

FLINT REGIONAL
**SCIENCE &
ENGINEERING
FAIR**



Handbook

Serving Students Grades 4-12
in Mid-Michigan & Beyond

Welcome to the Flint Regional Science & Engineering Fair!

We're happy you want to join in the fun of the Flint Regional Science & Engineering Fair. And we think you will have fun – learning and doing new things. Meeting new friends. Maybe even winning prizes or awards.

This handbook is designed for students, parents, teachers, and others to help learn about and work through the steps of creating a project for the Flint Regional Science & Engineering Fair. It's filled with all the "need-to-know's" and ideas, hints, "how-to's" and resources you might need.

A step-by-step, Interactive Project Guide is available on the FRSEF website upon registration. Use this handbook as a supplement to it.

ELIGIBILITY

- Students in grades 4-12
- Students attending any public, parochial, private, or home school anywhere in the greater Mid-Michigan area (e.g., Bay, Clinton, Eaton, Genesee, Ingham, Lapeer, Midland, Saginaw, Shiawassee, St. Clair, and Tuscola counties), or in any Michigan county not served by an International Science and Engineering Fair (ISEF) affiliated fair



Divisions & Categories

DIVISIONS

- Elementary: Grades 4, 5
- Junior: Grades 6–8
- Senior: Grades 9–12
- Group Projects: All Grades

Group Projects (made by more than one student) are judged against the individual student projects within the appropriate grade level. Group members must be in the same division.

CATEGORIES

There are three major categories used to divide projects in the Flint Regional Science & Engineering Fair. Within these, there are many other sub-categories. Use the list below to decide where your project best fits. All judging will use these categories. The Junior Division awards top prizes in each of the three main categories.

LIFE SCIENCES

- Behavioral & Social Science - Psychology, Human Behavior, Social Relationships
- Microbiology - Study of Bacteria and Viruses
- Plants Sciences - Study of Plant Life
- Medicine & Health Sciences - Study of Humans and Their Biology, Diseases and Health
- Cellular & Molecular Biology - Biology of Microorganisms
- Animal Sciences - Study of Animals

EARTH & ENVIRONMENT

- Biochemistry - Chemistry of Life Processes
- Chemistry - Study of the Nature and Composition of Matter and Laws Governing It
- Earth & Planetary Science - Climatology, Geology, Meteorology, Mineralogy, Oceanography, Space Science
- Environmental Science - Study of Air, Water and Land Pollution
- Environmental Management - Recycling and Ecosystem Management

PHYSICAL SCIENCE

- Computer Science - Study and Development of Computer Software, Hardware and Associated Logical Devices
- Engineering - Materials & Bioengineering - Electrical, Mechanical, Civil, Chemical
- Mathematics - Numerical and Algebraic Computations, Statistics
- Physics & Astronomy - Theories, Principles and Laws Governing the Physical Universe



Important Information:

Projects involving the following items are examples of those needing special handling or attention, and may require additional forms:

- Animals
- Humans
- Tissue
- Molds
- Fungi
- Liquids
- Food – animal or human
- Acids
- Caustics
- Hazardous chemicals
- Explosives
- Projectiles
- Heat
- Batteries
- Electricity
- High voltage
- Lasers
- Heavy metals
- Potentially hazardous materials or equipment
- Certain plants and soils

Have You Registered?

You can sign up for the Fair by going online at flintsciencefair.org.

