BraiNWaves

The Energy of Science

South Shore Regional School Board
Science Fair 2011/2012

Teacher / Student Guide

April 12-14, 2012
Nova Scotia Community College
Bridgewater, NS

South Shore Regional School Board
NOVA SCOTIA, CANADA

This guide is designed to assist you in preparing your Science Fair Project. It includes the information you will need to spark an idea, to plan and research your project. Good luck!

If you have questions, please call the following Science Fair Committee members:

Jane Berrigan -	Bridgewater Jr./Sr. High School
Gaston Comeau -	South Shore Regional School Board
Chad Frittenburg -	Bayview Community School
Brittany Hachey-	Hebbville
Ed Kelly-	Forest Heights
Stephanie Lowe-	PVEC
Tanya Lush-Dobrowolski	NSCC
Aaron Russell-	South Shore Regional School Board

Who is eligible?

To be eligible, students must:

- Be in grades 6 -12, although only students in grades 7-12 will be eligible to advance to the Canada-wide Science Fair. The Canada-wide Science Fair for 2012 will be held in Charlottetown, PEI.
- Submit an individual project OR submit with a group of NO MORE THAN TWO people. **Both participants must be present for judging**.
- Extenuating circumstances will be dealt with on an individual bases with 5 working days notice prior to the regional fair.
- A maximum of four students (representing individual or group projects) will advance to the Canada-wide Science Fair.

Participant Regulations

1. The science fair committee has the right to exclude exhibits that may be dangerous to the exhibitors; visitors or the premises.

2. An exhibitor may not leave his/her project unattended when the fair is open to the public unless someone responsible stands in for him.

3. Only participants, judges, and the members of the science fair committee are permitted in or near the judging area during judging.

The Canada Wide Science Fair is a week long event held in a different province each year in the month of May. This year the Canada-Wide Science Fair 2012 will be held in Charlottetown, Prince Edward Island, from May 12-19. **As well, as part of the Nova Scotia Team, Canada Wide Science Fair finalists must also attend the Nova Scotia Showcase – a three-day event held in the month of April in Halifax. Full commitment to both of these events is required. If the finalist cannot attend these events in their entirety, another representative will be chosen to represent South Shore at the Canada Wide Science Fair.**

Registration Process

- Registration to begin **FEBRUARY 1, 2012** and can be done online at **http://ssrsbstaff.ednet.ns.ca/sciencefair/index.html**
- Submit registration for only one project per student.
- Teachers must submit registration **BEFORE MARCH 22, 2012** - **NO LATE REGISTRATIONS ACCEPTED**.
- A maximum of 10% of school-based projects can be registered from each school in the regional science fair.

Project Necessities

- Students must use simulations in place of hazardous materials (such as toxins, corrosive chemicals, etc.).
- **PROJECTS WITH HAZARDOUS MATERIALS WILL NOT BE ACCEPTED**.
- Submit a project of student's own design. No pre-packaged kits accepted.
- ***NO* PROJECT IS TO INVOLVE UNETHICAL TREATMENT OF ANIMALS.**
- Students must provide their own computer for computer related projects.
- The regional science fair does not supply computer hardware or software for participants.

PLEASE REFER TO THE SAFE SECTION OF THIS GUIDE FOR MORE INFORMATION.

What kinds of projects can be submitted?

The following classifications and examples have been taken from the Canada-Wide Science Fair (CWSF) handbook developed by the Youth Sciences Foundation (YSF):

Automotive (Interdisciplinary Division):

- Studies dealing with health, safety and injury prevention; societal issues and the future automobile; materials and manufacturing; powertrains, fuels and emissions; design processes; intelligent systems and sensors.

Biotechnology & Pharmaceutical Sciences:

- Applying knowledge of biological systems to provide a service, create a product or solve
- a problem. Pharmaceutical sciences projects study the interaction of chemical substance with living systems. The main subject fields in biotechnology are crop development, animal science, genomics and microbial studies. Substances with medicinal properties – the potential to cure or reduce symptoms of an illness or medical condition – are considered pharmaceuticals.

Computing and Information Technology:

- Computing and information technology projects concentrate primarily on the development of computing hardware, software or applications, including programming languagesand algorithms, software design and databases, as well as the storage, transmission and manipulation of information.

Earth and Environmental Science:

- Projects focusing on geology, mineralogy, physiography, oceanography, limnology, climatology, seismology, geography or ecology. Projects in this field generally deal with learning how the Earth works and tackling problems in the environment.

