

# TEACHER'S GUIDE TO THE SAN FRANCISCO SCIENCE FAIR

## INTRODUCTION

The Randall Museum invites your participation in the Annual San Francisco Science Fair. This event encourages students in grades 6 to 8 to conduct an original scientific investigation, make a best guess about the outcome and verify accuracy using good scientific procedures. The goal of the Science Fair is to encourage *participation*, not competition. The four subject categories are:

1. BIOLOGICAL SCIENCES: e.g., plant growth, cell structure, molds, preservatives, growth and development, animal behavior, ecology;
2. PHYSICAL SCIENCES: e.g., airplanes, probability, crystals, evaporation, solar power, electricity, computers, photography;
3. BEHAVIORAL, SOCIAL AND HEALTH SCIENCES: e.g., product tests, diseases, exercise, perception, aptitude tests, human behavior, medicine.
4. ENVIRONMENTAL SCIENCE: e.g., pollution, alternative energy

Students must follow the procedures presented in this booklet in order to have their project accepted into the San Francisco Science Fair. Please pay particular attention to project format and display, safety rules, and humane practices.

Winning projects from grades 7 and 8 will pass on to the regional Golden Gate STEM Fair (GGSF) held at the U.S. Army Corps of Engineers Bay Model in Sausalito the week of March 9 - 14. **IF YOUR SCHOOL IS IN SAN FRANCISCO, YOU MUST ENTER OUR FAIR BEFORE GOING ON TO THE GGSF.** Our rules are designed so that projects qualifying for the S.F. Science Fair can generally go on to the GGSF without revision. **Note: Students whose projects involve live animals, human subjects (including surveys!), controlled substances, or pathogens MUST submit proposal forms BEFORE BEGINNING THEIR EXPERIMENTS**, absolutely no later than February 1 (this is for the GGSF not the Randall museum). Please see the GGSF website, <https://wp.ggstemfair.org>, for complete guidelines, forms, and addresses.

This guide is intended to augment the accompanying STUDENT'S GUIDE TO THE SAN FRANCISCO SCIENCE FAIR. These guides should answer your questions regarding scientific methods and display format. If you have further questions, please email at [sciencefaircoordinator@randallmuseum.org](mailto:sciencefaircoordinator@randallmuseum.org).

## **WHAT IS A SCIENCE FAIR PROJECT?**

A science fair project is a logical and careful investigation of a scientific problem. Students will begin with an idea or question of interest to them, research, experiment, conduct test to get their best guess (hypothesis) at the answer to the problem, and conclude by writing up their methods and results and displaying them.

## **SUMMARY OF HOW TO DO A SCIENCE FAIR PROJECT**

### **1.FINDING A PROBLEM TO SOLVE**

Students should:

- A. Choose scientific topics that INTEREST them.
- B. Use books, the Internet, teachers, scientists, professionals, etc. to NARROW IT DOWN to something that is both possible and interesting to do.
- C. State each problem as a one-sentence HYPOTHESIS that they will answer "yes" or "no."
- D. Make a DISCOVERY. They should NOT DO A DEMONSTRATION.

### **2.DOING EXPERIMENTS**

Students should:

- A. TEST THE HYPOTHESIS. Students must decide what materials and instruments they will need to conduct their work and measure their results.
- B. Use GOOD SCIENTIFIC METHODS. Students must make sure their experiments are well-controlled, repeatable, objective, and that they really test the hypothesis.
- C. Run MULTIPLE TRIALS of their experiments so there will be lots of data from which to draw conclusions.
- D. Record their data in measurable, numerical form; that is, QUANTIFY the results.
- E. Write down everything they observe in a PROJECT NOTEBOOK. Observations should be in some kind of numerical form for easy and unambiguous analysis.
- F. Organize all information from the experimental trials in tables or diagrams, and then DRAW CONCLUSIONS. Did they substantiate or disprove the hypothesis?

### **3.COMMUNICATING RESULTS**

Students should:

- A. Summarize the whole process in a FINAL REPORT. Include title, introduction, hypothesis, materials and procedures, observations and data, results, and conclusions.

- B. Be aware of both strengths and weaknesses in their work. Are they THOROUGH, and do they suggest further investigations?
- C. Display your findings on a board.
- The measurements of the board **MAY NOT EXCEED: 30" front to back, 48" wide, and 36" tall**
  - Every paper should be checked for any type of grammatical errors before attaching to the board.
  - Your exhibit should **tell all about your project. Include an Introduction or Statement of Purpose, Background research, Question and Hypothesis or Engineering goal, Materials, Method, Results - Tables, Graphs, Pictures, and Conclusions** using simple statements and attractive visuals.
  - Your display must have (A) **pictures (not of student faces) or sketches** and (B) a properly **labeled graph** of your data.
  - The project will be surrounded by many others, so it should be attractive and easy to view.

