Rules and Guidelines

for the

55th Science Engineering Fair of Houston

February 19 and 20, 2014
George R. Brown Convention Center – Hall A3
And February 21, 2014
Cullen Performance Hall, University of Houston, Main Campus

SPONSORED BY

Science Engineering Fair of Houston

UNIVERSITY OF HOUSTON
UNIVERSITY OF HOUSTON DOWNTOWN
GREATER HOUSTON PARTNERSHIP
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HOUSTON MUSEUM OF NATURAL SCIENCE
ENGINEERING, SCIENCE & TECHNOLOGY COUNCIL OF HOUSTON

AUGUST 2013

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2014
RULES AND GUIDELINES FOR THE SCIENCE ENGINEERING FAIR OF HOUSTON

This publication serves as the official source for the Rules and Guidelines of the **55th Science Engineering Fair of Houston (SEFH)** and applies to all public, private, charter and home school students in grades 7-12 within our service region, who intend to participate in this annual event. Sections of this document will be updated whenever necessary. Holders of this publication may make copies of any or all sections for students who are interested in participating in SEFH. In particular, this applies to the project approval and entry forms. Ignorance of these rules will not be accepted as an excuse for noncompliance. Projects not complying with these rules will be disqualified and removed from the exhibit area prior to judging.

Since 1960, SEFH has coordinated the regional science and engineering fair competition for public and private junior/middle and senior high schools in Houston and the surrounding 22-county area. The counties included in this service region are Austin, Brazoria, Calhoun, Chambers, Fort Bend, Galveston, Hardin, Harris, Jackson, Jasper, Jefferson, Matagorda, Montgomery, Newton, Orange, Polk, San Jacinto, Trinity, Tyler, Walker, Waller, Wharton, and Grimes (with the exception of Navasoto ISD). SEFH is recognized by the Internal Revenue Service as a 501(c)(3) non-profit organization. It is supervised by a board of directors and sponsored by the University of Houston, the Greater Houston Partnership, the Engineering, Science and Technology Council of Houston (ECH), and the Houston Museum of Natural Science. Businesses, foundations, industrial and technical organizations, and professional societies annually donate about 85% of the Fair's operating funds. From these many groups come the more than 1,200 volunteers responsible for the major fair committees and activities associated with SEFH. The Fair is a volunteer organization with no full-time employees. SEFH is affiliated with the Society for Science & the Public and the Intel International Science and Engineering Fair (ISEF) and as a result, follows all rules and requirements specified by them for its regional science and engineering fair competition.

The Science Engineering Fair of Houston provides a unique educational experience to participating students. **We emphasize the learning of mathematics, science and engineering through doing**. Through the development and presentation of science/engineering projects, students enhance their abilities to: (1) Make observations (2) Ask questions regarding particular phenomena or situations (3) Formulate ideas regarding the solution to a problem (4) Develop and carefully follow procedures related to finding an answer or solution to a problem (5) Effectively present their works to society. Because of this, SEFH receives widespread support from many scientists and engineers, the organizations they work for, professional societies, and foundations who support meaningful educational activities. **At SEFH, we stress "understanding not memorization."**

In addition to providing the rules of competition for SEFH, these rules and guidelines which pertain to conducting research were developed to facilitate the following:

- Protect the rights and welfare of the student research and human subjects
- Protect the health and well-being of the vertebrate animal subjects
- Follow federal regulations governing research
- Offer guidance to students doing research
- Promote safe laboratory practices
- Address environmental concerns

SEFH Ethics Statement

At SEFH, scientific fraud and misconduct are not condoned at any level of research or competition. Such practices include plagiarism, forgery, use or presentation of other researcher's work as one's own and fabrication of data. Fraudulent projects will fail to qualify for competition and recognition at the Science Engineering Fair of Houston.

What's New for 2014

For the 55th Science Engineering Fair of Houston we can classify the "what's new" as **good news, and in-between news.** Presenting in this order we have:

1. **Good News**. First, there are no significant rules changes or changes in approval forms for 2014. It would greatly benefit the student participants, if they would use the check list including in the Rules and Guidelines for Students Attending SEFH. Second, there will be no increase in our registration fee.
2. **In-Between News.** Dr. Mark Smith, who served as Executive Director of the 54th SEFH, transferred his position to Dr. Bonnie Dunbar, Director of the STEM Center at the University of Houston, on July 1, 2013. Dr. Smith remains at UH as a Professor of Chemistry.

Reminders from 2013

1. The following five forms are **required for each project:**

   Checklist for Adult Sponsor (1) Student Checklist (1A)

   Research Plan (1A attachment) Approval Form (1B)

   Abstract (available at http://www.societyforscience.org/isef/document)

   Signed Photo/Video and Liability Releases

   Other forms may also be required depending on the proposed research.

2. Projects which involve "human" studies that have been reviewed and approved by a properly constituted school or district IRB prior to any project experimentation do **NOT** have to be reviewed by the SRC until project inspection time at SEFH. This places a lot of responsibility on local IRB's when they complete Human Subject Form (4). After the IRB has approved the project and all committee members have signed this form, the student may begin recruiting and/or interacting with human subjects for the project. Local IRB's should carefully study the Human Subject Rules and Guidelines before reviewing any student forms.

3. **REMEMBER** that each project will be inspected by both our SRC and Rules and Safety Committee on Wednesday evening prior to judging on Thursday for compliance with the ISEF/SEFH Rules and Guidelines, and if the project is not approved by both of these committees, it will (as in previous years) be disqualified for participation in the fair on Thursday and Saturday.

   Some districts may decide to establish their own project review protocol (in addition to those for SEFH) for all projects that may be eligible for entry to SEFH.

4. **On the Student Checklist (1A), the ACTUAL Start Date and the ACTUAL End Date will need to be completed by the student when the project is actually started and ended and not at the time of approval.**

5. All studies involving the use of microorganisms (including bacteria, viruses, viroids, prions, rickettesia, fungi and parasites), recombinant DNA technologies, and human or animal fresh tissues, blood or body fluids require preapproval by the SRC. A Risk Assessment is also required for these projects. And, studies in these areas of research are prohibited in a home environment. Pay close attention to the BSI requirements for these types of projects. 1b

6. Some SEFH winners may be chosen to participate in the **I-SWEEEP 2014 competition.** This major international fair is a very exciting event. About 1,000 students from 75 countries and 45 states will participate.

7. All fair winners will be listed on our our web site, http://www.sefh.uh.edu within approximately ten (10) business days after the fair. Everything you may want to know about SEFH should be listed there, including project approval and entry forms and information about the **Science & Engineering Writing Contest** and the **Poster Design Contest**.
8. Information on the INTEL International Science Engineering Fair (ISEF) can be found at www.societyforscience.org/isef. SEFH's Grand Award winners or their alternates are eligible to attend this event.
9. An interactive website at www.madsci.org is available to answer questions by students, teachers and parents in many areas of science and engineering.
10. A good source for display project boards plus Science Fair Materials and Workshop Materials for Grades K-12 can be found at www.showboard.com or call showboard at 1-800-323-9189.
11. HUNSTEM at http://hunstem.uhd.edu/PROJECTS.html. is a valuable source for SEF-related project based learning materials and information sources.
12. ISEF has a comprehensive searchable index of ISEF project abstracts from 2003-present. The direct URL to this is http://www.societyforscience.org/isef/absonline.
13. **Science Buddies** http://www.sciencebuddies.org/

1c

SEFH Internet Resources

Science Fair Resources
http://www.sciencebuddies.org/
http://www.scifair.org (main site for the INTEL ISEF)
http://www.showboard.com (good source for SEFH display boards)
http://www.madsci.org (good source for common questions about SEF)
http://hunstem.uhd.edu/PROJECTS.html (provides links to many resources)
http://www.nsta.org/
http://www.ipl.org/youth/projectguide
http://www.madsci.org/libs/areas/reagents.html
http://www.educationplanet.com/sciencefair.html
http://sciencepage.org/scifair.htm

Project Ideas
http://sciencefairproject.virtualave.net/
http://www.cmste.uregina.ca/scifair.html
http://www.sciencebob.com/lab/sciencefair/resources.html
http://www.yahooligans.com/Science_and_Nature/Experiments_and_Actvities/Science_Fairs/
http://dir.yahoo.com/Science/Education/K_12/Fairs_and_Competitions/Projects_and_Ideas/

Science Fairs
http://sciencefairproject.virtualave.net
http://istf.ucf.edu
http://www.drexel.edu/dvsf/

Others
http://www.sciencedaily.com
http://www.enn.com
http://www.newscientist.com
http://www.familyeducation.com/article/0,1120,1-3600,00.html
http://pangloss.ca/mentors/sciencefairs.html
http://www.eskimo.com/~billb/amasci.html
http://www.ontariosciencecentre.ca/kids/cool_stuff/fairlinks.asp
http://homeworkspot.com/sciencefair/
http://ipl.org/youth/projectguide
http://www.chem4kids.com

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INFORMATION/CHECKLIST FOR STUDENTS DOING PROJECTS WHICH MAY BE ENTERED INTO THE SCIENCE ENGINEERING FAIR OF HOUSTON

Assignment/Activity	Date Due (if applicable)	Completed
1. Discuss doing a project with your teacher and parent/guardian, preferably at the start of the school year. Also, ask for the procedures used by your school or district to select projects for entry into the Science Engineering Fair of Houston (SEFH).		
2. If you decide to do a project, seek advice from others regarding possible topics. Your school librarian is a good person to consult when you decide on the type of project you wish to pursue.		
3. Do library research on your topic; seek advice from professionals (including your teachers) who are familiar with your area of research interest; decide on the exact title for your research; and inform your teacher.		
4. Obtain approval at your school for your SEFH Adult Sponsor/Safety Assessment Form (1), Research Plan (1A), and Approval Form (1B) **prior to** doing any project experimentation.		
5. If your project requires additional approval forms, they must be completed and approved by either your local Institutional Review Board (IRB) or the SEFH Scientific Review Committee (SRC) **prior to** any experimentation and by the SRC approval deadline date listed in the SEFH Schedule of Events.		
6. Start your project research. Use a laboratory notebook for recording research procedures and results. Follow appropriate safety procedures and SEFH rules when doing your research; use proper scientific procedures; and, where appropriate, the International System of Units (SI).		
7. Consult frequently with your project supervisor; pay attention to both positive and negative results; and be prepared for surprises and some frustration. Doing good science can be hard work!		
8. Complete your research and do a final analysis of results and conclusions with your supervisor. Inform your teacher that the project is completed.		
9. Discuss with your teacher the procedures you should now follow if you want to enter the SEFH. You may need to first enter a preliminary school and/or district fair.		
10. Consider describing your research efforts in the form of a Project Research Paper. This is not required by SEFH; however, it is beneficial to have as part of your project display. You may want to enter your paper in the SEFH Science Writing Contest. Abstracts are required for SEFH and for the State Fair, the Discovery Competition and the International SEF.		
11. Before preparing your project display, review the SEFH display rules. The display should be neat, visually appealing, indicate creativity/ originality, and serve as a "stand alone" description of your entire project. Since no electricity will be available, you may want to utilize photographs or a portable electronic device/laptop to illustrate certain portions of your project.		
12. Decide on the most appropriate category for your project. No category changes are allowed after project entry or at the fair site.		
13. On the SEFH entry form, do not request a floor mounted project unless you are certain that this is necessary.		
14. Submit the SEFH entry form to your school or district science fair coordinator prior to the deadline entry date. Be sure to attach copies (not originals) of your Adult Sponsor/Safety Assessment Form (1), Research Plan (1A), Research Plan Attachment and Approval Form (1B), Abstract, Photo/Video and Liability Releases, + any other approved forms that may have been required for your project to the entry form.		

15. Obtain a copy of the SEFH Calendar of Events from your teacher or supervisor.		
16. Review the SEFH Judging Criteria and Procedures. Discuss, in detail, the project results with your supervisor. Be prepared for a broad variety of questions pertaining to your project.		
17. Develop a 3-4 minute oral presentation describing your project including: why you chose the topic, experimental procedures and results, conclusions, how your research might be expanded or improved upon, and possible applications for your research.		

INFORMATION/CHECKLIST FOR STUDENTS ATTENDING THE SCIENCE ENGINEERING FAIR OF HOUSTON

Assignment/Activity	
1. Review the SEFH Calendar of Events with your parents/guardians for the Wednesday, Thursday, and Saturday activities.	
2. When you come to the Brown Convention Center on Wednesday afternoon or evening to register and have your project inspected for final approval, be sure to bring copies of your Adult Sponsor/Safety Assessment Form (1), Research Plan (1A), Research Plan Attachment, Approval Form (1B), Abstract, and signed Photo/Video and Liability Releases, + copies of any other approved forms that may have been required for your project. Keep them in a folder/binder. **Replacement copies are $1.00 per page.**	
3. You may want to bring a comfortable folding chair (not a lounge-style chair) to have available at your project during non-judging times. They can be stored overnight under your project display table.	
4. When you setup your project display **make certain that the number on your project display card** (which you receive at the registration table on Thursday) **matches the project number stapled to the table**. **If they don't match, you are in the wrong location**. Ask for assistance if you cannot locate your assigned project display area.	
5. **Before** you leave the Convention Center Wednesday evening, you **MUST** have your project approved by both the Scientific Review Committee **AND** the Rules & Safety Committee. Your project will be disqualified if you do not receive these **TWO** approvals Wednesday evening.	
6. On Thursday, "**The Judging Day**," please dress and groom yourself in an appropriate manner. Many professional scientists and engineers from the greater Houston area will judge you and your project. Do not present yourself as a "slob" unless that is the image you wish the judges to have of you and your project. You may want to have a light coat/jacket/sweater available since at times the Exhibition Hall E can be cold. Do not forget your Exhibitor Badge; **replacements cost $2.00**.	
7. Exhibitors must be at their project display during all judging periods. Your project will not be judged if you are not present. During judging times, only exhibitors, judges and SEFH personnel are allowed in the Exhibition Hall.	
8. Food service operations will be open on Friday of the Fair. No commercial food deliveries are allowed.	
9. A nurse will be on duty during the fair.	
10. **-No** projects can be dismantled or removed from the display area **until the time specified for your Division (Junior Division: 8:00 p.m. – 8:30 p.m.; Ninth and Senior Division: 9:30 – 10:00 p.m.)**	
11. Note that in addition to the approximately 200 SEFH place awards, about 50 Special Awarding Agencies present an additional 330 special awards each year.	
12. Students requiring special accommodations should contact the Fair Office prior to the Fair.	

A REVIEW OF THE SCIENTIFIC METHOD

The following is a review of the Scientific Method with some key questions/directions on how to design and conduct an experiment that will be used for a science or engineering fair project.

Problem/Purpose

- What is your goal?
- What idea are you trying to test?
- What is the scientific question you are trying to answer?

Hypothesis

- Tell how you think your project can demonstrate your purpose.
- Make a prediction regarding the outcome of your experiment.
- State the results you are predicting in measurable terms.

Procedure

- Give a detailed explanation of how the experiment will be performed to test your hypothesis.
- Be clear about the variables (elements of the experiment that change to test your hypothesis) versus your controls (elements of the experiment that do not change).
- Be very specific about how you will measure results to prove or disprove your hypothesis. You may want to develop a regular timetable for measuring results or making observations (i.e. every hour, every day, every week).
- Your procedure should be like a recipe--another person should be able to perform your experiment following your procedure. Test this with a friend or parent to be sure you have not forgotten anything. This is an important part of doing good science.

Materials:

- List all materials and equipment that were used.
- Your list of materials should include all of the ingredients of the procedure recipe.

Observations/Data/Results

- Keep a detailed journal (laboratory notebook) of observations, data and/or results. They can be data measurements and written notes about what you are sensing (hearing, seeing, or touching) about your experiment. Utilize the International System of Units where appropriate.
- Where appropriate, have both Control and Experimental groups.
- When possible, collect enough data for a statistical analysis.
- Photograph your project results or phases of the project if appropriate to help your analysis and possibly to demonstrate your experiment on your exhibit board. **Note the section pertaining to photographs and other visual depictions in the Display Rules and Safety Regulations.**
- Use charts, graphs and tables to summarize your data. You may want to use a portable electronic device to illustrate some portions of your project.

