SOUTHERN UTAH SCIENCE & ENGINEERING FAIR

Friday, March 31, 2017

Southern Utah University
Sharwan Smith Center and Multipurpose Gym
http://suu.edu/cose/fair/

SUSEF is a regional science competition for students in grades 5-12 in southern and eastern Utah. It has been affiliated with the Intel International Science and Engineering Fair (ISEF) since 1974.

Dear School Principals, Teachers, and Parents,

In these pages you will find rules and links to entry forms for the 2017 Southern Utah Science & Engineering Fair's (SUSEF's) Junior Fair. The SUSEF Committee would like to invite you and your students in grades 5-12 to participate.

Please note that SUSEF Junior Fair and SUSEF Senior Fair have different categories and separate rules and entry forms. Be sure you have the correct forms for your grade level. Carefully read through the Scientific Review Checklist! If you have any questions about the admissibility of a research plan, please contact the Scientific Review Committee Chair or Fair Director *before* experimentation begins.

Changes and Updates for 2017

- Registration will be online for the 2017 Fair. We are using the same system as last year that should continue to make registration more seamless. To register teachers must first register their school, then register as a teacher and choose their school. Then, students may register and choose their appropriate school and teacher. Students interested in ISEF must complete the additional ISEF forms after registration.

- This year's Registration Deadline is **Friday, February 10**. SUSEF entry fees for 2017 are **$20.00 per student**. Please note that in the case of a team project, each team member pays the entry fee.

- The Late Registration Deadline is **Wednesday, March 1.** Late registration fees are **$25.00 per student**.

- SUSEF participants should compete in a school or district science fair prior to entering SUSEF. These

"feeder" fairs must limit the projects they send to SUSEF to one of the following: *either* a total of 40 projects, *or* the top three projects in each category.

A science fair project is the ultimate answer to the often asked student question: "Why do I need to learn this stuff, anyway?" It integrates, into one functional activity, virtually all of the skills and arts that are usually taught separately (sometimes not at all or without obvious "purpose") in many schools. When brought to completion, the project is an amalgamation of reading, writing, spelling, grammar, math, statistics, ethics, logic, critical thinking, computer science, graphic arts, scientific methodology, self-learning of one or more technical or specialty fields, and (if the project qualifies for formal competition) public speaking and defense in front of expert judges. Perhaps it is the only educational activity that allows the students to teach themselves, to take from the established information what they need to discover something exciting and new, and to identify and choose the tools that they need to conduct and conclude their project. When science fair projects are repeated, year after year through junior and senior high school, the science fair process yields mature, self-confident, skilled, and competitive young leaders who have career goals and the preparation, discipline, and drive to attain them.
    —*Greater San Diego Science and Engineering Fair*

This booklet will provide you with the basic information needed to get started on your project. The forms referenced are only the forms needed for ALL projects. Some projects may require additional forms.

Good luck, and we'll see you at the fair!

The Southern Utah Science & Engineering Fair Committee

CATEGORY DESCRIPTIONS

Students may compete as individuals or in teams with a maximum of three members. Each category is judged separately. Team projects are judged alongside individual projects; however, teamwork is taken into account.

PROJECT CATEGORIES

1.   Animal Sciences
Animal development, dietary studies, behavior, ecology, genetics, animal husbandry, physiology, systematics, etc.

2.   Behavioral and Social Sciences
Human behavior or physical activities. Clinical and developmental psychology, cognitive psychology, physiological psychology, sociology, etc.

3.   Chemistry
Analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, physical chemistry, general chemistry, etc.

4.   Earth and the Environment
Climatology, weather, geology, planetary science, tectonics, etc. Pollution or quality of air, water, or soil. Bioremediation, ecosystems, environmental engineering, land resource management, forestry, recycling, waste management, etc.

5.   Engineering
Bioengineering, civil engineering, construction engineering, chemical engineering, industrial engineering, aerospace engineering, processing, material science, electrical engineering, computer engineering, controls, mechanical engineering, thermodynamics, solar, alternative fuels, renewable energies, vehicle development, robotics, etc.

