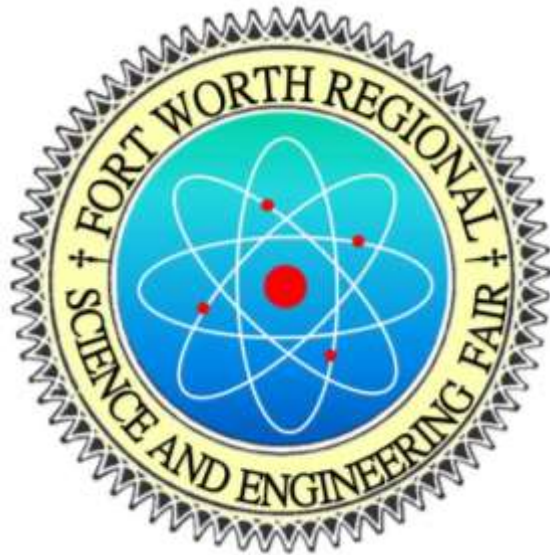


# Fort Worth Regional Science & Engineering Fair

2017

## Rules and Participation Guide



February 19-20, 2017

College Park Center, The University of Texas at Arlington  
601 S. Pecan, Arlington, Texas 76019

*"The oldest continuous running fair in Texas celebrating our 66<sup>th</sup> year"*

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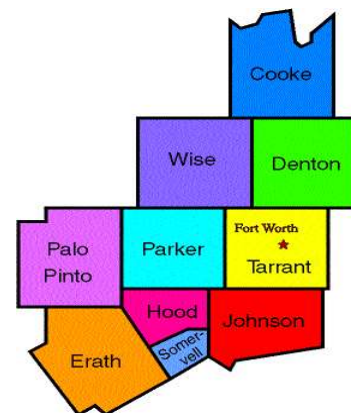
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## Introduction

The Fort Worth Regional Science & Engineering Fair (FWRSEF), now in its 66<sup>th</sup> year (see more history at <http://www.aboutus.org/Fwrsef.org>; or “[Race Reports Busy Month at Ft. Worth](#)”), is an organization made up of community and business volunteers whose purpose is to focus attention on science and stimulate interest in students beyond class work. The Fair offers an opportunity to display meritorious scientific talent through projects, and to arouse the interest of the public in scientific abilities of students and teachers. Over 200 awards were presented at the Science Fair each year (<http://www.fwrsef.org/past.php>).

Any student from grades 6-12 in public, private, home school, or parochial school in the Fort Worth region (Texas School District Region XI) may enter the fair. The region includes the following counties: Cooke, Denton, Erath, Hood, Johnson, Palo Pinto, Parker, Somervell, Tarrant and Wise ([Counties within Region XI](#)).

FWRSEF is affiliated with the [Intel International Science & Engineering Fair](#). A maximum of **6** Division I projects can be advanced to the International Intel Science & Engineering Fair in Los Angeles, CA. Approximately 20 Middle school students will be selected to participate in Broadcom MASTERS™ (<http://www.societyforscience.org/masters>).



If you would like additional information about the Science Fair or exhibits, contact one of the following people:

<b>For Questions about the 2017 Fair or rules contact:</b>	<b>For questions about Fair operation contact:</b>	<b>For questions about forming an SRB or IRC contact:</b>
University of Texas at Arlington Dr. Yuan B Peng, Fair Director Department of Psychology, Box 19528, University of Texas at Arlington Arlington, Texas 76019-0528 <a href="mailto:ypeng@uta.edu">ypeng@uta.edu</a> or <a href="mailto:director@fwrsef.org">director@fwrsef.org</a>	Kim Cullen Chairman, Operating Committee Fort Worth Regional Science & Engineering Fair P.O. Box 6125 Fort Worth, TX 76115 <a href="mailto:Ksteelersfan68@yahoo.com">Ksteelersfan68@yahoo.com</a>	University of Texas at Arlington Dr. Michael Roner Department of Biology, Box 19498 University of Texas at Arlington Arlington, TX 76019 <a href="mailto:roner@uta.edu">roner@uta.edu</a>

### Online Registration at

<http://www.scienteer.com/register/fortworthregionalscienceengineeringfair>

**If you would like to become a proud supporter or volunteer for the Fort Worth Regional Science & Engineering Fair, please contact the Fair Director ([director@fwrsef.org](mailto:director@fwrsef.org))**

## Important Dates and Times

*Important note: Team projects will no longer compete in an separate category. Team projects will compete in the appropriate science category with peer projects.*

*SRC or IRB must be registered each year with the Fort Worth Regional Science & Engineering Fair*

- December 9, 2016** Projects needing SRB approval must have approval of either a local SRB or the FWRSEF SRB – through online registration process
- January 20, 2017** Online Registration must be complete.
- February 3, 2017** Project categories are finalized. No changes to a category may be requested by a teacher, parent or student.
- February 19, 2017** Project setup for all grades (Division I & II) 12:00 pm to 5:00 pm at the College Park Center at The University of Texas at Arlington (<http://www.uta.edu/eventcenter/>)
- February 20, 2017**
- 9:00 am – Judging begins
  - 9:30 – 11:30 am Students in ALL Grades may demonstrate their projects to the judges  
Exhibit hall opens up for public viewing, Science Show, and Team Competitions.  
*Division I students (grades 9–12) demonstrate their projects to the judges (mandatory).*  
*Division II students (grades 6–8) demonstrate their projects to the judges (optional).*
  - 11:30 - 5:00 pm Student Activities (CPC) Science fair participants may participate in activities provided by UTA Science and Engineering, Lockheed Martin, and RadioShack on UTA campus. Prior registration required!
  - 3:00 – 7:00 pm Awards Presentation (winning projects will not be announced until the awards ceremony). All project need to be removed immediately after award ceremony.
  - 7:00 – 8:30 pm Awards Ceremony
  - 8:30 – 9:00 pm Public viewing and teardown
  - 9:00 pm **Exhibit hall closes.** All projects must be removed by this time by presenters or trusted parties. Unattended items will be removed by custodial service. No space to store un-collected projects.
- March 31 - April 1, 2017** **Division I + II, 2017 Texas Science and Engineering Fair** at the *Henry B. Gonzalez Convention Center*, San Antonio, Texas: <https://www.txsef.org/>
- May 14 - 19, 2017** **Division I only, [2017 Intel International Science and Engineering Fair](#)** in Los Angeles, California.
- June 2017** (*check online for application deadline*) **Division II only**, selected number of middle school students will be nominated to enter their project via online applications. From national entrants, 300 semifinalists will be selected, including 30 finalists who win an all-expense paid trip to Washington DC to compete at **the 2017 Broadcom MASTERS™**. More detailed will be provided in the following website.  
<https://student.societyforscience.org/broadcom-masters>