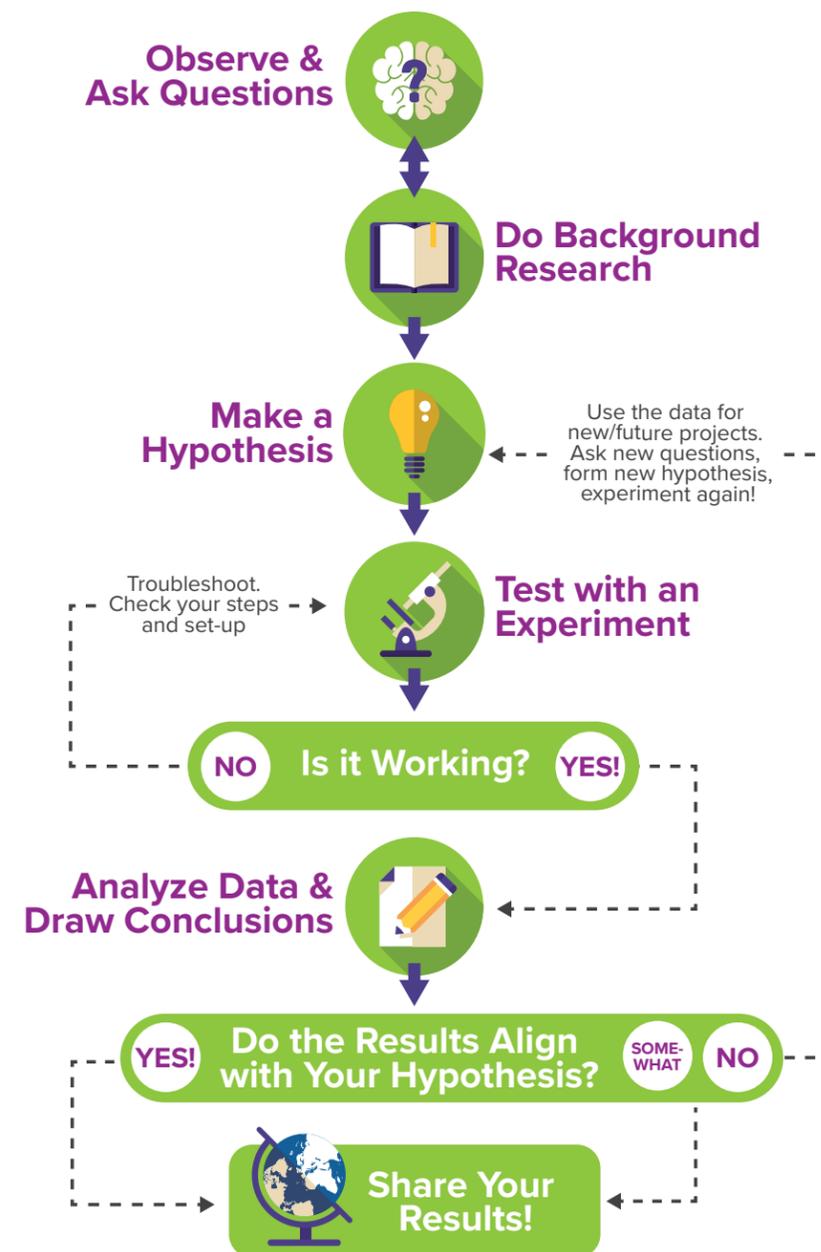
- Click "Get Started" to set up your personal account
- Complete the registration page
- Check your email for the Interactive Project Guide
- Use the Project Guide! It's a step-by-step map for making a science or engineering project
- Use your personal account to save and upload files and forms
- **Questions?** Email director@flintsciencefair.org