Engineering:

- Projects in this field are based on using and developing innovative technology (for example, computer hardware and software), often concerning chemical engineering, electrical engineering, industrial engineering, mechanical engineering, metallurgical engineering, materials engineering and hardware/software design.

Health Sciences:

- Any study dealing with human science, including the application of scientific knowledge to the health of humans.

Life Sciences:

- Using experiments, innovations or studies to see how living things (non-human) work and function.

In what age division should I enter?

· Junior: Grades 6-7-8
· Intermediate: Grades 9-10
· Senior: Grades 11-12

PLEASE NOTE THAT GRADE SIX STUDENTS CANNOT QUALIFY FOR THE CANADA WIDE SCIENCE FAIR.

How must I construct my project?

An exhibit to be proud of .

Building the display provides the chance to develop and demonstrate construction, artistic and written skills. There is a good deal of work involved to design an exhibit that explains to the observer what the project is all about.

Materials:

- Projects must be constructed of fire resistant materials.
- Recommended backboard includes wood or wood products ¼ inch thick or thicker, and / or synthetic materials.
- If backboard is decorated, there must me NO AIR POCKETS behind the material or paper used for decoration. For this purpose, students may use lamination, wallpaper paste, rubber cement, or glue. Panels may be painted.
- Overlapping sheets of notes or graphs are to be stored in a logbook, and not stacked on the backboard.
- Drawings, photographs, graphs and models can all be used to illustrate the work done. Large items of equipment may not fit in the space available and can be replaced with models, photographs and drawings.

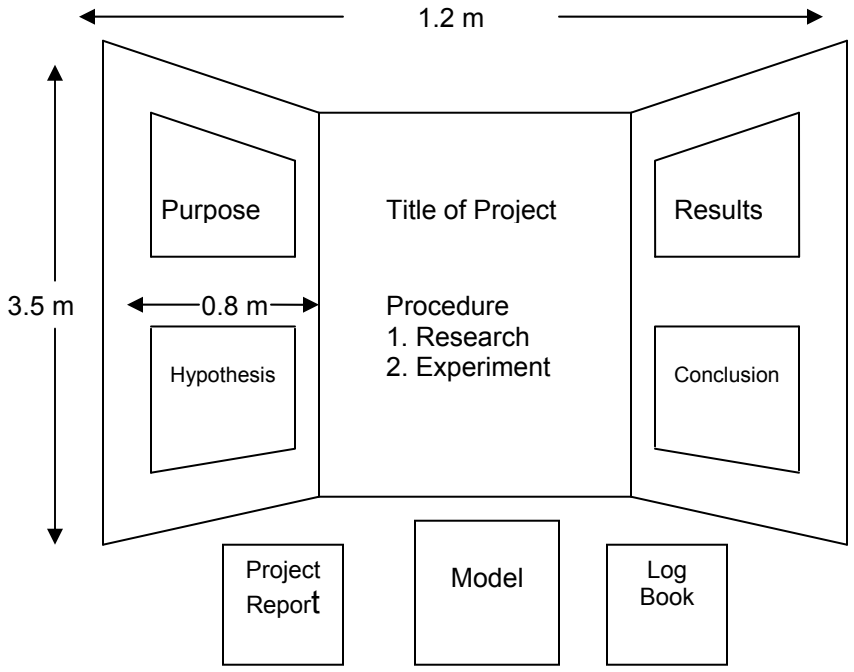
Summary:

- Each exhibitor will provide a project summary of 2-5 pages (8.5" x 11 "), typed and double-spaced, using one side only. Both the project summary and project report must follow MLA format. They must include index citations and bibliography.
- Project summaries must include: background, hypothesis, materials, procedure, results, and conclusions**. The Canada Wide Science Fair for registration requires these summaries.**
- The logbook is a book, which records in detail the information collected, the experiments conducted, the resource people and materials and daily or weekly observations. This is almost a diary of the time spent on the project and tells the judges that indeed the student

used proper procedures. Also, the information required for the display and project summary will be readily available.

Dimensions:

- 0.8 meters (front to back)
- 1.2 meters (side to side)
- 3.5 meters (maximum height from the table top)



Acknowledgements / Mentorship's:

- If a person, institution, or business, provided significant assistance (ex: guidance, materials, finance), this person or group must be acknowledged in your display and report.

