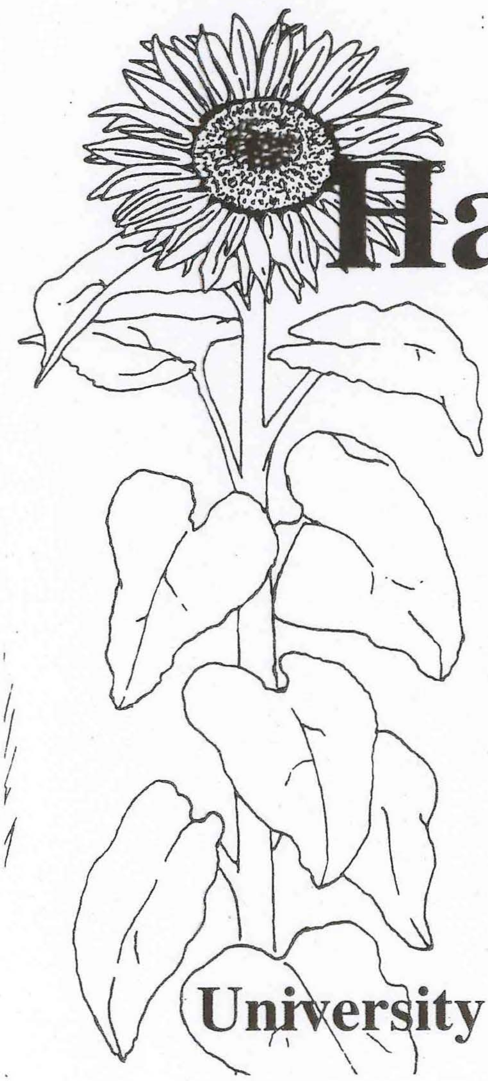
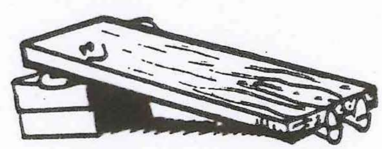
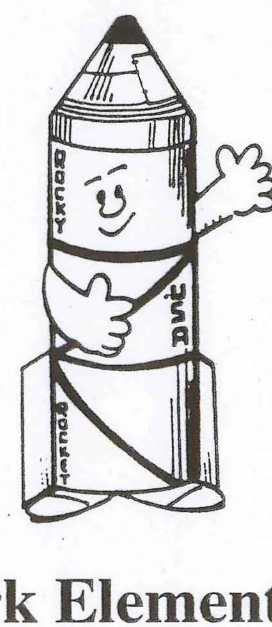
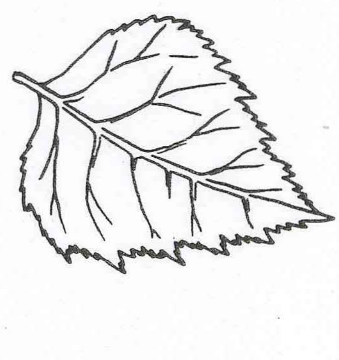
Science Fair Handbook









University Park Elementary School

Revised Sept 2000

Table of Contents

Contents | **Page**

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University Park Science Fair

Getting started

Science Fair is definitely a family affair at University Park Elementary School. It requires a team effort by the student, parents, friends or relatives, and even community members. Participants can be mentors who guide students through the process and make suggestions along the way or fully involved family partners who work and learn together. The first task for parents, family members, relatives and mentors is to read this handbook and help students understand the process of science exploration. Some students will participate in class projects, while others will have no prior knowledge of the kinds of projects and methods used. It does not require a science background, just a desire to learn about the natural world using a variety of scientific methods. After reading this handbook, talk to teachers, the science fair coordinator or parent volunteers to provide additional guidance on getting started.

Who may Participate?

There are four categories under which projects can be entered in the science fair depending on the number of participants:

1) Individual Category: A project is entered by one student.

2) Small Group (2-5 students): Students can work with classmates or perhaps a brother or sister (not necessarily in the same grade level) to work on a project together. The project should be understandable to all members of the group.

3) Class/Large Group project: All members of a class or an organized group at U-Park such as CampFire, and Girl and Boy Scouts, collectively work on a project with assistance from the teacher or leader. This type of project is especially valuable with beginning students to learn basic concepts such as making predictions, understanding a hypothesis, etc. The group participates in the process as a team including the judging interview. Usually one or a few students are elected to present the project, but all students participate in answering judge's questions.

4) Family Project: This is the chance for the entire family to get involved in contributing to a group project. Adult members are encouraged to participate in the entire process including the judging interview. The judges will look for projects that are understandable to all members of the family/group and for projects in which all members have participated equally at their own level. At least one member of the group must be a U-Park student, but any number of family members (parents, guardians, relatives, brothers, sisters) may participate.

Multiple entries: More than one project may be entered in the fair. A student may participate in a class project and submit one (or more) individually. Each project must be entered separately with the appropriate category identified on the entry form.

Parent Involvement

Rarely does a student complete an entire science project without adult assistance. Usually every family member plus a few friends and community members (and quite often the family pet) get involved at one stage or another. This may cause some conflict at science fairs when a judge complains, "This is the parent's science project, not the child's." Judges ask questions and find the child cannot explain how the project was completed or how a complicated graph was made. On the other hand, few students can read and understand this entire handbook or complete every requirement of a science fair project by themselves. Adult participation is essential. The level of participation varies as much as the kinds of children at U-Park School!

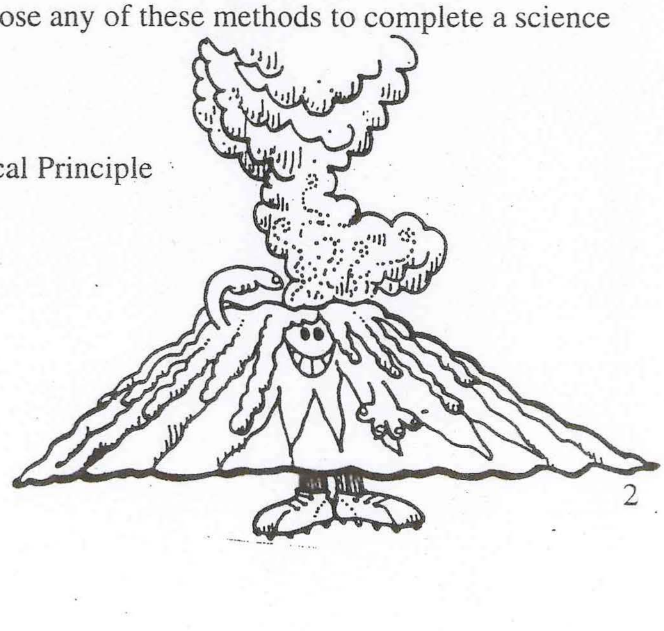
If a family project is completed, adults participate as equal partners. They are involved in all of the decision making from the science topic to the color of the display board. The entire family works as a team. Individual student and small group projects, are more student directed with parents or other adults as mentors and assistants. This doesn't mean there is no adult involvement in a student project. Students may need an adult to introduce the different methods of research; brainstorm to find an appropriate, safe, and feasible project; help students understand the requirements; provide materials and guidance along the way; keep students on track; help them think through their results and conclusions; perhaps help them learn and use computer word processing and graphics programs; help them type if keyboarding skills have not yet been mastered; and get the display to the school on time with the entry sheet in hand!