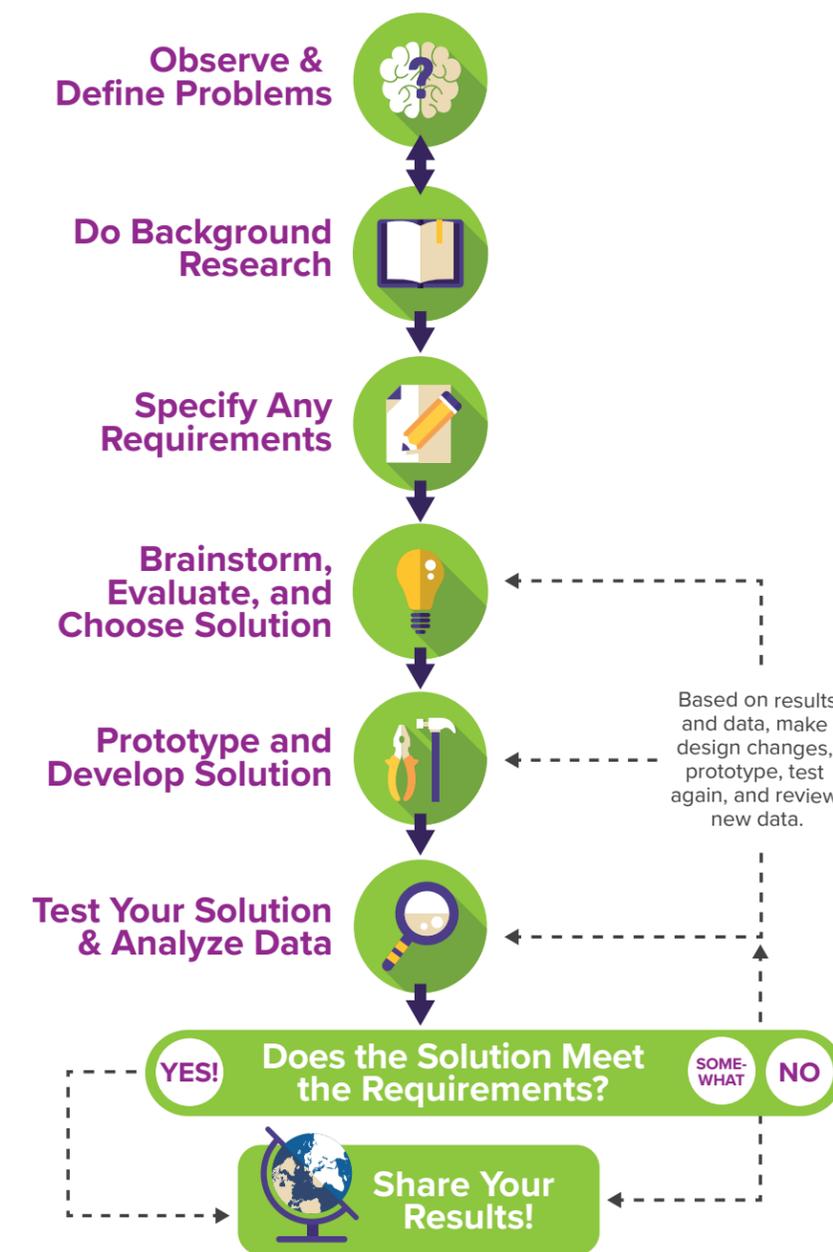
Are You a Scientist?

Scientists observe. They ask questions, then seek answers. They look for causes and effects. Scientists gain new knowledge by carefully studying, observing, and understanding how and why things happen. We call this “experimenting”, and scientists use a step-by-step process called the **Scientific Method** to conduct their experiments.



Are You an Engineer?

Engineers use science, math, and other tools to solve real-world problems. They design and build things. They improve or create things that make life better. They often work in teams with other engineers, scientists, technicians. To guide their problem-solving, engineers use a step-by-step process called the **Engineering Method**.





Choose a Topic

Coming up with a project idea is often the most difficult part, but it doesn't have to be. Here are a few ideas for starting:

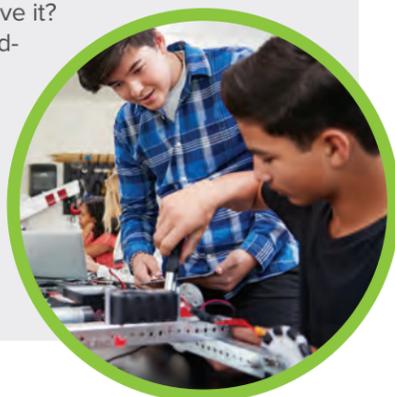
- Start by just looking around and asking questions:
Why does that do that? How does that work? What would happen if...
- Look for problems to solve in your everyday life.
Can I build a better way to do that? Can I make that chore or job easier?
- Talk with your teachers, parents, other relatives, or neighbors who know something about your proposed topic. They can give you more ideas or other points to consider.
- Most importantly, pick an area of science or technology that interests you. You'll have more fun and be more engaged if you're working on something you like.
- DO NOT just do an experiment that you find on the internet. Use what you find as a starting point, and give it your own twist. Change it up. Make it your own!

