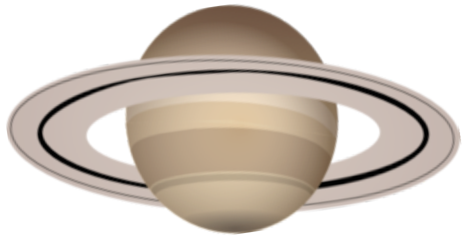
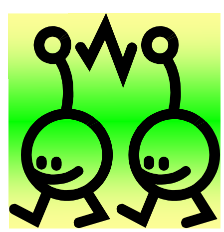




PROSPECT VALLEY
2015 SCIENCE FAIR

STUDENT HANDBOOK

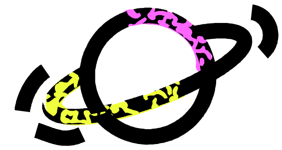


Sponsored by:

Prospect Valley PTA

Welcome to the Prospect Valley Elementary 2015

SCIENCE AND INVENTION FAIR



Are you a future scientist?

This is an exciting opportunity to do what a SCIENTIST does. Find a topic that you are curious about, and learn things about it that you did not already know. Then present what you discovered to other people. Your project may be either a DEMONSTRATION project or an INVESTIGATION project.

Are you a future inventor?

If your imagination and curiosity make you want to find an easier or better way of doing something, then do what an INVENTOR does. Use the "8 Steps of Inventing" to create something that solves a problem or satisfies a real need, then present your original INVENTION.

How it works...

The Science and Invention Fair is NON-COMPETITIVE. Local community members with a scientific background will provide each student with individual feedback and a written evaluation. Students will be expected to be able to describe their projects, have a basic understanding of their subject, and be able to answer questions about it. Every student will receive a Certificate of Participation. The Science Fair will be set up on the morning of Monday, April 20, 2015 and will be available for viewing by students, staff, and parents all day. Students will stand by their projects on Monday evening at the Spring Fling.

Projects may be done as an **individual**, as a **team** of up to 3 students, or as a **family**. Please fill out only one Final Registration Form if you are doing a team or family project. All materials and costs associated with the project need to be provided by the respective individual, team, or family.

Although a science or invention project provides an opportunity for parents and children to work together, it is important for students to experience for themselves the excitement of scientific discovery by learning how to ask questions and solve problems and present their results.

So…get your imagination in gear.
You ARE the scientists and inventors of the future!

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SCHEDULE

April 14, 2015 (Tuesday)	Last day for turning in the Final Registration Form
April 20, 2015 (Monday)	Science Fair Day!
7:30-8:10 am:	Students set up projects in the Gym.
8:30-2:30pm:	Science Fair open for classrooms, staff, and parent viewing. Science Mentors provide evaluations and feedback.
5:00-7:00:	Parent and public viewing of projects during the Spring Fling!

Please be sure to turn in your final registration form no later than Tues, April 14, 2015!

PARENT INFORMATION

This handbook is intended to be a guide for students in preparing their Science or Invention project. We have provided descriptions of the 3 project types (Demonstration, Investigation and Invention) in order to help your child determine which of the 3 types of projects he or she would like to prepare.

Young students or first-time participants may feel more comfortable choosing a **Demonstration project**. This is a terrific way to study a scientific process, but it does not require an understanding of the Scientific Method. Please be sure that if they do a model or collection, it is supported by background information or scientific explanation.

An **Investigation Project** requires an understanding of the Scientific Method. Students choosing this type of project will design experiments in order to answer a scientific question. This is certainly the best project for students who want to experience science like a true scientist!

An **Invention Project** is an opportunity for creative problem solving and can be a very rewarding experience. Following the "8 Steps of Inventing" helps a student learn the invention process just like true inventors. Even elementary age children have obtained patents for real inventions!

The important thing to remember is to help your child find a project that is personally interesting to him or her. **Help your child plan a schedule so that the project can be completed by the deadline.** Resist the temptation to control their project or do the work for them. Direct them to resources at libraries, on the internet, at museums, etc. but let them do the work.