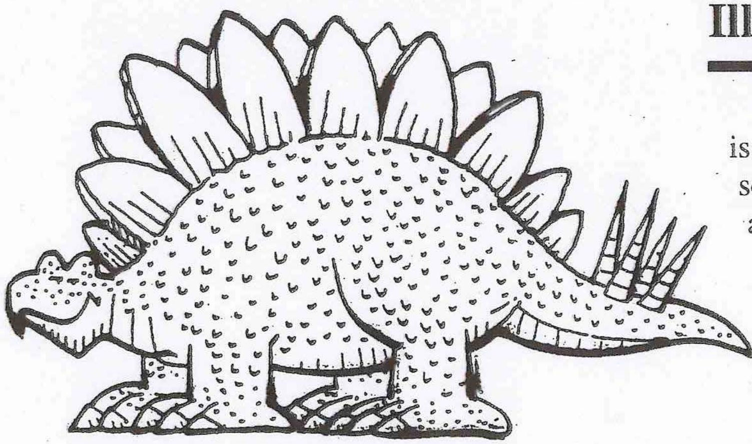
The bottom line is, a good science project is a great learning experience for everyone involved. During the interviews, judges will be looking for students who have participated in all aspects of the project; can understand all components even those completed with adult assistance; are excited and interested in their project; and can think of dozens more projects to try next. Judges, in turn, provide mountains of enthusiasm for science, share science discoveries from their own experiences, and make ample suggestions for next year's projects.

Types of Science Projects

There are many methods used by scientists to study and gather information about the world around them. Some methods are listed below. You may choose any of these methods to complete a science project.

- Illustrated Science Report
- Demonstration of a Scientific or Mathematical Principle
- Scientific Collection
- Scientific Experiment
- Invention or Innovation
- Original Computer Program





Illustrated Science Report

The beginning of all scientific research is a trip to the library and a visit to other scientists to learn what is already known about a particular topic. You might be interested in learning about how animals survive the winter in a subarctic environment, but you may not have enough information to design a scientific experiment. You might be interested in learning about tropical rain forests, but it is difficult to conduct an experiment on tropical rain forests in Fairbanks, Alaska! Reading books and speaking with scientists reveals what is known about a topic, but it also reveals the limits of knowledge. By learning what is not known, scientists can add to knowledge by conducting experiments, making collections, inventing something and not reinventing the wheel!

To complete an illustrated science report, use all sources available to find out as much about a topic as possible. With Internet resources as well as community resources, the amount of information is vast and worldwide.

Steps in Completing an Illustrated Science Report

1. Choose a topic for the report. It must be a science-related topic; something about the natural world around you.

2. Compile a database of information relating to the topic using as many resources as possible. Gather information by using school and community resources. Start with the school library, then follow up with community and other public resources such as:

- Airports
- Alaska Bird Observatory
- Alaska Cooperative Extension
- Alaska Sea Grant Program
- Alaska State Agencies (i.e. Fish and Game, Division of Forestry, Alaska Public Lands Information Center)
- Books, periodicals and newspapers
- Botanical Gardens (i.e. Alaska Botanical Garden, UAF Georgeson Botanical Garden)
- Businesses (i.e. water quality testing labs, biological research labs, etc.)
- Encyclopedias
- Filmstrips and tapes
- Hospitals and clinics
- Internet worldwide resources
- Local organizations (i.e. Arctic Amateur Radio Club, Dog Mushers Association, Tanana Valley Railroad Association)
- Museums (i.e. UAF Museum, Alaskaland Air Museum)
- Nature Centers (such as Creamer's Wildlife Refuge)

Public Libraries
Radio Stations
US. Fish and Wildlife Service
US. military bases
US. Weather Service
University of Alaska Fairbanks
Veterinary hospitals
and more

3. **Keep a notebook** of all information including sources of information.

4. **Write a report.** Write a summary of your findings using all of the sources you list at the end of the report. The written report should include:

a) **Title** located on the front page of your report and using key terms that describe what your report is about,

b) **Introduction**- a short introduction to your topic, your objectives for writing the report, why you chose to study that particular topic, and how you got interested in it,

c) **The main body of the report** subdivided into separate topics or chapters if necessary,

d) **Illustrations and visual aids (photographs, drawings, etc.)**- Some may be used in the report, on the display or both,

e) **Summary** - the highlights of what you learned, and

f) **Sources of information**- See the "making a display" section for methods of listing sources and the "how to list sources" section on the next page.

5. **Make a display of your report**. Your display shows the highlights of your written report. It should be designed to be readable and understandable by all viewers. Your display must include:

a) **Title**- Repeat the title on the display boards that is on your report.

b) **Introduction**- a short summary of the introduction found in your written report. This introduction should be located on the display board.

c) **A copy of your written report**- It can be set on the table in front of your display.

d) **Visual aids**- Your display must contain visual aids to help the reader understand your subject. Include a written explanation (caption) of each to help your audience under stand its purpose. Visual aids may include: models, maps, pictures, graphs, drawings, charts, photographs, etc. Commercial science kits and models are not acceptable. If a model is included, it should be home made!

e) **Summary-** highlights of what you learned. These should be main points of your report. If science fair viewers do not have time to read your entire report, they should get a good idea of what you learned from this summary.

f) **List all sources of information** including books, interviews, visits, people, etc. You may have learned in one of your classes a specific way to list references in a report. You should use the methods taught in your classroom or refer to the examples below. The goal is to provide enough information for anyone to find the same source. Below are some guidelines for listing sources.

g) **Acknowledgments-** List all of the people who helped with your project including the person who drove you to all those interviews or helped you find the Internet sources. List their names and how they helped you. If you already listed a person in the "Sources of Information" section, you do not need to repeat their names here.

How to List Sources in Science Fair Reports and Displays

Books, magazines, other written references

Include Author, date of publication, title of article, publisher and location or title of magazine publication, information on volume or issue numbers, page numbers of the article.