Next Step - Scientists

- 1. Study Your Topic:** Once you have a general topic, refine it. Narrow the subject down to one or two questions that make an interesting experiment. Then, hit the library! Or the internet. Ask your teachers, family, or friends. Learn more about the subject to really finalize your project.
- 2. Make a Hypothesis:** The hypothesis is the cornerstone of the Scientific Method. As a scientist, this is where your project starts. It is your cause and effect statement: If this happens, then that will occur. Based on the topic you want to explore and your research, create your cause and effect hypothesis. Then create an experimental process that will allow you to test your hypothesis. Remember, your hypothesis does not have to be correct. The whole idea of the experiment (of the Scientific Process) is to test, not to prove.

Next Step - Engineers

- 1. Brainstorm & Research Your Ideas:** Brainstorming is where many different ideas are tossed around and considered. Ask others to help. The more ideas the better! There are no bad ideas or boundaries at this point. Review, revise, and research more about your favorites. Evaluate your options and choose the best one (or start over – that's always an option).
- 2. Define your goal:** What is the problem? Why is it important to solve? How will you solve it? What will the end-result achieve (how will your solution make life better)?



Plan Your Project

It might sound obvious, but a good project has to be started (and started soon)! It also needs to be finished well. In between comes a lot of planning. Let's start!

CREATE A PROJECT CALENDAR

Begin by marking the dates of the Science Fair and any deadlines. Next, mark off all of the days you know that you cannot work on your project. Now, starting at the first day of the Fair, work backward as follows:

1. Plan at least 2 weeks to write the final draft of your research paper & create your display.
2. Expect 7-10 days to write and review your research paper's rough draft.
3. Estimate how long you will need to do your experiment (building, testing, experimenting, revising, etc.); add in enough extra time to collect data at least three times.
4. Plan two weeks for research.
5. Add in at least a week to complete and submit your Research Plan and required forms for your experiment.

WRITE YOUR RESEARCH PLAN

Your Research Plan needs to answer the following:

- 1. Why Did You Choose This Project?** Include background information of your research question or problem. Why is it important? If applicable, include societal impact.
- 2. What Do You Plan to Do?** For a Science Project: Research Question(s) or Hypothesis(es) and Expected Outcome(s). For an Engineering Project: Engineering Goal(s)
- 3. How Do You Plan to Do It?** Procedures: Detail all procedures and experimental design including methods for data collection. Describe only your project. Do not include work done by others. Risk and Safety: Identify any potential risks and safety precautions needed. Data Analysis: Describe the procedures you will use to analyze the data/results.
- 4. What Are Your Sources of Information?** Bibliography: List major references (e.g., science journal articles, books, internet sites) from your literature review. If you plan to use vertebrate animals, one of these references must be an animal care reference.

Senior Division Only: Any changes made during the research can be added to the original research plan as an addendum, recognizing that some changes may require returning to the Independent Review Board (IRC) or Scientific Review Committee (SRC) for appropriate review and approvals. If no additional approvals are required, this addendum serves as a project summary to explain research that was conducted. If no changes are made from the original research plan, no project summary is required.

SUBMIT YOUR PLAN

1. From your personal account page on the FRSEF website, answer the questions (click appropriate boxes) related to your project.
2. Based on your responses the correct forms will be provided for you to either print and fill out or fill out online.
3. Once all forms are completed and signed by your adult supervisor(s), upload the forms and your Research Plan to the FRSEF online account you created upon registration. Login for instructions.



Important Information:

You cannot begin your experiment until you submit your Research Plan and the Scientific Review Committee (SRC) forms.

Signed and scanned forms must be saved to the FRSEF online account you created upon registration. Login for instructions.

CamScanner or Adobe Scan are free apps that allow you to scan an image and convert it into a pdf.

A high-res photo (jpg) of the completed forms with signatures is also acceptable.



Need Help?

The Interactive Project Guide is designed to walk you through the entire Science Fair process step-by-step. To access the guide, register online at FlintScienceFair.org.



Keep Good Notes!

Keep a lab notebook throughout your research and display it at the fair.

Record everything you do – even if something doesn't turn out as expected, or you make a mistake. Record what you did, why you did it, and the results.

Every notation should be dated. Do not leave empty pages between entries.

Include random notes, your thoughts, observations, background information, photos of your project in-progress, photos of experiments, etc.



Need Help?

Your digital Interactive Project Guide has more insights for each section. There are many online resources for writing research papers, too. Of course, your teachers should be able to help.



