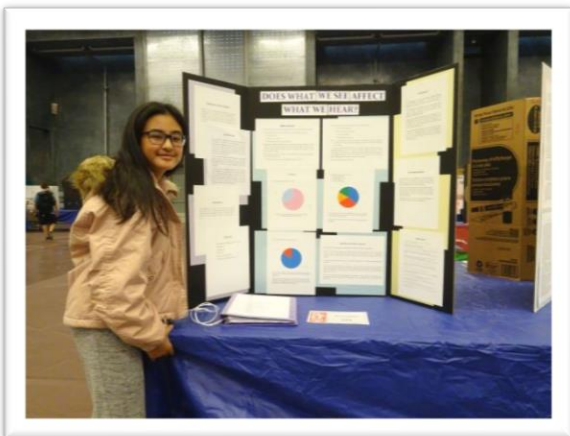


7 p.m.

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Set Up and Ready for Judging

With smiles and enthusiasm, the student exhibitors are set up and ready for Wednesday morning and the judges.

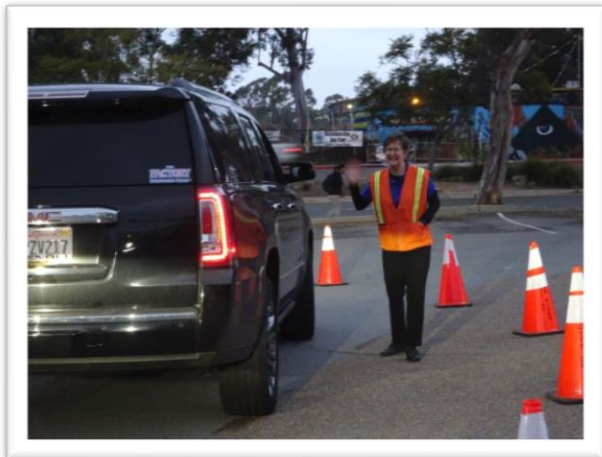


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Judging Day – Wednesday, March 13, 2019

Students Arrive

It's still dark when the volunteers and traffic police arrive to help with traffic and supervise students. Parents and school buses begin to arrive to drop off students at 7 am. Students begin to fill the tents where they wait until they are brought up to the BPAC.



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### Judges Get Ready

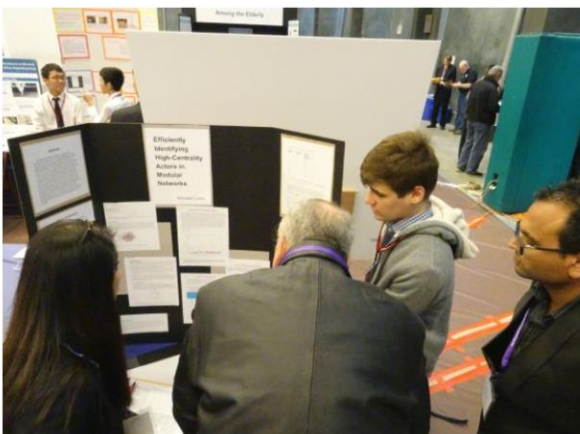
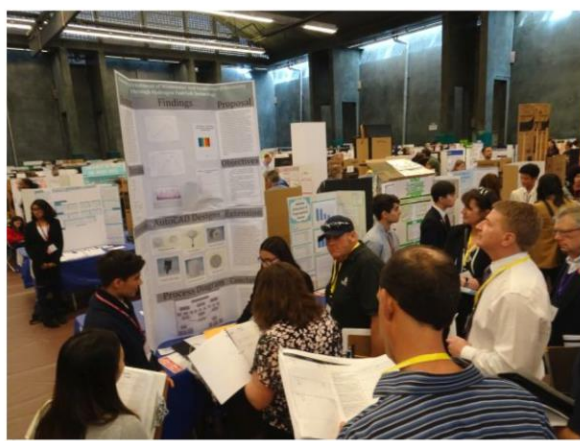
While the students are gathering in the tents, the 400 judges are also arriving. They check in at the Judges tent, and pick up their judging materials and assignments. The judges then begin taking a close look at the projects and notebooks before the students arrive. Some meet in their teams and plan how they will interview the students.



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### Judging Begins

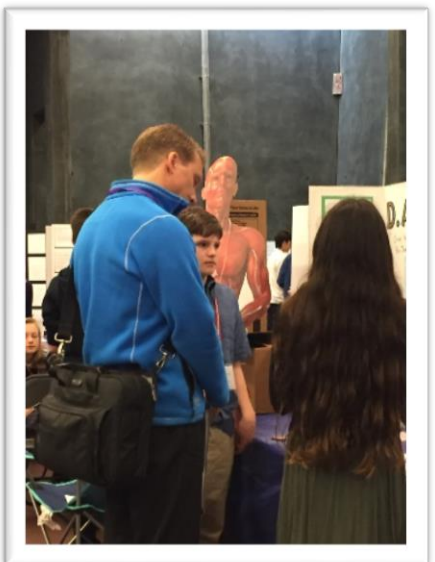
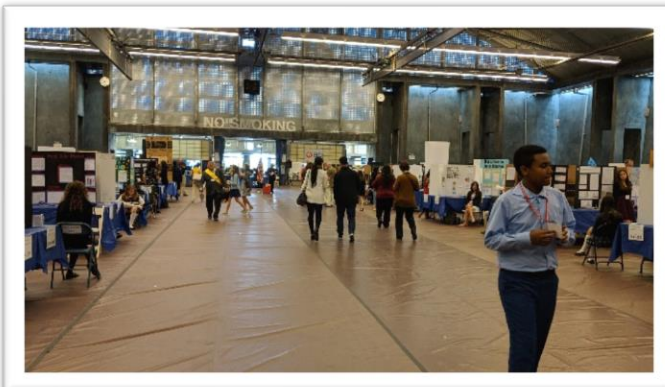
At 8:20 a.m. the Judges are ready to meet the student exhibitors, and the Fair Director leads the 600+ students up to the BPAC for their grand entrance through the main doors. Judging begins...