Additional copies of the Fort Worth Regional Science & Engineering Fair Rules and forms are available at:  
<http://www.fwrsef.org>

ISEF rules can be obtained from Society for Science & the Public (SSP) website  
<https://student.societyforscience.org/international-rules-pre-college-science-research>

**All equipment and materials exhibited during the Fair are entered at the risk of the exhibitor. Neither the Fort Worth Regional Science & Engineering Fair nor its sponsors assume any responsibility for loss or damage to equipment or materials.**

## 2015-2016 Sponsors

### Underwriter level:



**LOCKHEED MARTIN**



### Advocate Level:

- UTA-Dean of Engineering
- The Northrop Grumman Foundation
- Lockheed Martin Leadership Association
  - American Society for Quality

### Associate Level:

- Fort Worth HACEMOS Organization
  - IEEE Fort Worth Section
- Delbert E. Lawry Award - Kathleen Sassman
  - Society of Flight Test Engineers
- Society of Texas Environmental Professionals
- Tarrant County Veterinary Medical Association

### Friend Level:

- Society of Allied Weight Engineers
  - Fort Worth Audubon Society
- Fort Worth Psychological Association
  - Water environment association
- American Industrial Hygiene Association

## Message from the Director

The Fort Worth Regional Science and Engineering Fair will soon enter its 66<sup>th</sup> year of continual support for young scientists who work towards the advancement of science, mathematics, and engineering. Our Fair is the oldest, continually operating regional science fair in the state of Texas (see more of our Fair history at <http://www.aboutus.org/Fwrsf.org>; or "[Race Reports Busy Month at Ft. Worth](#)"). Students from ten counties, Cooke, Denton, Erath, Hood, Johnson, Palo Pinto, Parker, Somervell, Tarrant, and Wise ([Counties within Region XI](#)) are encouraged to bring science to life, with no charge to them or their schools!

This coming Fair will be held at the College Park Center at The University of Texas at Arlington (<http://www.uta.edu/eventcenter/>) on February 19-20, 2017. We sincerely solicit everyone's support to ensure that we can provide a podium for the youth of our great state. In order to encourage the youth, we are not charging any fee to the schools or the students and hence we look forward to support from generous donors as in the past. We need your help to make this a success! You can help by contributing at any of the recognized levels. All contributors will receive recognition by the Fair on our Website ([www.fwrsef.org](http://www.fwrsef.org)). Rules and Participating Guide book and will be prominently displayed during the Fair's two-day event. In addition, you may also choose to give a special award (monetary or other) to students in your area(s) of choice. We ask you to be an integral part in the Fair's long tradition of advancing science and engineering among the students of our community.

Think about the impact it will have on the lives of the young students. The Fort Worth Regional Science and Engineering Fair offers young students, who will be successful scientists in the future, a unique opportunity to present their meritorious scientific talent through projects. It also helps to generate public interest in the scientific abilities of our region's students and teachers. Your support will ensure that these young scientists can compete for over 200 awards, as seen past years. It will also reward the best researchers with a trip to the [2017 Texas Science & Engineering Fair](#) at the Henry B. Gonzalez Convention Center in San Antonio (**March 31 – April 1, 2017**). The FWRSEF Best of Fair (up to 6 projects) will be sent to the [2017 Intel International Science and Engineering Fair](#) in Los Angeles, California (**May 14-19, 2017**) with all or most expenses paid. Approximately 20 middle school students will be nominated to compete in the [Broadcom MASTERS](#). Nominees will enter the competition by completing an online application where they will be asked to explain their science project and have an opportunity to demonstrate their use of STEM principles - science, technology, engineering and math - in the development and presentation of their project. From national entrants, 300 Semifinalists will be selected, including 30 Finalists who win an all-expense paid trip to Washington, D.C., where they will compete for awards and prizes, including the top education award of \$25,000 presented by the Samueli Foundation, a gift of Susan and Henry Samueli, a founder of Broadcom Corporation.

Please support the long tradition the Fair has of advancing science and engineering among the students in our community. Your support is greatly appreciated and valued, Please do not hesitate to contact us with any questions. Thank you for considering this request to be part of the 2017 Fort Worth Regional Science and Engineering Fair.

Sincerely,



Dr. Yuan B Peng, Fair Director  
Fort Worth Regional Science & Engineering Fair

## Getting Started (Using the Scientific Method)

Get an idea of what you want to study. Ideas might come from hobbies or problems you see that need a solution. Perhaps there is a topic you have studied in school that you would like to learn more about. Due to the limited time and resources, you may need to narrow down your topic to one specific topic.