Experiment or Build & Analyze

SCIENTISTS – EXPERIMENT

- Gather Materials
- Refine Plan
 - Finalize experimental methods
 - Define controls
 - Define variables (dependent, independent)
- Experiment:
 - Many times - at least three times for general experiments
 - State your variables
- Review SRC Human/other Test Questions (still OK?)
- Analyze Your Data
- Draw Conclusions

ENGINEERS – BUILD & ANALYZE

- Gather Materials
- Prototype Your Project
- Build, Test, Analyze, Improve
 - Many times – the more you test, the more you can improve
 - Rebuild (back to the drawing board) if necessary
- Review SRC Human/other Test Questions
- Analyze Your Data

Write Your Research Paper

Your Research Paper should contain at least nine sections, outlined below. A template is included in the Interactive Project Guide. Use it to create your document.

- **TITLE PAGE** - Use the same title used for your Research Plan.
- **TABLE OF CONTENTS** - Follows the title page. Write this after your paper is complete and your pages are numbered.
- **SUMMARY** (also known as the ABSTRACT) - A short overview of your project.
- **INTRODUCTION** - Provides general background research regarding the project.
- **EXPERIMENTAL PROCEDURE** - Gives the details of how the experiment was done. It should be so precise that someone could repeat your work without any additional information.
- **DISCUSSION** - Presents all of your observations and data - tables, charts, graphs, photos, etc. Lets your readers know exactly what you did.
- **CONCLUSION** - Briefly restates the findings and results detailed in your discussion.
- **CREDITS** - Gives credit to other people, businesses, or institutions for their work and assistance.
- **REFERENCES** - Your bibliography - a list of the information taken from the work and writings of others.



Use Your Resources

Many companies or university departments/professors are excited to assist with your project. Don't be afraid to ask!

The FRSEF also has equipment and resources available. We can even arrange review or help sessions during any stage of the project.

Contact the FRSEF with any questions at director@flintsciencefair.org.



Helpful Hints...

- **Use Subheadings:** Subheadings help the reader follow the flow of the paper.
- **Spell Check:** Spelling counts! Use a spell checking program (Grammarly is a good one) to review your document.
- **Proofread:** Ask your teacher and another adult to proofread your paper. If they have trouble understanding your paper, maybe you left something out, or you may need to rewrite to make it more clear.
- **Make it Readable:** Make sure the final draft is typed with double-spaced lines and one-inch margins all around. Don't forget to number all pages except the title page.
- **Revise:** Have your paper proofread a final time and fix any remaining errors.

HOW TO CREATE AN AWESOME SCIENCE FAIR DISPLAY

This is your chance to show everyone what you've been doing! Let's make it look amazing!

Your project display should explain your work clearly, briefly, yet completely. Your display should answer the following questions: Why did you choose this topic? How did you do this project? What were your results or findings?

How do your results expand our understanding of the field?

ELEMENTARY

displays may not exceed: 30" deep, 36" wide, 108" high



JUNIORS

displays may not exceed: 30" deep, 36" wide, 108" high



SENIORS

displays may not exceed 30" deep, 48" wide, 108" high



FOLLOW THE RULES!

Floor-standing displays are NOT permitted. Do not use forbidden items in your display

DRAW PEOPLE IN

with a catchy title and visually appealing display.



MAKE IT EASY TO READ

Size 18 Arial Narrow as a minimum.

USE GRAPHS & PICTURES

Make sure everything is labeled clearly & correctly (including table titles, graph axes and units).



INCLUDE FOOTNOTES!

Provide explanations of data and give credit for all photos, images, and graphs – even if you did them yourself.

DISPLAY VIDEOS, OBJECTS & PROTOTYPES

Use items that can help explain your research. (Do not display images of yourself on the board.)

Project Checklist

One more run-through to make sure you are ready and make the weekend go much smoother.