*“To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science.”* — Albert Einstein

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Categorical judging for the Place Awards occurs all morning...and in the afternoon is the Professional Society judging.

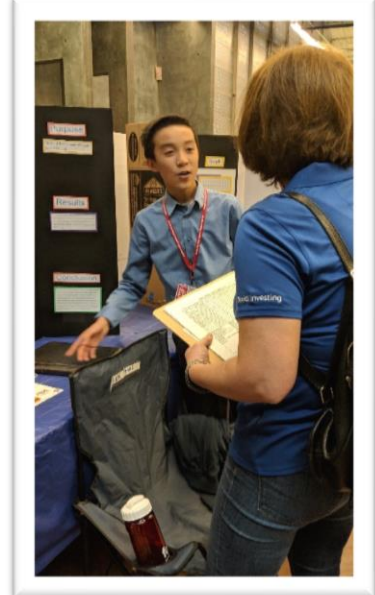
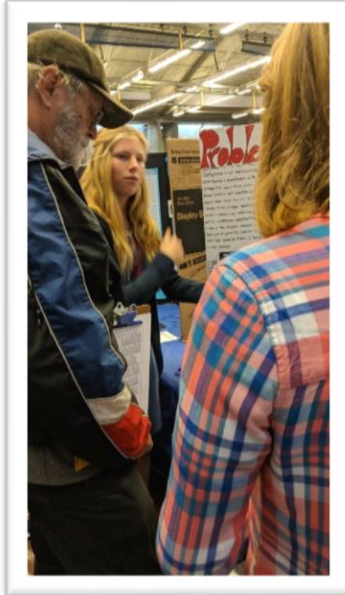
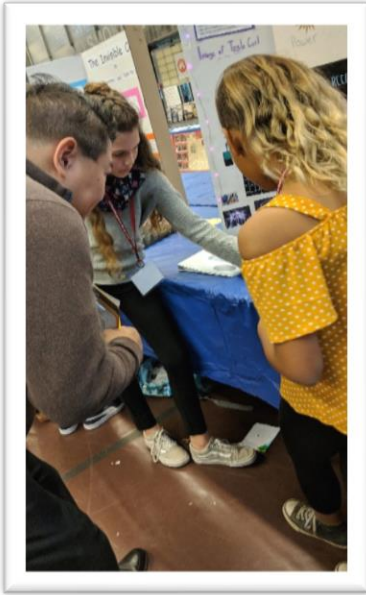


*"The art and science of asking questions is the source of all knowledge."*

- Thomas Berger

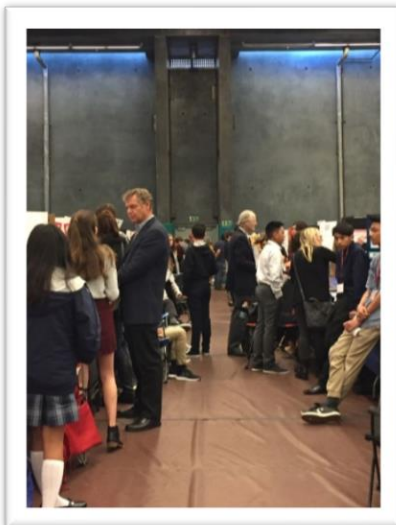
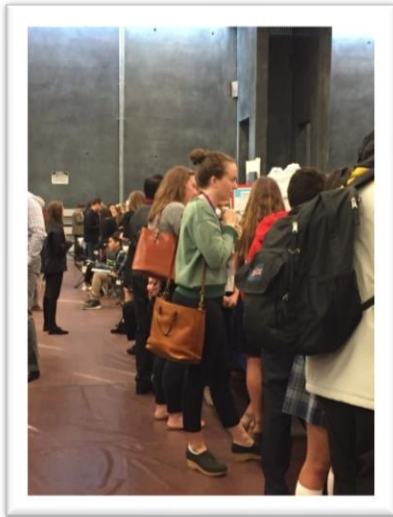
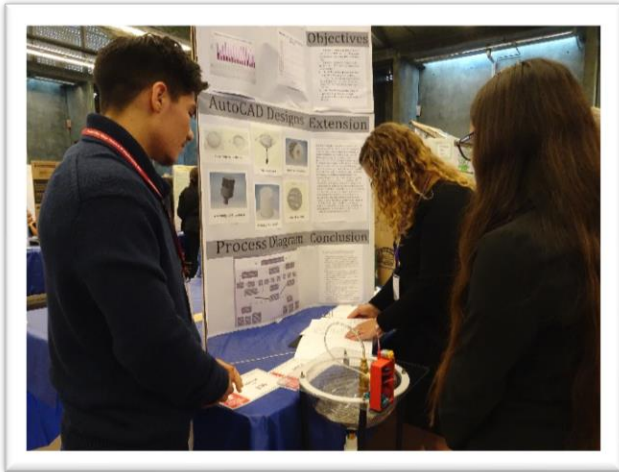
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Judges talk with the student exhibitors, ask them questions, and check their data...