Judging:

Judges are looking for several things like:

- Originality – in the idea and the approach that you have taken.
- Accuracy – in the collection of information and your use of the scientific method.
- Completeness – in carrying out the experiments and understanding what you have done.
- Results – in ending up with knowledge that is important to you.

TIPS and IDEAS

Planning and Preparation:

1. What will I choose?

- You must have a keen interest in your topic; otherwise, a very positive and interesting experience could become a little tedious to you. Develop and answer a question about it. Invent something. Create a different use for something. Solve a problem. Enjoy the

process.

2. I have my topic, and some idea about what I want to do with it. Now what?

- State your hypothesis. A hypothesis is a tentative statement that proposes a possible explanation to some phenomenon or event. A useful hypothesis is a **testable** statement, which may include a prediction. A formalized hypothesis is written in the form of an if-then statement. For example, if we say "Trees will change color when it gets cold." we are making a prediction not a hypothesis. To change this prediction into a hypothesis you could modify the statement to read, "**If** leaf colour change is related to temperature, **then** exposing plants to low temperatures will result in a change in leaf colour.
- Research!! Gather information about your topic, keeping your hypothesis in mind. Get your information from books, magazines, internet, people who are experts or knowledgeable about your topic, companies, teachers, parents, CD's, DVD's, TV, etc.
- **KEEP NOTES AND SOURCES** so that you and other people can go back to find the information again. Keep the bibliography AS YOU GO, in APA or MLA format.
- Make a prediction about outcome, based on your research.

3. I have my information. What's my next step?

- Organize at this stage.
- List your needed materials in advance.
- Reuse and recycle, or develop where possible. Buying new is expensive. Innovation is impressive. Remember that Dr. Richard Feynman solved the problem of the Challenger with a glass of ice water. Simplicity often provides advantage.

4. I have my information. What's my next step?

- Make a timeline. Set your goals well in advance. Your project will require several months of planning, organizing, carrying out, and testing / experimentation. DO NOT BEGIN LATE!!!

5. Troubles? Questions?

- Consult with your teacher at agreed-upon stages.

6. Now I am ready to experiment. How can I do this? What are "observations"?

Log Book: Throughout the experiment / testing, keep notes. These notes will be used to write the formal **Observations** section of your report. Some ideas for notes:

- Bound journal, binder, notebook
- Audio record
- Video
- Record everything you see, taste, feel, hear and smell
- Measure
- These notes are for reference later on. They compose your LOG BOOK. You cannot use them AS your report. Your report must be formally written and presented as well.
- **BRING ROUGH NOTES TO THE SCIENCE FAIR** along with your formal report

7. Examine results:

When formulating your conclusions, first look at your observations. What are you looking FOR?

- Examples of patterns, for instance, as heat increases, materials change in a progressive manner.
- Examine how these patterns support or refute your hypothesis.
- Look for discrepancies.
- Look for things that happen together: what appears to be, or what might be a result of a cause.
- Look for oddities, surprises, and the unexpected.
- Demonstrate the pattern of results through such means as charts or graphs.

8. What are "conclusions"?
Use the following questions as a guide to drawing your conclusions:

- How do you explain your results?
- Why did they happen?
- What were some sources of error?
- What relationships or correlations do you see?
- If you were to continue with this project, what might be the next step?
- How would this apply to real life?
- What might this explain?
- Would different variables change your results? How? For the better? Would a change degrade the results? Improve them? Compromise?
- **IMPORTANT: ANSWER YOUR HYPOTHESIS**

9. What are "evaluations"?
Use the following questions as a guide to making your evaluations:

- Was your project a success?
- What can your learn from your project?
- How useful are your results for others?
- What applications do your results have?

HELPFUL WEBSITES:

Topic selection wizard - http://www.sciencebuddies.org/mentoring/tsw_start.shtml

Science Fair Nova Scotia - http://www.sciencefairinfo.ns.ca/

10 easy steps to a successful project - http://www.scifair.org/articles/steps.shtml

Picking an idea - http://www.cdli.ca/sciencefairs/

Science fair central at Discovery School - http://www.cdli.ca/sciencefairs/

Youth Science Foundation – Canada-wide Science Fair - http://www.cdli.ca/sciencefairs/

Science fair survival guide - http://www.ri.net/schools/East_Greenwich/Cole/sciencefair.html

Super science fair support center - http://www.scifair.org/

SAFETY GUIDELINES:

DISPLAY DIMENSIONS

Your project display, including the backboard, title board, presentation and prop material and all display equipment must fit entirely within the following dimensions.