Steps	Activity
Define your Problem	<ul style="list-style-type: none"><li>• What is your goal?</li><li>• What idea are you trying to test?</li><li>• What is the scientific question you are trying to answer?</li></ul>
Hypothesis	<ul style="list-style-type: none"><li>• Explain how you think your project can demonstrate your purpose.</li><li>• Make a prediction regarding the outcome of your experiment.</li><li>• State the results you are predicting in measurable terms.</li></ul>
Procedure	<ul style="list-style-type: none"><li>• Give a detailed explanation of how you will conduct the experiment to test your hypothesis.</li><li>• 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).</li><li>• Be very specific about how you will measure results to prove or disprove your hypothesis. You should include a regular timetable for measuring results or observing the projects (for example, every hour, every day, every week).</li><li>• 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.</li></ul>
Plan Your Experiment	Once you have a feasible project idea, write a research plan. This plan should explain how you will do your experiment and exactly what it will involve. All students participating in the fair are required to complete a Research Plan (Form 1A).
Consult Your Adult Sponsor	You are required to discuss your research plan with an adult sponsor <i>before</i> experimentation and obtain a signature of approval. In reviewing (1A) Research Plan, your Sponsor should determine if additional forms and approvals as needed.
Record Observations and Results	<ul style="list-style-type: none"><li>• Keep a detailed journal of observations, data, and results. Your journal should contain data measurements and written notes about what you are sensing (hearing, seeing, or touching) about your experiment.</li><li>• If appropriate, photograph your project results or phases of the project to help your analysis and possibly to demonstrate your experiment on your exhibit board.</li></ul>
Analysis	<ul style="list-style-type: none"><li>• Explain your observations, data, and results. This is a summary of what your data has shown you.</li><li>• List the main points that you have learned.</li><li>• Why did the results occur? What did your experiment prove?</li><li>• Was your hypothesis correct? Did your experiment prove or disprove your hypothesis? This should be explained thoroughly.</li></ul>
Conclusion	<ul style="list-style-type: none"><li>• Answer your problem/purpose statement.</li><li>• What does it all add up to? What is the value of your project?</li><li>• What further study do you recommend given the results of your experiment? What would be the next question to ask?</li><li>• If you repeated this project, what would you change?</li></ul>
Submit Your Entry Forms	All forms are available at <a href="http://www.fwrsef.org">http://www.fwrsef.org</a> . The ISEF rules and forms can be obtained from the Society for Science & the Public website <a href="http://www.societyforscience.org">http://www.societyforscience.org</a> . Online Registration ( <a href="http://www.scienteer.com/register/fortworthregionalscienceengineeringfair">http://www.scienteer.com/register/fortworthregionalscienceengineeringfair</a> ) must be done by <b>January 20, 2017</b> .

## ***Project Categories***

Please visit <https://student.societyforscience.org/international-rules-pre-college-science-research> for a full description and definition of the Intel ISEF categories. Project categories may **not** be changed after **February 3, 2017**. **The FWRSEF reserves the right to combine and eliminate categories if a low participation is present.**

<b>Category</b>	<b>Description</b>
<b>ANIMAL SCIENCES</b>	Animal Behavior, Cellular Studies, Development, Ecology, Genetics, Nutrition & Growth, Physiology, Systematics & Evolution, Other
<b>BEHAVIORAL &amp; SOCIAL SCIENCES</b>	Clinical & Developmental Psychology, Cognitive Psychology, Physiological Psychology, Sociology & Social Psychology, Other
<b>BIOCHEMISTRY</b>	Analytical Biochemistry, General Biochemistry, Medicinal Biochemistry, Structural Biochemistry, Other
<b>BIOMEDICAL &amp; HEALTH SCIENCES</b>	Disease Diagnosis, Disease Treatment, Drug Development & Testing, Epidemiology, Nutrition, Physiology & Pathology, Other
<b>CELLULAR &amp; MOLECULAR BIOLOGY</b>	Cell Physiology, Genetics, Immunology, Molecular Biology, Neurobiology, Other
<b>CHEMISTRY</b>	Analytical Chemistry, Computational Chemistry, Environmental Chemistry, Inorganic Chemistry, Materials Chemistry, Organic Chemistry, Physical Chemistry, Other
<b>COMPUTATIONAL BIOLOGY &amp; BIOINFORMATICS</b>	Biomedical Engineering, Computational Pharmacology, Computational Biomodeling, Computational Evolutionary Biology, Computational Neuroscience, Genomics, Other
<b>EARTH &amp; ENVIRONMENTAL SCIENCES</b>	Atmospheric Science, Climate Science, Environmental Effects on Ecosystems, Geosciences, Water Science, Other
<b>EMBEDDED SYSTEMS</b>	Circuits, Internet of Things, Microcontrollers, Networking & Data Communications, Optics, Sensors, Signal Processing, Other
<b>ENERGY: CHEMICAL</b>	Alternative Fuels, Computational Energy Science, Fossil Fuel Energy, Fuel Cells & Battery Development, Microbial Fuel Cells, Solar Materials, Other
<b>ENERGY: PHYSICAL</b>	Hydro Power, Nuclear Power, Solar, Sustainable Design, Thermal Power, Wind, Other
<b>ENGINEERING MECHANICS</b>	Aerospace & Aeronautical Engineering, Civil Engineering, Computational Mechanics, Control Theory, Ground Vehicle Systems, Industrial Engineering-Processing, Mechanical Engineering, Naval Systems, Other
<b>ENVIRONMENTAL ENGINEERING</b>	Bioremediation, Land Reclamation, Pollution Control, Recycling & Waste Management, Water Resources Management, Other
<b>MATERIALS SCIENCE</b>	Biomaterials, Ceramic & Glasses, Composite Materials, Computation & Theory, Electronic, Optical & Magnetic Materials, Nanomaterials, Polymers, Other
<b>MATHEMATICS</b>	Algebra, Analysis, Combinatorics, Graph Theory, & Game Theory, Geometry & Topology, Number Theory, Probability & Statistics, Other
<b>MICROBIOLOGY</b>	Antimicrobials & Antibiotics, Applied Microbiology, Bacteriology, Environmental Microbiology, Microbial Genetics, Virology, Other
<b>PHYSICS &amp; ASTRONOMY</b>	Astronomy & Cosmology, Atomic, Molecular, & Optical Physics, Biological Physics, Computational Physics & Astrophysics, Condensed Matter & Materials, Instrumentation, Magnetics, Electromagnetics & Plasmas, Mechanics, Nuclear & Particle Physics, Optics, Lasers, Masers, Quantum Computation, Theoretical Physics, Other