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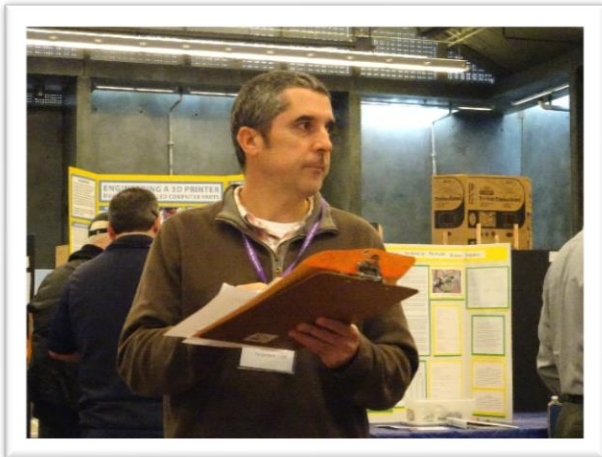
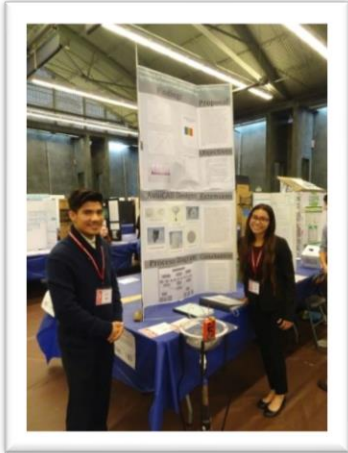
They recommend projects for the California Science and Engineering Fair and for the coveted Sweepstakes Awards.





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When it comes to deciding the Sweepstakes Awards, these special judges are very thorough and will take the time to read through the student exhibitors' notebooks when the students are at lunch or after judging is over.



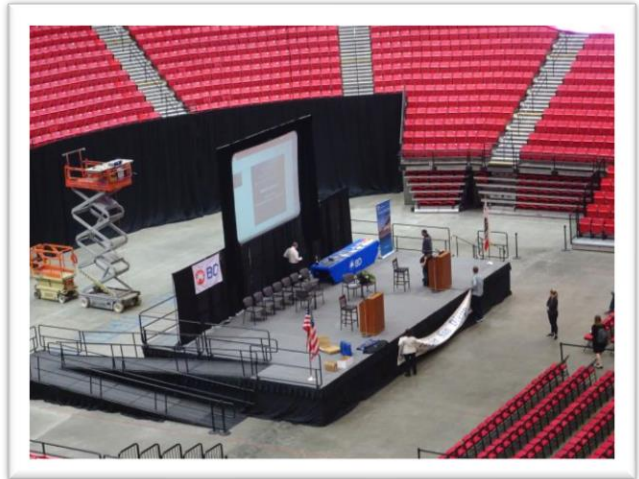
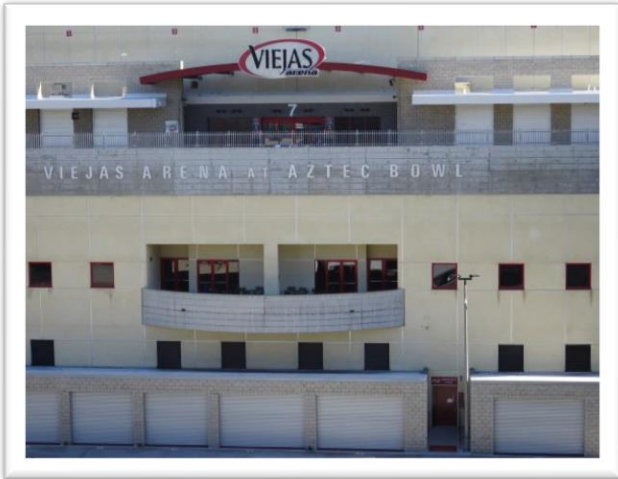
*"Science is a way of thinking much more than it is a body of knowledge."*

*- Carl Sagan*

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Awards Ceremony – Thursday, March 14, 2019

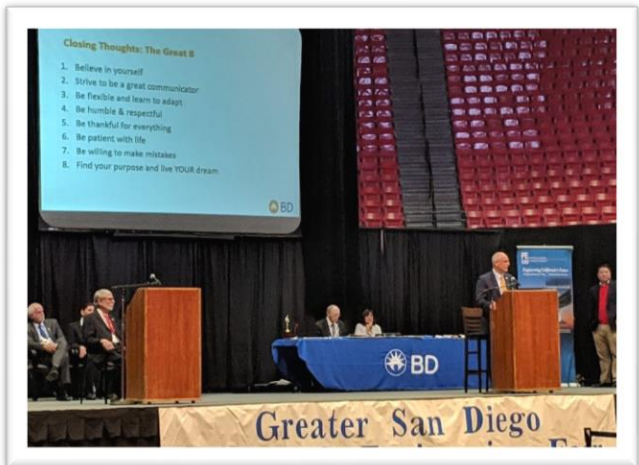
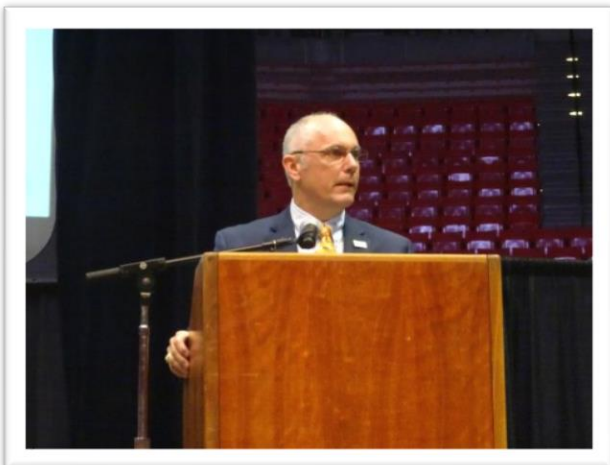
Decisions are made...Place awards are decided, Special Awards and Sweepstakes Awards are determined... Time for the announcements! This year, the GSDSEF Awards Ceremony is at Viejas Arena at San Diego State University.



GSDSEF volunteers and SDSU staff members prepare for the Awards Ceremony.



Student Leadership Board (SLB) President, Alina Pollner, leads the Pledge of Allegiance and SLB Secretary, Ananya Rao, sings the national Anthem.



Rob Sobie, BD Pyxis Supply Solutions gives the keynote speech.