Analysis:

- Explain your observations, data and/or results. This is a summary of what your data has shown you.
- List the main points of what you've learned.
- Why did the results occur? What did your experiment prove?
- Was your hypothesis correct? Did your experiment prove or disprove your hypothesis? Should be explained thoroughly.

Conclusion:

- Answer your problem/purpose statement.
- What does it all add up to? What is the value of your project?
- What further study do you recommend given the results of your experiment? What would be the next question to ask?
- If you repeated your project, what would you change?

SELECTING A PROJECT

For many students, deciding on the objective of their research project appears to be a difficult and frustrating experience. Unfortunately, some students feel that they must have a highly complex project in order to be successful. This is simply not the case. Each year students do excellent science and engineering projects through experiments, which try to answer very basic and fundamental questions about phenomena, or situations they encounter on a daily basis. As students formulate the title and objectives for their projects, they should be strongly encouraged to use the many books, journals, magazines, and newspapers available to them in their school and local public/university libraries, in addition to their own ideas and everyday experiences. There are also many excellent web sites for science and engineering that can provide students with ideas and resources.

After students have selected their project, they should complete and obtain all approvals for the Adult Sponsor/Safety Assessment Form (1), Research Plan (1A), Research Plan Attachment, and Approval Form (1B), and then immediately determine if any additional approvals are needed before starting their project research. On completion of their research, students should review the project display rules and the SEFH judging criteria and procedures. It is also important that they enter their project in the most appropriate category. If, for example, a student enters a botany project in chemistry, judges who are professional chemists will judge it as a chemistry project. No category changes are allowed after project entry or at the fair site.

Each year many parents, guardians and teachers ask the question, "How much assistance should we give the student on his/her project?" There is no simple answer to this question. When students pursue graduate degrees in science and engineering, most of their major professors provide them with the general (and in many cases, the exact) topic for their research. The professor also serves as a close mentor while they perform the research and formulate their conclusions. To a lesser degree, this same procedure is followed in the "real world" of business and industry. In addition, very few major scientific accomplishments are truly the work of just one individual. The Fair does expect that most of the work presented in a project is based on the efforts of the student. This is a major reason why our judges spend so much time questioning the students about their project. To our knowledge, no other fair in the world devotes as much time to this portion of the judging process as SEFH. We appreciate and encourage the fact that many projects end up involving the entire family.

PROJECT ENTRY QUOTAS

	Private* & parochial schools & districts with one-two high schools	Districts with three-four high schools and/or academies	Districts** with more than four high schools and/or academies
Senior Division (gr 10-12)			
Individual Projects	39 exhibits	65 exhibits	80 exhibits
Team Projects	3 exhibits	4 exhibits	5 exhibits
Ninth Grade Division			
Individual Projects	26 exhibits	39 exhibits	52 exhibits
Team Projects	6 exhibits	8 exhibits	10 exhibits
Junior Division (gr 7&8)			
Individual Projects	39 exhibits	52 exhibits	65 exhibits
Team Projects	8 exhibits	12 exhibits	16 exhibits

*Charter Schools and Home Schools are considered to be Private Schools. All entries from these and Parochial Schools must be submitted to SEFH through the SEF coordinator for that school. All Public School entries must be submitted to SEFH through the SEF Coordinator for the School District.

**Each of the major regions for Houston ISD are considered as a district with more than four high schools and/or academies.

TEAM PROJECTS

Note: A team must have 2 or 3 members, all from the same school, and at least 2 members must be present with the project at all judging times during the fair. Team membership may not be changed once a project research year has started. It may be changed for a continuing project. Once started as a team project it cannot be converted to an individual project and vice versa. Each team member is expected to be fully involved and familiar with all aspects of the project.

CHECKLIST FOR PROJECTS WHICH REQUIRE SPECIAL PROJECT APPROVALS

Students whose projects involve the following must secure the indicated approvals **PRIOR TO STARTING THEIR PROJECT RESEARCH** for entry into SEFH**.** This is also true for continuing projects and those done at a registered research institution or industrial laboratory. **ALL PROJECTS REQUIRE PRIOR APPROVAL OF THE ADULT SPONSOR/ FORM (#1), STUDENT CHECKLIST (1A), RESEARCH PLAN AND APPROVAL FORM (#1B) AT THE LOCAL SCHOOL LEVEL.** Continuing projects require **CONTINUATION PROJECTS FORM (#7).**

VERTEBRATE ANIMALS

___Adult Sponsor #1, Student Checklist #1A, Research Plan and Approval Form #1B
___Approval by the SEFH SRC
___Vertebrate Animal Form #5A or #5B
___Qualified Scientist Form #2 (if applicable)
___Regulated Research Institution Form #1C (if applicable)
___Continuation Projects Form # 7 (if applicable)

HUMAN SUBJECTS (including surveys of human subjects)

___Adult Sponsor #1, Student Checklist #1A, Research Plan and Approval Form #1B
___Local or District IRB Approval*
___Human Participants Form #4
___Regulated Research Institution Form #1C (if applicable)
___Qualified Scientist Form #2 (if applicable)
___Continuation Projects Form # 7 (if applicable)

HAZARDOUS CHEMICALS, ACTIVITIES or DEVICES

___Adult Sponsor #1, Student Checklist #1A, Research Plan and Approval Form #1B
___Qualified Scientist Form #2 (if applicable)
___Risk Assessment Form #3
___Regulated Research Institution Form #1C (if applicable)
___Continuation Projects Form # 7 (if applicable)

POTENTIALLY HAZARDOUS BIOLOGICAL AGENTS (including animal tissues)

___Adult Sponsor #1, Student Checklist #1A, Research Plan and Approval Form #1B
___Approval by the SEFH SRC
___Qualified Scientist Form #2 (if required by SRC)
___Regulated Research Institution Form #1C (if applicable)
___Hazardous Risk Assessment Form #6A (if applicable)
___Human and Vertebrate Animal Tissue Form #6B (if applicable)
___Continuation Projects Form # 7 (if applicable)

Copies of all approved forms must be presented at the Science Engineering Fair of Houston when the project is inspected by the SRC and must be maintained in a binder or folder for review on request by any judge or fair official during the fair. In addition, copies (not the originals) of all approved forms must also be attached to the SEFH project entry form.

NOTE: Major deviations in any approved IRB or SRC plan may only be implemented after obtaining written approval from the IRB or SRC. Projects that are continuing ones from a previous year require approval each year of the project research. All required forms for the previous years work must be available for review at the fair. If IRB or SRC approval is required, copies of the previous approval forms must be submitted along with those for the current year.

WHERE TO SEND SRC APPROVAL REQUESTS	
DISTRICT/PRIVATE	SRC MEMBERS AND ADDRESSES
Aldine ISD (All Divisions)	Xandra Williams-Earlie, 14909 Aldine Westfield Rd., Houston, TX 77032, (281) 985-6420; xwilliams-earlie@aldine.k12.tx.us
Alief ISD (All Divisions)	Karen Jacobs, Alief ISD P.O. Box 68, Alief, TX 77411, (281) 498-8110 ext. 4100; karen.d.jacobs@aliefisd.net
Clear Creek ISD (JR Division)	Tammie Hyde, Clear Creek ISD, 2401 Meyer St.; Seabrook, TX 77586; (281) 284-3100; mailto:tlhyde@ccisd.net**.**
Clear Creek ISD (SR & Ninth Division)	Terri Berry, Clear Creek ISD, 2425 East Main Street, League City, TX 77573, (281) 284-0089; tberry@ccisd.net
Conroe/Spring ISD (SR & Ninth Division)	Cynthia McMahan, 3200 W. Davis, Conroe, TX 77304, (936) 709-5731; cmcmahan@conroeisd.net
Conroe/Spring ISD (JR Division)	Janene Fowler, McCullough Junior High, 3800 South Panther Creek Drive, The Woodlands, TX 77381 832-592-5100 ; mailto:jfowler@conroeisd.net
Friendswood ISD (Ninth & Sr. Division)	Theresa Lawrence, 702 Greenbriar, Friendswood High School, Friendswood, TX 77546, (281) 482-3413; tlawrence@fisdk12.net
Friendswood ISD (Jr. Division)	Megan Marshall, 1000 Manison Parkway, Friendswood, TX 77546, (281) 996-6200; mailto:mmarshall@fisdk12.net
Fort Bend ISD (All Divisions)	Mark Kinsey, 4200 Elkins Drive, Sugar Land, TX 77479; (281) 634-2150; mark.kinsey@fortbend.k12.tx.us
Galveston ISD (All Divisions)	Jean Langevine, 4115 Avenue O, Galveston, TX 77550; (409) 766-5768; jean_langevine@gisd.org
Houston ISD (JR Division)	Cheryl Willis, 1600 Gellhorn, Houston, TX 77029; (713) 671-3860; cwillis@houstonisd.org
Houston ISD (SR & Ninth Division)	Yolanda Evans, 4400 W 18th Street, Houston, TX; (713) 556-6823; yevans1@houstonisd.org
Magnolia ISD (All Divisions)	Laurel Frank, 31141 Nichols Sawmill Rd; PO Box 826, Magnolia, TX 77353; (281) 252-2025; lfrank@magnoliaisd.org
Pasadena ISD (All Divisions)	Brandy Knust, 3600 Red Bluff, Pasadena, TX 77503, (713) 749-0480; bknust@pasadenaisd.org
All other districts, Private, Charter, Home Schools, All Divisions	Sally Wall, Science Consultant, 16802 Holly Trail Dr.; Houston, TX 77058; (281) 728-0204; sciencesally@gmail.com **Ms. Wall is Chair of the SRC; contact her for further SRC information.**

PROJECT CATEGORIES

Common subject categories are used for the individual project competition in all three divisions. For team projects, the subject categories are grouped into more general categories. The Fair is actually composed of two fairs, both occurring simultaneously - each with Junior/Middle School (grades 7&8), Ninth, and Senior divisions (grades 10-12). Listed below are the categories that are included in the two fairs. Note: A team must have 2 or 3 members, all from the same school, and at least 2 members must be present with the project at all judging times during the fair. Team membership may not be changed once a project research year has started. Team members must be from the same school. It may be changed for a continuing project. Once started as a team project it cannot be converted to an individual project and vice versa. Each team member is expected to be fully involved and familiar with all aspects of the project.

Individual Projects – All Divisions

Engineering/Physical Sciences
Chemistry
Computer Science
Earth/Space Sciences
Energy & Transportation
Engineering
Mathematics
Physics & Astronomy

Life Sciences
Animal Sciences
Behavioral/Social Sciences
Biochemistry/Microbiology
Botany/Plant Sciences
Environmental Science
Medicine/Health

Team Projects/Junior Division only

Engineering/Computers/Mathematics
Physical Sciences

Botany/Environmental/Zoology
Behavioral/Biochemistry/Medicine & Health

Team Projects/Ninth Grade only

Engineering/Physical Sciences

Life Sciences

Team Projects/Senior Division only

Engineering/ Physical Sciences

Life Sciences

ENTERING THE RIGHT CATEGORY

Every year, some students end up entering their projects in the wrong category. **Since SEFH judges are required to judge the content of each project based on the category in which it is entered,** these students are seriously penalized. Thus, we urge you to pay particular attention to the category that you indicate on the entry form. Once SEFH receives the completed entry form, you will be required to remain in the category that you entered. Listed below are the categories for individual project competition and a few examples of the types of projects which might be appropriate for each category.

Animal Sciences: Animal genetics, ornithology, ichthyology, herpetology, entomology, animal ecology, anatomy, paleontology, cellular physiology, animal biorhythms, animal husbandry, cytology, histology, animal physiology, neurophysiology, invertebrate biology, etc.
Behavioral/Social Sciences: Psychology, sociology, anthropology, archeology, ethiology, ethnology, linguistics, animal behavior (learned or instinctive), learning, perception, urban problems, gerontology, reading problems, public opinion surveys, and education testing, etc.
Biochemistry/Microbiology: Molecular biology, molecular genetics, enzymes, photosynthesis, blood chemistry, protein chemistry, food chemistry, hormones, bacteriology, virology, protozoology, fungal and bacterial genetics, yeast, etc.
Botany/Plant Science: Agriculture, agronomy, horticulture, forestry, plant biorhythms, palynology, plant anatomy, plant taxonomy, plant pathology, plant genetics, hydroponics, algology, mycology, etc.
Chemistry: Physical chemistry, organic chemistry (other than biochemistry), inorganic chemistry, materials, plastics, metallurgy, soil chemistry, etc.
Computer Science: New developments in software or hardware, information systems, computer systems organization, computer methodologies, and data (including structures, encryption, coding and information theory), etc.
Earth/Space Sciences: Geology, geophysics, physical oceanography, meteorology, atmospheric physics, seismology, petroleum, geography, speleology, mineralogy, topography, optical astronomy, radio astronomy, astrophysics, etc.
Energy & Transportation: Aerospace, aeronautical engineering and aerodynamics, alternative fuels, fossil fuel energy, green energy science & technology, vehicle development, renewable energies, etc.
Engineering: Civil, mechanical, aeronautical, chemical, electrical, photographic, sound, automotive, marine, heating and refrigerating, transportation, environmental engineering, etc. Power transmission and generation, electronics, communications, architecture, bioengineering, lasers, etc.
Environmental Science: Pollution (air, water, land), pollution sources and their control, waste disposal, impact studies, environmental alteration (heat, light, irrigation, erosion, etc.), ecology.

Mathematics: Calculus, geometry, abstract algebra, number theory, statistics, complex analysis, probability, topology, logic, operations research, and other topics in pure and applied mathematics.
Medicine/Health: Medicine, dentistry, pharmacology, veterinary medicine, pathology, ophthalmology, nutrition, sanitation, pediatrics, dermatology, allergies, speech and hearing, optometry, etc.
Physics & Astronomy: Optics, acoustics, particle, nuclear, atomic, plasma, superconductivity, fluid and gas dynamics, thermodynamics, semiconductors, magnetism, quantum mechanics, biophysics, astronomy, lasers, etc.

CHARACTERISTICS OF A GOOD SEFH PROJECT

A. One of the most important factors in developing a project is deciding on the question(s) to be answered through the results of your project. Be certain of your question and determine if you have the capability, facilities, time, etc. to answer your question. At this point, you should seek the advice of your teachers, and perhaps professional scientists or engineers, before making the final decision on the topic for your project. There are a number of excellent libraries, with qualified librarians who can assist you in obtaining background information for your project.

B. Study all the SEFH rules, requirements, and time deadlines carefully, prior to developing your Research Plan. Discuss these with your Adult Project Supervisor as he/she completes SEFH Form #1 and #1B.

C. **Obtain all necessary project approvals. IF** your project involves vertebrate animals, human subjects (including surveys), recombinant DNA, tissues, microorganisms, cell cultures, environmental sampling, dangerous chemicals, or equipment, **YOU MUST** obtain approval for your project BEFORE starting your research. Ask your teacher or supervisor for the required approval forms.

D. In most instances, if a good question(s) has been asked, the ultimate success of the project will depend on the amount of effort you put into it and the way you answer your question. You should try to start your experimentation no later than October. Many students schedule their time so that they complete their experimentation and calculations during the Christmas holidays. Some students do their research during the summer. **If you are doing a team project,** SEFH expects all team members to contribute equally to the research efforts and to also have equal knowledge of the engineering or scientific principles relevant to the project.

E. If you do an experimental project, be sure to **maintain a properly organized Laboratory Notebook** which includes everything you do for your project on a day by day basis. Where appropriate, **use SI units**. This notebook should be included as part of your project display. The cover of the book should **not** show your name, school or teacher, just the project title and time period for the research.

F. As you analyze your results, consult your Supervisor for additional assistance if you do not totally understand something. **If you learn a lot from your project, the chances are, so will others - and that's what good research is all about**.