- Have you completed the FRSEF Online Registration and uploaded all of the required forms?
- Have you read and complied with the International Rules and Guidelines (available on the FRSEF website)?
- Do you have your Research Paper to leave with your project?
- Do you have your Lab Notebook to leave with your project?
- Does your project contain any prohibited photos, including dissection or other visuals of vertebrates in other-than-normal conditions? If so, remove them.
- Do you have written permission to display photos of everyone used in your display materials?
- Do you have any living creatures, yeast, molds, microbes, opened or unpackaged food in your display? Remove and replace with pictures.
- Does your display meet your division's size requirements?
- Does your display include credits for all photos, images, and graphs?
- Have you arranged to have your project transported for set up by 6:30 pm on Friday evening?
- Have you arranged to be present for Saturday's judging interviews?
- Have you arranged to be present for Sunday's awards ceremony?
- Have you arranged to pick up your project after the Fair?

Remember: Special safety or handling rules may apply for conducting your experiment and what or how items can be included in your project display. Some items are prohibited or special handling rules apply due to safety concerns and ethical issues. The Rules, Procedures, and Forms page on the FRSEF website provides comprehensive guidance and specific directions for many situations and identifies any special forms you might need to submit to the Scientific Review Committee (SRC). If you have any questions, please contact director@flintsciencefair.org.



Check Yourself!

Review the rules and your checklists often.

Scientific experiments and engineering prototypes change. Make sure your forms are up to date as your project progresses.

An "oops" discovered during fair set-up can ruin months of great work.

Verify your online registration details are correct 2-3 weeks before the fair!



Where to Park

Parking is available in several lots around the Riverfront Conference Center.

Free parking is available in the parking garage adjacent to the Center. Signs will point to this option.

There is a circle drive in front of the Center for dropping off displays.

Paid parking is available on the flat lot across the street

For the Awards Ceremony, free parking is available in the parking ramp next to Northbank. Look for signs. A pedestrian tunnel connects the structures.

See the FRSEF website for a map of the area.

What to Expect: A Day-to-Day Guide of the Fair

The Flint Regional Science and Engineering Fair is held at University of Michigan-Flint's Riverfront Conference Center, located on Saginaw Street in downtown Flint. Displays and judging, as well as the Fair expo events are held here. The Awards Ceremonies are held at the University of Michigan-Flint's Northbank Center, which is nearby - just across the river on North Saginaw Street.

FRIDAY SET-UP

- If your school has scheduled a set-up time, plan to arrive by bus with your classmates. Follow instructions as provided by your teachers.
- You should have your project ID number when you arrive (the number you were given when you registered). Your number will also be placed on one of the tables in the display area.
- All divisions are color-coded. Look for table coverings corresponding to your division's color and then find your ID number and set up there. Signs at the end of tables will show the range of project numbers on that table for easier locating.
- If you have a problem or need help, find a Fair representative. They should have tape, tools, markers, pens, etc. for last-minute repairs.
- After your project is set up, get it approved by a Fair representative. They will tell you if anything is wrong with your set-up, and they will help you fix it. Common problems include: live creatures; displaying food, molds, and cultures; or projects that are too big.
- After your project has been approved and the form you were given has been signed by a Fair representative, leave the signed form with your project.
- After you have completed ALL items listed above, you may go.

YOU MUST BE FINISHED BY 6:30 pm.

SATURDAY - JUDGING INTERVIEWS

The examination of your research by other scientists is part of the scientific method. This type of examination is used throughout the scientific world to confirm the correctness of research. This is an educational experience for both the experimenter and the examiner.

The interviewer needs to know everything about your experiment. It is their job to find out how much you know about your project. By asking progressively harder questions, the judge learns more about our world through your work. You will be ranked on how well you actually did your project, not on how well you could have done it.

- Both Finalists and non-finalists are interviewed by FRSEF judges and Special Award judges. Remember, non-finalists are eligible for Special Awards. Be enthusiastic and make the most out of the interview process. Ask your own questions to learn areas for improvement next time.
- Arrive on time for your division. You will receive an email indicating your check-in time prior to the Fair. The FRSEF website will also have this information, as well as an approximate timetable. Dress nicely. Be prepared to stay *until at least noon*.
- Senior Finalists are interviewed in separate rooms. You will use your presentation slides used for preliminary judging. Please arrive at your assigned room 5 minutes prior to your assigned time.
- All other Finalists and Non-finalists are interviewed in the display room. When your group is called, line up inside the stanchions in the hallway outside the display room. Here you will be matched with judges and proceed to your project for your interview.
- You are free to go after your interview; however, you are encouraged to take an hour or more to explain your project to the public on Saturday afternoon after judging (approximately between 2:00 and 4:00 pm).