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ALL student exhibitors receive their Place Award ribbon on stage. They shake hands with dignitaries from the GSDSEF and companies such as Qualcomm, BD, Sony Playstation and other local and national companies. Special Awards given by Professional Societies are also presented on stage by members of these organizations. These students receive money awards ranging from \$100 to \$2000 and/or plaques.



Greater San Diego  
& Engineering



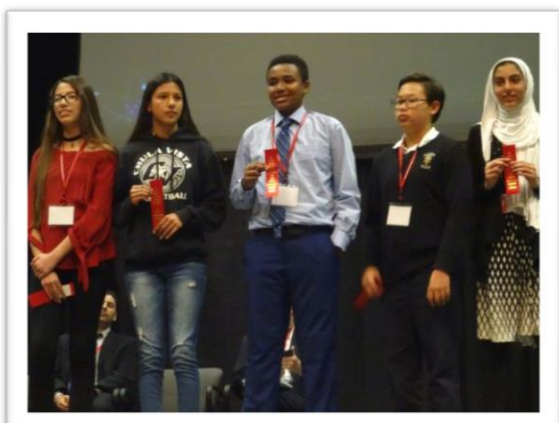
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*"Curiosity – the rover and the concept – is what science is all about: the quest to reveal the unknown."*

*– Ahmed Zewail*

The Science Fair Experience - GSDSEF 2019



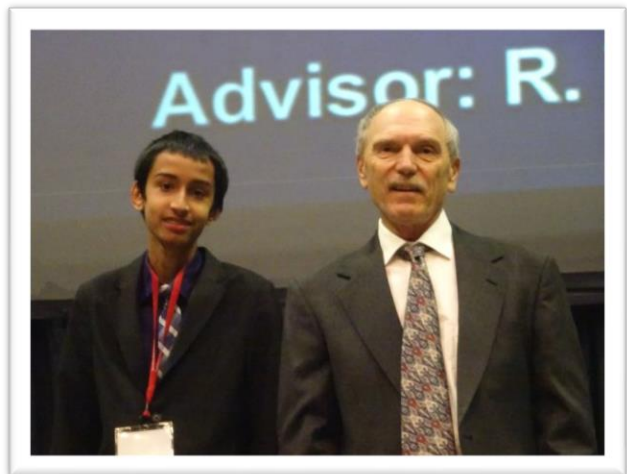
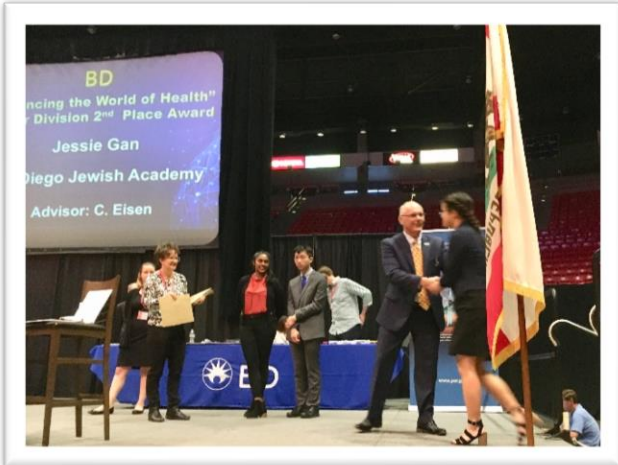
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*"It is a profound and necessary truth that the deep things in science are not found because they are useful: they are found because it was possible to find them."*

*- J. Robert Oppenheimer*

The Science Fair Experience - GSDSEF 2019



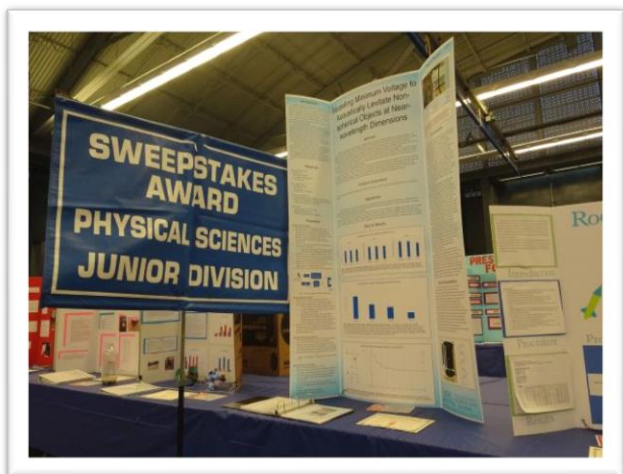
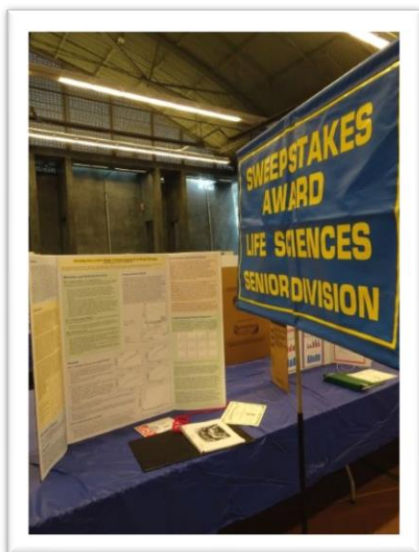
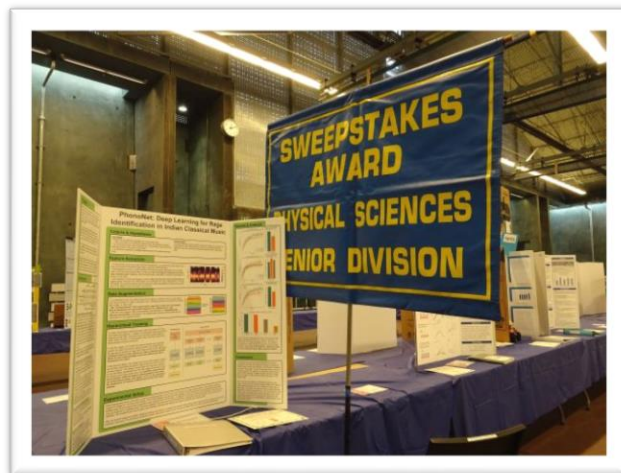
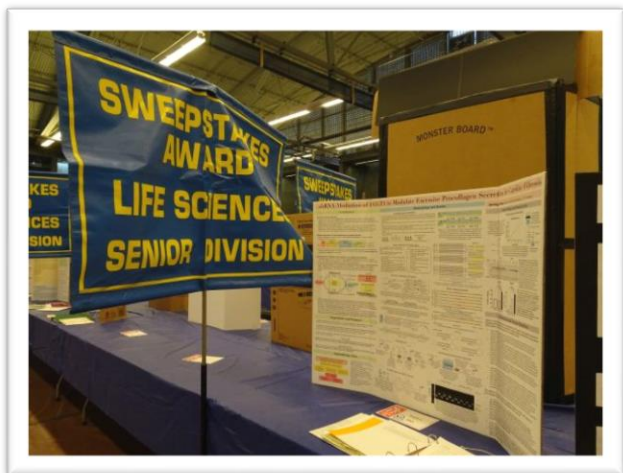
*“Science is a way of life. Science is a perspective. Science is the process that takes us from confusion to understanding in a manner that's precise, predictive and reliable - a transformation, for those lucky enough to experience it, that is empowering and emotional.”*