G. After you have completed your project, your next activity is to plan how you will display the results of your project. You should first go back and review with your Supervisor all SEFH rules which pertain to displays. **A good project deserves a good display.** Your display should be neat, well organized, pleasing to look at, and tell the entire story of your research: the project title, questions asked, objectives, experimental procedures, results, and conclusions. A judge should be able to read everything on your project board from a distance of 3 feet or 1 meter. Try to minimize the narrative portion and maximize the use of attractive and meaningful charts, graphs, mathematical expressions, models, photographs and tables. Your display should **"sell"** your project to the judges without you being present.

H. A neatly prepared Project Abstract is required for the Houston Regional Fair, SEFH (a suggested format is included later in these guidelines). Have multiple copies available to distribute to them. An abstract will also be required for the State Fair and the Discovery competition.

I. **Enter your project in the proper subject category.** If a project, which is primarily chemistry, is entered in the engineering category, it will be judged as an engineering project. Similarly, a chemistry project which uses computers for data analysis should not be entered in the computer category. No category changes are allowed.

J. Prior to exhibiting your project, go back to your Supervisor and review, in detail, the entire project. Make certain that you understand, and can explain to others (especially judges), all the engineering and scientific principles and variables associated with your project, the procedures followed, the results, and your conclusions. Be able to propose possible applications for your research and to suggest further studies that might also be done. **Understanding is important -- memorization is not.**

K. You should be prepared to present an exciting 3 or 4 minute oral summation of your project to persons with varying technical backgrounds **and** to answer a broad variety of questions which relate directly, and in some instances indirectly, to your project.

L. On the judging day, be sure to dress and groom yourself in an appropriate manner and present a positive image of yourself to the judges. Remember that most of your judges will be professional scientists and engineers from the greater Houston area. Do not try to "fool" the judges. If you don't know the answer to a question, say so, and then ask that person if they could give you the answer for future reference (another judge may ask you that same question later in the day). Do not hesitate to seek advice from your judges, as they are really there both to judge and to assist you.

THE LABORATORY NOTEBOOK

A properly maintained laboratory notebook is one of a researcher's most valuable tools. It contains the permanent written record of the scientist's or engineer's mental and physical activities from both experiment and observation, to the ultimate understanding of the question or solution they are going to obtain from their research project. The act of writing in the notebook forces the researcher to stop and think about what he/she is about to do and what is actually done. Because of this, the proper writing of **a project laboratory notebook is an essential part of doing "good" science.** The following guidelines are consistent with those of many major industrial laboratories and universities. They are not requirements, only suggestions. While SEFH does not require students to have a laboratory notebook for their project, they should understand that since most of the **fair judges** are practicing scientists and engineers, they **will expect to see a laboratory notebook as part of the project display material.** Part six of the Official Scoring Sheet for the fair refers to the laboratory notebook.

Guidelines:

1. The notebook should be bound; not a loose-leaf notebook or spiral ring composition book. A cover of stiff cardboard (pasted board), covered with a fabric or thin chemically treated paper is preferred. A size of about 8 x 10 inches is adequate for most projects.
2. The front cover of the notebook should contain a title that describes the research, and the time period covered for the data recorded in the book. If more than one notebook is used, then this should also be indicated by adding Volume I, II, etc. The first two pages of the book should be reserved for a table of contents. All remaining pages should be numbered on the top outside corner of the page. The table of content entries should be added as the project progresses. All written entries in the notebook should be done in ink; preferably using a ballpoint pen with black ink. If others do not easily read the researcher's handwriting, then entries should be printed.
3. The right-hand pages should be used for making formal entries. The left-hand pages should be used for calculations, doodling, scratch paper, etc. All right-hand pages should be dated when information is recorded on them.
4. No pages should be removed from the notebook. If information on a particular page becomes invalid for whatever reason, a single diagonal line should be drawn through the information and a brief sentence or two added explaining why the material is no longer valid. If an error is made in recording something, it should not be erased or obliterated in any way. Instead, draw one line through the incorrect entry and write the correct entry as near to it as possible. Never write a number or word over another number or word.
5. Photographs, computer printouts, recorded printouts, etc. should be properly labeled and taped or glued onto one of the right-hand pages. All numbers should be recorded in the notebook using the correct number of digits and labeled with the proper units. Students are strongly encouraged to use the International System of Units (SI). Always enter data directly in the notebook, in ink, at the time it is obtained (unless the data is being recorded automatically by an instrument).
6. If a detailed experimental procedure is being followed that is available in a readily available reference source (such as a textbook), the procedure should only be summarized in the notebook and the reference listed for the exact procedure. Any changes from the referenced procedure should be recorded and explained in the notebook.
7. Mathematical type formulas used in the project should be recorded on the right hand pages with a definition of each term in the formula along with at least one sample calculation. Again, the proper physical units should always be recorded next to the respective numerical values.
8. When chemicals are used, the name, formula, purity, and manufacturer of the chemical should be recorded.
9. When instruments are used, the name, model number, manufacturer, and operational settings for the instrument should be recorded in the notebook.10. The purpose of each experiment in the project should be clearly stated in the notebook as it is performed, along with the corresponding procedures, data, assumptions, conclusions, etc. In summary, a project notebook is not supposed to be an attractive document; it is a working document. Yes, it may even have a few chemical stains on it and a torn page or two. However, the entries should be legible, complete, reasonably neat, and logically presented.
   In summary, a project notebook is not supposed to be an attractive document; it is a working document. Yes it may even have a few chemical stains on it and a torn page or two. However, the entries should be legible, complete, reasonably neat, and logically presented.

ALL PROJECTS

Ethics Statement

Scientific fraud and misconduct are not condoned at any level of research or competition. This includes plagiarism, forgery, use or presentation of other researcher's work as one's own, and fabrication of data. Fraudulent projects will fail to qualify for competition in affiliated fairs and the Intel ISEF. Society for Science & the Public reserves the right to revoke recognition of a project subsequently found to have been fraudulent.

Eligibility/Limitations

1) Each Intel ISEF-affiliated fair may send up to the number of projects authorized by its affiliation agreement.

2) A student must be selected by an Intel ISEF-affiliated fair, and
   a. be in grades 9–12 or equivalent;
   b. not have reached age 20 on or before May 1 preceding the Intel ISEF.

3) Each student may enter only one project. That project may include no more than 12 months of continuous research and may not include research performed before January 2012.

4) Team projects may have two or three members. Teams may not have had more than three members at a local fair. Teams may not substitute members in a given research year.

5) Students may compete in only one Intel ISEF affiliated fair, except when proceeding to a state/national fair affiliated with the Intel ISEF from an affiliated regional fair.

6) Projects that are demonstrations, 'library' research, informational projects, 'explanation' models or kit-building are not appropriate for the Intel ISEF.

7) All sciences (physical, life, social) are represented at the Intel ISEF. A complete list of categories with descriptions is at www.societyforscience.org/isef/project_categories.

8) A research project may be a part of a larger study performed by professional scientists, but the project presented by the student must be only their own portion of the complete study.

Requirements

General

1) All domestic and international students competing in an Intel ISEF-affiliated fair must adhere to all rules as set forth in this document.

2) All projects must adhere to the Ethics Statement above.

3) All projects must adhere to the requirements of the affiliated fair(s) in which it competes to qualify for participation in the Intel ISEF. Knowledge of these requirements is the responsibility of the student and Adult Sponsor.

4) Projects must adhere to local, state and U.S. Federal laws, regulations and permitting conditions. In addition, projects conducted outside the U.S. must also adhere to the laws of the country and jurisdiction in which the project was performed.

5) The use of non-animal research methods and the use of alternatives to animal research are strongly encouraged and must be explored before conducting a vertebrate animal project.

6) Introduction or disposal of non-native species, pathogens, toxic chemicals or foreign substances into the environment is prohibited.

7) Intel ISEF exhibits must adhere to Intel ISEF display and safety requirements.

Approval and Documentation

8) Before experimentation begins, a local or regional Institutional Review Board (IRB) or Scientific Review Committee (SRC) associated with the Intel ISEF-affiliated fair must review and approve most projects involving human participants, vertebrate animals, and potentially hazardous biological agents.

9) Every student must complete the Student Checklist (1A), a Research Plan and Approval Form (1B) and review the project with the Adult Sponsor in coordination with completion by the Adult Sponsor of the Checklist for Adult Sponsor (1).

10) A Qualified Scientist is required for all studies involving BSL-2 potentially hazardous biological agents and DEA-controlled substances and is also required for many human participant studies and many vertebrate animal studies.

11) After initial IRB/SRC approval (if required), any proposed changes in the Student Checklist (1A) and Research Plan must be re-approved before laboratory experimentation/data collection resumes.

12) Projects which are continuations of a previous year's work and which require IRB/SRC approval must undergo the review process with the current year proposal prior to experimentation/data collection for the current year.

13) Any continuing project must document that the additional research is new and different (see Continuation Projects Form (7)).

14) If work was conducted in a Regulated Research Institution, industrial setting or any work site other than home, school or field, at any time during the current Intel ISEF project year, the Regulated Research Institutional/ Industrial Setting Form (1C) must be completed and displayed at the project booth.

15) After experimentation, each student or team must submit a (maximum) 250-word, one-page abstract which summarizes the current year's work. The abstract must describe research conducted by the student, not by the supervising adult(s).

16) A project data book and research paper are not required, but are recommended. Regional or local fairs may require a project data book and/or a research paper.

17) All signed forms, certifications, and permits must be available for review by all regional, state, national and international affiliated fair SRCs in which the student(s) participate. This review must occur after experimentation and before competition.

Continuation of Projects

1) As in the professional world, research projects may build on work performed previously. A valid continuation project is a sound scientific endeavor. Students will be judged only on laboratory experiment/data collection performed over 12 continuous months beginning no earlier than January 2012 and ending May 2013.

2) Any project based on the student's prior research could be considered a continuation project. If the current year's project could not have been performed without the outcome of a past year's research project, then it is considered a continuation for competition. These projects must document that the additional research is a substantive expansion from prior work (e.g. testing a new variable or new line of investigation.) Repetition of previous experimentation with the same methodology and research question, even with an increased sample size, is an example of an unacceptable continuation.

3) Display board and abstract must reflect the current year's work only. The project title displayed in the Finalist's booth may mention years (for example, "Year Two of an Ongoing Study"). Supporting data books (not research papers) from previous related research may be exhibited if properly labeled as such.

4) Longitudinal studies are permitted as an acceptable continuation under the following conditions:
   a. The study is a multi-year study testing or documenting the same variables in which time is a critical variable. (Examples: effect of high rain or drought on soil in a given basin, return of flora and fauna in a burned area over time.)
   b. Each consecutive year demonstrates time-based change.
   c. The display board is based on collective past definitive data and its comparison to the current year data set. No raw data from previous years may be displayed.

5) All continuation projects must be reviewed and approved each year and forms must again be completed for the new year.

NOTE: For competition in the Intel ISEF, documentation must include the Continuation Project Form (7), the previous year's abstract and research plan and the abstract for all other prior years. Documentation must be labeled clearly with the year (ex: 2011-2012). Retention of all prior years' paperwork is required and must be presented to the Intel ISEF SRC upon request.

Team Projects

1) Team projects compete and are judged in the scientific category of their research at the Intel ISEF.

2) Teams may have two or three members. Teams may not have had more than three members at any level of affiliated fair. Teams may not substitute members in a given research year.

3) Team membership cannot be changed during a given research year, including converting from an individual project to a team project, or vice versa. In future years, the project may be converted from an individual to a team project, from a team to an individual project and/or change team members.

4) Each team is encouraged to appoint a team leader to coordinate the work and act as spokesperson. However, each member of the team should be able to serve as spokesperson, be fully involved with the project, and be familiar with all aspects of the project. The final work should reflect the coordinated efforts of all team members and will be evaluated using similar rules and judging criteria as individual projects.

5) Each team member must submit an Approval Form (1B). Team members must jointly submit the Checklist for Adult Sponsor (1), one abstract, a Student Checklist (1A), a Research Plan and other required forms.

6) Full names of all team members must appear on the abstract and forms.

Roles and Responsibilities of Students and Adults

1) The Student Researcher(s)

The student researcher is responsible for all aspects of the research project including enlisting the aid of any required supervisory adults (Adult Sponsor, Qualified Scientist, etc.), obtaining necessary approvals (SRC, IRB, etc.), following the Rules & Guidelines of the Intel ISEF, and performing the experimentation, engineering, data analysis, etc.

Scientific fraud and misconduct are not condoned at any level of research or competition. This includes plagiarism, forgery, use or presentation of other researcher's work as one's own, and fabrication of data. Fraudulent projects will fail to qualify for competition in affiliated fairs and the Intel ISEF. Society for Science & the Public reserves the right to revoke recognition of a project subsequently found to have been fraudulent.

2) The Adult Sponsor

An Adult Sponsor may be a teacher, parent, professor, and/or other professional scientist in whose lab the student is working. This individual must have a solid background in science and should have close contact with the student during the course of the project. The Adult Sponsor is responsible for working with the student to evaluate any possible risks involved in order to ensure the health and safety of the student conducting the research and the humans and/or animals involved in the study. The Adult Sponsor must review the student's Student Checklist (1A) and Research Plan to certify that that: a) experimentation is within local, state, and Federal laws and Intel ISEF rules; b) forms are completed by other required adults; and c) criteria for the Qualified Scientist adhere to those set forth below.

The Adult Sponsor must be familiar with the regulations that govern potentially dangerous research as they apply to a specific student project. These may include chemical and equipment usage, experimental techniques, research involving human and/or vertebrate animals, and cell cultures, microorganisms, or animal tissues. Regulations must be discussed with the student when completing the Research Plan. Some experiments involve procedures or materials that are regulated by state, federal or non-U.S. national laws. If not thoroughly familiar with the regulations, the Adult Sponsor should help the student enlist the aid of a Qualified Scientist.

The Adult Sponsor is responsible for ensuring the student's research is eligible for entry in the Intel ISEF.

3) The Qualified Scientist

A Qualified Scientist should have earned a doctoral/professional degree in a scientific discipline that relates to the student's area of research. A PhD, MD or a master's degree with additional experience and expertise in the student's area of research is acceptable when approved by a Scientific Review Committee (SRC). The Qualified Scientist must be thoroughly familiar with local, state, and federal regulations that govern the student's area of research.

The Qualified Scientist and the Adult Sponsor may be the same person, if that person is qualified as described above. A student may work with a Qualified Scientist in a city, state or country that is not where the student resides. In this case, the student must work locally with a Designated Supervisor (see below) who has been trained in the techniques to be applied by the student.

4) The Designated Supervisor

The Designated Supervisor is an adult who is directly responsible for overseeing student experimentation. The Designated Supervisor need not have an advanced degree, but must be thoroughly familiar with the student's project, and must be trained in the student's area of research. The Adult Sponsor may act as the Designated Supervisor.

If a student is experimenting with live vertebrates and the animals, their behavior, or their habitat is influenced by humans, the Designated Supervisor must be knowledgeable about the humane care and handling of the animals.

5) The Institutional Review Board (IRB)

An Institutional Review Board (IRB) is a committee that, according to federal regulations (45-CFR-46), must evaluate the potential physical and/or psychological risk of research involving humans. All proposed human research must be reviewed and approved by an IRB before experimentation begins. This includes review of any surveys or questionnaires to be used in a project.

Federal regulations require local community involvement. Therefore, it is advisable that an IRB be established at the school level to evaluate human research projects. If necessary, the local or Intel ISEF-affiliated SRC can serve as an IRB as long as it has the required membership. An IRB must:

a. consist of a minimum of three members.
b. include an educator
c. include a school administrator (preferably principal or vice principal),
d. include an individual who is knowledgeable about and capable of evaluating the physical and/or psychological risk involved in a given study. This may be a medical doctor, physician's assistant, registered nurse, psychologist, licensed social worker or licensed clinical professional counselor.

Additional Expertise: If an expert is not available in the immediate area, documented contact with an external expert is recommended. A copy all correspondence with the expert (e.g. emails) must be attached to Form 4 and can be used in lieu of the signature of that expert.