- 1.2 m wide, 0.8 m deep and 3.5 m high from the floor. No portion of the display shall project into any aisle. Exhibits exceeding these dimensions must be modified before they will receive safety approval.

BACKBOARD & DISPLAY MATERIALS

Be sure to follow these rules carefully. Your display will be inspected as part of the safety check and backboards/displays not meeting these standards will have to be reconstructed from approved materials. Build it right the first time!

The following are CWSF guidelines:
Backboards and title boards must be constructed of the following materials:

- Wood products and dimensional lumber at least 6 mm (0.25inch) thick, Sintra, InteFoam, Intecell, Flame-Rated Corrugated Products, Coroplast Firewall F.R.B., metal, Plexiglas/acrylic or any other material that meets the UL-94 standard and bears a factory-attached UL-94 label. Backboards and title boards constructed of the following materials are specifically prohibited:
- Coroplast (except Firewall F.R.B.), foam board (plastic foam sandwiched between sheets of paper product), paper products, plastic sheeting and foamed polystyrene (Styrofoam).
- Backboard panels may be painted with any common paint. Other coating materials (e.g., fabric) must be UL-approved and proof of such approval is required.
- Presentation information including text, graphics, photographs and other data on the backboard must be printed on bond (laser, inkjet, or standard copier), photographic or laminated paper. Construction paper, Bristol board and papers listed above may be used to outline or border presentation information or to add small decorative elements to the backboard. Presentation information, including outlines, borders and decorative elements must be attached to approved backboard material with adhesive so it makes a solid contact over the complete surface.
- Anything used to raise presentation information more than 2 mm above the surface of the backboard must be constructed of approved backboard material.
- Papers presented on the exhibit table must be secured in a binder, Duo-tang, presentation folder, plastic sleeve or other appropriate enclosure.

FIRE SAFETY

The Host Committee will ensure that fire extinguishers of proper size and rating are available in the exhibit area and will establish an exhibit hall layout that minimizes long rows in order to reduce flame spread.

- Operation of an open flame, candle, torch or any other heating device is not permitted.
- Smoking is not permitted in the exhibit area.
- Packing material shall not be stored under tables.

ELECTRICAL SAFETY

- All AC electrical equipment used in your display must have a functional 3-wire plug with ground or be CSA approved. Extension cords, power bars and lighting must be CSA approved.
- Electrical cords shall have a 3-wire conductor with ground and must be CSA approved and in good repair.
- Power bars, lighting and other electrical devices shall be CSA approved.
- Any modification to an electrical device negates the CSA approval and that device must not be used.
- Dry cells (Alkaline, NiCad, NiMH, LiIon, etc.) and sealed lead acid batteries (gel cells) may be used. Wet cell batteries are not permitted.
- Electrical devices constructed by finalists must comply with the following requirements to be approved for display. As they cannot be CSA approved, these devices may only be connected and operated during judging.
- Electrical devices must be protected by a non-combustible enclosure.
- An insulating grommet is required at the point where electrical service enters an enclosure.
- Electrical devices shall use as low a voltage as possible.
- The electric current must be limited so as not to cause any danger or discomfort if the terminals are touched.
- A pilot light must be used to indicate when power is on.

STRUCTURAL & MECHANICAL SAFETY

Check the following:

- Exhibits must be sturdy, self-supporting and sufficiently stable to prevent accidental tipping.
- Sharp edges or corners of prisms, mirrors, enclosures and glass or metal plates that may be contacted by the public must be removed or protected to prevent injury.
- Dangerous moving parts, such as belts, gears, pulleys and blades, must be provided with a guard to prevent access to the moving parts.
- An in-running nip hazard of any part of a motor, device or thing that may be a danger shall be guarded to prevent contact with the pinch point.
- A certificate of safety inspection must be displayed if a project involves the construction or use of a boiler or pressure vessel with a capacity greater than 42.5 litres or operated at a pressure greater than 103 kilopascals. Evidence of inspection by an engineer with certification in boilers and pressure vessels should be displayed when the project involves any finalist-constructed pressure vessel, regardless of size or pressure. Such vessels may be displayed, but must not be pressurized at any time.
- Compressed gas cylinders shall not be displayed.
- Moving exhibits (e.g., radio-controlled vehicles, robots) shall be restricted to the regulation display space. The Host Committee may, at its discretion, provide an area to safely demonstrate projects that require more than the regulation display space.