*- Brian Greene*

***The Science Fair Experience - GSDSEF 2019***

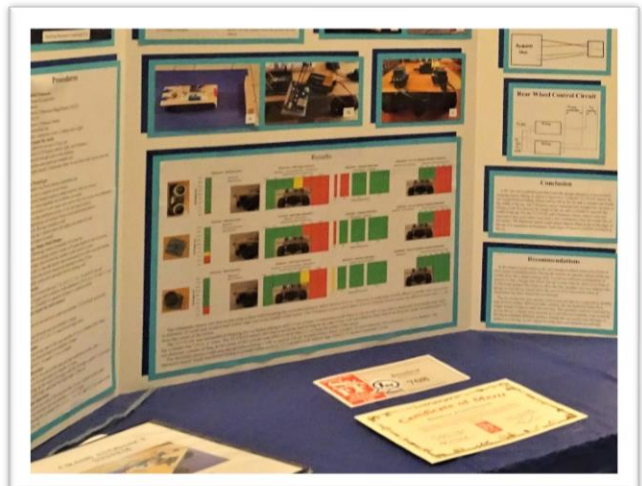
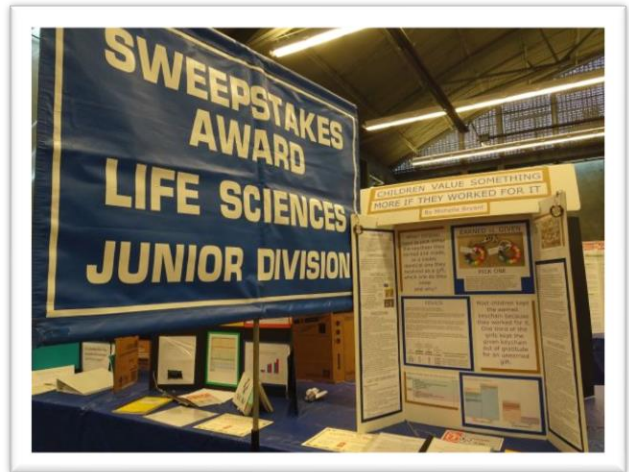
Public Viewing Days – Thursday to Sunday, March 14 -17, 2019

By Friday morning, the Sweepstakes winners have banners placed by their projects. All projects get a Certificate of Merit and their booth card gets a Place Award sticker. The BPAC is open for public viewing from 10 am to 4 pm.





The Science Fair Experience - GSDSEF 2019

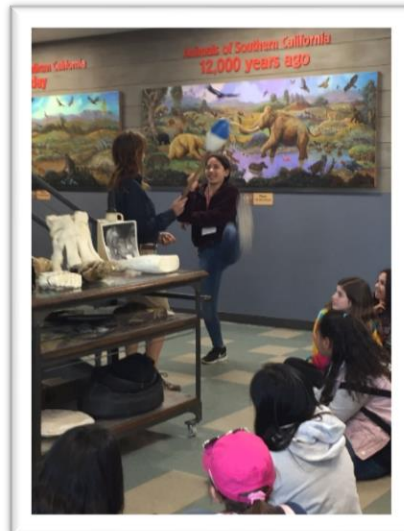


*"What is a scientist after all? It is a curious [person] looking through a keyhole, the keyhole of nature, trying to know what's going on."* *- Jacques Yves Cousteau*

*The Science Fair Experience - GSDSEF 2019*

Student Tours – Thursday and Friday, March 14 and 15, 2019

Special behind-the-scenes tours are set up at the Reuben H. Fleet Science Center, the San Diego Air & Space Museum, and the San Diego Zoo. At the zoo, students go on a bus tour for a behind-scenes tour of the giraffe enclosure and the elephants corral. Zoo keepers let students hold tusks, elephant bones, and giraffe tail hair. They even show how they train elephants for their “spa day.” Students are lucky to catch the hippo out of the water and yawning widely – a rare treat!