For assistance, please feel free to call or email the Science Fair Chair:

Robin Chalker **Email:** rochalker@comcast.net
Liz Loya **Email:** lizloya@comcast.net

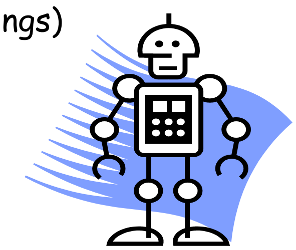
TYPES OF PROJECTS

INVENTION PROJECTS

An invention is some thing (or a way of doing something) that solves a problem or satisfies a real need. It can be a completely unique and innovative design, or a redesign and improvement of something that already exists. Follow the steps below to help you with the invention process:

EIGHT STEPS TO INVENTING

1. **Look for problems that need solving.** A problem that affects you or your family might be a good place to start.
2. **Plan your invention.** You may wish to do some research on existing products; the internet is great for this. This will help you avoid duplicating other existing inventions, and allow you to improve on them!
3. **Use your imagination.** Getting around existing problems will often require you to think outside of the box!
4. **Keep a log**. Write down all your ideas, experiments, research, tests, setbacks, and successes. See the section in this handbook entitled "Keeping a Log Book." This is the written record of your invention process. Include this with your final display.
5. **Draw your invention.** Make a detailed drawing (or several drawings) and label all parts so others will be able to understand how your invention works.



6. **Make a model of your invention**. If it is small enough, you can bring the final model to the science fair. Otherwise, include photos on your display board.
7. **Test your invention to make sure it works**. This may require testing of multiple prototypes before you have successfully solved the problem. Record this information and include it in your log or display. Also include information such as: How effective or useful is your invention? How is your invention original, and how could you further improve it?
8. **Name your invention.** Have fun with this! You can use rhyming words, or include your name in some form, or make it silly or serious.

DEMONSTRATION PROJECTS

This type of project reflects what you have researched and learned about a topic. Although these projects do not use the Scientific Method (page 13), students should be thorough in presenting any scientific principles that help explain the topic. There are 2 types of Demonstration Projects:

DISPLAYS

- Collections
  Include some scientific information about your collection.
  Label your collection.
  Make up a question that can be answered by your collection.
  OR…Compare collections from different locations.
- Posters, charts or illustrations (2-dimensional display)
- Show the history of a discovery or invention that you have researched.
- Use diagrams to explain a scientific principle.
- OR…Assume the identity of a famous scientist or inventor & explain what he or she did.

MODELS (Three-dimensional representation of existing objects):

- Build a model of something that is otherwise too small to be easily seen, such as a small insect or an interesting molecule.
- Build a model of something that is otherwise too large to display.
- Build a model of a known invention and explain how it works and who invented it.
- Make up a question that can be explained using your model.
- OR…Demonstrate a scientific principle using your model.
- Build a miniature scene or diorama to demonstrate the answer to a question, or to explain a scientific theory or principle.

Demonstration projects can be self-explanatory, demonstrated by you to your viewers, or interactive and manipulated by the viewer.

INVESTIGATION PROJECTS

These projects involve collecting data in order to determine how or why something happens. There are two types of Investigation projects: Observational and Experimental. These are both favorite methods among REAL scientists for answering questions about our world! The steps for each project are summarized below.

OBSERVATIONAL INVESTIGATION PROJECT

For this type of project, you observe and record information without changing anything. A survey is an example of an Observational Investigation. For this type of study, you will need to:

- **Determine the purpose** of your study. This can be stated as a question that you wish to answer.
- **Do some background research** to learn more about your topic. Remember to summarize the most important facts on your display.
- **Form a hypothesis** (your best guess at a possible answer to your question).
- **Conduct an experiment** to collect information that will help answer your question and test your hypothesis to see if it was correct.
- **Analyze the data** that you collected. Explain what you think happened.
- **Make a conclusion**. Tell us what you learned, how your data answered your question, and whether your initial hypothesis was correct.
- **Make a display** of your project, trying to keep things organized and easy to read. It is helpful to make sections using the titles: Purpose, Research, Hypothesis, Experimental Methods, Data Analysis, and Conclusion.