CHEMICAL SAFETY

The following materials shall not be displayed:

- Flammable, toxic or dangerous chemicals
- Prescription drugs and over-the-counter medications
- Photographs or empty packages of prohibited materials may be displayed. The display of chemicals is discouraged; however, other substances can be used to simulate chemicals for display purposes.
- Table salt can be used to simulate many chemicals, such as ammonium nitrate.
- Water can represent alcohol, ether and many other liquids.

- Molasses can be used to simulate petroleum products.
- When chemicals are simulated, they should be identified with the name of the substance they represent, preceded by the word “simulated.” Any WHMIS labels (supplier or workplace) should be attached to show understanding of safe work practices. The total quantity of liquids displayed at a project shall not exceed 1 litre. Photographs and/or video should be used to demonstrate processes requiring larger quantities of liquid.

BIOHAZARDS

The following materials shall not be displayed:

- Biological toxins
- Cell or tissue samples including blood and blood products, except on sealed microscope slides, which may be displayed
- Plants or plant tissue
- Soil containing organic material
- Cultures - photographs or simulated cultures may be used.

HUMAN SUBJECTS

The project display may include pictures of participants if prior permission has been obtained. Projects dealing with forensic science topics must preserve the anonymity of any human victims, and project displays must avoid sensational or gratuitous, macabre images.

ANIMALS & ANIMAL PARTS

- Live animals (microorganisms, non-vertebrate and vertebrate) shall not be displayed.
- The only parts of vertebrate animals that may be displayed are those that are either naturally shed by an animal or parts properly prepared and preserved. For example, porcupine quills (safely contained), shed snake skin, feathers, tanned pelts and hides, antlers, hair samples, skeletons and skeletal parts are permissible, while cell and tissue samples are not, as indicated under Biohazards.
- Photographs of animals, animal parts or organs may be used on the display and in the Project Report; however, finalists and Regional Science Fair committees must be aware that other exhibitors and members of the public might find such photographs offensive. Finalists are encouraged to choose their photographs in accordance with the accepted norms of the community.

<u>Regulations regarding use of animals in experiments</u>

1. If experiments are to be conducted on living subjects for science fair experiments, then only lower forms of life may be used. Lower orders of life such as bacteria, fungi, protozoa and insects can reveal much biological information.

2. No living vertebrate animal shall be displayed in exhibits in science fairs.

3. Vertebrate animals are not to be used in experiments for science fairs with the following exceptions:

   i) Observation of normal living patterns of wild animals in free-living state or in a zoological park, gardens or aquariums. ii) Observations of normal living patterns of pets, fish, or domestic animals.

iii) Cells such as red blood cells, other tissue cells, plasma, serum or anatomical specimens such as organ, tissue, or skeletons, must be purchased or acquired from supply houses or research facilities in order to be used in science fair projects. Specimens obtained contrary to the above are prohibited.

iv) Observational type studies, on only chicken egg embryos may be used in science fair projects. If the normal egg embryos are to be hatched, satisfactory, humane, considerations, must be made for the disposal of the chicks. If the arrangements cannot be made, then the chicken embryo must be destroyed on the 19th day of incubation. No eggs capable of hatching may be exhibited in science fairs.

FIREARMS, HAZARDOUS MATERIALS & EQUIPMENT

- Firearms (even if appropriately locked), ammunition, dangerous goods or explosives shall not be displayed. The manner in which such materials were used in a project may be conveyed through text, photos, video, computers or simulation.
- Images of humans or animals that have been injured by the use of firearms or explosives shall not be displayed. Such images are deemed unsuitable for general public viewing and do not contribute to the scientific value of a project.
- X-ray or hazardous radiation-producing equipment may be displayed but must not be operated at any time.
- Radioisotopes or compounds containing radioisotopes at activities above normal background shall not be displayed.

DISPLAY EQUIPMENT & DAMAGE

Although every effort will be made to prevent damage to exhibits, YSF Canada, the Host Committee or other sponsoring organizations or cooperating groups will accept no responsibility for loss or damage to any exhibit or part thereof.

For further information regarding safety and ethics please visit:

http://www.ysf.ca/SMARTS/support/safetyethics.aspx