*The Science Fair Experience - GSDSEF 2019*

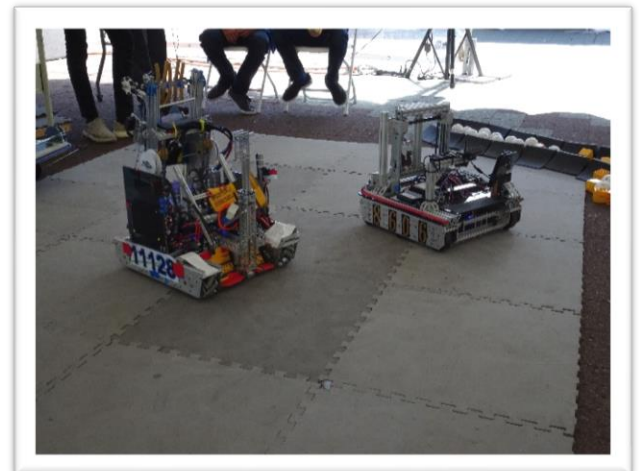
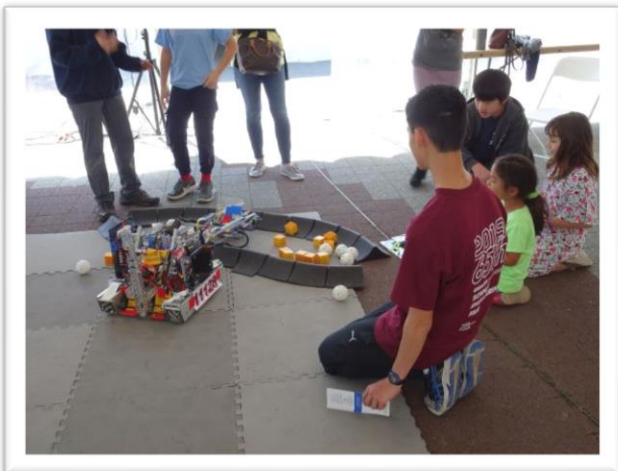
Family Day – Sunday, March 17, 2019

The SLB members organize Family Science Day. They invite community organizations to present and give demonstrations. This year representatives from the National Park Service from Cabrillo National Monument and Sea World take part, well as the Zoo with their special ambassadors - an albino Nelson’s Milk Snake, a skink, and an armadillo.



*The Science Fair Experience - GSDSEF 2019*

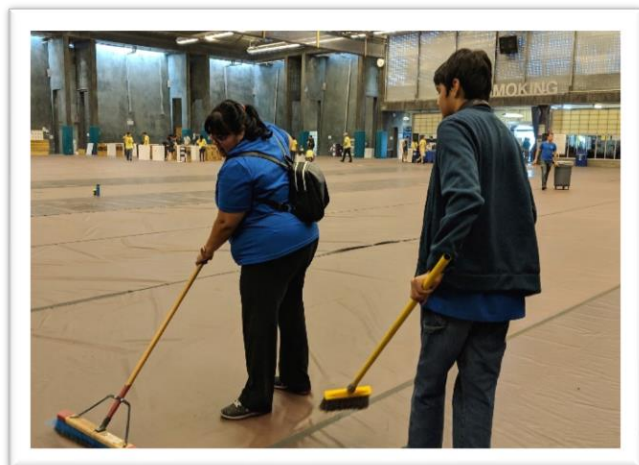
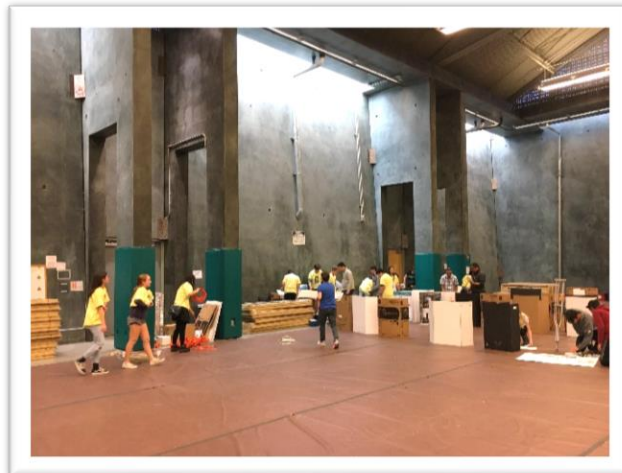
The SLB has hands-on activities and demonstrations, as well as a Scavenger Hunt where participants can win prizes. Kids are able to check out carnivorous plants, make a bracelet with UV beads that change from milky white to bright colors in the sun, and see how to make a density tower created by different colored household liquids make a colorful layered tower. A robotics demonstration by high school students show younger kids how computer tech and engineering work together.