**PLANT SCIENCES**

Agronomy, Ecology, Genetics/Breeding, Growth & Development, Pathology, Physiology, Systematics & Evolution, Other

**ROBOTICS & INTELLIGENT MACHINES**

Biomechanics, Cognitive Systems, Control Theory, Machine Learning, Robot Kinematics, Other

**SYSTEMS SOFTWARE**

Algorithms, Cybersecurity, Databases, Operating Systems, Programming Languages, Other

**Note: The FWRSEF reserves the right to combine categories if a low participation is present.**

## Basic Rules for Your Project

**Student Eligibility** - Any student in grades 6-8 (Division II) and grades 9-12 (Division I) who attends a public, private, or parochial school or is home schooled and who resides in Region XI and has NOT reached age 21 on or before May 1, 2017 preceding the Intel ISEF is eligible to enter the Fair. The region includes the counties of Cooke, Denton, Erath, Hood, Johnson, Palo Pinto, Parker, Somervell, Tarrant and Wise.

**Qualifications to Enter Fair** – Students who attend a school that does not have a District Fair and home schooled students may participate in the Regional Fair if their projects have been reviewed and recommended by at least one science teacher.

**Limitations on Participation** – No more than forty students may participate in the Fair from any one school in each division without prior permission from the fair director. Schools having students in Division I and II may send forty participants from each division to the Regional Fair.

**Ethics Statement** - 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 in affiliated fairs or the ISEF.

**Experiments involving Human and Vertebrate Subjects** – Students will be required to follow rules for the ISEF (rules can be found at <http://www.societyforscience.org/isef/rulesandguidelines>) for projects involving human or vertebrate subjects. Failure to follow these rules can result in disqualification.

### Additional rules

1. Each team and/or student may enter only one project per year.
2. When registering, you will select the appropriate category for your project (see the list of categories). You will have until 7 days before the FWRSEF (February 12, 2017) to request a change in your selected category. Note: The FWRSEF reserves the right to combine similar categories due to low number of entries for efficient use of space and judging resources.
3. You are encouraged to gather information from your teachers, trained or professional people, but the project must be done by the student.

4. A project may not be entered in the Fair, if it has previously been entered in any other Regional Fair or is an identical repetition of one shown by the same project or at previous Regional Fairs.
5. A student may again project research on a continuing problem provided the research shows significant progress when compared with the previous year. Continued research must include previous year(s)' abstract(s) and research report(s) as a part of the current year's display, as a separate notebook. This project year includes research conducted over the past 12-month period.
6. All projects involving humans must be submitted to an SRC for approval before experimentation begins.
7. A project with a death rate of 50 percent or greater in any group or subgroup will fail to qualify for competition.
8. Students should retain original signed copies of all forms. Do not send your originals.
9. Please read rules concerning human subject, nonhuman vertebrates, rDNA, pathogens, controlled substances, and human and animal tissue. Prior approval by an SRC/IRB is mandatory.
10. Incomplete registration forms will be returned to the teacher; science fair personnel will NOT fill out forms for you. The entry forms, validation forms, and all other documentation required in the FWRSEF rules MUST be submitted or delivered before the deadline for registration (see the Important Dates and Time Section for this information). No project will be registered after this date.
11. The *Checklist for Adult Sponsor/Safety Assessment Form*, a research plan and a maximum 250-word abstract must be part of the student papers.

### Rules for Team Projects

1. **Team Category** - To be consistent with the rules at ISEF, there is no longer a separate team category for awards. Team projects will compete with individual projects.
2. **Membership** - Teams may have up to three members. NOTE: Teams may not have more than three members at a local fair and then eliminate members to qualify for the Intel ISEF. Team membership cannot be changed during a given research year including converting to or from an individual project, but may be altered in subsequent years.

3. **Team Leader** - Each team should 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 the same rules and judging criteria as individual projects.
4. **Forms** - Each team member must fill out all the required forms and submit an Approval Form 1B. Each team member must also jointly submit the Checklist for Adult Sponsor Form 1, Student Checklist Form 1A, Abstract, Research Plan and any other required forms.

### **Travel Awards to International ISEF (Only Division I)**

The 1<sup>st</sup> places in each category (including team category) are eligible to compete for the Best of Fair against other categories. Up to **6 projects** may be selected from all categories to participate in the [2017 Intel International Science and Engineering Fair](#) in Los Angeles, California (**May 14-19, 2017**). FWRSEF reserves the right to determine the number of projects advanced to the international fair based on the Judge Committee's recommendation. Travel sponsorship is capped at **\$1,500** for individual project, **\$3,000** for team project. Only actual reasonable expenditures for teams, individual, and sponsors will be reimbursed. Parents are welcomed to attend, but will need to support their own expenses unless invited by the Board of Trustees as an adult sponsor. A follow up email will be sent to all ISEF participants and parents shortly after the Regional Fair.

## Information for Displaying Your Project at the Fair

Don't try and complete your project when setting it up for exhibit. Materials and tools will not be available. When you bring your project to the exhibit hall it should be ready for display. Since your project is on public exhibition, normal wear and tear should be expected. While we make every effort to provide security for projects, we cannot ensure a project will not be damaged during exhibition. Loose items and items of value should be locked, wired down, or fixed to a base. Neither the Science Fair Committee nor its sponsors assume any responsibility for loss or damage.