Other Items for your Information:

Food will be available for purchase in the waiting area on Saturday.

A number of outside organizations will present displays and activities on site on Saturday. Please take advantage of these to learn more about real-world applications for a STEM education.

Please confine your travels through UM-F to those areas being used by the Fair. Only students being interviewed are allowed on the display floor during judging.

There are usually activities for students, but both students and parents should plan to bring something to entertain yourself while waiting for judging. Parents are free to leave the building during the judging period, but please be mindful of the schedules and plan accordingly.

SUNDAY - AWARDS AND HONORS

Three separate award ceremonies are held in the Northbank Center (a short walk or drive from the conference center. Signs and guides will direct you to parking and the entrance. Maps and times are on the FRSEF website.

The Awards Ceremony will consist of the recognition of the entrants and the distribution of special awards, major prizes, gift cards, and scholarships.

SUNDAY - REMOVAL OF PROJECTS

You may remove your project at any time following your judging; however, there is open viewing for the public Saturday afternoon, and the opportunity to see as many different projects as possible might inspire another student to participate next year. All projects must be removed by Sunday evening (after the last awards ceremony). Displays not removed Sunday will be recycled.



Stay Informed!

Use our website! Stay up to date and have all the information you need. www.flintsciencefair.org



Important Information:

Remember, the awards shows on Sunday are held in a separate venue - Northbank Center, on North Saginaw Street.

Please see an FRSEF official or the website for directions and other information.



Check Out Our Website!

See a complete list of awards, prizes, and scholarships available when you go to FlintScienceFair.org. And learn about students just like you that have won big!

Yes! It's All Worth It! Awards, Prizes and Scholarships

Awards, prizes, and trips valued at more than \$10,000 are typically presented each year by the Fair Board, with thousands of dollars more in Special Awards, camps, and scholarships presented thanks to the generosity and commitment of Fair sponsors.

Students who develop high-quality projects are designated "Finalists." It is from among the finalists that judges select winners of the various categories within the divisions for top awards. Both Finalists and Non-finalists, are eligible for Special Awards.

SENIOR DIVISION TOP PRIZES

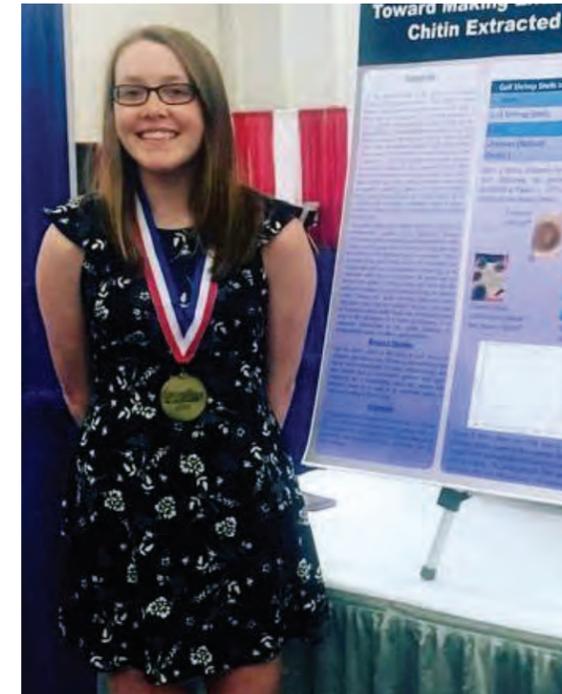
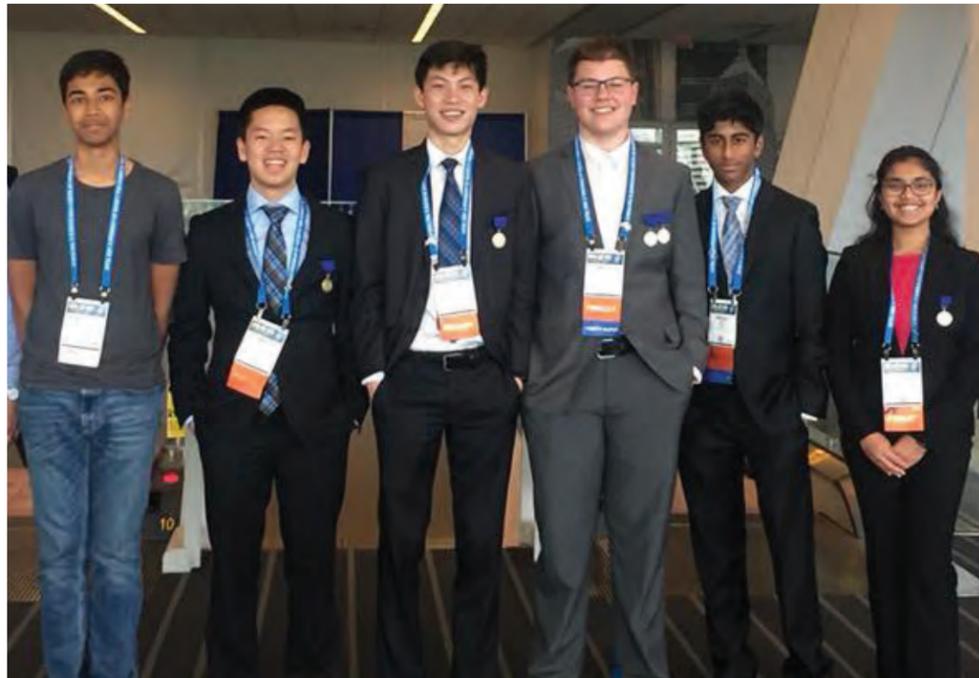
The top Senior Division winners are awarded all-expense-paid trips to the International Science & Engineering Fair (ISEF). Two students (freshmen or sophomores) attend as observers.