Examples:

Jones, Howard. 1998. How caribou get salt in their diets in winter. Alaska Natural History. Random House Publishers, New York.

Holms, Karen. 1998. How ice crystals form. Muse Magazine. Vol. 23 No. 2. pgs 23-35.

Lectures and interviews:

Include name of person giving information, who they are, who they work for, date and location of interview or lecture.

Examples:

Colson, Jane. 1997. Finding dinosaur bones on the North Slope, Alaska. Interview with a research scientist, University of Alaska Fairbanks Museum. Fairbanks, Alaska. Sept. 9.

Carter, James. 1998. What is the aurora? Lecture at the Noel Wien Library by visiting scientists from the Geophysical Institute, University of Alaska Fairbanks. Dec 10.

Visits to museums, etc.

Include where you went, the purpose and dates of the visit.

Examples:

Creamer's Field State Wildlife Refuge. Fairbanks, Alaska. 1999. Visit to make observations on chickadees. Jan 2

Aviation Museum, Alaskaland. Fairbanks, Alaska. 1999. Visit to observe and draw airplane wing shapes. Oct 10.

Internet sources or computer CDs

Include author or company responsible for the web site, date published on the Internet, title of article, Internet address or key search words, and date you got the information from the Internet.

Example:

Smithsonian Institution. 1998. How do birds fly? Article in Science and Discovery web page. at http://www.smithsonian.org. Jan 2, 1999.

Microsoft Corporation. 1998. How Pendulum's Work. Microsoft Encarta 98 Encyclopedia. CD. Keyword: pendulums.

University Park Elementary School PTA

AWARD: 1ST 2ND 3RD

JUDGING SHEET - SCIENTIFIC REPORT

ENTRY NUMBER:__________ **STUDENT**______________________________

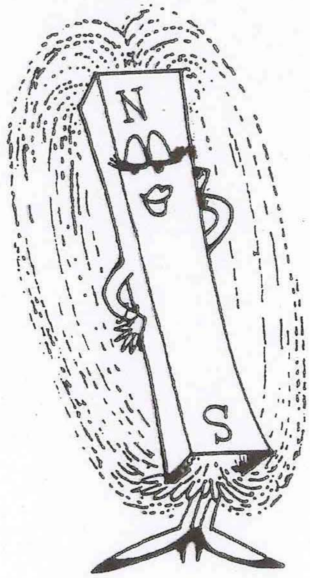
EVALUATOR______________________________(please print)

Please mark an X in the box that best fits the description	Outstanding	Very Good	Good	Needs more Work
Report is focused on one clearly defined theme				
Report is based on thorough research				
Written report shows understanding of topic				
Report is neat, readable				
Report is free of grammatical and spelling errors				
Report has clear objectives				
Report describes target audience (Who will read it?)				
Display and report have relevant visual aids (drawings, photos, models etc.)				
Visual aids on display and report are self explanatory				
Display is appealing to the eye				
The report has appropriate and sufficient sources				
Sources are cited in text				
Summary highlights main points of report				
Summary is well organized, follows a logical order				
Oral report is clear, shows understanding of topic				
Oral report shows ability to extend beyond project				
Display is complete: title, introduction, objectives audience, visual aids/illustrations, summary, sources acknowledgements [circle missing component(s)]				

COMMENTS TO THE STUDENT (continue on top of back)

Entry number__________

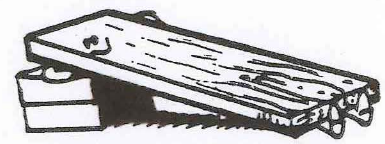
Judge's recommendation: (circle) 1st 1st or 2nd 2nd 2nd or 3rd 3rd DISTRICT



Demonstration of a Scientific or Mathematical Principle

Sometimes scientists need to study a well-established scientific principle or theory in order to understand their particular topic and develop new research ideas. They need to know, not only what the scientific principle is, but how it was developed, how it works, and how it may be applied to the world today. A demonstration is an interactive display that allows you, your classmates, the judges, and other viewers to learn about a scientific principle and applications of that principle to our everyday lives. Some examples of a demonstration topic might be:

a model of how the planets revolve around the sun
how pulleys work and are used every day
how x-rays work and how they are used in science and medicine
how different metals conduct heat
how different kinds of light affect plant growth
how sap moves in a tree
how the heart works



A demonstration differs from a scientific report because demonstrations are interactive. A report may have a model or illustration showing simple machines, but a demonstration allows viewers to use simple machines to show first hand how they work. These displays at science fairs are always crowded with viewers pushing buttons, turning lights on and off, dumping water into very interesting contraptions, peeking through holes, rolling balls, peering through lenses, smelling strange things, and really interacting with science. Through these demonstrations, students and viewers find out first hand that science is everywhere and touches every segment of our lives.

Steps in Completing a Scientific Demonstration

1. Choose a topic that uses or demonstrates a scientific principle. The topics might answer questions such as:

a) How does ____________ work?
- a battery
- a pulley
- a toaster

b) How is (are) ___________ made?
- fingerprints
- steel

c) What do _____________do?
- lenses
- levers

d) What is____________________?
- Bernoulli's Principle
- the Doppler effect?

2. Gather information relating to the topic. Refer to a list of possible sources in the Illustrated Scientific Reports section (pg 3 Number 2).

3. Keep a notebook of all information including sources of information.

4. **Make an interactive display** using graphs, charts, diagrams and working models to demonstrate the principle or how it is applied to everyday life. Commercially available kits are not acceptable. Make the demonstration sturdy so that many people of all ages can view it and use it safely and easily. Avoid fragile, breakable parts. Any project deemed a safety hazard will be rejected. A demonstration on how rockets work is possible, but live rocket launches will not be permitted. Use photographs to show rocket launches, or anything involving combustion, live animals, acids and other possible hazardous materials. Videos may be used as long as you contact the science fair coordinator one week before the fair so a VCR can be signed out. (Please note: VCR's are not available at the District Science fair). If you're not sure, ask your teacher or the science fair coordinator before you get started.

5. Make a display of your demonstration. Your display must include:

a) Title- an interesting title that identifies the principle or the question,

b) Objectives- a statement or two clearly identifying which principle you are demonstrating,

c) Explanation- Describe how the scientific or mathematical principle works, who first identified it, and how it was discovered,

d) Application- Describe how the principle impacts our world today. Give some examples or include them as part of your interactive display,

e) Demonstration- Your display must contain visual aids to help the reader understand your subject. All visual aids should have a written explanation (caption) to explain the principle, Provide clear directions on how to operate any interactive models. Your demonstration may include models, maps, pictures, graphs, drawings, charts, photographs and more. Remember, commercially available models and kits are not acceptable.

f) Sources of Information. List all books, magazines, Internet resources, people, etc. you used to obtain information for your project. Refer to the Illustrated Research Report section for examples of how to list sources (pg.5).

g) Acknowledgment. List all of the people (teachers, parents, librarians, scientists, relatives, etc.) who helped you with this project and tell what they did.