No Adult Sponsor, parent or other relative of the student, the Qualified Scientist, or Designated Supervisor who oversee the project may serve on the IRB reviewing that project. Additional members are recommended to help avoid a potential conflict of interest and to increase the expertise of the committee.

IRBs exist at federally Regulated Research Institutions (e.g., universities, medical centers, NIH, correctional facilities). Prisoner advocates must be included on the IRB when research participants are incarcerated. The institutional IRB must initially review and approve all proposed research conducted at or sponsored by that institution. The Adult Sponsor and the local IRB are responsible for ensuring that the project is appropriate for a pre-college student and adheres to the Intel ISEF rules.

An IRB is responsible for assessing risk and documenting the determination of risk level on Human Participant Form 4. However, in reviewing projects just prior to a fair, if the SRC serving at that level of competition judges an IRB's decision as inappropriate, thereby placing human participants in jeopardy, they may override the IRB's decision and the project may fail to qualify for competition. It is advised that IRBs consult with the local or affiliated fair SRCs and/or with the Intel ISEF SRC in questionable cases.

6) The Affiliated Fair Scientific Review Committee A Scientific Review Committee (SRC) is a group of qualified individuals that is responsible for evaluation of student research, certifications, research plans and exhibits for compliance with the rules and applicable laws and regulations at each level of science fair competition. Local SRCs may be formed to assist the Affiliated Fair SRC in reviewing projects. The operation and composition of the local and Affiliated Fair SRCs must fully comply with the International Rules. Directions for obtaining preapproval are available from the affiliated fair. A list of fairs is at: http://apps.societyforscience.org/isef/find_a_fair.

Most proposed research projects involving vertebrate animals and/or potentially hazardous biological agents must be reviewed and approved BEFORE experimentation. Local or regional SRC prior review is not required for human studies previously reviewed and approved by a properly constituted IRB.

ALL projects, including those previously reviewed and approved by an IRB must be reviewed and approved by the SRC after experimentation and before competition in an Intel ISEF Affiliated Fair. Projects which were conducted at a Regulated Research Institution (not home, high school or field) and which were reviewed and approved by the proper institutional board before experimentation, must also be approved by the Intel ISEF Affiliated Fair SRC.

An Affiliated Fair SRC must:
a. include a minimum of three persons
b. include a biomedical scientist (earned doctoral degree, such as Ph.D., M.D., D.V.M., D.D.S., PharmD., or D.O.)
c. include an educator
d. include at least one additional member

Additional expertise: many project evaluations require additional expertise (e.g., on biosafety and/or of human risk groups.) If the SRC needs an expert as one of its members and one is not in the immediate area, all documented contact with an external expert must be submitted. If animal research is involved, at least one member must be familiar with proper animal care procedures. Depending on the nature of the study, this person can be a veterinarian or animal care provider with training and/or experience in the species being studied.

No Adult Sponsor, parent or other relative of the student(s), the Qualified Scientist, or the Designated Supervisor who oversee the project may serve on the IRB reviewing that project. Additional members are recommended to diversify and to increase the expertise of the committee.

A Scientific Review Committee (SRC) examines projects for the following:
a. evidence of literature search and appropriate attribution
b. evidence of proper supervision
c. use of accepted and appropriate research techniques
d. completed forms, signatures and dates showing maximum of one year duration of research and appropriate preapproval dates (where required)
e. evidence of search for alternatives to animal use
f. humane treatment of animals
g. compliance with rules and laws governing human and/or animal research and research involving potentially hazardous biological agents
i. documentation of substantial expansion for continuation projects
j. compliance with the Intel ISEF ethics statement

7) Other Review Committees
Certain areas of research conducted in a Regulated Research Institution require review and approval by federally mandated committees that have been established at that institution. These committees include:
a. Institutional Animal Care and Use Committee (IACUC); Animal Care and Use Committee (ACUC); Animal Ethics Committee
b. Institutional Review Board (IRB)
Human Subjects Research Board (HSRB)
c. Institutional Biosafety Committee (IBC)
d. Embryonic Stem Cell Research Oversight Committee (ESCRO)

8) The Intel ISEF Scientific Review Committee (Intel ISEF SRC)

All projects are reviewed by the Intel ISEF Scientific Review Committee prior to competition. The Intel ISEF SRC is the final arbiter of the qualification of students to participate in the Intel ISEF. Before the fair, committee members review research plans and all required forms to confirm that applicable Intel ISEF rules have been followed. The Intel ISEF SRC may request additional information from students prior to the Intel ISEF or may interview potential Intel ISEF participants at the fair to ensure that they qualify to compete.

The Intel ISEF SRC, like an Affiliated Fair SRC, is made up of adults knowledgeable about research regulations. In addition to the review of all projects at the Intel ISEF, committee members answer questions about the rules throughout the year from students and teachers. The ISEF SRC can be contacted at SRC@societyforscience.org.

Members of the Intel ISEF Scientific Review Committee 2013

Dr. Nancy Aiello, Chair

Mr. Henry Disston Mr.

Marcus Friskop Dr.

Paula Johnson

Dr. Maria Lavooy Mrs.

Christine Miller Mrs.

Evelyn Montalvo Dr.

Jason Shuffitt

Human Participants

Student researchers must follow federal guidelines (Code of Federal Regulations 45 CFR 46) to protect the human research participant and the student researcher. When students conduct research with humans, the rights and welfare of the participants must be protected. Most human participant studies require preapproval from an Institutional Review Board (IRB) and informed consent/assent from the research participant.

Exempt Studies

(Do Not Require IRB Preapproval or Human Participants Paperwork)

Some studies involving humans are exempt from IRB pre-approval or additional human participant forms. Exempt projects for the Intel ISEF and affiliated fairs are:

- Testing of a student-designed invention, program, concept, etc. where the feedback received is a direct reference to the product, where personal data is not collected, and where the testing does not pose a health or safety hazard. It is recommended that a Risk Assessment Form (3) be completed.

- Data/record review studies (e.g., baseball statistics, crime statistics) in which the data are taken from preexisting data sets that are publicly available and/or published and do not involve any interaction with humans or the collection of any data from a human participant for the purpose of the student's research project.

- Behavioral observations of unrestricted, public settings (e.g., shopping mall, public park) in which all of the following apply:
  a. the researcher has no interaction with the individuals being observed;
  b. the researcher does not manipulate the environment in any way, and
  c. the researcher does not record any personally identifiable data.

- Projects in which the student receives the data in a de-identified/anonymous format which complies with both of the following conditions:
  a. the professional providing the data certifies in writing that the data have been appropriately de-identified and are in compliance with all privacy and HIPAA laws, and
  b. the affiliated fair SRC ensures that the data were appropriately de-identified by review of the written documentation provided by the supervising adult(s).

Rules

1) The use of human participants in science projects is allowable under the conditions and rules in the following sections. Based upon the Code of Federal Regulations (45 CFR 46), the definition of a human participant is a living individual about whom an investigator conducting research obtains (1) data or samples through intervention or interaction with individual(s), and/or (2) identifiable private information. These projects require IRB review and preapproval, and may also require documentation of written informed consent/assent/parental permission. Examples of studies that are considered "human participant research" requiring IRB preapproval include:
   - Subjects participating in physical activities (e.g., physical exertion, ingestion of any substance, any medical procedure)
   - Psychological, educational and opinion studies (e.g., surveys, questionnaires, tests)
   - Studies in which the researcher is the subject of the research
   - Behavioral observations that
     a) involve any interaction with the observed individual(s) or where the researcher has modified the environment (e.g., posts a sign, places an object).
     b) occur in non-public or restricted access settings (e.g., day care setting, doctor's office)
     c) involve the recording of personally identifiable information
   - Data/record review projects that include data that are not de-identified/anonymous (e.g., name, birth date, phone number and/or other identifying variables.)

2) Student researchers must complete ALL elements of the Human Participants portion of the Research Plan Instructions and evaluate and minimize the physical, psychological and privacy risks to their human participants. See Risk Assessment below and the Risk Assessment Guide for additional guidance.

3) The research study must be in compliance with all privacy and HIPAA laws as they apply to the project (e.g. the project involves medical information.)

4) All research projects involving human participants, including any revisions, must be reviewed and approved by an Institutional Review Board (IRB) before the student may begin recruiting and/or interacting with human participants. The IRB must assess the risk and document its determination of risk on Form 4. After initial IRB approval, a student with any proposed changes in the Research Plan must repeat the approval process and regain approval before laboratory experimentation/data collection resumes.

5) Research conducted by a pre-college student at a federally Regulated Research Institution (e.g., university, medical center, government lab, correctional institution) must be reviewed and approved by that institution's IRB. A copy of the IRB approval for the entire project

(which must include the research procedures/measures the student is using) and/or an official letter from the IRB attesting to approval is required. A letter from the mentor is not sufficient documentation of IRB review and approval.

6) Research participants must voluntarily give informed consent/assent (in some cases with parental permission) before participating in the study. Adult research participants may give their own consent. Research participants under 18 years of age and/or individuals not able to give consent (e.g. developmentally disabled individuals) give their assent, with the parent/guardian providing permission. The IRB will determine whether the consent/assent/parental permission may be verbal or must be written depending on the level of risk and the type of study, and will determine if a Qualified Scientist is required to oversee the project. See Risk Assessment below and the Risk Assessment Guide for further explanation of informed consent.
   - Informed consent requires that the researcher provides complete information to the participant (and where applicable, parents or guardians) about the risks and benefits associated with participation in the research study, which then allows the participants and parents or guardians to make an informed decision about whether or not to participate.
   - Participants must be informed that their participation is voluntary (i.e., they may participate or decline to participate, with no adverse consequences of nonparticipation or aborted participation) and that they are free to stop participating at any time.
   - Informed consent may not involve coercion and is an on-going process, not a single event that ends with a signature.
   - When written parental permission is required and the study includes a survey, the survey must be attached to the consent form.

7) A student may observe and collect data for analysis of medical procedures and medication administration only under the direct supervision of a medical professional. This medical professional must be named in the research protocol approved by the IRB. Students are prohibited from administering medication and/or performing invasive medical procedures on human participants. The IRB must also confirm that the student is not violating the medical practice act of the state or country in which he/she is conducting the research.

8) Student researchers may NOT publish or display information in a report that identifies the human participants directly or through identifiers linked to the participants (including photographs) without the written consent of the participant(s) (Public Health Service Act, 42, USC 241 (d)).

9) All published instruments that are not in the public domain must be administered, scored and interpreted by a Qualified Scientist as required by the instrument publisher. Any and all use and distribution of the test must be in accordance with the publisher's requirements, including procurement of legal copies of the instrument.

10) Studies that involve the collection of data via use of the internet (e.g., email, web-based surveys) are allowed, but researchers should be aware that they can pose challenges in a) collecting anonymous data, b) obtaining informed consent and c) ensuring that participants are of the appropriate age to give informed consent. See the Risk Assessment Guide and the Online Survey Consent Procedures.

11) After experimentation and before Intel ISEF competition, the Intel ISEF SRC reviews and approves previously-approved projects to ensure that students followed the approved Research Plan and all of the Intel ISEF rules.

12) The following forms are required:
   a. Checklist for Adult Sponsor (1), Student Checklist (1A), Research Plan, and Approval Form (1B)
   b. Human Participants Form (4) with applicable consents and survey(s)
   c. Regulated Research Institution Form (1C), when applicable
   d. Qualified Scientist Form (2), when applicable

Sources of Information are available as a separate section at the end of the document.

IRB Waiver of Written Informed Consent

The IRB may waive the requirement for documentation of written informed consent/assent/parental permission if the research involves only minimal risk and anonymous data collection and if it is one of the following:

a) Research involving normal educational practices
b) Research on individual or group behavior or characteristics of individuals where the researcher does not manipulate the participants' behavior and the study does not involve more than minimal risk.
c) Surveys, questionnaires, or activities that are determined by the IRB to involve perception, cognition, or game theory and do NOT involve gathering personal information, invasion of privacy or potential for emotional distress.
d) Studies involving physical activity where the IRB determines that no more than minimal risk exists and where the probability and magnitude of harm or discomfort anticipated in the research are not greater than those ordinarily encountered in DAILY LIFE or during performance of routine physical activities.

If there is any uncertainty regarding the appropriateness of waiving written informed consent/assent/parental permission, it is strongly recommended that documentation of written informed consent/assent/parental permission be obtained.

Projects involving no more than minimal risk and those with more than minimal risk are allowed under the following guidelines.

Human Participant Risk Assessment

No more than minimal risk exists when the probability and magnitude of harm or discomfort anticipated in the research are not greater (in and of themselves) than those ordinarily encountered in everyday life or during performance of routine physical or psychological examinations or tests.

More than minimal risk exists when the possibility of physical or psychological harm or harm related to breach of confidentiality or invasion of privacy is greater than what is typically encountered in everyday life. Most of these studies require documented informed consent or minor assent with the permission of parent or guardian (as applicable).

1) Examples of Greater than Minimal Physical Risk
   a. Exercise other than ordinarily encountered in everyday life
   b. Ingestion, tasting, smelling, or application of a substance. However, ingestion or tasting projects that involve commonly available food or drink will be evaluated by the IRB which determines risk level based upon the nature of the study and local norms.
   c. Exposure to any potentially hazardous material.

2) Examples of Greater than Minimal Psychological Risk
   A research activity (e.g. survey, questionnaire, viewing of stimuli) or experimental condition that could potentially result in emotional stress. Some examples include: answering questions related to personal experiences such as sexual or physical abuse, divorce, depression, anxiety; answering questions that could result in feelings of depression, anxiety, or low self esteem; or viewing violent or distressing video images.

3) Privacy Concerns
   The student researcher and IRB must consider whether an activity could potentially result in negative consequences for the participant due to invasion of privacy or breach of confidentiality. Protecting confidentiality requires measures to ensure that identifiable research data are not disclosed to the public or unauthorized individuals.
   Risk level can be reduced by protecting confidentiality or collecting data that is strictly anonymous. This requires the collection of research in such a way that it is impossible to connect research data with the individual who provided the data.

4) Risk Groups
   If the research study includes participants from any of the following groups, the IRB and student research must consider whether the nature of the study requires special protections or accommodations:
   a. Any member of a group that is naturally at-risk (e.g. pregnant women, developmentally disabled persons, economically or educationally disadvantaged persons, individuals with diseases such as cancer, asthma, diabetes, AIDS, dyslexia, cardiac disorders, psychiatric disorders, learning disorders, etc.)
   b. Special groups that are protected by federal regulations or guidelines (e.g. children/minors, prisoners, pregnant women, students receiving services under the Individuals with Disabilities Education Act (IDEA).

   See the online Risk Assessment Guide and Online Survey Consent Procedures for more detailed information on risk assessment.

Vertebrate Animals

The following rules were developed to help pre-college student researchers adhere to the federal regulations governing professional scientists and to protect the welfare of both animal subjects and the student researcher. When students conduct research with animal subjects, health and well-being is of high priority.

SSP strongly endorses the use of non-animal research methods and encourages students to use alternatives to animal research. If the use of vertebrate animals is necessary, students must consider additional alternatives to reduce and refine the use of animals.

All projects involving vertebrate animals must adhere to the rules below AND to either Section A or Section B rules, depending on the nature of the study and the research site.

A project is considered a tissue study and not a vertebrate animal study if tissue is obtained from an animal that was euthanized for a purpose other than the student's project. (Documentation is required of the IACUC approval for the original animal study from which tissues are obtained.) In tissue studies, a student may observe the vertebrate study, but may not manipulate or have any direct involvement in the vertebrate animal experimental procedures.

Rules for ALL Vertebrate Animal Studies

1) The use of vertebrate animals in science projects is allowable under the conditions and rules in the following sections. Vertebrate animals, as covered by these rules, are defined as:
   - Live, nonhuman vertebrate mammalian embryos or fetuses
   - Tadpoles
   - Bird and reptile eggs within three days (72 hours) of hatching
   - All other nonhuman vertebrates (including fish) at hatching or birth.