☺ If this is the type of project you would like to try, follow the step-by-step worksheets for ***Getting Started On An Investigational Project*** (page 12), and ***Using The Scientific Method*** of investigation (page 13). Also, see the following example.

EXAMPLE OF AN
OBSERVATIONAL INVESTIGATION PROJECT

Title: Birds in My Yard

PURPOSE/QUESTION	What type of bird is most prevalent near my house?
RESEARCH	Common feeder birds in Western North America include Chickadees, Nuthatches, Finches, Blackbirds, Thrushes, Sparrows and more.
HYPOTHESIS	I hypothesize that there are more Red-winged Blackbirds than other types of birds near my house.
EXPERIMENT/METHODS	Using a bird identification chart, I will record the numbers and types of birds I see near my yard and at my bird feeder. I will do this every morning before school, and every afternoon after school, for 1 week.
DATA ANALYSIS	Altogether, I saw 44 birds including 5 species. There were: 20 Varied Thrushes; 11 Red-winged Blackbirds; 9 Black-capped Chickadees; 2 Western Scrub Jays (Blue Jays) 2 Cassin's Finch
CONCLUSION	The most common bird was the Varied Thrush. They live in a tree in my yard and visit the bird feeder a lot. My hypothesis was not supported (Blackbirds were the second most common bird, not the first). This made me think of another question. If we changed the kind of bird food in the feeder, would different birds come to visit? This would be my next question to test.

EXPERIMENTAL INVESTIGATION PROJECT

For this type of project, you will observe and record measurements and results while changing one factor in the experiment. This enables you to study the effects of that factor. For an Experimental Investigation project will need to:

- **Determine the purpose** of your study. This can be stated as a question that you wish to answer.

- **Do some background research** to learn more about your topic. Summarize the most important facts on your display.

- **Form a hypothesis** (your best guess at a possible answer to your question).

- **Design and conduct an experiment** to collect information that will help answer your question, and test your hypothesis to see if it was correct. Your experiment should include:
  - *Control sample(s):* The part of the experiment that you don't change.
  - *Experimental sample(s)*: The part of the experiment that will have one feature that is different than the control sample.
  - *An Independent Variable* : The factor that you choose to vary in the experimental samples.
  - *A Dependent Variable*: The phenomenon or "thing" that was affected by your independent variable. Measure and record how this changed.

- **Analyze the data** that you collected. Explain what you think happened.

- **Make a conclusion**. Tell us what you learned, how your data answered your question, and whether your initial hypothesis was correct. State any new questions or ideas that came to mind.

- **Make a display** of your project, trying to keep things organized and easy to read. It is helpful to make sections using the subtitles: Purpose, Research, Hypothesis, Experiment (or Methods), Data Analysis, and Conclusion.

☺ If this is the type of project you would like to try, follow the step-by-step worksheets for ***Getting Started On An Investigational Project*** (page 12), and ***How To Use The Scientific Method*** of investigation (page 13). Also, see the following two examples.

EXAMPLE #1 OF AN
EXPERIMENTAL INVESTIGATION PROJECT

Title: Watching Marigolds Grow.

PURPOSE OR QUESTION	In which medium will flowers like marigolds grow best?
RESEARCH	Several different soils and media are available for growing plants. Some are rich in nutrients, some let water drain quickly through them, and some are light and fluffy. We will test 5 different media.
HYPOTHESIS	I hypothesize that over a 6 week period, marigolds will grow best in store-bought potting soil.
EXPERIMENTAL METHODS	Purchase 5 marigold plants that are as close to the same size as possible. Gently rinse the soil from the roots of all 5 plants. Repot each plant in different media. Water, sunlight and temperature should be the same for all 5 plants over the 6 week period.
CONTROL SAMPLE	Repot 1 marigold in the soil it came in.
EXPERIMENTAL SAMPLE(S)	Repot 1 marigold in sand. Repot 1 marigold in vermiculite. Repot 1 marigold in topsoil from your garden. Repot 1 marigold in store-bought potting soil.
INDEPENDENT VARIABLE	Planting media.
DEPENDENT VARIABLE(S)	Plant fullness, height, leaf color and blossoms.
ANALYSIS	The plant in the good potting soil grew better; it was fuller and taller *[the actual measurements of all plants should be shown on the display]*. The leaves were darker green. It had more blossoms and they were bigger. *[Show photographs for the display].*
CONCLUSION	My hypothesis was supported. The store-bought potting soil was best for growing marigolds. Maybe this is because it contains a mixture of different media that provide nutrients and good drainage. My experiment is important because it will help us to choose a good soil for planting flowers this Spring.