6. *Math and Computer Science*
Algebra, analysis, applied mathematics, geometry, probability and statistics, algorithms, data bases, artificial intelligence, networking and communications, computational science, computer graphics, software engineering, programming languages, computer system, operating system, etc.

7. *Medicine and Health*
Disease diagnosis and treatment, epidemiology, genetics, molecular biology of diseases, physiology/pathophysiology, metabolism, immunology, etc

8. *Physics and Astronomy*
Astronomy, atoms, molecules, solids, biological physics, instrumentation and electronics, magnetics and electromagnetics, nuclear and particle physics, optics, lasers, masers, theoretical physics, theoretical or computational astronomy, etc.

9. *Plant Sciences*
Agriculture/agronomy, development, ecology, genetics, photosynthesis, plant physiology (molecular, cellular, organismal), plant systematics, evolution, etc.

10. *Product Testing and Consumer Sciences*
Product comparisons, product development, advertising claims, consumer chemistry, foods and food preparation, etc.

THE PROCESS OF SCIENCE
(Excerpted from the Intel ISEF 2008 Student Handbook)

The ISEF and Affiliated Fairs are research (data) driven. Students design research projects that provide quantitative data through experimentation followed by analysis and application of that data. Projects that are demonstrations, 'library' research or informational projects, 'explanation' models or kit building are *not* appropriate for research based science fairs.

The Scientific Method
1. Be curious, choose a limited subject, ask a question; identify or originate/define a problem. It is important that this question be a 'testable' question – one in which data is taken and used to find the answer. The question should not merely be an 'information' question where the answer is obtainable through literature research.
2. Review published materials related to your problem or question. This is called background research.
3. Evaluate possible solutions and guess why you think it will happen (hypothesis).
4. Experimental design (procedure). In designing the experiment, it is critical that only one variable – a condition that may effect the results of the experiment – is changed at a time. This makes the experiment a 'controlled' experiment.
5. Challenge and test your hypothesis through data collection and analysis of your data. Use graphs to help see patterns in the data.
6. Draw conclusions based on empirical evidence from the experiment.
7. Prepare your report and exhibit.
8. Review and discuss the findings with peer group/professional scientists
9. New question(s) may arise from your discussions. This sets the stage for another research project as new questions are raised from others and the process repeats itself. The hypothesis often changes during the course of Supporting your hypothesis is secondary to what is learned and discovered during the research.

Not all areas of study are best served by scientific method-based research. Because engineers, inventors, mathematicians, theoretical physicists, and computer programmers have different objectives than those of other scientists, they follow a different process in their work. The process that they use to answer a question or solve a problem is different depending on their area of study. Each one uses their own criteria to arrive at a solution.

Engineering Projects

"Scientists try to understand how nature works; engineers create things that never were." An engineering project should state the engineering goals, the development process and the evaluation of improvements. Engineering projects may include the following:
1) Define a need or "How can I make this better?"
2) Develop or establish design criteria (could be more than one)
3) Do background research and search the literature to see what has already been done or what products already exist that fill a similar need. What make them good and what makes them weak?
4) Prepare preliminary designs and a materials list. Consider costs, manufacturing and user requirements.
5) Build and test a prototype of your best design. Consider reliability, repair and servicing.
6) Retest and redesign as necessary. Product testing.
7) Present results

Computer Science Projects

These often involve creating and writing new algorithms to solve a problem or improve on an existing algorithm. Simulations, models or 'virtual reality' are other areas on which to conduct research.

Mathematics Projects

These involve proofs, solving equations, etc. Math is the language of science and is used to explain existing phenomena or prove new concepts and ideas.

Theoretical Projects

These projects may involve a thought experiment, development of new theories and explanations, concept formation or designing a mathematical model.

ADULTS INVOLVED IN SCIENCE FAIR PROJECTS

The 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 and animals used as subjects. The Adult Sponsor must review the student's Research Plan and Student Checklist to make sure that experimentation is done according to all SUSSEF rules. This person is also responsible for making sure that all paperwork is filled our completely and properly.

The Designated Supervisor

The Designated Supervisor is an adult who is directly responsible for overseeing student experimentation. The Adult Sponsor may act as the Designated Supervisor. If the 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.