University Park Elementary School PTA

AWARD: 1ST 2ND 3RD

JUDGING SHEET - DEMONSTRATION

ENTRY NUMBER:__________ STUDENT____

EVALUATOR____(please print)

Please mark an X in the box that best fits the description	Outstanding	Very Good	Good	Needs more Work
Demonstration is focused on one clearly defined principle				
Demonstration is based on thorough research				
Written explanations are clear, show understanding of topic				
Oral explanations are clear, show understanding of topic				
Display has a logical order, is easy to understand				
Display is appealing to the eye				
Display uses more than one method to show or describe principle (models, photos, drawings, hand's on, etc.)				
Display includes explanation for each visual aid or directions for using it				
Display includes impact or application of principle on world around us				
The project has appropriate and sufficient sources				
Display is complete :title, objective, explanation, demonstration, visual aids, application, sources, acknowledgement [circle missing component(s)]				

COMMENTS TO THE STUDENT (continue on top of back)

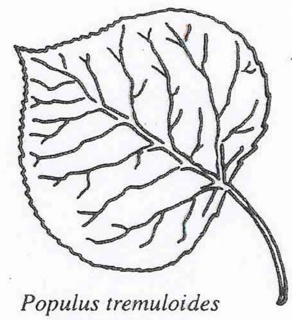
Entry number__________

Judge's recommendation: (circle) 1st 1st or 2nd 2nd 2nd or 3rd 3rd DISTRICT

Scientific Collection

Many scientists make collections of things to help them understand how the world functions and how it is changing. Plant taxonomists make collections of dried, pressed plants to study where plants live, how species are related, and how long they have existed in a particular area. Glaciologists might study collections of ice cores to learn about the history of glacier movements. Medical scientists might study a collection of human bones to trace the origin or spread of a disease. Bones. Fossils. Insects. Rocks. Soil and ice cores. Plants. Birds. Shells. Bird nests. Animal skins. Collections of all of these plus much more are often the main function of natural history museums, science museums and botanical gardens.

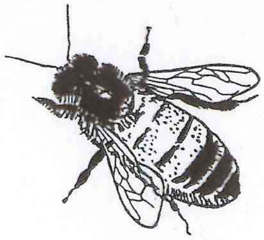
Collections help us name and describe the world around us. Scientists who make collections have specific terms to describe objects in their collection. These terms are used worldwide so that all scientists studying a particular plant, animal or rock can communicate easily with each other. Plant and animal scientists use Latin names to describe a species, and the same name is used worldwide. Geologists use special terms to describe the rocks and minerals they collect.



Populus tremuloides
Quaking aspen

Making a collection means gathering a lot of one type of object (rocks, plants, etc.), learning how to preserve specimens for future study, and learning how to classify and describe them so the collection is useful to many scientists. A lot of information is available in books on how to make a collection, but Fairbanks students have an incredible resource practically in their back yards. Scientists at the University of Alaska Fairbanks Museum, the Georgeson Botanical Garden, the Mining, Fisheries and Ocean Sciences and Geology Departments have outstanding collections that help them study arctic and subarctic environments. It is well worth communicating with scientists who can demonstrate first hand how to make a scientific collection.

Items in a collection are also grouped by characteristics each item has in common with others. Rocks might be grouped into igneous, metamorphic and sedimentary rocks or something as simple as brown, black and white rocks. Plants might be grouped by the Latin family, genus and species names or by characteristics such as deciduous plants and evergreen plants or trees, shrubs and herbs. For beginning students, the best classifications are based on color, shape or other characteristics the student identifies when looking at their collection. Older students should be encouraged to use the scientific classifications used by scientists.



Steps in Completing a Scientific Collection

1. Decide what you want to collect. It must be science-related such as rocks and minerals, wood, leaves, plants, butterflies, insects, etc. You cannot use commercially prepared collections or kits. The collection is something you must gather yourself.

2. Remember the ethics of collecting! Ask first before collecting anything on private property. Special rules apply to state lands, national parks, national forests, wildlife refuges, etc. Contact the agencies responsible for management of those lands before collecting anything. Do not collect it if it is uncommon in the area, and be aware of plant and animal species that are threatened or endangered.

2. Compile information about how to make a collection, how to preserve and display what you collect, and how to classify, organize and label your collection. Use as many resources as possible including books, magazines, visits to museums, botanical gardens and libraries, visits with scientists and Internet resources.

3. Keep a notebook of all information including sources of information.

4. Keep a separate field notebook and record:

The name (if you know it) and description of what you collected
The date of your collection
A short description of where you collected it

1. Yellow daisy (Arnica lessengii) collected in gravel along Farmer's Loop near the Ballaine Lake parking area. It is growing all over the dry roadside slope.
22. Garnets- collected at a gravel pit, 4.5 mile Chena Ridge Road

Devise a method to remember which item in your collection belongs to each entry in your field notebook. For instance, people making plant collections save the plants in folded newspaper. You could put a number on the newspaper that corresponds to the number in your field notebook.

Your collection should come from a variety of locations. It may include one or two objects given to you by someone else, but try to get an idea of where they originally came from. It also may include one or two items you may have purchased. Some rock collectors will purchase interesting rocks for their collection, but make sure this source is noted in your book. Commercially available collections, often completely labeled and in display cases, are unacceptable. Most items should be things you collected.

5. Learn the proper methods used to preserve, label and display your collection. This is best done by a visit to a museum or interviews with scientists. Try to identify all the items in your collection and label them neatly and correctly.

6. Make a display of your collection. Your display must include:

a) Title-What did you collect?

b) Introduction- a short paragraph describing what you collected and how you got interested in your project.

c) Methods- How did you obtain your specimens? How long have you been collecting? How were your specimens preserved and labeled? Include photographs, diagrams, charts, etc. if appropriate.

d) Collection- Display all or part of your collection along with appropriate labels. If your collection is large, choose special items to display, then use photographs or notebooks to show other parts of your collection. The collection should be arranged in some logical order such as metamorphic, igneous and sedimentary rocks; plant family, genus and species; evergreen and deciduous leaves; herbs, shrubs and trees, etc. Older students should try to use appropriate scientific terms for identifying plants, animals, rocks, etc. Younger students may use common, everyday terms.

e) Field notebook- Include a copy of your field notebook. It can be set on the table in front of your display.

e) Interpretation- Include a short paragraph on the importance, meaning or relationships of the collection or, for younger children, answer the question, "What I learned from my collection."

f) List all sources of information including books, interviews, visits, people, etc. Refer to the Illustrated Science Report for ways to list references (pg 5).

g) Acknowledgments- List all of the people who helped with your project including the person who carried all those rocks home in their backpack. List their names and how they helped you. If you already listed a person in the "Sources of Information" section, you do not need to repeat their names here.