   Exception: Because of their delayed cognitive neural development, zebrafish embryos are not considered vertebrate animals until 7 days (168 hours) post-fertilization.

2) Alternatives to the use of vertebrate animals for research must be explored and discussed in the research plan. Alternatives include the following "Four R's":
   - Replace vertebrate animals with invertebrates, lower life forms, tissue/cell cultures and/or computer simulations where possible.
   - Reduce the number of animals without compromising statistical validity.
   - Refine the experimental protocol to minimize pain or distress to the animals.
   - Respect animals and their contribution to research.

3) All vertebrate animal studies must be reviewed and approved before experimentation begins. An Institutional Animal Care and Use Committee, known as an IACUC, is the institutional animal oversight review and approval body for all animal studies at a Regulated Research Institution. The affiliated fair SRC serves in this capacity for vertebrate animals studies performed in a school, home or field. Any affiliated fair SRC serving in this capacity must include a veterinarian or an animal care provider with training and/or experience in the species being studied.

4) All vertebrate animal studies must have a research plan that includes:
   a. Justification why animals must be used, including the reasons for the choice of species, the source of animals and the number of animals to be used. Describe any alternatives to animal use that were considered, and the reasons these alternatives were unacceptable. Explain the potential impact or contribution this research may have on the broad fields of biology or medicine.
   b. Description of how the animals will be used. Include methods and procedures, such as experimental design and data analysis. Describe the procedures that will minimize the potential for discomfort, distress, pain and injury to the animals during the course of experimentation. Identify the species, strain, sex, age, weight, source and number of animals proposed for use.

5) Studies involving behavioral observations of animals are exempt from advance SRC review if ALL of the following apply:
   - There is no interaction with the animals being observed,
   - There is no manipulation of the animal environment in any way, and
   - The study meets all federal and state agriculture, fish, game and wildlife laws and regulations.

6) Students performing vertebrate animal research must satisfy local, state, country laws and regulations of the jurisdiction in which research is performed as well as U.S. federal law.

7) Research projects which cause more than momentary or slight pain or distress are prohibited. If there is illness or unexpected weight loss this must be investigated and a veterinarian must be consulted to oversee any indicated medical care. This investigation must be documented by the Qualified Scientist, Designated Supervisor who is qualified to determine the illness or a veterinarian. If the illness or distress is caused by the study, the experiment must be terminated immediately.

8) No vertebrate animal deaths due to the experimental procedures are permitted in any group or subgroup. Such a project will fail to qualify for competition.
   a. Studies that are designed or anticipated to cause vertebrate animal death are prohibited.
   b. Any death that occurs must be investigated by a veterinarian, the Qualified Scientist or the Designated Supervisor who is qualified to determine the cause of death. The project must be suspended until such investigation occurs and the results must be documented in writing.
   c. If death was the result of the experimental procedure, the study must be terminated, and the study will not qualify for competition.

9) All animals must be monitored for signs of distress. Because significant weight loss is one sign of stress, the maximum permissible weight loss or growth retardation (compared to controls) of any experimental or control animal is 15%.

10) Students are prohibited from designing or participating in an experiment associated with the following types of studies on vertebrate animals:
   a. Induced toxicity studies with known toxic substances that could impair health or end life, including, but not limited to, alcohol, acid rain, pesticides, or heavy metals.
   b. Behavioral experiments using conditioning with aversive stimuli, mother/infant separation or induced helplessness.
   c. Studies of pain.
   d. Predator/vertebrate prey experiments.

11) Justification is required for an experimental design that involves food or fluid restriction and must be appropriate to the species. If the restriction exceeds 18 hours, the project must be reviewed and approved by an IACUC and conducted at a regulated research institution.

12) Animals may not be captured from or released into the wild without approval of authorized wildlife or other regulatory officials. Fish may be obtained from the wild only if the researcher releases the fish unharmed, has the proper license, and adheres to state, local and national fishing laws and regulations. Students are prohibited from performing electrofishing.

13) A Qualified Scientist or Designated Supervisor must directly supervise all research involving vertebrate animals, except for observational studies.

14) After initial SRC approval, a student with any proposed changes in the Research Plan of the project must repeat the approval process before laboratory experimentation/ data collection resumes.

Sources of Information are available as a separate section at the end of the document.

A. Additional Rules for Projects Conducted at School/Home/Field

Vertebrate animal studies may be conducted at a home, school, farm, ranch, in the field, etc. This includes:
- Studies of animals in their natural environment.
- Studies of animals in zoological parks.
- Studies of livestock that use standard agricultural practices.

These projects must be reviewed and approved by an SRC in which one member is either a veterinarian and/or an animal care provider/expert with training and/or experience in the species being studied.

1) These projects must adhere to BOTH of the following guidelines:
   a. The research involves only agricultural, behavioral, observational or supplemental nutritional studies on animals.
   AND
   b. The research involves only non-invasive and non-intrusive methods that do not negatively affect an animal's health or well-being.

All studies meeting the general guidelines but not meeting the above criteria specifically for home, school or field must be conducted at a Regulated Research Institution. See Section B.

2) Animals must be treated kindly and cared for properly. Animals must be housed in a clean, ventilated, comfortable environment appropriate for the species. They must be given a continuous, clean (uncontaminated) water and food supply. Cages, pens and fish tanks must be cleaned frequently. Proper care must be provided at all times, including weekends, holidays, and vacation periods. Animals must be observed daily to assess their health and well-being. A Designated Supervisor is required to oversee the daily husbandry of the animals. Any of the following U.S. documents provide further guidance for animal husbandry:
   - *Federal Animal Welfare Regulation*
   - *Guide for the Care and Use of Laboratory Animals*
   - *Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching* (Ag-Guide)

3) The affiliated fair Scientific Review Committee must determine if a veterinarian's certification of the research plan and animal husbandry plans is required. This certification is required before experimentation and SRC approval and is documented on Vertebrate Animal Form 5A. A veterinarian must certify experiments that involve supplemental nutrition, administration of prescription drugs and/or activities that would not be ordinarily encountered in the animal's daily life.

4) If an illness or emergency occurs, the affected animal(s) must receive proper medical or nursing care that is directed by a veterinarian. A student researcher must stop experimentation if there is unexpected weight loss or death in the experimental subjects. The experiment can only be resumed if the cause of illness or death is not related to the experimental procedures and if appropriate steps are taken to eliminate the causal factors. If death is the result of the experimental procedure, the study must be terminated, and the study will not qualify for competition.

5) The final disposition of the animals must be described on Vertebrate Animal Form 5A. Euthanasia for tissue removal and/or pathological analysis is not permitted for a project conducted in a school/home/field site.

6) The following forms are required:
   a. Checklist for Adult Sponsor (1), Student Checklist (1A), Research Plan, and Approval Form (1B)
   b.. Vertebrate Animal Form (5A)
   c. Qualified Scientist Form (2), when applicable

B. Additional Rules for Projects Conducted in a Regulated Research Institution

All studies not meeting the criteria in Section A. but are otherwise permissible under Intel ISEF rules must be conducted in a Regulated Research Institution (RRI). A Regulated Research Institution within the U.S. is defined as a professional research/teaching institution that is regularly inspected by the USDA and is licensed to use animals covered by the Animal Welfare Act and may also be subject to U.S. Public Health Service Policy. Also included are all federal laboratories such as National Institutes of Health, Veteran's Affairs Medical Centers and the Centers for Disease Control. In addition, pharmaceutical and biotechnology companies and research institutions that utilize research animals that are not covered by the Animal Welfare Act but have an operational Institutional Animal Care and Use Committee and are in compliance with U.S. federal laws are included in this definition. For project conducted outside of the United States, a Regulated Research Institution would be a comparable research institution that adheres to country laws governing the care and use of vertebrate animals.

Some protocols permitted in a Registered Research Institution are not permitted for participation in the Intel ISEF; adherence to RRI rules is necessary but may not be sufficient.

1) The Institutional Animal Care and Use Committee (IACUC) or the comparable animal oversight committee must approve all student research projects before experimentation begins. Such research projects must be conducted under the responsibility of a principal investigator. The local and regional SRC must also review the project to certify that the research project complies with Intel ISEF Rules. This local and regional SRC review should occur before experimentation begins, if possible.

2) Student researchers are prohibited from performing euthanasia. Euthanasia at the end of experimentation for tissue removal and/or pathological analysis is permitted. All methods of euthanasia must adhere to current American Veterinarian Medical Association (AVMA) Guidelines.

3) Research projects that cause more than momentary or slight pain or distress to vertebrate animals are prohibited unless approved anesthetics, analgesics and/or tranquilizers are used.

4) Research in nutritional deficiency or research involving substances or drugs of unknown effect is permitted to the point that any clinical sign of distress is noted. In the case that distress is observed, the project must be suspended and measures must be taken to correct the deficiency or drug effect. A project can only be resumed if appropriate steps are taken to correct the causal factors.

5) The following forms are required:
   a. Checklist for Adult Sponsor (1), Student Checklist (1A), Research Plan, and Approval Form (1B)
   b. Regulated Research Institution Form (1C)
   c. Vertebrate Animal Form (5B)
   d. Qualified Scientist Form (2)

Potentially Hazardous Biological Agents

Rules for use of microorganisms (including bacteria, viruses, viroids, prions, rickettsia, fungi, and parasites), recombinant DNA (rDNA) technologies or human or animal fresh/frozen tissues, blood, or body fluids.

Research using microorganisms (including bacteria, viruses, viroids, prions, rickettsia, fungi, and parasites), recombinant DNA (rDNA) technologies or human or animal fresh/frozen tissues, blood, or body fluids may involve potentially hazardous biological agents. Students are permitted to do some research projects with potentially hazardous biological agents meeting the conditions and rules described below which were designed to protect students and to ensure adherence to federal and international biosafety regulations and guidelines.

When dealing with potentially hazardous biological agents, it is the responsibility of the student and all of the adults involved in a research project to conduct and document a risk assessment (Form 6A) to define the potential level of harm, injury or disease to plants, animals and humans that may occur when working with biological agents. The risk assessment determines a biosafety level which in turn determines if the project can proceed, and if so, the laboratory facilities, equipment, training, and supervision required.

All projects involving microorganisms, recombinant DNA technologies and human or animal fresh/frozen tissues, blood or body fluids must adhere to the rules below AND, depending on the study, to the additional rules in Section A, B or C.

Rules for ALL Studies with Potentially Hazardous Biological Agents

1) The following types of studies are exempt from prior SRC review and require no additional forms:
   a. Studies involving baker's yeast and brewer's yeast, except when used with rDNA studies.
   b. Studies involving Lactobacillus, Bacillus thurgensis, nitrogen-fixing, oil-eating bacteria, and algae-eating bacteria introduced into their natural environment. (Not exempt if cultured in a petri dish environment.)
   c. Studies of mold growth on food items if the experiment is terminated at the first evidence of mold.

2) The following types of studies are exempt from prior SRC review, but require a Risk Assessment Form 3:
   a. Studies involving protists, archaea and similar microorganisms.
   b. Research using manure for composting, fuel production, or other non-culturing experiments.
   c. Commercially-available color change coliform water test kits. These kits must remain sealed and must be properly disposed.
   d. Studies involving decomposition of vertebrate organisms (such as in forensic projects).

3) The use of potentially hazardous microorganisms (including bacteria, viruses, viroids, prions, rickettsia, fungi, and parasites), recombinant DNA (rDNA) technologies or human or animal fresh/frozen tissues, blood, or body fluids, is allowable as follows:
   a. An affiliated fair SRC, an IBC or an IACUC must approve all research before experimentation begins. The initial risk assessment determined by the student researcher and adults supervising the project must be confirmed by the SRC, IBC or IACUC.
   b. Experimentation involving the culturing of potentially hazardous biological agents, even BSL-1 organisms, is prohibited in a home environment. However, specimens may be collected at home as long as they are immediately transported to a laboratory with the BSL containment determined by the affiliated fair SRC.
   c. Research determined to be at Biosafety Level 1 (BSL-1) must be conducted in a BSL-1 or higher laboratory. The research must be supervised by a trained Designated Supervisor or a Qualified Scientist. The student must be properly trained in standard microbiological practices.
   d. Research determined to be a Biosafety Level 2 (BSL-2) must be conducted in a laboratory rated BSL-2 or above (commonly limited to a Regulated Research Institution). The research must be reviewed and approved by the Institutional Biosafety Committee (IBC) or a letter or document from the Regulated Research Institution that the research does not require review. The research must be supervised by a Qualified Scientist.
   e. BSL-3 or -4 research is prohibited.
   f. Laboratory studies culturing known MRSA (Methicillin-resistant Staphlococcus aureus), VRE (Vancomycin-resistant enterococci) and KPC (Klebsiella pneumonia) must be conducted in a BSL-2 laboratory in a Regulated Research Institution with documented IBC Committee review and approval.
   g. Studies that genetically engineer bacteria with multiple antibiotic resistance are prohibited.
   h. Extreme caution must be exercised when selecting and sub-culturing antibiotic-resistant organisms. Studies using such organisms require at least BSL-2 containment.
   i. Naturally-occurring plant pathogens may be studied (not cultured) at home, but may not be introduced into a home/garden environment.
   j. The culturing of human or animal waste, including sewage sludge, is considered a BSL-2 study.
   k. All potentially hazardous biological agents must be properly disposed at the end of experimentation in accordance with their biosafety level. For BSL 1 or

BSL 2 organisms: Autoclave at 121 degrees Celsius for 20 minutes, use of a 10% bleach solution (1:10 dilution of domestic bleach), incineration, alkaline hydrolysis, biosafety pick-up and other manufacturer recommendations are acceptable.

l. Any proposed changes in the Research Plan by the student after initial local or affiliated fair SRC approval must undergo subsequent SRC or IBC review and approval before such changes are made and before experimentation resumes.

4) The following forms are required:
- Checklist for Adult Sponsor (1), Student Checklist (1A), Research Plan, and Approval Form (1B)
- Regulated Research Institution Form (1C) - when applicable.
- Qualified Scientist (2), when applicable
- Risk Assessment (3), when applicable
- PHBA Risk Assessment Form (6A), when applicable
- Human and Vertebrate Animal Tissue Form (6B) – for all studies involving tissues and body fluids.

Sources of Information are available as a separate section at the end of the document.

A. Additional Rules for Projects Involving Unknown Microorganisms

Studies involving unknown microorganisms present a challenge because the presence, concentration and pathogenicity of possible agents are unknown. In science fair projects, these studies typically involve the collection and culturing of microorganisms from the environment (e.g. soil, household surfaces, skin.)

1) Research with unknown microorganisms can be treated as a BSL-1 study under the following conditions:
   a. Organism is cultured in a plastic petri dish (or other standard non-breakable container) and sealed. Other acceptable containment includes two heavy-duty (2-ply) sealed bags.
   b. Experiment involves only procedures in which the Petri dish remains sealed throughout the experiment (e.g., counting presence of organisms or colonies).
   c. The sealed Petri dish is disposed of via autoclaving or disinfection under the supervision of the Designated Supervisor.

2) If a culture container with unknown microorganisms is opened for any purpose, (except for disinfection for disposal), it must be treated as a BSL-2 study and involve BSL-2 laboratory procedures.

B. Additional Rules for Projects Involving Recombinant DNA (rDNA) Technologies

Studies involving rDNA technologies in which microorganisms have been genetically modified require close review to assess the risk level assignment. Some rDNA studies can be safely conducted in a BSL-1 high school laboratory with prior review by a knowledgeable SRC:

1) All rDNA technology studies involving BSL-1 organisms and BSL-1 host vector systems must be conducted in a BSL-1 laboratory under the supervision of a Qualified Scientist or Designated Supervisor and must be approved by the SRC prior to experimentation. Examples include cloning of DNA in *E. coli* K12, *S. cerevesiae*, and *B. subtilis* host-vector systems.

2) Commercially available rDNA kits using BSL-1 organisms may be conducted in a BSL-1 laboratory under the supervision of a Qualified Scientist or trained Designated Supervisor and must be approved by the SRC prior to experimentation.