### Display Restrictions

The following items are **NOT ALLOWED** to be displayed with the project:

- No living organisms, including plants, taxidermy specimens or parts, preserved vertebrate or invertebrate animals, human or animal food are permitted at the display.
- Human/animal parts or body fluids (for example, blood, urine) (Exceptions: teeth, hair, nails, dried animal bones, histological dry mount sections, and completely sealed wet mount tissue slides).
- Plant materials (living, dead or preserved) usually which were part of the scientific experimentation and which are in their raw, unprocessed, or non-manufactured state (Exception: manufactured construction materials used in building the project or display).
- Laboratory/household chemicals including water (Exceptions: water integral to an enclosed apparatus or water supplied by the Display and Safety Committee).
- Poisons, drugs, controlled substances, hazardous substances or devices (for example, firearms, weapons, ammunition, reloading devices).
- Dry ice or other sublimating solids.
- Sharp items (for example, syringes, needles, pipettes, knives).
- Flames or highly flammable materials.
- Batteries with open-top cells.
- Awards, medals, business cards, flags, etc. (Exception: The current year Intel ISEF medal may be worn at all times).
- Photographs or other visual presentations depicting vertebrate animals in surgical techniques, dissections, necropsies, or other lab procedures.
- Active Internet or e-mail connections.

*Please note the following items are allowed at the project, but with specific restrictions.* Projects will be checked before exhibition and any items identified in violation will be removed from the project to ensure the safety of the general public:

- Soil or waste samples are permitted if permanently sealed in a slab of acrylic.
- Any device with unshielded pinch points or moving parts such as belts, pulleys, or chains may be displayed, but not operational.
- Class II lasers are permitted only if:
  - a) Operated only by the student.
  - b) Operated only during Display and Safety inspection and during judging.
  - c) Labeled with a sign reading "Laser Radiation: Do Not Stare Into Beam".
  - d) Enclosed in protective housing that prevents physical and visual access to beam.
  - e) Disconnected when not operating.
- Class III and IV lasers may not be operated.
- Large vacuum tubes or dangerous ray-generating devices if properly shielded.
- Pressurized tanks that contained non-combustibles if properly secured.
- Any apparatus producing temperatures that will cause physical burns if adequately insulated.

### Electrical Requirements

- *Limited on-site electricity will be provided for project display based on availability. If your project requires power source, please inform the fair director as soon as possible and you could also bring a portable battery to the competition.*
- All electrical connectors, wiring, switches, extension cords, fuses, etc. must be UL-listed and must be appropriate for the load and equipment. Connections must be soldered or made with UL-listed connectors. Wiring, switches, and metal parts must have adequate insulation and over current safety devices (such as fuses) and must be inaccessible to anyone but the student. Exposed electrical equipment or metal that is liable to be energized must be grounded or shielded with a non-conducting material or with a grounded metal box or cage to prevent accidental contact.
- Wiring which is not part of a NRTL Listed appliance or piece of equipment must have a fuse

or circuit breaker on the supply side of the power source and prior to any project equipment.

- There must be an accessible, clearly visible on/off switch or other means of disconnect from the 120 Volt power source.
- All electrical work must conform to the National Electrical Code or exhibit hall regulations.
- Any device that generates considerable heat must be turned off when the finalist is not present.

### **Maximum Project Size**

- 30 inches (76 centimeters) deep
- 48 inches (122 centimeters) wide
- 108 inches (274 centimeters) high including table

**Note:** Fair-provided tables will not exceed a height of 36 inches (91 centimeters).

### **What are required to be Visible at the Project**

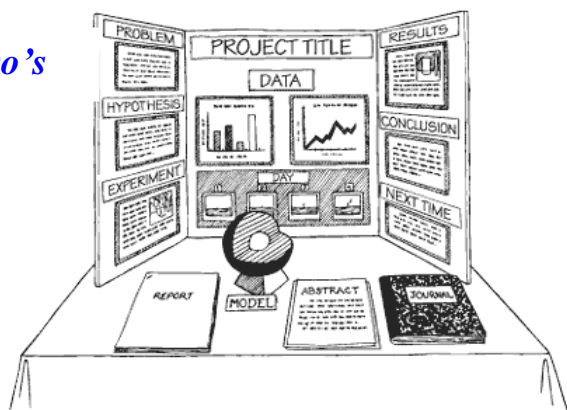
- Original Abstract approved by the Scientific Review Committee.
- Scientific Review Committee approval form (Printed form received on-site at registration).
- Registered Research Institutional/Industrial Setting Form (1C) - if applicable to the project.
- Continuation Project Form (7) - if applicable.

### **Helpful Hints**

- Place all typed material on a colored backing, such as construction paper. Leave a border of 1/4 to 1/2 inch (0.63 to 1.25 cm) around the edges of each piece of typed material. Use a paper cutter so that the edges will be straight.
- Make the project title stand out by using larger letters for it and smaller letters for the headings.
- To arrange the letters on the backboard, first lay the letters out on the board without attaching them. Then, use a yardstick (meter stick) and pencil to draw a straight, light guideline where the bottom of each letter should line up. This will help you keep the lettering straight. Before adhering everything, ask the opinion of other students, teachers, or family members.
- Bring an emergency kit with extra letters, glue, tape, construction paper, backboard, stapler, scissors, pencils, pens, touch-up paint, markers, and so forth. This kit should contain anything that you think you might need to make last-minute repairs to the display.
- Reminder about mortality rates on experiments for vertebrates.
- Reminder about not conducting experiments with pathogens or biological agents in the home. These must be done in a laboratory.