University Park Elementary School PTA

AWARD: 1ST 2ND 3RD

JUDGING SHEET - SCIENTIFIC COLLECTION

ENTRY NUMBER:__________ **STUDENT**______________________________

EVALUATOR______________________________(please print)

Please mark an X in the box that best fits the description	Outstanding	Very Good	Good	Needs more Work
The collection is focused on one clearly defined theme				
The collection is based on thorough research				
Written explanations are clear, show understanding of topic				
Collection notebook is complete: coll. dates, description, identification [circle those missing]				
Oral explanations are clear, show understanding of topic				
Display has a logical order, is easy to understand Display is appealing to the eye				
Display uses appropriate methods of preservation and labeling, and display of collected items				
Collection is classified by similarities among items (younger children) or by appropriate scientific classification (older children)				
Display includes interpretation (importance, meaning, relationships of collection) OR For younger children: "what I learned from my collection"				
The project has appropriate and sufficient sources				
Display is complete :title, theme, method, collection, interpretation, notebook, sources, acknowledgement [circle missing component(s)]				

COMMENTS TO THE STUDENT (continue on top of back)

Entry number__________

Judge's recommendation: (circle) 1st 1st or 2nd 2nd 2nd or 3rd 3rd DISTRICT

The Scientific Experiment

A scientific experiment uses a method called the scientific method to explore questions about the natural world. For scientists, understanding and using this method is just as important as the results of the experiment. This "way of thinking" is the basis for good, unbiased, repeatable experiments that give scientists and others confidence in their results and conclusions. Beginning students need help understanding the scientific method. As future experiments are conducted, the process becomes automatic, and young scientists develop a way of thinking that is used by scientists worldwide. One of the jobs of the science fair judge is to encourage students to use the scientific method in all experiments.

Steps in Completing a Scientific Experiment

The scientific method has eight basic steps:

1) Identify a question or problem.
2) Gather information about the problem.
3) Form a hypothesis or prediction.
4) Design an experiment to test the hypothesis and gather necessary supplies.
5) Conduct the experiment and record data.
6) State the results and present the data in tables, graphs, diagrams, etc.
7) Develop conclusions. (Was the hypothesis correct?)
8) Present results to others.

1) Identify a question

Adults can help students identify a question by conducting brainstorming sessions or simply writing down one of the zillions of questions children ask during the day. Some of the most interesting science questions have come from informal conversations while driving to a soccer game or during mealtime conversations. The question might take the following forms:

What is the effect of ____________ on ________________?

What is the effect of shade on plant growth?
What is the effect of temperature on plastic?

How does ________________ affect_______________?

How does music affect student test scores?
How does salt water affect rusting of nails?

Which (what) _______________ (verb)__________________?

Which fertilizer	makes	plants grow faster?
What dog food	does	my dog prefer?
What flower color	do	honeybees prefer?

2) Gather information about the question

Gather information by using school and community resources. Start with the school library, then follow up with community and other public resources. A list of possible sources of information may be found in the section on Illustrated Scientific Reports (pg 3 number 2). Develop a good background on the topic before starting the experiment.

3) Form a hypothesis or prediction.

Based upon the information gathered, form a hypothesis or prediction. This is a statement, not a question, that explains what you expect to happen or what you expect to prove.

I predict:
My hypothesis is:

shade will make plants grow taller and have bigger leaves.
cold temperatures will make plastic milk bottles brittle.
students who take music lessons have higher test scores.
iron nails rust more quickly in salt water than fresh water.
my dog has no preference for a specific kind of dog food.

4) Materials and Methods- Design an experiment to test the hypothesis or prediction and gather necessary materials. List everything you need to do to complete the experiment from a list of supplies to the type of data you want to collect. Make a list of what you will do first, then second and so on until the experiment is complete. Keep the following things in mind when designing your experiment:

a) Identify all the variables

This is often the most difficult stage of the experiment because you must make sure you are testing only one variable. A variable is anything that can influence the results of your experiment. For instance, if the project involves plant growth, variables might include:

light	soil type	wind movement
temperature	water	
fertilizer	humidity	

If you are interested in studying the effects of shade on plant growth, all other variables must be kept the same for each plant. All plants must receive the same amounts of water, fertilizer, humidity, etc. Only the light level is changed.

b) Make sure there is a control

All experiments are comparisons. If you are testing the prediction that iron nails rust faster in salt water, the nails need to be compared to others in water without salt (the control). Only by comparing the nails in the salt and unsalted water, with all other variables being the same can you test your hypothesis that salt water makes nails rust faster than fresh water. (Ask the questions, bigger than what, taller than what, faster than what, larger than what?)

c) Repeat the experiment

If you are growing bean plants in shade and light, make sure there is more than one plant in the shade and more than one in the light. Plant dozens of bean plants in shade and light. Plants are like people, and each seedling responds a little differently to changes in its environment (Some may not even germinate!). By recording the results from lots of plants, you get a better understanding of how all bean plants will respond.

Also, repeat the entire experiment more than once. You predicted that your pet dog, Fido, preferred fish over other kinds of dog food. On Tuesday, you set up an experiment to see which dog food he ate. Maybe he didn't feel like eating fish on Tuesday. If the same experiment is repeated over several days, you have greater confidence in saying, "Yes, my dog likes fish."

d) Decide what data you will collect, what you will measure, count, etc.

Before you conduct the experiment what kind of measurements or data will you collect? To study how fast rust forms on a nail, you might decide to count the number of days until the first rust forms or until the entire nail is rusted. To test your prediction that shade causes beans to grow taller and have bigger leaves, you might measure plant height every day. You might choose to measure the length and width of each leaf. Try to make a list of what you will count or measure before you begin the experiment.

e) If possible, take pictures of your experiment. Sometimes photographs can be very helpful in explaining your results, and they look great on your science fair display.

5. Conduct the experiment and record data.

Complete the experiment exactly the way it is written in your methods. Observe your experiment daily and keep a journal of your observations. Your observations might just help you explain your results. Record all your data (measurements, counts, times, etc.) in a notebook.

6. Compile the results and show the data

If you have lots of numbers, consider putting your data in a table, graph, pie diagram or other illustration. Each illustration should have a written explanation or caption. In addition, write a short paragraph explaining exactly what happened.