3) An rDNA technology study using BSL-1 agents that may convert to BSL-2 agents during the course of experimentation must be conducted entirely in a BSL-2 facility.

4) All rDNA technology studies involving BSL-2 organisms and/or BSL-2 host vector systems must be conducted in a Regulated Research Institution and approved by the IBC prior to experimentation.

5) Propagation of recombinants containing DNA coding for oncogenes or other human, plant or animal toxins (including viruses) is prohibited.

C. Additional Rules for Projects with Tissues and Body Fluids, including Blood and Blood Products

Studies involving fresh/frozen tissue, blood or body fluids obtained from humans and/or vertebrates may contain microorganisms and have the potential of causing disease. Therefore, a proper risk assessment is required.

1) *The following types of tissue do not need to be treated as potentially hazardous biological agents:*
   a. Plant tissue
   b. Plant and non-primate established cell lines and tissue culture collections (e.g., obtained from the American Type Culture Collection). The source and/or catalog number of the cultures must be identified in the Research Plan.
   c. Fresh or frozen meat, meat by-products, pasteurized milk or eggs obtained from food stores, restaurants, or packing houses.
   d. Hair.
   e. Teeth that have been sterilized to kill any blood-borne pathogen that may be present. Chemical disinfection or autoclaving at 121 degrees Celsius for 20 minutes is recommended.
   f. Fossilized tissue or archeological specimens.
   g. Prepared fixed tissue.

2) Research involving human and/or non-human primate established cell lines and tissue culture collections (e.g., obtained from the American Type Culture Collection) must be considered a BSL-1 or BSL-2 level organism as indicated by source information and treated accordingly. The source and/or catalog number of the cultures must be identified in the Research Plan.

3) If tissues are obtained from an animal that was euthanized for a purpose other than the student's project, it may be considered a tissue study. Documentation of the IACUC approval for the original animal study from which tissues are obtained is required.

4) If the animal was euthanized solely for the student's project, the study must be considered a vertebrate animal project and is subject to the vertebrate animal rules for studies conducted at a Regulated Research Institution. (See vertebrate animal rules.)

5) Biosafety level 1 tissue studies involve the collection and examination of fresh/frozen tissue and/or body fluids, (not including blood or blood products; see rule 7) from a non-infectious source with little likelihood of microorganisms present. Biosafety level 1 studies must be conducted in a BSL-1 laboratory or higher and must be supervised by a Qualified Scientist or trained Designated Supervisor.

6) Biosafety level 2 tissue studies involve the collection and examination of fresh/frozen tissues or body fluids that may contain microorganisms belonging to BSL-1 or -2. These studies must be conducted in a Regulated Research Institution in a BSL-2 laboratory under the supervision of a Qualified Scientist.

7) All studies involving human or wild animal blood or blood products should be considered a Biosafety level 2 study and must be conducted in a BSL-2 laboratory under the supervision of a Qualified Scientist. Studies involving domestic animal blood may be considered a BSL-1 level study. All blood must be handled in accordance with standards and guidelines set forth in the OSHA, 29CFR, Subpart Z. Any tissue or instruments with the potential of containing blood-borne pathogens (e.g. blood, blood products, tissues that release blood when compressed, blood contaminated instruments) must be properly disposed after experimentation.

8) Human breast milk of unknown origin, unless certified free of HIV and Hepatitis C and domestic unpasteurized animal milk are considered BSL-2.

9) Any study involving the collection and examination of body fluids which may contain biological agents belonging to BSL-3 or -4 is prohibited.

10) Studies of human body fluids, where the sample can be identified with a specific person, must have IRB review and approval, and informed consent. Student researchers using their own body fluids are exempt from this requirement.

11) Self-sampling of capillary blood for analysis (e.g. glucometer reading) may be conducted in a home setting.

12) Studies involving embryonic human stem cells must be conducted in a Registered Research Institution and reviewed and approved by the ESCRO (Embryonic Stem Cell Research Oversight) Committee.

Potentially Hazardous Biological Agents Risk Assessment

Use this information to complete PHBA Risk Assessment Form 6A

Risk assessment defines the potential level of harm, injury or disease to plants, animals and humans that may occur when working with biological agents. The end result of a risk assessment is the assignment of a biosafety level which then determines the laboratory facilities, equipment, training, and supervision required.

Risk assessment involves:

- Assignment of the biological agent to a risk group
  - Studies involving a known microorganism must begin with an initial assignment of the microorganism to a biosafety level risk group based on information available through a literature search.
  - The study of unknown microorganisms and the use of fresh tissues relies on the expertise of the supervising adult(s).
- Determination of the level of biological containment available to the student researcher to conduct the experimentation. (See "Levels of Biological Containment" for details.)
- Assessment of the experience and expertise of the adult(s) supervising the student.
- Assignment of a biosafety level for the study based on risk group of biological agent, level of biological containment available and the expertise of the Qualified Scientist or Designated Supervisor who will be supervising the project.

If a study is conducted at a non-regulated site (e.g. school), the biosafety level must be confirmed by the local or affiliated fair SRC. If the research is conducted at a Regulated Research Institution, the biosafety level must be assigned by an Institutional Biosafety Committee (IBC) or equivalent approval body or a letter from an institutional representative certifying that the research does not require review. If no approval body exists at the Regulated Research Institution, a letter or document from the Regulated Research Institution that the research does not require review is required and the local or affiliated fair SRC must review the project and assign a biosafety level. If possible, this review should be before experimentation.

Classification of Biological Agents Risk Groups

Biological agents, plant or animal, are classified according to biosafety level risk groups. These classifications presume ordinary circumstances in the research laboratory, or growth of agents in small volumes for diagnostic and experimental purposes.

BSL-1 risk group contains biological agents that pose low risk to personnel and the environment. These agents are highly unlikely to cause disease in healthy laboratory workers, animals or plants. The agents require Biosafety Level 1 containment. Examples of BSL-1 organisms are: *Escherichia coli strain K12, Agrobacterium tumifaciens, Micrococcus leuteus, Neurospora crassa, Bacillus subtilis.*

BSL-2 risk group contains biological agents that pose moderate risk to personnel and the environment. If exposure occurs in a laboratory situation, the risk of spread is limited and it rarely would cause infection that would lead to serious disease. Effective treatment and preventive measures are available in the event that an infection occurs. The agents require Biosafety Level 2 containment. Examples of BSL-2 organisms are: *Mycobacterium, Streptococcus pneumonia, Salmonella choleraesuis.*

BSL-3 risk group contains biological agents that usually cause serious disease (human, animal or plant) or that can result in serious economic consequences. Projects in the BSL-3 group are prohibited.

BSL-4 risk group contains biological agents that usually produce very serious disease (human, animal or plant) that is often untreatable. Projects in the BSL-4 group are prohibited.

Levels of Biological Containment

There are four levels of biological containment (Biosafety Level 1–4). Each level has guidelines for laboratory facilities, safety equipment and laboratory practices and techniques.

BSL-1 containment is normally found in water-testing laboratories, in high schools, and in colleges teaching introductory microbiology classes. Work is done on an open bench or in a fume hood. Standard microbiological practices are used when working in the laboratory. Decontamination can be achieved by treating with chemical disinfectants or by steam autoclaving. Lab coats are required and gloves recommended. The laboratory work is supervised by an individual with general training in microbiology or a related science.

BSL-2 containment is designed to maximize safety when working with agents of moderate risk to humans and the environment. Access to the laboratory is restricted. Biological safety cabinets (Class 2, type A, BSC) must be available. An autoclave should be readily available for decontaminating waste materials. Lab coats, gloves and face protection are required. The laboratory work must be supervised by a scientist who understands the risk associated with working with the agents involved.

BSL-3 containment is required for infectious agents that may cause serious or potentially lethal diseases as a result of exposure by inhalation. Projects in the BSL-3 group are prohibited.

BSL-4 containment is required for dangerous/exotic agents that pose high risk of life-threatening disease. Projects in the BSL-4 group are prohibited.

Hazardous Chemicals, Activities or Devices

(Includes DEA-controlled substances, prescription drugs, alcohol & tobacco, firearms and explosives, radiation, lasers, etc.

The following rules apply to research using hazardous chemicals, devices and activities. These include substances and devices that are regulated by local, state, country, or international law, most often with restrictions of their use by minors such as DEA-controlled substances, prescription drugs, alcohol, tobacco, firearms and explosives. Hazardous activities are those that involve a level of risk above and beyond that encountered in the student's everyday life.

These rules are intended to protect the student researcher by ensuring proper supervision and the consideration of all potential risks so that the appropriate safety precautions are taken. Students are required to meet all standards imposed by Intel ISEF, school, local, and/or regional fair(s).

Rules for ALL Projects Involving Hazardous Chemicals, Activities and Devices

1) The use of hazardous chemicals and devices and involvement in hazardous activities require direct supervision by a Designated Supervisor, except those involving DEA-controlled substances, which require supervision by a Qualified Scientist.

2) The student researcher must conduct a risk assessment in collaboration with a Designated Supervisor or Qualified Scientist prior to experimentation. This risk assessment is documented on the Risk Assessment Form 3.

3) Student researchers must acquire and use regulated substances in accordance with all local, state, U.S. federal and country laws. For further information or classification for these laws and regulations, contact the appropriate regulatory agencies.

4) For all chemicals, devices or activities requiring a Federal and/or State Permit, the student/supervisor must obtain the permit prior to the onset of experimentation. A copy of the permit must be available for review by adults supervising the project and the local and affiliated and the ISEF Scientific Review Committee in their review prior to competition.

5) The student researcher must minimize the impact of an experiment on the environment. Examples include using minimal quantities of chemicals that will require subsequent disposal; ensuring that all disposal is done in an environmentally safe manner and in accordance with good laboratory practices.

6) The following forms are required:
   a. Checklist for Adult Sponsor (1), Student Checklist (1A), Research Plan and Approval Form (1B)
   b. Regulated Research Institution Form (1C), when applicable
   c. Qualified Scientist Form (2), when applicable
   d. Risk Assessment Form (3)

Additional Rules for Specific Regulated Substances

There are additional rules for the following regulated substances:

A. DEA-controlled Substances
B. Prescription Drugs
C. Alcohol & Tobacco
D. Firearms and Explosives

A. DEA-Controlled Substances

The U.S. Drug Enforcement Administration (DEA) regulates chemicals that can be diverted from their intended use to make illegal drugs. Other countries may have similar regulatory bodies; students outside of the U.S. must adhere to their own country's drug regulatory agency requirements in addition to U.S. DEA regulations. DEA-controlled substances and their schedule number are at the DEA website under Sources of Information. It is the responsibility of the student to consult this list if there is a possibility that substances used in experimentation could be regulated.

1) All studies using DEA-controlled substances must be supervised by a Qualified Scientist who is licensed by the DEA (or other international regulatory body) for use of the controlled substance.
2) All studies using DEA Schedule 1 substances must have the research protocol approved by DEA before research begins. Schedule 2, 3 and 4 substances do not require protocol approval by DEA.

B. Prescription Drugs

Prescription drugs are drugs regulated by federal or country laws and are available only through a pharmacy to protect against inappropriate or unsafe use. Special precautions must be taken in their use for a science project as follows:

1) Students are prohibited from administering prescription drugs to human participants.
2) A veterinarian must supervise student administration of any prescription drugs to vertebrate animals.

C. Alcohol and Tobacco

The U.S. Alcohol and Tobacco Tax and Trade Bureau (TTB) regulates the production of alcohol and distribution of alcohol and tobacco products. Many such products are restricted by age for purchase, possession and consumption. Students outside of the U.S. must adhere to U.S. regulations and to their local and country laws and regulations.

1. The Designated Supervisor is responsible for the acquisition, usage and appropriate disposal of the alcohol or tobacco used in the study.

2. Production of ethyl alcohol (wine or beer) is allowable in the home under parental supervision and must meet the TTB home production regulations.

3. Fermentation studies in which minute quantities of ethyl alcohol are produced are permitted.

4. Students are allowed to distill alcohol for fuel or other non-consumable products. To do so, the work must be conducted at school and a TTB permit must be obtained by school authorities. Details regarding this process are available from the Alcohol and Tobacco Tax and Trade Bureau (TTB) website.

D. Firearms and Explosives

The U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF), along with state agencies, regulates the purchase and use of firearms and explosives. A firearm is defined as a small arms weapon from which a projectile is fired by gunpowder. An explosive is any chemical compound, mixture or device, the primary purpose of which is to function by explosion. Explosives include, but are not limited to, dynamite, black powder, pellet powder, detonators, and igniters.

The purchase of a firearm by a minor is generally unlawful. The use of a firearm, without proper state certification, is illegal. Students should check the training and certification requirements of individual states and countries.

1) Projects involving firearms and explosives are allowable when conducted with the direct supervision of a Designated Supervisor and when in compliance with all federal, state and local laws.

2) A fully assembled rocket motor, reload kit or propellant modules containing more than 62.5 grams of propellant are subject to the permitting, storage and other requirements of federal explosive laws and regulations.

3) Potato guns and paintball guns are not firearms unless they are intended to be used as weapons. They must be treated as hazardous devices.

Guidance for Risk Assessment

Please find below guidance on conducting risk assessment when using the following:

A. Hazardous Chemicals
B. Hazardous Devices
C. Radiation

A. Hazardous Chemicals

A proper risk assessment of chemicals must include review of the following factors:

Toxicity – the tendency of a chemical to be hazardous to health when inhaled, swallowed, injected or in contact with the skin.
Reactivity — the tendency of a chemical to undergo chemical change.
Flammability — the tendency of a chemical to give off vapors which readily ignite when used under normal working conditions.
Corrosiveness — the tendency of a chemical, upon physical contact, to harm or destroy living tissues or physical equipment.

When assessing risk, the type and amount of exposure to a chemical must be considered. For example, an individual's allergic and genetic disposition may have an influence on the overall effect of the chemical. The student researcher must refer to Material Safety Data Sheets provided by the vendor (MSDS) to ensure that proper safety precautions are taken. Some MSDS sheets (e.g., Flinn) rank the degree of hazard associated with a chemical. This rating may assist students and adult sponsors in determining risk associated with the use of a chemical.

A risk assessment must include proper disposal methods for the chemicals used in an experiment. The Flinn Catalog (referenced in the Sources of Information section) provides information for the proper disposal of chemicals. If applicable, the student researcher must incorporate in the research plan disposal procedure required by federal and state guidelines.

Environmentally Responsible Chemistry The mission of environmentally responsible (green) chemistry is to avoid the use or production of hazardous substances during a chemical process. The principles of green chemistry are described on the EPA website in the Sources of Information section. The following principles must be incorporated into the research plan:

- Waste prevention
- Use of the safest possible chemicals and products
- Design of the least possible hazardous chemical syntheses
- Use of renewable materials
- Use of catalysts in order to minimize chemical usage
- Use of solvents and reaction conditions that are as safe as possible
- Maximization of energy efficiency
- Minimization of accident potential

B. Hazardous Devices

The documentation of risk assessment (Form 3) is required when a student researcher works with potentially hazardous/dangerous equipment and/or other devices, in or outside a laboratory setting that require a moderate to high level of expertise to ensure their safe usage. Some commonly used devices (Bunsen burners, hot plates, saws, drills, etc.) may not require a documented risk assessment, assuming that the student researcher has experience working with the device. Use of other potentially dangerous devices such as high vacuum equipment, heated oil baths, NMR equipment, and high temperature ovens must have documentation of a risk assessment. It is recommended that all student designed inventions also have documentation of a risk assessment.

C. Radiation

A risk assessment must be conducted when a student uses non-ionizing radiation beyond that normally encountered in everyday life. Non-ionizing radiation includes the spectrum of ultraviolet (UV), visible light, infrared (IR), microwave (MW), radiofrequency (RF) and extremely low frequency (ELF). Lasers usually emit visible, ultraviolet or infrared radiation. Lasers are classified into four classes based upon their safety. Manufacturers are required to label Classes II – IV lasers.

Class I lasers – those found in CD players, laser printers, geological survey equipment and some laboratory equipment. There are no known risks associated with using a Class I laser.