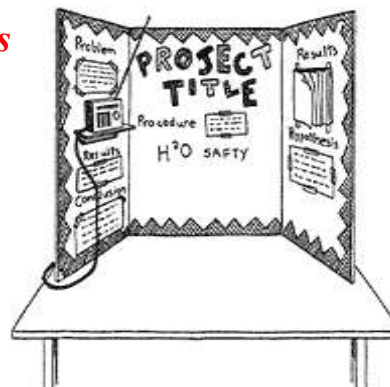
## Project Display 101

### Do's



- **Do** use computer-generated graphs.
- **Do** display photos representing the procedure and the results.
- **Do** use contrasting colors.
- **Do** limit the number of colors used.
- **Do** display models when applicable. If possible, make the models match the color scheme of the backboard.
- **Do** balance the arrangement of materials on the backboard. This means evenly distributing the materials on the board so that they cover about the same amount of space on each panel.
- **Do** use rubber cement or double-sided tape to attach papers. White school glue causes the paper to wrinkle.
- **Do** attach charts neatly. If there are many, place them on top of each other so that the top chart can be lifted to reveal the ones below.

### Don'ts



- **Don't** hand-print the letters on the backboard.
- **Don't** attach folders that fall open on the backboard.
- **Don't** make mistakes in spelling words or writing formulas
- **Don't** leave large empty spaces on the backboard.
- **Don't** hang electrical equipment on the backboard so that the electric cord runs down the front of the backboard.
- **Don't** leave the table in front of the backboard empty. Display your models (if any), report, copies of your abstract, and your journal here.
- **Don't** make the title or headings hard to read by using uneven lettering, words with letters of different colors, or disorganized placement of materials.
- **Don't** use glass in the display.

## Required Documentation for Your Project

### Checklist for Required Documents

Every student who enters the Fair, in both Division I and II must complete and submit the Checklist for Adult Sponsor, Research Plan (1A) and Approval Form (1B). Some categories require additional forms. See examples in the following checklist.

**Note:** All required forms must be submitted with the FWRSEF Entry Forms. You will be automatically informed which forms to fill during online registration in Scienteer.

	250 Word Abstract	Checklist for Adult Sponsor	Research Plan	1A Attachment Form	Approval Form	Institutional/Industrial Setting Form	Qualified Scientist Form	Designated Supervisor Form	Human Participant Form	Informed Consent Form	Non-human Vertebrate Animal Form	Human and animal tissue form	Continuation Projects Form
		1	1A	1A	1B	1C	2	3	4A	4B	5	6	7
Animal Sciences	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Behavioral & Social Sciences	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Biochemistry	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Cellular & Molecular Biology	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Chemistry	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Computer Science	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Earth Science	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Eng: Electrical & Mechanical	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Eng: Materials & Bioengineering	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Energy & Transportation	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Environmental Management	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Environmental Sciences	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Mathematical Sciences	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Medicine and Health	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Microbiology	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Physics and Astronomy	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*
Plant Sciences	✓	✓	✓	✓	✓	*	*	*	*	*	*	*	*

✓ = Required for all projects.

\* = May be required for your project. See ISEF Rules at: <http://www.societyforscience.org/isef/rulesandguidelines>

## Judging

Division I and Division II projects will be judged separately. Each project will be judged on its own merits in competition with other projects. The judges will use the items to be considered in judging as listed and will consider the degree to which standards are met. Each of the criteria has a maximum value as listed. The judges will evaluate each project on a point basis.

Judges look for well thought-out research. They look at how significant your project is in its field, as well as how significant it is to the student. They look to see if they feel anything was left out. Such as: Did you start with five experiments and only present the data for three of them?

### Evaluation Criteria for Category Judging

*The criteria and questions below are used by the Grand Awards Judges of the Intel ISEF and is suggested as a guide for your category judging. Scientific Thought and Engineering Goals are separated into "Ila" and "Iib" to be used appropriately by category. There are also added questions for team projects.*

#### I. Creative Ability (Individual—30, Team—25)

1. Does the project show creative ability and originality in the questions asked?
  - the approach to solving the problem?, the analysis of the data?, the interpretation of the data?
  - the use of equipment?, the construction or design of new equipment?
2. Creative research should support an investigation and help answer a question in an original way.
3. A creative contribution promotes an efficient and reliable method for solving a problem. When evaluating projects, it is important to distinguish between gadgeteering and ingenuity.

#### II a. Scientific Thought (Individual - 30, Team - 25)

*For an engineering project, or some projects in categories such as computer science and mathematical sciences, the more appropriate questions are those found in "Iib". Engineering Goals.*

1. Is the problem stated clearly and unambiguously?
2. Was the problem sufficiently limited to allow plausible approach? Good scientists can identify important problems capable of solutions.
3. Was there a procedural plan for obtaining a solution?
4. Are the variables clearly recognized and defined?

5. If controls were necessary, did the student recognize their need and were they correctly used?
6. Are there adequate data to support the conclusions?
7. Does the Finalist or team recognize the data's limitations?
8. Does the Finalist/team understand the project's ties to related research?
9. Does the Finalist/team have an idea of what further research is warranted?
10. Did the Finalist/team cite scientific literature, or only popular literature (i.e., local newspapers, Reader's Digest).

#### II b. Engineering Goals (Individual—30, Team—25)

1. Does the project have a clear objective?
2. Is the objective relevant to the potential user's needs?
3. Is the solution workable? Acceptable to the potential user? Economically feasible?
4. Could the solution be utilized successfully in design or construction of an end product?
5. Is the solution a significant improvement over previous alternatives?
6. Has the solution been tested for performance under the conditions of use?

#### III. Thoroughness (Individual—15, Team—12)

1. Was the purpose carried out to completion within the scope of the original intent?
2. How completely was the problem covered?
3. Are the conclusions based on a single experiment or replication?
4. How complete are the project notes?
5. Is the Finalist/team aware of other approaches or theories?
6. How much time did the finalist or team spend on the project?
7. Is the finalist/team familiar with scientific literature in the studied field?