Plants grown in light were 10 inches tall, but plants grown in shade were 15 inches tall. My dog Fido chose the fish dog food on seven of the ten days. He ate beef dog food on the other three days. The iron nails in salt water rusted completely in three days. The nails in fresh water rusted in 12 days.

7. Present results to others.

Scientists are not finished with their project until they share results of their experiments with other scientists and the public. Your display for a scientific experiment should contain the following elements:

1. Title- something interesting that grab's the viewer's attention and has key terms that show what your experiment is about

2. Introduction- Give a short introduction to your project.

Why did you choose to work on this project?

What did you learn from your library research and from other scientists about your topic?

3. Question- State very clearly what question you were interested in asking.

4. Hypothesis or prediction- State very clearly your guess at the answer to your question.

5. Methods- Describe everything you did in the order it was completed.

6. Results - Include all your measurements, counts, graphs and table.

7. Conclusions- Discuss your results. Do they support your hypothesis or not? Remember it is okay if your results do not support your hypothesis. Unexpected results may be difficult to explain, but they often lead to exciting discoveries. Negative results are okay! Can you find anything in your daily observations and notes that help explain your results?

8. The next experiment- What experiment would you like to do next? Did you learn some thing from your experiment that might be interesting to try next?

9. Sources of information- List all of your sources of information. Refer to the Illustrated Science Report Section for ways to list sources (pg 5).

10. Acknowledgment- Please acknowledge all the people that helped with your project. List their names, who they are, and how they helped you.

PLEASE NOTE: Experiments with live animals are permitted as long as they do not harm the animal. NO ANIMALS MAY BE EXHIBITED. Instead, use photographs, drawings or video tapes. If you need a VCR and television, please contact the school librarian one week before the Fair or bring one from home. Also remember, the District Science Fair does not have VCR capabilities.

University Park Elementary School PTA

AWARD: 1ST 2ND 3RD

JUDGING SHEET - EXPERIMENT

ENTRY NUMBER:__________ STUDENT____

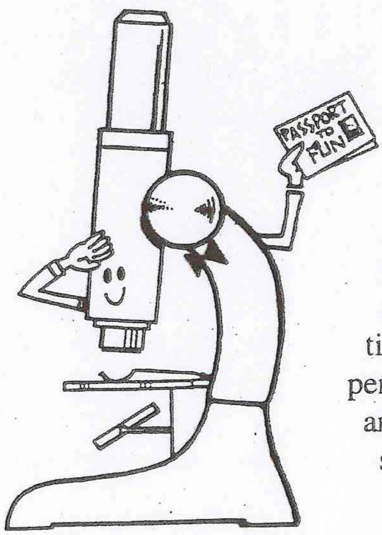
EVALUATOR____(please print)

Please mark an X in the box that best fits the description	Outstanding	Very Good	Good	Needs more Work
The question the project seeks to answer is clear				
The hypothesis or prediction is clear				
Procedures are clear and understandable				
Procedures are complete and repeatable				
Procedures address the hypothesis or prediction				
Data and observation records are clear and complete				
Data and observations are repeated				
Data are illustrated in graphs, tables, etc.				
Conclusions are consistent with data				
Conclusions relate to the hypothesis				
Display is easy to understand				
Display is appealing to the eye				
Display is complete (title, question,hypothesis or prediction, methods, results, conclusions, sources, acknowledgements)				
The project had appropriate and sufficient sources				
Written explanations show understanding of project				
Oral explanations show understanding of topic				
Oral explanations show ability to extend beyond project				

COMMENTS TO THE STUDENT (continue on top of back)

Entry number__________

Judge's recommendation: (circle) 1st 1st or 2nd 2nd 2nd or 3rd 3rd DISTRICT



Invention or Innovations

Scientists wanting more information about what plants and animals were made of, invented the microscope using lenses and mirrors to magnify parts too small to see with the eye. An engineer in Philadelphia invented a machine that helps doctors perform eye surgery using lasers rather than a knife. Inventions are useful tools that solve a problem or fulfill a need. We are surrounded by inventions every day from simple light bulbs to bread machines, from pencils to Velcro® fasteners. Innovations are similar to inventions but are improvements of an object or a new way of doing or making something. Both inventions and innovations require a problem that needs to be solved followed by many hours of try and try again.

Steps in Completing an Invention or Innovation

1. **Think of a problem** that needs to be solved or an object that needs to be improved. The problem does not need to be complex. The most interesting projects are ones you design based on problems or objects you see in your daily life.

2. **Begin an Inventor's Notebook.** This notebook contains all of your ideas, good and not so good, that might help you solve your problem. Write down what your goal is, then write down possible solutions. Include drawings, lists of tools, possible methods to try, and why one method didn't work and others did. In other words, keep a diary of everything you do. Make sure each entry also has a date.

3. **Visit the library**, other scientists, industry representatives, etc. to help answer questions about your project. Perhaps your invention requires the use of a remote control switch, but you don't know anything about switches. Many people in the community and library resources can help you get from point A to point B.

4. **Construct your invention or innovation.** Test it. Did it work? If not, can you think of reasons why? Write the results of all of your tests in your Inventor's Notebook. Remember, ALL your attempts, and even ideas you might think are silly, should be written down. That "silly" thought just might be the key once you've thought about it for a while.

5. **Make a display** of your invention or innovation. Your display should include:

   a) **Name of your invention or innovation-** Make it something catchy and interesting.

   b) **Problem or need-** What problem were you interested in solving? What was the purpose for starting your project?

c) **Inventor's Notebook**- Include a copy of your notebook with all comments, results of trial runs, successes and failures.

d) **Explanation**- In outline form, describe steps for building your invention. You need to give enough detail so that others could build your invention if they wanted to. Include all the materials needed for your invention or innovation.

e) **Working Model**- Make a working model of your invention for your display. Remember, if you don't want viewers to use your model, place a sign, "Please don't touch" on your display.

f) **Evaluation**- Do you think your invention is a success or not? Why? If you would make additional changes, what would they be? What's next?

g) **Sources of information**- List all people, books, magazine and other resources you used to complete your project. Look in the section on Illustrated Scientific Report for methods of listing sources (pg 5).

h) **Acknowledgments**- List all the people who helped with your project and tell what they did. You do not need to repeat names if they are already listed as sources of information.

NOTE: Inventions require a lot of repetition. Try one thing. If it doesn't work, try something else. If the invention doesn't quite work the way you want it too by the time the Science Fair happens, enter anyway. Talk to the judge about your progress and problems. A completed project may be entered the next year.