Class II lasers – found in laser pointers, aiming and range-finding devices. These pose a risk if the beam is viewed directly over a long period of time.

Class III lasers – found in higher-powered laser pointers, printers and spectrometers. They are hazardous devices which can cause eye damage when the beam is viewed directly even for a short period of time.

Class IV lasers – high powered lasers used in surgery, research, and industry. They are extremely hazardous and can cause eye and skin damage from both direct and indirect exposure. The beam is also a fire hazard.

Projects involving radionuclides (radioisotopes) and X-rays must involve a careful examination of the risks associated with the study. Depending upon the level of exposure, radiation released from these sources can be a health hazard. Most research institutions have a Radiation Safety Office which oversees the use of ionizing radiation and ensures compliance with state and federal regulations.

Sources of Information are available as a separate section at the end of the document.

Project Approval Forms

Click on "Project Approval Forms" on SEFH Website

DISPLAY RULES AND SAFETY REGULATIONS

1. A student may enter only one exhibit. The student must be a full-time student in good standing at a SEFH affiliated school.
2. Completed project entry and approval forms must be on file with the Fair Office on or prior to the deadline date for entry, including the project entry fee. Copies of these forms should also be available in a labeled folder at the display.
3. The exhibit must be set up in the category indicated on the entry form and at the assigned location.
4. The exhibit must pass inspection by both the SRC and Rules & Safety Committee on Thursday evening at the Fair. Exhibits not passing both inspections must be removed form the exhibit area on Thursday evening prior to closing time.
5. The entry exhibit must be the work of the student or team entering the Fair.
6. Repetition of a previous year's research project is not permitted. However, a student may exhibit new research on a continuing problem providing the research demonstrates significant progress over the previous year. **If the project is a continuing one,** a Roman numeral should appear at the end of the title which indicates the years it has been entered in the Fair (e.g.-A Study of Houston Cockroaches - III) and the Continuation Projects Form (7) must be completed. Display board must indicate work for the current year.
7. Exhibit titles are limited to 6 words or less, and a maximum of 50 letters/characters.
8. The name of the student, teacher, or district must **not be a visible part of the display**.
9. Except for move-in and unpacking, the exhibitor is responsible for the set-up of his/her own exhibit.
10. No radios, TVs, tape players, or other sound transmitting devices may be played unless the sound is transmitted via headphones or the devices are used as part of the display/project presentation. Laser pointers are not allowed.
11. Students for individual and team projects must be at their project during all judging periods. **At least two team members** of team projects must be present during judging. All projects will be judged within the scheduled judging times.
12. Disruptive students will be disqualified from the Fair.13. Students are encouraged to provide judges with copies of a one page abstract or summary of their project; however, the material cannot identify the student, teacher, school or district.14. Project laboratory notebooks for all related research should be available at the display for review by judges.
15. Projects will not have access to 110V power outlets.

Unacceptable for Display

1. living organisms, including plants
2. microbial cultures or fungi (live or dead)
3. glass or glass objects unless they are critical to the display.
4. taxidermy specimens or parts
5. preserved vertebrate or invertebrate animals or their parts
6. waste, rock, sand or soil samples - even if encased in acrylic
7. chemicals
8. human/animal parts or body fluids
9. human or animal food
10. sharp items (i.e., syringes, needles, pipettes).
11. poisons, drugs, controlled substances, weapons, ammunitions
12. dry ice or other sublimating solids.
13. flames or highly flammable display materials
14. gases of any type
15. batteries with open top cells
16. items which identify the student, teacher or school
17. offensive audio/visual displays
18. operation of a class III or IV laser
19. any equipment or devices which may be hazardous to the public including laser pointers
20. liquids (including water, mercury or alcohol thermometers)
21. previous student/project awards
22. empty tanks that once contained combustibles unless purged
23. photographs or other visual presentations depicting vertebrate animals in other-than-normal conditions
24. active Internet or e-mail connections as part of the display or demonstration of the project.

Acceptable For Display Only-(But Not Operated)

1. projects with unshielded belts, pulleys, chains, and moving parts with tension or pinch points
2. class III and IV lasers
3. devices which emit loud noises
4. devices which require more than 125V
5. soil, sand, rock and/or waste samples if permanently encased in acrylic or a similar inert material

Acceptable for Display & 0peration With Restrictions

1. Photographs and/or visual depictions **if:**
   a. Credit lines of their origins: "Photograph taken by …" or "Image taken from …" are attached. (If all photographs being displayed were taken by the Finalist, one credit lien prominently displayed indicating that the Finalist took all photographs is sufficient.)
   b. They are from the Internet, magazines, newspapers, journals, etc., and credit lines are attached.
   c. They are photographs of the student.
   d. They are photographs of human subjects for which signed consent forms are available at the project.
   e. They are not deemed offensive by the Scientific Review Committee or the Rules and Safety Committee.
2. Class II lasers
   a. must be student-operated
   b. posted sign must read **"Laser Radiation: do not stare into beam"**
   c. must have protective housing that prevents access to beam
   d. must be disconnected when not operating.
3. large vacuum tubes or dangerous ray-generating devices must be shielded properly; mechanical devices with moving parts must have adequate safeguards
4. any apparatus producing temperatures that will cause physical burns must be adequately insulated.
5. The only power sources allowed are exhibiter furnished batteries of 12V or less.
6. All electrical connectors, wiring, etc. must be UL listed and appropriate for the load and equipment.

SIZE: Project space limitations are: 76cm (30in) deep; 122cm (48in) wide; 274cm (108in) high including table; tables are 76cm high. Heavy displays should be floor mounted when possible. Floor mounted projects are limited to the same space limitations and cannot be placed in front of a project table. No exceptions. Unless otherwise requested on the entry form, all projects will be assigned a project display table.

PROJECT ABSTRACTS

Abstracts are required by SEFH (they are also required by the State and International fairs)..You are encouraged to have extra copies available to distribute to your judges. The abstract **must not list your name, teacher, school, district or anything else that might serve to identify you**. It should also be done neatly using proper grammar and punctuation. It should not contain more than 250 words. A sample abstract is shown below. Project Abstracts for the State SEF and the Intel ISEF require the use of a special form; however, they are also limited to 250 words.

A SOLUTION TO POLLUTION: ENERGY FROM WASTE MATERIALS

Sewage sludge and solid wastes are an unavoidable by product of modern society. High disposal costs for these waste materials, coupled with a projected increase in waste production over the next decade, form a serious problem. This experiment was aimed at contributing to a partial solution of the waste disposal and energy shortage enigma.

For this experiment, sewage sludge, wood and sludge/wood mixture were pyrolized in a batch reactor to produce oil. The production rates of oil were compared for the three materials. The average production rates of oil from all materials were excellent. The boiling range of the wood-derived oil proved to be slightly better than that of the sludge-derived oil, with the sludge/wood-derived oil being intermediate.

Sludge, waste wood and sludge/solid waste pyrolysis should be economically attractive, as the feedstocks are both renewable and inexpensive. Plant attractiveness is increased when the costs of alternate methods of waste disposal are taken into account.

In general, an abstract should include the following:

(a) purpose of the experiment

- An introductory statement of the reason for investigating the topic of the project.
- A statement of the problem and/or hypothesis being studied.

(b) procedures used

- A summarization of the key points and an overview of how the investigation was conducted.
- An abstract does not give details about the materials used unless it greatly influenced the procedure or had to be developed to do the investigation.
- An abstract should only include procedures done by the student. Work done by a mentor (such as surgical procedures) or work done prior to student involvement should not be included.

(c) data

This section should provide key results that lead directly to the conclusions you have drawn.
It should not give too many details about the results nor include tables or graphs.

(d) conclusions

- Conclusions from the investigation should be described briefly.
- The summary paragraph should reflect on the process and possibly state some applications and extensions of the investigation.

The abstract **should not include**:

a) acknowledgements (including naming the research institution and/or mentor with which you were working), or

b) Work or procedures done by a mentor or a supervisor.

Guidelines for Citing References

In general, the author of a scientific or technical document is responsible for providing complete and accurate references so that a reader may locate the original reference material. Cited references should relate directly to statements, illustrations, data and other material included in the document. The complete listing of references should follow the body of the text and should be numbered consecutively in the order in which they are mentioned. References located in the text, tables, and legends should be annotated at the point of use by Arabic numerals contained within parentheses – multiple cited references should be separated by a comma, for example (17, 19, 23). Finally, they should be single spaced.

Here are a few examples taken from the U.S. National Library of Medicine Uniform Resource Locator website at (http://www.nlm.nih.gov/bsd/uniform_requirements.html) Find the one resembling most the source you have to cite and use the example's format to construct your reference.

Books:

Individual author(s)

Murray PR, Rosenthal KS, Kobayashi GS, Pfaller MA. Medical microbiology. 4th ed. St. Louis: Mosby; 2002.

Editor(s) as author(s)

Gilstrap LC 3rd, Cunningham FG, VanDorsten JP, editors. Operative obstetrics. 2nd ed. New York: McGraw-Hill; 2002.

Organization(s) as author

Royal Adelaide Hospital; University of Adelaide, Department of Clinical Nursing. Compendium of nursing research and practice development, 1999-2000. Adelaide (Australia): Adelaide University; 2001.

Chapter in a book

Meltzer PS, Kallioniemi A, Trent JM. Chromosome alterations in human solid tumors. In: Vogelstein B, Kinzler KW, editors. The genetic basis of human cancer. New York: McGraw-Hill; 2002. p. 93-113.

Journals/Magazines:

Standard article

Halpern SD, Ubel PA, Caplan AL. Solid-organ transplantation in HIV-infected patients. N Engl J Med. 2002 Jul 25; 347:284-7.

No author given

21st century heart solution may have a sting in the tail. British Med J. 2002;325:184.

Organization as author

Diabetes Prevention Program Research Group. Hypertension, insulin, and proinsulin in participants with impaired glucose tolerance. Hypertension. 2002;40:679-86.

Article in a Journal supplement

Glauser TA. Integrating clinical trial data into clinical practice. Neurology. 2002;58(12 Suppl 7):S6-12.

Scientific or technical report

Yen GG (Oklahoma State University, School of Electrical and Computer Engineering, Stillwater, OK). Health monitoring on vibration signatures. Final report. Arlington (VA): Air Force Office of Scientific Research (US), Air Force Research Laboratory; 2002 Feb. Report No.: AFRLSRBLTR020123. Contract No.: F496209810049.

Other Published Material:

Newspaper article

Tynan T. Medical improvements lower homicide rate: study sees drop in assault rate. The Washington Post. 2002 Aug 12; Sect. A:2 (col. 4).

Dictionary and similar references

Dorland's illustrated medical dictionary. 29th ed. Philadelphia: W.B. Saunders; 2000. Filamin; p. 675.

Computer file

Renal system [computer program]. MS-DOS version. Edwardsville, KS: Medi-Sim; 1988.

Classical material

The Winter's Tale: act 5 scene 1, lines 13-16. The complete works of William Shakespeare. London: Rex, 1973.

Electronic Material:

CD-RomUI

Anderson SC, Poulsen KB. Anderson's electronic atlas of hematology [CD-ROM]. Philadelphia: Lippincott Williams & Wilkins; 2002.

Journal article on the internet

Jacobsen JW, Mulick JA, Schwartz AA. A history of facilitate communications: Science, pseudoscience, and antiscience: Science working group on facilitated communication. Am Psychol 1995;. 50: 750-65. Retrieved January 25, 1996, from the World Wide Web: http://www.apa.org/journals/jacobson.html

Homepage/Web site

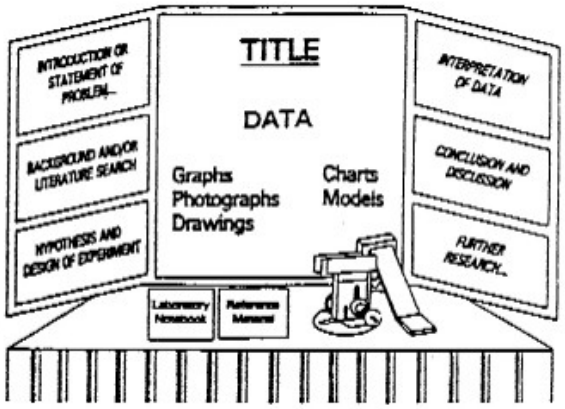
Cancer-Pain.org [homepage on the Internet]. New York: Association of Cancer Online Resources, Inc.; c2000-01 [updated 2002 May 16; cited 2002 Jul 9]. Available from: http://www.cancer-pain.org.

Database on the Internet

MeSH Browser [database on the Internet]. Bethesda (MD): National Library of Medicine (US); 2002- [cited 2003 June 10]. Meta-analysis; unique ID: D015201; [about 3 p.] Available from: http://www.nlm.nih.gov/mesh/MBrowser.html Files updated weekly

PROJECT DISPLAY

Prior to planning your display, be sure to carefully review the rules for project displays. How you display your material; the color scheme you use; your use of graphics, pictures, lettering, etc. will all be important as you try to make your display serve as a "silent" salesperson for your project. Where appropriate use the International System of Units (SI). Try to make your display a creative visual summary of your entire project. See display rule section for comments regarding photographs. **Everything** associated with your display must fit into the space allocated for your project, which is 76cm deep x 122 cm wide x 274cm high if floor mounted. Only use floor mounted projects for extra tall or extra heavy display boards and/or equipment If table mounted, the height limit is still 274 cm, including the table which is about 76 cm high. Most display boards are constructed of plywood or foam core (gatorboard). A good source for display boards is www.showboard.com. Expensive equipment should only be displayed when it is necessary for explaining project results. If desired, videotapes or computer visualization of project action may be part of the display. An overnight check-in security room will be available at the fair.



This backboard example shows the type of information and material normally included in a project display

AT THE FAIR

Each year the SEFH is held at the George R. Brown Convention Center. Food Services, pay telephones, security guards, and a nurse are available during fair hours. NO COMMERCIAL FOOD ORDERS may be delivered or brought onto the fair site for consumption at the fair site.

DRIVING DIRECTIONS - 1001 Avenida de las Americas 77010

I-45 SOUTH	**Coming from Dallas, Conroe, The Woodlands, Bush Intercontinental Airport** Take I-45 South> to I-10 East > to US-59 South (exit #770A)> exit Downtown Destinations-Hamilton Street > right on Capitol Street > left on Avenida de las Americas.
I-45 NORTH	**Coming from Galveston, NASA, Clear Lake, Houston Hobby Airport** Take I-45 North > exit Downtown Destinations (exit #45) > exit Pease Street > right on Chartres Street > left on Polk Street > right on Avenida de las Americas.
US-59 SOUTH	**Coming from Kingwood, Humble, Bush Intercontinental Airport** Take US-59 South > exit Downtown Destinations-Jackson Street > left on Franklin Street > right on Hamilton Street > right on Capitol Street > left on Avenida de las Americas.
US-59 NORTH	**Coming from the Galleria, Missouri City, First Colony, Sugar Land** Take US-59 North > exit Downtown Destinations-Polk Street > left on Polk Street > right on Avenida de las Americas.
I-10 WEST	**Coming from Baytown, Channelview, New Orleans** Take I-10 West > to US-59 South (exit #770A) > exit Downtown Destinations-Hamilton Street > right on Capitol Street > left on Avenida de las Americas.
I-10 EAST	**Coming from Katy, San Antonio** Take I-10 East > to 59 South (exit #770A) > exit Downtown Destinations-Hamilton Street > right on Capitol Street > left on Avenida de las Americas.
SH-288 NORTH	**Coming from Pearland, South Loop, Reliant Park** Take SH-288 North > to US-59 North > exit Downtown Destinations-Polk Street > left on Polk Street > right on Avenida de las Americas.
SH-290 EAST	**Coming from Austin, Copperfield** Take SH-290 East > to Loop 610 South > to I-10 East > to US-59 South (exit #770A) > exit Downtown Destinations-Hamilton Street > right on Capitol Street > left on Avenida de las Americas.