*The Science Fair Experience - GSDSEF 2019*

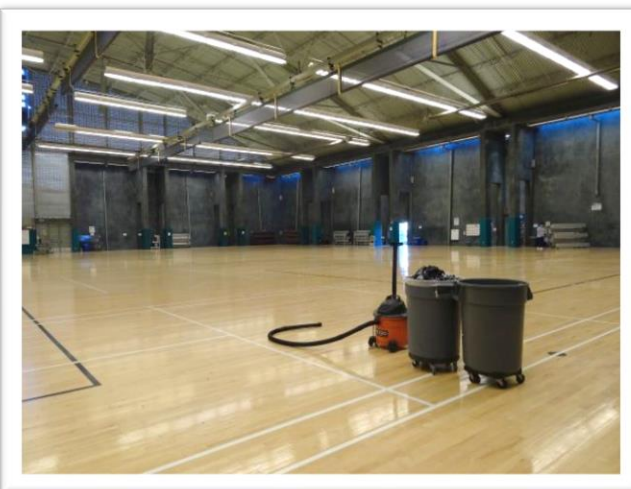
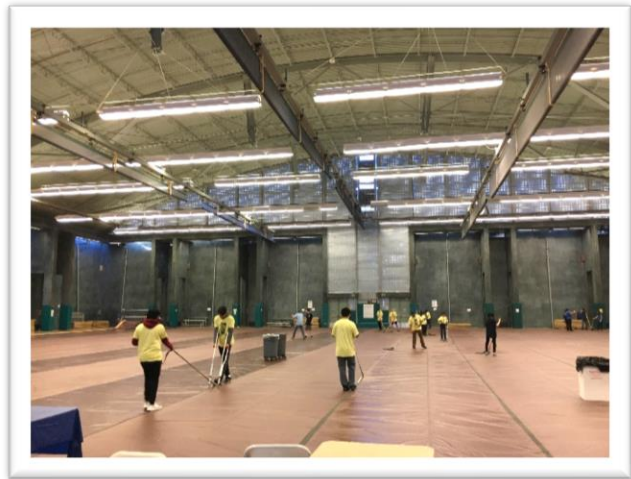
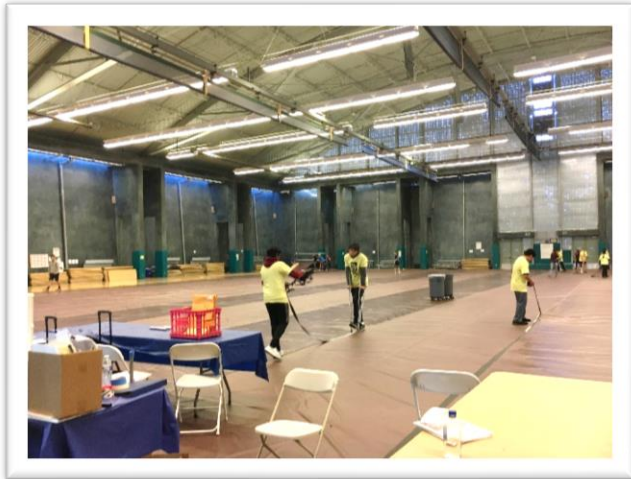
Closing of the 2019 Fair – Sunday, March 17, 2019

Project take-down begins promptly at 3 pm (not one moment sooner) and clean up begins soon after. Many volunteers help make clean up a quick job. Tablecloths are folded... tables are removed... floor coverings are swept and mopped...



*The Science Fair Experience - GSDSEF 2019*

... the floor covering is untaped and rolled back up... and trucks are loaded... thanks to the army of volunteers from BD, the community, high school students from Canyon Crest Academy, SLB members, and the Management Committee.

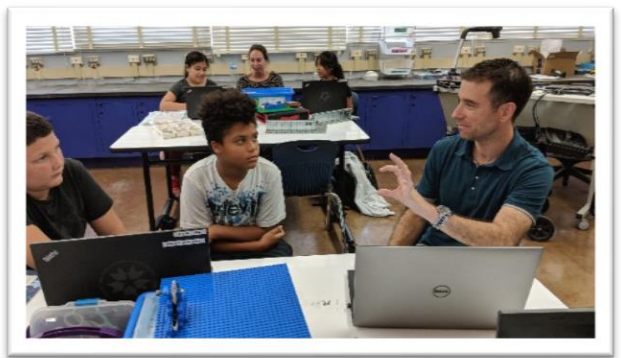
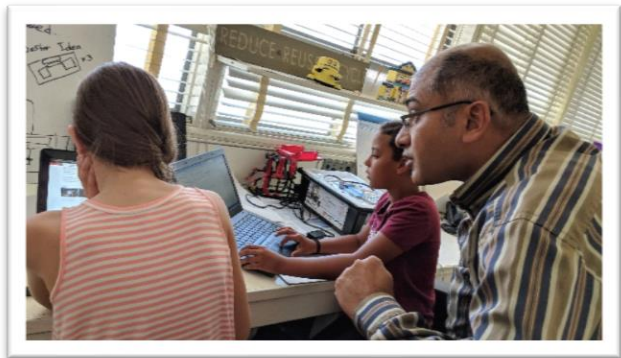


*"Scientists have become the bearers of the torch of discovery in our quest for knowledge."  
- Stephen Hawking*

## SPECIAL SECTIONS: Sixth Grade Showcase!

When it comes to learning about STEM (science, technology, engineering and math), few opportunities provide a better chance to get hands-on experience than a good ol', project-based science fair, **and it's never too early to start!** That's why more than two dozen BD associates in San Diego recently served as science fair mentors to local 6<sup>th</sup> graders.

The GSDSEF invited these amazing 6<sup>th</sup> graders to "showcase" their projects in this year's Fair.



## The Science Fair Experience - GSDSEF 2019

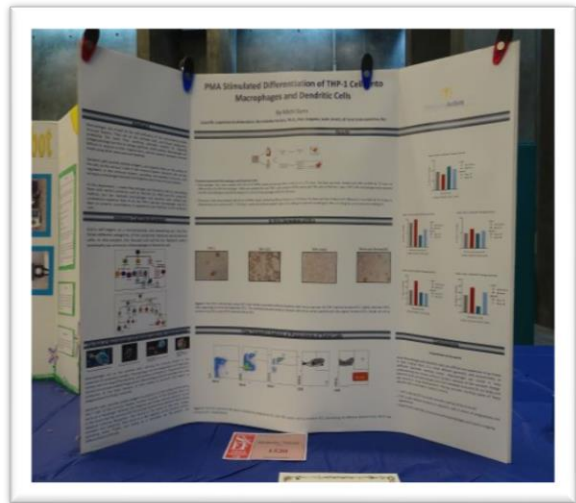
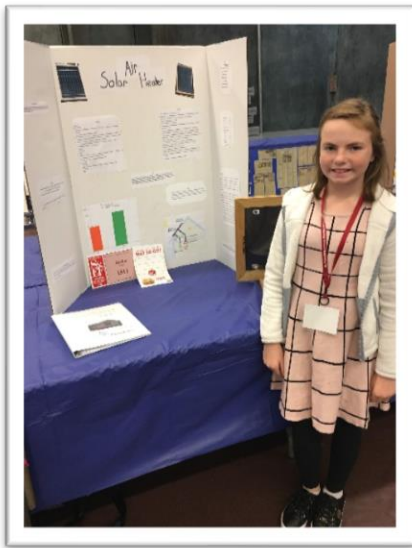
These sixth graders from Marston Middle and Solana Pacific Elementary School are the first ever to participate in the GSDSEF. They presented their science research and engineering prototypes – from hovercrafts to a lemonade making machine to a multi-purpose catapult – to judges. Although they were not judged for place awards, each student received a Certificate of Merit and a very special Award ribbon on stage at the Awards Ceremony.