University Park Elementary School PTA

AWARD: 1ST 2ND 3RD

JUDGING SHEET - INVENTIONS OR INNOVATIONS

ENTRY NUMBER:__________ STUDENT____

EVALUATOR____(please print)

Please mark an X in the box that best fits the description	Outstanding	Very Good	Good	Needs more Work
Name of invention is "catchy", interesting, intriguing				
Problem or need is clearly explained				
Materials list is clear and complete				
Explanation of how to build or use invention is clear				
Inventor's Notebook is well organized and complete				
Inventor's notebook contains design work &materials list for possible solutions				
Inventor's Notebook contains what worked/didn't work				
Evaluation of invention is clear (Was it a success? Why?)				
Evaluation includes future changes or alterations				
Display is easy to understand				
Display is appealing to eye				
Model of invention or innovation is well constructed				
Model of invention or innovation works!				
The project has appropriate and sufficient sources				
Display is complete :name of invention, problem or need, materials list, explanation, working model, sources, acknowledgement [circle missing component(s)]				

COMMENTS TO THE STUDENT (continue on top of back)

Entry number__________

Judge's recommendation: (circle) 1st 1st or 2nd 2nd 2nd or 3rd 3rd DISTRICT

Original Computer Programs

Computers have been useful science tools for more than 50 years, and they are now indispensable. Computer programs make even the most complex tasks of compiling and analyzing data, writing, editing, and publishing scientific reports much easier. Like inventions, computer programs help solve problems. They help scientists create and test new ideas, perform complex mathematical functions in fractions of seconds, and they help scientists communicate with other researchers worldwide. This project allows students to develop an original computer program that helps solve a problem or answer a question. The problem need not be complex, but it does require the student to have prior knowledge in programming. The program can be a graphics or math demonstration, a game, a model, or a program that helps solve a problem or organize information. The program must be original, self explanatory, "run" smoothly and require no special computer skills for the people who will eventually use the program.

Steps in Completing an Original Computer Program

1. **Identify a question or problem** that requires the use of computers.

2. **Computer access-** If you need access to a computer, talk to your teacher about using the computer lab or a computer in your classroom. The school will provide a Macintosh or Apple computer. Check with your teacher to find out what software is available on the school's computers.

3. **Sources of information-** Contact community resources, libraries, computer scientists, etc. for assistance in writing your program.

4. **Design your original program** using any computer platform or language necessary.

5. **Make a printout** of your program and a copy of your program on disk. Both must be handed in to the main office at least three days before the science fair. Check the science fair calendar for specific dates.

6. **Make a display** of your original computer program. It must include:
    a) **Title-** Make it interesting and be creative!

    b) **Objective-** Explain why you wrote the program, the question or problem you intended to solve, and who will use your program.

    c) **Directions-** Provide directions to your viewers on how to start the program, how to use it, all the information necessary for people to interact with your program, how to end and return to the beginning.

    d) **Sample program-** Include on your display, a sample printout of what can be expected by running your program. Label as many components as necessary in order to give your viewers the most information about running your program.

e) Sources of information- List all people, books, magazine and other resources you used to complete your project. Look in the section on Illustrated Scientific Report for methods of listing sources (pg 5).

f) Acknowledgments- List all the people who helped with your project and tell what they did. You do not need to repeat names if they are already listed as sources of information.

NOTE: The school has only Apple/Macintosh computers available for computer projects. Make sure your program is compatible with the school's software and operating systems or make arrangements to bring in your home computer for judging day. Talk to the science fair coordinator to arrange for space at the fair. For security reasons, personal computers may not be left in the gym overnight.

University Park Elementary School PTA

AWARD: 1ST 2ND 3RD

JUDGING SHEET - COMPUTER PROJECT

ENTRY NUMBER:__________ STUDENT____

EVALUATOR____(please print)

Please mark an X in the box that best fits the description	Outstanding	Very Good	Good	Needs more Work
Program runs smoothly, without flaws				
Objectives clearly stated, understandable				
Objectives define a specific user or audience				
Operation of program requires no special computer expertise on part of users				
Directions for use (start, run, exit, etc) are clear, easy to understand				
Sample printout shows results of program				
Display is easy to understand				
Display is appealing to eye				
Written explanations are clear, show understanding of program				
Oral explanations are clear, show understanding of program				
Oral explanations show ability to extend beyond project				
Project has appropriate and sufficient sources				
Display is complete: title, objective, program, directions, sample printout, sources, acknowledgements [circle missing component(s)]				

COMMENTS TO THE STUDENT (continue on top of back)