PARKING INFO

The George R. Brown features a 1600-space parking garage located at the corner of Polk Street and Avenida de las Americas. Conveniently connected to the GRB and the Hilton by Level 2 skywalks, parking couldn't be easier.

There is a beautiful 12-acre park which contains several eating facilities located directly in front of the convention center. A 650-car underground parking garage is below the park with entrances directly across from the convention center.

NORTH	Parking is also available in lots one block from the GRBCC on Rusk Street.
SOUTH	Parking is available in the 1600-space Hilton Americas-Houston parking garage, as well as lots near the Holiday Inn Express on Chenevert Street.
EAST	Chinatown is located just east of the GRBCC and Highway 59. There are several parking lots open to the public, in addition to street parking.
WEST	Several lots are located between the GRB and the Four Seasons Hotel/Houston Center. Houston Center has multiple parking garages available for convention center parking.

Judging Criteria & Procedures

PROCEDURES

All Exhibits will be judged in one of three divisions: the Junior/Middle School (7th and 8th grades); the Ninth (9th grade); and the Senior (10, 11, & 12th grades) Divisions. Team Projects are allowed to compete in all divisions. Each division is subdivided into subject classifications such as chemistry, engineering, zoology, botany, etc. Prior to judging, all project displays must be inspected and approved by the Rules/Safety Committee and the Scientific Review Committee on Thursday evening. Projects not approved must be removed from the Exhibition Hall prior to judging.

The judging process takes place in three phases. Phase I occurs during the morning of the judging day and involves only judges for the SEFH place awards. All exhibits are visited individually by the members of a judging team. During the judging interview a judge will normally ask the exhibitor to present a 3-5 minute description of the project. This will be followed by a series of specific questions by the judges. The exhibitor may also ask questions and seek advice from the judges at this point. Each judge should obtain all the information necessary to make a professional evaluation of each criterion listed on the project scoring sheet. After completing these interviews, the judges will gather as a team to discuss their findings and arrive at their own ranking of the projects. Each judge "normalizes" his/her scores by assigning a score of 100 to the top-ranked project, 95 to the second-ranked project, etc. The team captain compiles the judges' normalized scores and delivers the collective rankings to the category coordinator. The coordinator and team captain will then decide which projects will advance to Phase II judging.

During Phase II, the SEFH place award judging for almost 200 awards continues and the Special Award judging begins. The 80-90 special awarding agencies may or may not all use the SEFH judging sheets. Some agencies will judge just projects in particular categories while others will be interested in all categories. They determine their own judging criteria, procedures and awards. SEFH place award judging continues in the same manner as Phase I; however, different judges may be involved. Place award judges meet during and after Phase II to determine the place awards for each division and category. Normally no scores are tabulated for this process; rather, the judges arrive at their rankings through in-depth discussions and by consensus.

During Phase III (held in the early evening), Special award judging continues and the SEFH category coordinators (or their deputies) meet with the judging chair to evaluate the first place award winners in each of the three divisions. These judges normally work in small teams so that a wide spectrum of expertise can be brought to bear during each interview. After the teams complete their interviews, 3 overall division award winners for the Junior/Middle School Division, 3 for the Ninth Grade Division and 4 for the Senior Division are determined. In addition, Grand Award projects and several alternates are chosen for entry into the annual International Science Engineering Fair (ISEF).

Throughout the judging process judges must not attempt to learn the student's name, their school, or the name of their advisor. Such information may be requested from the category coordinator after the judging is complete. Judges are free to introduce themselves and identify their affiliation (in fact, the badge worn by each judge should contain this information), but the anonymity of the exhibitors must be preserved. In addition, judges must be aware that eager ears are listening to their conversations with other judges. Thus, judges are encouraged to interact as little as possible in the exhibit area and to retire to the judging auditorium to discuss the projects. The official scoring sheets and other notes kept by judges should be concealed while in the exhibit area. After each judging phase, the scoring sheets and any notes taken by judges will be collected and destroyed.

All judging results are confidential and will be known only to the judges involved in the decision and the officials of the fair until they are publicly announced at the awards ceremony held on the day following the judging.

CRITERIA

The **Official Scoring Sheet** contains a complete summary of the criteria to be used by the judges in evaluating each project. The sheet is deliberately detailed to provide guidance for judges as well as for exhibitors and to insure that the judging process is carried out as equitably as possible. A careful study of the official scoring sheet is critical. The salient points to be assessed by each judge have been broadly divided into five categories: objectives, design, execution, conclusions, and presentation. Note that it is not essential for a project to be completely original. It is essential; however, for the student to clearly acknowledge the source(s) of ideas that went into his or her project. Appropriate recognition will be given to those projects that do contain clearly original ideas and that demonstrate the student's creativity - both in the genesis and the execution of the project.

Judges will ascertain whether the student has applied the proper scientific and/or engineering principles in the design and execution of the experiment and carried out their data collection and analysis in a systematic manner. The project's conclusions should follow logically from the data analysis and reflect careful consideration by the student of possible errors in the experiment. Finally, judges will evaluate the quality of the student's presentation. Note that a student who fails to keep their presentation within the time limits set by the judge may be scored appropriately. Judges are prepared to hear very polished presentations from the more experienced students. Judges will go beyond the student's prepared presentation by posing questions that can determine the student's level of understanding of the principles underlying their project. Students who do not have a good understanding of the science/engineering related to their projects will be downgraded accordingly by the judges.

SCIENCE ENGINEERING FAIR OF HOUSTON
SCORING SHEET FOR INDIVIDUAL & TEAM PROJECTS

A copy of the scoring sheet used for the SEFH place award judging of individual and team projects is shown below. Special Award judges may or may not use a similar scoring method since the nature and purpose of their awards varies from agency to agency.

PROJECT TITLE_____PROJECT NO._____

JUDGING PHASE _____ JUDGE _____ JUDGING TEAM_____

For Team Projects: NO. OF STUDENTS ON TEAM ____ NO. OF STUDENTS PRESENT FOR JUDGING_____

ASSIGN A MAXIMUM SCORE OF 10 POINTS IN EACH CATEGORY BELOW

PROJECT OBJECTIVES	1. Creativity and originality	
	2. Clear statement of objectives; identification of all relevant variables	
PROJECT DESIGN	3. Creativity and originality	
	4. Knowledge and understanding by student of the scientific or engineering principles relevant to the project (if team project consider each team member)	
	5. Adequacy of scientific or engineering approach used; use of relevant literature	
PROJECT EXECUTION	6. Thoroughness of experimentation or development used to reach objectives; proper recording of data in laboratory notebook	
	7. Level of skills and effort used by the student to carry out the project; amount of work done by the student; understanding of equipment or techniques used to obtain data (if team project consider each team member)	
PROJECT CONCLUSIONS	8. Conclusions consistent with the data obtained and with the relevant principles of science or engineering (if not, is there an adequate explanation of the inconsistency)	
PROJECT PRESENTATION	9. Quality and coherence of the oral presentation within the time allotted (usually about 5-10 minutes)	
	10. Quality and clarity of the display, including the organization and presentation of data	
	TOTAL SCORE (maximum = 100)	
	NORMALIZED SCORE	
Obtain normalized score by ranking projects according to total score and assigning a normalized score of 100 to the first project, 95 to the second, etc.		

NOTES:

1. Projects continued from previous year(s) should be clearly identified as such with a Roman numeral at the end of the project title. For example--"Pollution in Lake Houston, II" would indicate a continuing project being entered in the fair for the second time. These projects should be judged only on what has been done since the last fair.

2. Judges should not solicit any information from an entrant that would identify the student, their sponsor, or their school. If such information is required, the judge should contact the judging chairperson or special awards chairperson.

COMMENTS:

SEFH POSTER DESIGN CONTEST
For the 54th Science Engineering Fair of Houston

(See Entry Form Below)

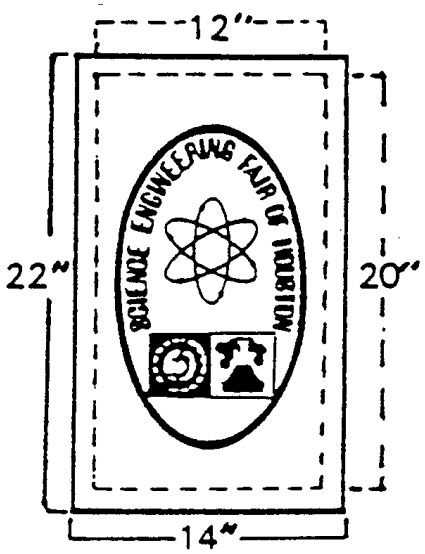
The major objective of the SEFH Poster Design Contest is to encourage students to think about science and engineering in an artistic way, and to create imaginative interpretations of the substance of science and engineering. Each year, three place awards and several honorable mention awards will be given. The awards will be presented at the 2014 SEFH Awards Ceremony. Entered posters will be displayed at the George R. Brown Convention Center during the fair.

ELIGIBILITY

Students in grades 7 through 12 currently enrolled in public and non-public schools as full-time students, in the 22-county fair region, are eligible to enter. Each entering student may submit one self-made poster(s) not copied from other sources. There is no limit on the number of entries that can be submitted from a particular school.

POSTER SPECIFICATIONS

Media must consist of poster board and any combination of ink or paint. Pencil or charcoal is not allowed. The design must be ready for reproduction. No more than three colors may be used. Shades of black and gray count as a single color. White is not counted as a color and may also be used. Shades of any other color will count as multiple colors depending on the number of shades used. Poster size must be 14" x 22" with a 1" margin on each side. The size of the artwork will be contained within a 12" x 20" space; a vertical design is required using the 14" side as the base. The 1" margins are for printing purposes. Do NOT mat, mount or frame the poster. The title, "The 54th Science Engineering Fair of Houston," must appear on the poster. When designing the poster, students should remember that the design will be used for brochures, posters, patches, and T-shirts. Thus, designs with a lot of fine detail work should be avoided. The theme should symbolize the Fair as an aid to education and depict one or more areas of mathematics, science or engineering. Bold, simple designs are encouraged.



JUDGING CRITERIA

Posters will be judged for creativity, scientific and technical accuracy, artistic skill and visual quality. All entries submitted must be original. Copying is not acceptable. Computer generated work is permissible if it is original. Work copied from published photographs, magazines, book illustrations, or other artwork cannot be submitted.

SUBMITTING ENTRIES

A completed copy of the entry form must be taped to the backside of the poster. All posters from a school should be enclosed in a single wrapping paper package, marked with the name of the teacher & school, and either brought to the Fair Office or mailed to the SEFH Poster Contest, c/o University of Houston, STEM Center, 316 E. Cullen Building, Houston, TX 77204-2015. **All entries must be received by the deadline date (Monday, January 6, 2014)** that is listed in the Calendar of Events. The Posters will be displayed in the lobby of the George R. Brown Convention Center during the Fair. Posters (except for the First Place winning entry) may be picked up at the Information Booth at the fair. **There is no entry fee.**

SEFH POSTER CONTEST ENTRY FORM

(Please type or print using blue or black ink)

Name _____ Grade _____ Home Phone _____

Address _____ City _____ Zip Code _____

School _____ Phone _____ Principal _____

School Address _____ City _____ Zip Code _____

I hereby certify that this is my original work and that it is not copied from a published photograph, magazine, book illustration, or any other artwork. I understand that the Science Engineering Fair of Houston, Inc. is not responsible for loss, theft or damage and hereby grant the Fair permission to use my art for public display. If my poster is chosen for the First Place Award, I also give the Fair permission to make any modifications which improve the poster for reproduction and to utilize the poster, at no cost to the Fair, as cover art for publications and other materials describing the Fair. I hereby verify that to the best of my knowledge, this is an original artwork.

Student's Name _____ Parent/Guardian Signature _____

Teacher's Name _____ Teacher's Signature _____

SCIENCE & ENGINEERING WRITING CONTEST

The Science Engineering Fair of Houston invites all participants in school or district level science fairs that are affiliated with SEFH to submit papers about their projects to the annual Science & Engineering Writing Contest. Goals of the contest include the following:

*To encourage development of analytical thinking and writing.
*To recognize and reward excellence in technical writing.
*To promote awareness of the importance of effective communication in science, engineering, and technology.

Eligibility

If you are a participant in this year's SEFH or an SEFH affiliated school or district level science fair, you are eligible to submit a research paper and other materials you have prepared for your SEFH project. Your project must adhere to the research and approval rules established by SEFH. Team projects are not eligible. There is no entry fee or entry quota for a school or district.

Awards

Winners will be recognized at the SEFH Awards Ceremony at the Cullen Performance Hall. Students will be informed of their awards prior to the ceremony. First, Second, Third Place, and Honorable Mention awards, where appropriate, will be presented in each division. Winning entries in the Senior Division may be eligible for competition in the International Student Technical Writing Contest sponsored by the Society for Technical Communication. Previous SEFH winners have been very successful in this competition.

Preparation of the Entry

Discuss the format and content of the paper with your supervising teacher to satisfy particular requirements for your topic. An abstract and bibliography/reference list should be included. Credit to those who assisted you with your project, including individuals, businesses, educational or research institutions should be included in an Acknowledgments section. Reference notes are encouraged. Number all pages. In addition to the paper, you may submit any or all of the following supporting materials: graphics, illustrations, photographs, or sample programs. Be conservative in your use of color printing. Guidelines for Citing References are presented on the next page. Supporting materials enhance the communication process but should be relevant and clearly labeled. Since entries cannot be returned, you may want to make duplicate copies of the paper, as well as the supporting materials, if you intend to include them with your project display.

1. Type the paper, using double-spacing, on one side of good quality 8 1/2 inch by 11 inch paper.
2. Put the following information on a cover sheet, which will be removed prior to judging:

Name:	School Telephone Number:
Home Address and Zip Code:	Name of Principal:
Home Telephone Number:	Name of Supervising Teacher:
Grade Level:	Title of Paper:
School:	Purpose of Paper:
School Address and Zip Code:	Intended Audience:

3. Behind the cover sheet, put a title page, but do not include your name or other identifying information.
4. Staple your cover sheet, title page, abstract, paper, bibliography and supporting materials in the upper-left corner.
5. To assure impartial judging, please adhere to the following: (1) Do not put your name on any of the pages of the paper or supporting materials; (2) Do not identify your school, school district, principal, supervising teacher or parents on any of the pages, or make reference to them in the paper.

Submission of the Entry

Send the entry prior to the deadline date listed in the Calendar of Events to: **Dr. Aimee Roundtree, SEFH Science Writing Contest, c/o UH-Downtown, One Main Street, S-1063, Houston, TX 77002.**

Judging Criteria

A team composed of scientists, engineers and professional writers will review all of the entries, selecting winners for their clear statements of purpose; logical organization of writing and scientific argument; conciseness and consistency in word choice; relevance of the graphics to the text; skillful execution of the graphics; and competent use of grammar, spelling, and punctuation. See the last page for a copy of the judging sheet used by SEFH essay judges. These criteria were developed by the international contest to which the top three winners of the SEFH Senior division essay contest will be submitted.

For more information about the Science & Engineering Writing Contest, contact Dr. Aimee Roundtree at (713) 222-5315 or by e-mail at roundtreea@uhd.edu.

See page 24 for Citing Reference Guidelines

Paper Title:_____

Judging Sheet

Objective Tone - does not inject unsubstantiated opinion

Score: 0 -5 _____

Purpose - thesis of entry is clearly stated

Score: 0 -10 _____

Significance/Audience - explains significance of topic to audience

Score: 0 -10 _____

Organization - structure of the entry is clear; conclusions are adequately supported; pages are numbered

Score: 0 -10 _____

Focused Writing - uses active voice, doesn't ramble

Score: 0 -5 _____

Word Choice - uses appropriate, precise word choice

Score: 0 -5 _____

Standard Usage - uses proper grammar, spelling, and punctuation

Score: 0 -5 _____

References - uses references, footnotes, bibliography, and links appropriately; attributes sources

Score: 0 - 10 _____

Graphics - graphics are clear and comprehensible

Score: 0 -5 _____

Effectiveness - the whole entry is effective in its purpose for its audience

Score: 0 - 10 _____

TOTAL_____