#### IV. Skill (Individual—15, Team—12)

1. Does the finalist/team have the required laboratory, computation, observational and design skills to obtain supporting data?
2. Where was the project performed (i.e., home, school laboratory, university laboratory)? Did the student or team receive assistance from parents, teachers, scientists or engineers?
3. Was the project completed under adult supervision, or did the student/team work largely alone?



4. Where did the equipment come from? Was it built independently by the Finalist or team? Was it obtained on loan? Was it part of a laboratory where the Finalist or team worked?

**V. Clarity (Individual—10, Team—10)**

1. How clearly does the Finalist discuss his/her project and explain the purpose, procedure, and conclusions? Watch out for memorized speeches that reflect little understanding of principles.
2. Does the written material reflect the Finalist's or team's understanding of the research?
3. Are the important phases of the project presented in an orderly manner?
4. How clearly is the data presented?
5. How clearly are the results presented?

6. How well does the project display explain the project?
7. Was the presentation done in a forthright manner, without tricks or gadgets?
8. Did the Finalist/team perform all the project work, or did someone help?

**VI. Teamwork (Team Projects only—16)**

1. Are the tasks and contributions of each team member clearly outlined?
2. Was each team member fully involved with the project, and is each member familiar with all aspects?
3. Does the final work reflect the coordinated efforts of all team members?

Detailed description can be found in the following website  
<http://www.societyforscience.org/isef/rulesandguidelines>  
<http://www.societyforscience.org/document.doc?id=31>

## Awards

A select committee for each division composed of scientists with appropriate backgrounds will determine our Fair's winners for each division separately. First place winners in each category of each division are automatically included as those projects considered for Best of Fair competition within a division. No other winning projects are entered for Best of Fair consideration.

In addition to the category awards, numerous special awards are offered by the sponsors of our Fort Worth Regional Science and Engineering Fair, as well as national ISEF sponsors. Judging teams provided by these businesses and professional organizations select their special award winners based on criteria reflective of the mission and objectives of those organizations.

**School trophies** will be awarded to the senior high school and either junior high or middle school with the best overall collection of projects, based on quality and extent of participation.

**Best Teacher trophies** will be awarded to three high school and three middle school teachers with the best overall collection of projects, based on quality and extent of participation.

Ribbons and other awards will be given to category winners. Many sponsors also award plaques, ribbons, and other prizes.

Please be aware that the number of awards per category (including team projects) will be determined based on the number of entries per category. Determination of the actual number of awards is up to the board. Each entrant will receive a Certificate of Participation

## ***Adults Involved in a Science Project***

### **Adult Sponsor**

An Adult Sponsor may be a teacher, parent, university professor, or 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 ultimately responsible not only for the health and safety of the student conducting the research, but also for the humans or animals used as subjects. The Adult Sponsor must review the **student's Research Plan (1A)** to make sure that: **(a)** experimentation is done within local, state, and federal laws and these International Rules; **(b)** that forms are completed by other adults involved in approving or supervising any part of the experiment; and **(c)** that criteria for the qualified scientist adhere to those set forth in the Operational Guidelines.

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 or non-human animals, and cell cultures, microorganisms, or animal tissues. The issues must be discussed with the student when completing the **Research Plan (1A)**. Some experiments involve procedures or materials that are regulated by state and federal 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 International Science and Engineering Fair.

### **Qualified Scientist**

A Qualified Scientist should possess an earned doctoral/professional degree in the biomedical sciences. However, a master's degree with equivalent experience and/or 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 the 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 outlined above.

A student may work with a Qualified Scientist in another city or state. In this case, the student must work locally with a Designated Supervisor (see below) who has been trained in the techniques the student will use.

### **Designated Supervisor**

The Designated Supervisor is an adult who supervises a student's experiment. In the case of hazardous substances or devices, a Designated Supervisor is directly responsible for overseeing student experimentation. A Qualified Scientist may or may not be necessary. The Designated Supervisor need not have an advanced degree, but should 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 are in a situation where their behavior or habitat is influenced by humans, the Designated Supervisor must be knowledgeable about the humane care and handling of the animals. If the Designated Supervisor is not knowledgeable, the Adult Sponsor must ensure that the student enlists the help of an Animal Care Supervisor.

### **Animal Care Supervisor**

The Animal Care Supervisor is required for all non-human vertebrate animal projects and must be familiar with the proper care and handling of research animals used in the project. The Qualified Scientist or Designated Supervisor or animal care professional usually serves as the Animal Care Supervisor.

## ***Responsibilities of Faculty Sponsors***

It is the responsibility of the adult sponsor (Teacher) to complete the Checklist, Safety Assessment form, **Research Plan (1A)** and **Approval Form (1B)** prior to the beginning of the project for each student. The teacher is also responsible for seeing that all students comply with all rules and regulations governing required documentation for ALL research projects (particularly vertebrate tissue, recombinant DNA, non-human vertebrates, pathogens, controlled and hazardous substances, and human research). The teacher is also responsible for compliance with all safety precautions and basic rules for exhibitors as set forth in the FWRSEF rules and in the rules of the International Science and Engineering Fair. A copy of the ISEF rules can be obtained from the ISEF Website:

<http://www.societyforscience.org/isef/rulesandguidelines>.

### **FWRSEF rules:**

1. Zebrafish embryos are not considered vertebrate animals until 168 hours after fertilization.
2. Laboratory studies culturing Klebsiella Pneumonia must be conducted in a BSL-2 laboratory with documented IBC review and approval
3. Self sampling of capillary blood for analysis can be conducted in a home setting (e.g. glucometer reading).

## Scientific Review Committee / Institutional Review Board Approval

SRC or IRB approval must occur before the beginning of projects involved with human participants, non-human vertebrate animals, pathogenic agents, controlled substances, recombinant DNA, human or animal tissues.