Institutional Review Board

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 subjects. All proposed human research must be approved prior to experimentation. This includes any surveys or questionnaires to be used in a project. An IRB must consist of a least three members: a science teacher, a school administrator, and a psychologist, psychiatrist, medical doctor, physician's assistant, or registered nurse. The Adult Sponsor, parents, Qualified Scientist, or the Designated Supervisor overseeing a project must not serve on the IRB reviewing that project.

Scientific Review Committee

A Scientific Review Committee (SRC) is a group of qualified individuals responsible for evaluation of student research, certifications, research plans, and exhibits for compliance with the rules and pertinent laws and regulations. An SRC must consist of a minimum of three members. Ideally, these would include a biomedical scientist, a science teacher, and a school administrator. An SRC examines projects for the following:

  a. evidence of literary research
  b. evidence of proper supervision
  c. use of accepted and appropriate research techniques
  d. completed forms, signature, and dates
  e. evidence of search for alternatives to animal use
  f. humane treatment of animals
  g. compliance with rules and laws governing human and animal research
  h. compliance with rules regarding hazardous biological agents
  i. documentation of substantial expansion for continuation project
  j. compliance with the ISEF ethics statement.

HELP ON THE WEB

http://suu.edu/cose/fair/

Our site. Rules, dates, photo albums, forms, and links.

http://www.sciencebuddies.org/

Includes a topic selection wizard, project ideas, and a mentoring system.

http://www.societyforscience.org/isef

The site for the Intel International Science and Engineering Fair.

JUDGING
(Excerpted from the Intel ISEF 2008 Student Handbook)

Initially, judges get their information from your board, abstract and research paper to learn what the project is about, but it is the *interview* that will be the final determination of your work. Judges applaud those students who can speak freely and confidently about their work. They are not interested in memorized speeches or presentations – they simply want to *talk* with you about your research to see if you have a good grasp of your project from start to finish.

Judges often ask questions to test your insight into your projects such as: "How did you come up with this idea? "What was your role?", "What didn't you do?", "What further plans do you have to continue research?" and "What are the practical applications of your project?" Remember that the judges need to see if you understand the basic principles of science behind your project or topic area. They want to determine if you have correctly measured and analyzed the data. They want to know if you can determine possible sources of error in your project and how you might apply your findings to the 'real' world. Finally, the judges seek to encourage you in your scientific efforts and your future goals/career in science. Relax, smile and enjoy your time to learn from them and accept their accolades for your fine work

SUSEF JUDGING CRITERIA (points)

	Individual	Team
Creative Ability	30	25
Scientific Thought	30	25
Thoroughness	15	12
Skill	15	12
Clarity	10	10
Teamwork	--	16
Total	100	100

YOUR DISPLAY BOARD, OR:
You Never Get a Second Chance to Make a First Impression!

Your goal is to attract and inform the casual observer. Make your work easy to understand!

1. Create a Good Title
Your title is an extremely important attention grabber. A good title should simply and accurately present your research. The title should make the casual observer want to know more.

2. Take Photographs
Many projects involve elements that may not be safely exhibited at the fair, but are an important part of the project. You might want to take photographs of important parts/ phases of your experiment to use in your display. Photographs or other visual images of human test subjects must have informed consent. Credit must be given for all photographs.

3. Be Organized
Make sure your display is logically presented and easy to read. A glance should allow for anyone (especially judges) to locate the title, experiments, results, and conclusions. When you arrange your display, imagine that you are seeing it for the first time.

4. Make It Eye Catching
Make your display stand out. Use neat, colorful headlines, charts, and graphs to present your project. Pay special attention to the labeling of graphs, charts, diagrams, and tables. Anyone should be able to understand the visuals without further explanation.

5. Have It Correctly Presented and Well Constructed
Be sure to adhere to the size limitations and safety rules when preparing your display. Leave your glassware and chemicals at home. Make sure your display is sturdy, as it will need to remain intact for quite a while.

2017 SUSEF SPONSORS

SPECIAL THANKS

The Southern Utah Science & Engineering Fair would like to express our gratitude to the many judges who volunteered their time and expertise; and also to the dedicated teachers and advisers who worked all year with the students to help make our SUSEF 2016 fair a success.

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Southern Utah Science & Engineering Fair Committee, 2017

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