*"Look up at the stars and not down at your feet. Try to make sense of what you see, and wonder about what makes the universe exist. Be curious."* - Stephen Hawking



The Science Fair Experience - GSDSEF 2019



*"PMA Stimulated Differentiation of THP-1 Cells into Macrophages and Dendritic Cells"*



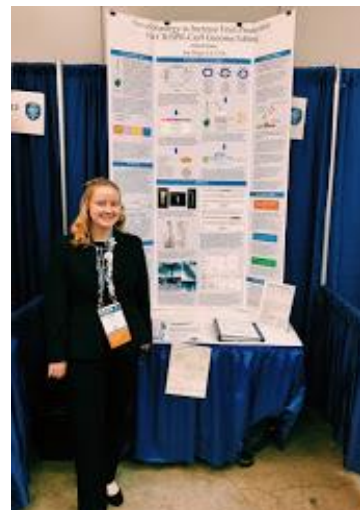
The GSDSEF extends a huge thank you to BD and their associates for the multiple ways they support science education!

## The Science Fair Experience - GSDSEF 2019

### Student Leadership Board Messages:

"The Greater San Diego Science and Engineering Fair has taught me much, much more than science and engineering. It has taught me how to talk to adults, be confident in my presentation, keep an organized lab notebook, and has introduced me to amazing students and judges alike. My first year, in eighth grade, I came running out of the Balboa Park Activity Center after judging was complete with no shoes on (rookie mistake—make sure your shoes don't give you blisters before you stand for hours in them) and dehydrated (another rookie mistake—you can never have too much water in science fair), but had possibly the most impactful day of my life. I had discovered my passion, and GSDSEF made me realize that in my future, I want to pursue a career in STEM, particularly in research. Without a doubt, science fair and conducting research has had the biggest effect on my life thus far."

--Alina Pollner, SLB President 2018-2019

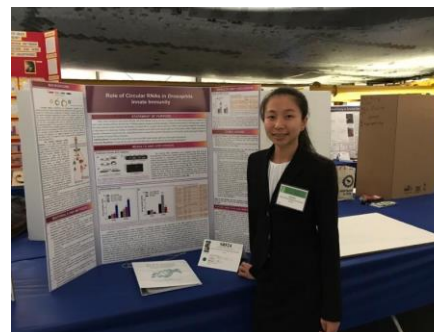


You're often told not to describe an event or activity as life changing since it is then rendered as "cliche," but there is no other way to describe my science fair experience other than "life changing." Science fair changed the way I talk, the way I speak, the way I interact with others, and what I know. It is one of my few high school activities that I consider will continue to impact me positive ways as I grow older. It helped me realize my interest for the pure sciences and especially helped me solidify my interest in pure mathematics. Science fair was also the venue through which I could make numerous connections with people in academia and industry who I am sure will make an impact in my professional career. Participating in science fair for 5 years, I came out a different person than who I went in as, so how else could I describe my experience but life changing?

Rachana Madhukara, SLB Vice-President of Activities 2018-2019

*"Mathematics is the most beautiful and most powerful creation of the human spirit." - Stefan Banach*  
*"Mathematics, rightly viewed, possesses not only truth but supreme beauty." - Bertrand Russell*

"Participating in the Greater San Diego Science and Engineering Fair has probably been one of the best decisions I've made in my life. Sure, I've had my fair share of stress. But in the end, when you get to proudly present your own work, and when you get to share what you are passionate about with people who are excited to hear from you, it's all worth it. Honestly, the greatest thing about research is that it is up to YOU to decide what directions you want to take. You never know where research will lead you, what doors it will open for you, and what people it will bring you to meet. The GSDSEF has given me some of my most memorable experiences, and it has made me all the more certain of my future path in STEM."



Julia Situ, SLB Vice-President of Outreach 2018-2019

## Afterword

**The Science Fair Experience – GSDSEF 2019** is a publication produced by different subcommittees of the Greater San Diego Science & Engineering Fair. The original concept was the brainstorm of Dr. Mark Atkins in 2018. The Science Fair Experience – GSDSEF 2019 is the second volume of this publication.

In the Foreword, we used the memorable words Mary Domb Mikkelson had written over 30 years ago, “What and why is there a Science Fair? It is many things – or more accurately, many people.”

As we continue to produce this publication, we are looking forward to refining it to include additional and unique special features highlighting the Science Fair experience from the perspectives of the industrious students, the dedicated teachers, the supportive parents, and the various volunteers and community members – judges, mentors, sponsors, and Management Committee members who spend hundreds of hours planning, organizing, and supporting the Science Fair each year - which over the last 65 years has evolved to become a Science, Technology, Engineering, and Math Fair.

- The GSDSEF Board of Directors, Management Committee, and Student Leadership Board  
2018-2019

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The GSDSEF would like to thank the following for their photograph contributions in creating this year’s document:

Dr. Mark Atkins  
Dr. Erika Pollner  
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Mr. True Xiong  
Mr. Steve Rodecker  
Mrs. Olivia Tian  
Mrs. DaVonna Charles  
Mrs. Jelen Rodecker

*“Science knows no country, because knowledge belongs to humanity,  
and is the torch which illuminates the world.”*

*- Louis Pasteur*