**Unacceptable items for display:**

- Live animals should NEVER be a part of your display, but may be shown by using a picture or sketch.
- Living organisms (including plants, fungi, and bacteria) as to not encourage mice or pests
- Any biological materials
- Chemicals
- Electrical items that need to be plugged in

**SOME HELPFUL HINTS ON RUNNING YOUR LOCAL SCHOOL SCIENCE FAIR**

1. Steer students **away** from routine projects such as effects of fertilizers on plants or which paper towel brand is the most absorbent. Also, judges get tired of too many similar projects and may not give an unadventurous project the attention it deserves.
2. Make sure that students working with humans or animals, either by experiment or by observation, submit proposals to the Scientific Review Committee by the GGSF deadline and comply with all humane regulations. To avoid this headache altogether, steer students away from live animal projects.
3. Use parents, educators, and community contacts to full advantage to provide

- support and publicity for your local fair.
4. Difficulties often arise in judging projects and determining awards. Make sure you have an adequate number of qualified judges to select winners. No judge should look at more than twenty projects - beyond this point it is difficult for them to do justice to each project.
  5. Be sure that all participants receive praise for their efforts and for what they have learned.
  6. Try to ensure that similar projects are grouped together so that judging can be carried out fairly. At the San Francisco Science Fair, we sometimes will re-categorize a project if we feel it belongs in a different place. This will not affect the outcome of judging.
  7. Help students construct projects that are freestanding and will not require fixing later. Displays that are sagging or falling apart are difficult to read and may divert attention away from the students' work.
  8. **Please try to make sure your students, especially those who win awards, do attend our Awards Ceremony on Saturday, February 29 from 9:30 a.m. to 11:30 a.m.** We will contact your school on Friday, February 28 to let you know who your school's winners are.

## JUDGING CRITERIA

All of our judges are a people in the local science community, varying from different ages and backgrounds. In order to keep from any bias please ensure that display boards follow the rules above and to make all information is clear, and easy to read. The boards will be judged on:

1. **SCIENTIFIC METHODOLOGY** -- Does the experimental procedure test the hypothesis? Does the data support the conclusions? Was the work well controlled; were an adequate number of trials done; is the work repeatable; were good records kept? Does the student recognize the limitations of the project and suggest further ideas for research?
2. **CREATIVITY** -- Are there signs of insight and originality of approach? Is the project a discovery and not a demonstration? Do clarity of thought and imagination play a role in its development?
3. **COMMUNICATION** -- Is the problem easily understood and concisely stated? Is it logically presented? Is the display attractive, dramatic? Is the exhibit neatly constructed, with legible lettering? Are grammar and spelling correct? Do the title and report convey information that helps to develop the project idea?

## SCIENCE FAIR RULES AND GUIDELINES

NOTE: These rules and guidelines have been designed such that any entrant into the San Francisco Science Fair at the Randall Museum will be eligible to go from there into the Golden Gate STEM Fair.

1. All work should be done by the entrant. Outside advising in the early stages from parents, teachers, or professionals is fine, but the student must do his or her own work.
2. Projects done by teams of more than one student will be accepted into the San Francisco Science Fair at the Randall Museum, but the Golden Gate STEM Fair accepts projects done alone. No groups allowed.
3. The student's name and any identifying information (school, teacher's name, etc.) may appear **only** on the back of the project and/or in a corner of the display small enough to be covered by a 3" by 5" card. Names will not be visible during judging. Awards or ribbons from your school science fair must be removed before setting up a display.
4. When set up for display, the project must be no larger than 44 inches wide by 30 inches deep and must be able to stand on a table by itself for at least a week. It should be labeled similarly to the diagram on page 6 in this booklet. Museum staff will not repair a poorly constructed display or in any other way attend to the equipment. Oversize projects may be disqualified.
5. All electrical apparatus must be built according to standard electrical safety laws. Projects that use 110 or more volts may not use push-button switches (doorbell type) or open- knife switches. All projects using 110 or more volts must have a main disconnect switch of a type approved by the National Board of Underwriters. All wires must be of the size and insulation appropriate for the current and voltage used. All electrical apparatus of 110 or more volts must be enclosed by barriers that positively prevent observers from receiving an electrical shock.
6. In keeping with GGSF guidelines, electricity will no longer be provided by the San Francisco Science Fair. Working electrical apparatus placed on display can be powered only by batteries.
7. Dangerous chemicals or drugs, open flames, and explosives must not be exhibited.
8. No hypodermic needles or syringes or other sharp objects are allowed with projects.
9. No live or dead animals, plants, or cultures (bacteria, fungi, molds, etc.), food, or liquids may be exhibited; use photographs or drawings instead.
10. **Projects that involve animals, humans, pathogens, or controlled**

**substances must meet the requirements of the Golden Gate STEMFair.** For more information, see the GGSF website, <https://wp.ggstemfair.org>.

11. ALL entrants are responsible for the installation, maintenance, and removal of their projects. **All projects must be removed from the Randall Museum by the Saturday following the Science Fair Ceremony.** Any remaining or unclaimed projects will be discarded after this date. Museum staff will not be responsible for the security of items exhibited.

For more information please look at the Randall museum website or email at [sciencefaircoordinator@randallmuseum.org](mailto:sciencefaircoordinator@randallmuseum.org)