JUNIOR DIVISION TOP PRIZES

Top Junior Division winners receive cash prizes. The top 10% of the Junior Finalists are nominated to participate in the Fisher Thermo Science Junior Innovators Challenge (formerly Broadcom MASTERS) program.

ELEMENTARY DIVISION TOP PRIZES

Top Elementary Division winners receive cash prizes. Elementary participants are also eligible to earn Special Awards.



Awards & Scholarships

COLLEGE AND UNIVERSITY SCHOLARSHIPS

Local colleges and universities often select students for scholarships through the Fair, including scholarships to special pre-college programs. Kettering University, UM-Flint, and Baker College have given scholarships in the past.

SPECIAL AWARDS

A variety of scientific, engineering, local groups, and government organizations present Special Awards to students. These may include:

- Scholarships to special summer programs
- Cash awards
- Expense-paid trips to scientific and engineering events, national conventions, etc.
- Plaques & Certificates
- Medals
- Magazine subscriptions

SSP Fisher Thermo Science Junior Innovators Challenge

Formerly the Broadcom MASTERS (Math, Applied Science, Technology and Engineering for Rising Stars) program is a competition for grades 6-8. Each year, the FRSEF nominates several students from our Fair to enter this challenge.

300 Semifinalists will be evaluated from which 30 Finalists will be selected to win an all-expense paid trip to Washington, D.C., where they will compete for awards and prizes, including the top award of \$25,000.

International Science & Engineering Fair

ISEF is the world's largest international pre-college science competition. The competition features nearly 1,800 students selected from more than 80 countries, regions, and territories. The Fair includes special tours and workshops that offer great educational value that cannot be obtained in any other way. ISEF prizes include:

- Over \$3,000,000 in prizes and scholarships
- Grand Awards (\$5,000), first place (\$3,000), second place (\$1,500), and third place awards (\$500) in each of 13 categories.
- Two finalists are chosen to attend the Nobel Prize ceremonies in Stockholm.
- Schools and regional fairs of the Grand Award Winners receive plaques and a \$1,000 grant.



PO Box 687, Flint, Michigan 48501
810.797.5290 or director@flintsciencefair.org

FlintScienceFair.org

The Flint Regional Science and Engineering Fair is an all-volunteer non-profit 501c3 corporation.
Donations are tax deductible and go toward prizes and direct Fair expenses.