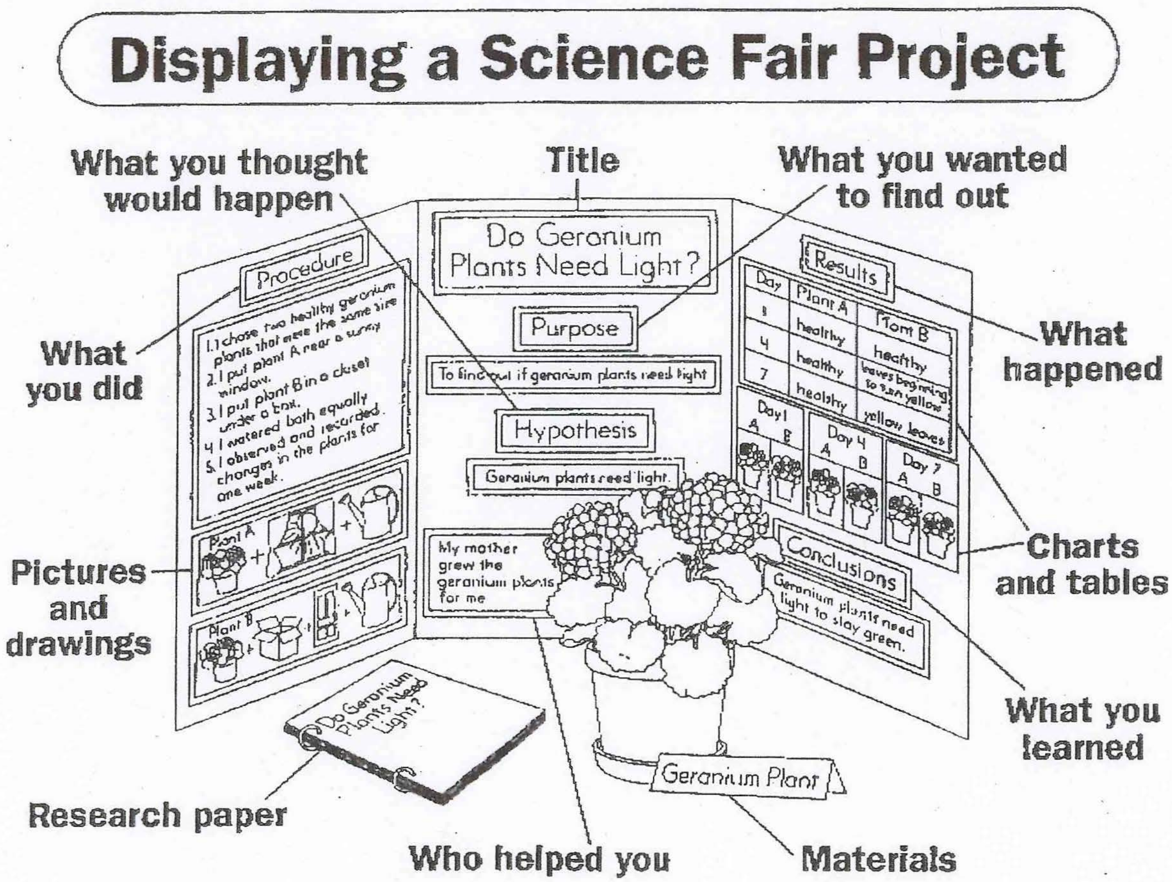
Entry number__________

Judge's recommendation: (circle) 1st 1st or 2nd 2nd 2nd or 3rd 3rd DISTRICT

Your Science Fair Exhibit

Exhibits come in a wide variety of shapes, sizes and colors, but there are specific guidelines that must be followed:

Exhibit size. Make your display as compact as possible and one that can fit in your car. Your display cannot be larger than 3 feet wide, 2 feet front to back and 6 feet tall.



What should the display be made of?

The display needs to be sturdy enough to hold all of your illustrations, diagrams, and other things you need to explain your project. There should be some type of backboard on which at least the title of the project is mounted. The display must be freestanding when placed on a table. It cannot be leaned up against a wall or another project. Any kind of stiff cardboard, cardboard boxes, wood or foam core board may be used to construct the project as long as it can stand up on its own. Some families construct a wooden display board that may be reused year after year. Poster board is too wobbly by itself and needs some kind of support. Many local school and art supply stores in Fairbanks sell freestanding science fair display boards.

Use large, dark-colored lettering so your words can be seen at least 3 feet away. Hand print, type or use computers to make your letters clear and readable. Try to use markers or bold print so your words stand out on the display.

(at least 2 inches tall)

Title

(at least 3/4 inch tall)

Headings

(at least 1/4 inch tall)

Paragraphs, captions for pictures, sources of information, acknowledgments, etc.

Do you need electricity? Make sure you bring an extension cord with your exhibit.

Your Name: Do not put your name anywhere on the front of your exhibit. It should occur only on the entry form that will be attached to the back of your exhibit.

Do you have a hand's on exhibit? Make sure all parts are sturdy enough for lots of use. Hundreds of children and adults will view and try your demonstration, so make sure it will hold up through the judging interview, class viewing and public viewing. You may want to check your exhibit during the science fair to make sure everything is working properly.

Do you have an exhibit you DON'T want people to touch? Make sure you say so by putting a large sign on your project PLEASE DON'T TOUCH! Make the sign freestanding, and place it in the front of your exhibit or on the table so it's the first thing people see.

Avoid breakable parts. If your experiment requires expensive or fragile parts, consider bringing them only for the judging interview. Use photographs or drawings during the remainder of the science fair.

Animals and Hazardous Materials. No live animals may be exhibited. Do not exhibit anything hazardous such as disease-causing organisms, bacteria, open flames or chemicals.

Display Only and Competitive Exhibits. You have the option of entering a display only or a competitive exhibit. The display only category is for students who are not interested in competition but want to try something new and explore an interest. Entries are awarded a certificate and ribbon of participation, and you have the option of discussing your project with the judges.

Blue, red and white ribbons are awarded for competitive projects based on the level of achievement for specific goals outlined for the various entry categories (see attached judging sheets). You compete against a set of goals, not against other projects. All entries receive a certificate of participation and a ribbon.

The Science Fair!

Sign in please! Your display must be brought to the gym by the deadline unless arrangements are made with the science fair coordinator ahead of time. Tables will be set up in the gym the morning of the science fair. Groups of tables will be labeled with each grade level. Find your grade, and put your exhibit on one of the tables. If you need electricity, please talk to one of the science fair volunteers for an appropriate place to set up your display.

You must sign in at the main entry table and tell the attendant what type of project you have, how many people have entered, and whether your project is for display only or competition. Make sure you have a completed and signed entry form for each exhibit. You will tape the entry form to the back of your exhibit, tape an exhibit number to the front of your display, and put the appropriate judging sheet on the table in front of your exhibit.

The next day, an adult volunteer will come to your classroom and escort you to the gym. You will be interviewed by a judge and asked questions about your project. The interviews last 15 to 20 minutes. After the interview, you will get your picture taken, then will be escorted back to your room.

The judges make written comments on the judging sheet and make suggestions as to first, second or third place ribbon. In the afternoon, a committee of parents, teachers and judges reviews the judging sheets and makes sure judging was fair and uniform.

What happens if you are sick on judging interview day? Make sure a family member brings your project anyway. Make sure an adult contacts the science fair coordinator, your teacher, or the main office to let them know you will not be there for an interview. Your project will be evaluated by the judges and awarded a ribbon. If you are back in school before the science fair ends, the science fair committee will make every effort to arrange an interview with a scientist. Your project, along with all the others will be evaluated for the district science fair.

District Science Fair

A number of projects are selected for the District Science Fair held at Alaskaland. The exact number of projects for each school is determined by enrollment and past participation. We try to send at least two projects from each grade level, then divide any remaining slots among outstanding projects school-wide. Judges may recommend projects for district, but the final determination is by a committee of teachers, judges and parent volunteers.

NOTE: Students who use a computer for a District science fair project must provide their own equipment or sign out equipment from the school. It is recommended that the computer be brought to the fair on the day of judging and removed after all judging is completed.

University Park Science Fair Entry Form

TITLE: ____

NAME(S)　　　GRADE:　　TEACHER:　　　　PHONE NUMBER:

____

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(continue on back if necessary)

TYPE OF PROJECT (CHECK ONE)

_____ Original Computer Program
_____ Illustrated Scientific Report
_____ Invention or Innovation
_____ Scientific Experiment
_____ Non-competitive entry, for display only*
_____ Scientific Collection
_____ Demonstration of Scientific or Mathematical Principle

*Do you want judge's comments for your non-competitive entry?
_____ yes _____ no

ENTRY TYPE (CHECK ONE)

_____ Individual
_____ Small Group (2-5 students)
_____ Class Project
_____ Family

PROJECT DESCRIPTION:

____

____

____

____

____

Signature of Parent or Guardian ____________________