### School administers their own SRC or IRB

- A. An SRC or IRB may be constituted at the local school with appropriately qualified personnel (see ISEF Rules).
- B. If a local school science fair establishes an SRC or IRB it must be registered each year with the Fort Worth Regional Science & Engineering Fair before December 9, 2016. Register the SRC or IRB by sending a letter of notification including names and qualifications of committee members to the Science Fair Director see page 1 for contact information.
- C. To ensure project can participate in the State and International Fairs, the local SRC/IRB should follow the guidelines given in the International Science and Engineering Fair Rules at <http://www.sciserv.org/isef>.
- D. If a school uses a local SRC/IRB, then student projects **DO NOT** have to be reviewed by the FWRSEF SRC/IRB as indicated in section G. Students must submit all necessary forms with entry forms at the time of registration.

An SRC must consist of a minimum of three persons. Additional members are recommended to avoid conflict of interest. The SRC must include:

- a biomedical scientist (Ph.D., M.D., D.V.M., D.D.S., or D.O.)
- a science teacher
- at least one other member

### Affiliated Fair Scientific Review Committee (SRC)

- If the student lives in a rural area and does not have access to a degreed biomedical scientist, the student or SRC must enlist the services of someone from another geographic area. These rules and necessary forms should be sent to that person so he or she is familiar with the procedures.
- One of the SRC members must be familiar with proper animal care procedures when animal research is involved.
- Neither the Adult Sponsor, parents, nor the Qualified Scientist who oversees a specific project is permitted to serve on the SRC or IRB reviewing that project. Consequently, neither the Adult Sponsor nor the Qualified Scientist may sign the SRC portion of Approval Form (1B). This eliminates conflict of interest.

### School does not want to administer their own SRC or IRB

- A. If a local school science fair **DOES NOT** establish an SRC or IRB, then it must use the FWRSEF SRC/IRB.
- B. The FWRSEF SRC will meet once per month from September through January of the fair year.
- C. **All necessary documents must be sent to**

**University of Texas Arlington  
Dr. Michael Roner  
Department of Biology  
Box 19498  
Arlington, TX 76019**

Email: [roner@uta.edu](mailto:roner@uta.edu)

## **An SRC follows this three-step process:**

- Step 1** Before experimentation, the SRC reviews and approves experimental procedures for projects involving human participants, non-human vertebrates, pathogenic agents, controlled substances, recombinant DNA, and human/animal tissue to make sure they comply with the Rules and any pertinent laws. Human studies reviewed and approved by a properly constituted IRB do not have to be reviewed by the SRC until Regional Fair competition.
- evidence of library search
  - evidence of proper supervision
  - use of accepted research techniques
  - completed forms, signatures and dates
  - humane treatment of animals
  - compliance with rules and laws governing human and animal research
  - appropriate use of recombinant DNA, pathogenic organisms, controlled substances, tissues and hazardous substances and devices
  - appropriate documents and substantial expansion for continuation projects
- Step 2** After experimentation and shortly before the Regional Fair, the SRC reviews and approves those same projects to make sure that students followed the approved Research Plan (1A) and the Rules.
- Step 3** After experimentation and shortly before the Regional Fair, the SRC also reviews all remaining projects to make sure students followed the applicable Rules.

It is important that students retain all original signed forms. Even though copies may have been sent with registration papers, students should bring original signed forms to the Intel ISEF in case an SRC interview is necessary. Do not send original forms to Science Service.

## **Before Beginning Experimentation**

The committee will periodically review submitted projects and approve them or show where violations may be corrected to bring them into compliance with ISEF rules. Teachers will be notified of approval or recommendations for compliance. It is the responsibility of the teacher to inform students when approval or compliance recommendations are made.

A list of submitted projects will be maintained through January 21, 2017. No projects will be accepted for approval after this date. If entry forms are received at the time of registration and there is no evidence that a project has been reviewed by a local SRC/IRB or the FWRSEF SRC, then the project will not be entered into the FWRSEF. If the local SRC/IRB violates rules established by Intel ISEF rules, the FWRSEF reserves the right to disqualify the entry.

## **Affiliated Fair Institutional Review Board (IRB)**

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

An IRB at the school or ISEF Affiliated Fair level must consist of a minimum of three members. Additional members are recommended to avoid conflict of interest. The IRB should include:

- (a) a science teacher
- (b) a school administrator
- (c) and one of the following: a psychologist, psychiatrist, medical doctor, physician's assistant, or registered nurse

Due to federal regulations requiring local community involvement, an IRB should be established at the school level to deal with human research projects. If it is impossible to establish an IRB at the school, the teacher/school should contact the ISEF-Affiliated Fair Director for assistance in evaluating human research prior to experimentation.

### **Special Notes on the IRB**

- (a) If the project is behavioral, a psychologist, psychiatrist, or individual with human behavioral training must serve on the IRB.
- (b) For subjects under 18, student researchers must obtain written informed consent from all subjects and their parent/guardian when more than minimum risk is involved.
- (c) Neither the Adult Sponsor, parents, nor the Qualified Scientist who oversees a specific project is permitted to serve on the SRC or IRB reviewing that project. Consequently, neither the Adult Sponsor nor the Qualified Scientist may sign the SRC portion of Approval Form (1B). This eliminates conflict of interest.

## ***Related Websites and Project Ideas***

<http://www.fwrsef.org>

Fort Worth Regional Science and Engineering Fair web site

Here you can find copies of forms,  
rules, dates, past fairs, contact information

<https://www.txsef.org/>

Texas State Fair Website

<https://student.societyforscience.org/intel-isef>

Intel International Science and Engineering Fair Website

These forms in their most current form are available for download from

<https://student.societyforscience.org/forms>

<https://student.societyforscience.org/broadcom-masters>

Broadcom MASTERS

<http://www.easybib.com/>

The free automatic bibliography and citation maker

<http://easyscience.com/>

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