EXAMPLE #2 OF AN
EXPERIMENTAL INVESTIGATION PROJECT

Title: Finding the Best Time for Winter Baseball!

PURPOSE/QUESTION	What is typically the warmest time of the day in the winter?
RESEARCH	Sunlight is the major source of heat for earth. The energy from sunlight is converted to heat when it is absorbed by the ground. The most heat is produced when the sun is directly overhead.
HYPOTHESIS	I hypothesize that the warmest time of the day will be around noon, since the sun is highest in the sky at that time compared to morning and evening.
EXPERIMENT	We measured the temperature in my front yard at various times during the day (7 am, 10 am, noon, 2 pm, and 7 pm). We did this for 10 days. We chose not to take measurements on stormy days since that can affect the temperature for other reasons.
EXPERIMENTAL SAMPLE(S)	Temperature at 10 am; Temperature at noon; Temperature at 2 pm; Temperature at 7 pm.
INDEPENDENT VARIABLE	Time of day.
DEPENDENT VARIABLE(S)	Temperature.
DATA ANALYSIS	For most days, temperatures were lowest in the morning, and increased until 2 pm. For 7 of 10 days, the warmest time that we measured was at 2 pm. *<<On the display, the actual times and temperatures should be shown in a table>>*
CONCLUSION	My original hypothesis was not supported. The daily temperature continues to rise after noon, and is highest at 2 pm. Maybe this is because the heat continues to build up for several hours. This information is useful since it will help me to choose the best time of day for neighborhood baseball games in the Winter!

GETTING STARTED ON AN INVESTIGATIONAL PROJECT

1. **Choosing a general topic.** Think about different things that interest you and make you wonder. Look around at home and on your way to school. Or perhaps you are interested in something you recently read about, or saw on T.V. From nature, to planets and machines, the choice is yours. A terrific list of ideas for projects can be found in the back of this handbook to help you, along with links to science fair websites. Be sure to choose a topic that you want to learn more about. *For example, "I would like to learn more about plants."* Now it's your turn.

I am interested in learning more about:

____.

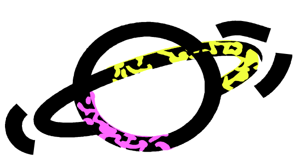
2. **Asking a question.** If you already have a specific question about your topic of interest, write it down on the line below. As you do some background research (in the next section), you are likely to think of other questions as well. Be sure to write down at least 2 questions. This is important because you may not have the materials or ability to test some of your questions.

I would like to answer one of the following questions:

Question 1.____

Question 2.____

Now you are ready to begin using the Scientific Method to help answer your question.



HOW TO USE

THE SCIENTIFIC METHOD

The Scientific Method of investigation is how scientists find the answers to problems. It also helps them explain to others how they found the answers. There are 6 steps to the Scientific Method:

(1) Stating the purpose of your study
(2) Doing background research
(3) Forming a hypothesis
(4) Designing and performing the experiment
(5) Analyzing the data
(6) Making a conclusion

Follow these step-by-step instructions to help you use the Scientific Method as you design your study. Get ready to be creative!!!

STATING THE PURPOSE OF YOUR STUDY

The purpose or reason for your study can be written as a statement:

"Purpose: To determine the best soil for growing marigolds."

Or, the purpose of your study can be written as a question:

"Question: In which media will marigolds grow best?"

You may use your favorite question from the previous section "Getting Started."

The Purpose or Question of my study is:

____

____

DO SOME BACKGROUND RESEARCH

Gather as much information about your question as you can. Talking to experts, reading books or searching the Internet can help you plan your project. Write down the most important information that will help you to design your experiment. You will later need to summarize these facts on your final display, along with a list of where you got these facts.

FIGURE OUT WHAT MATERIALS TO USE

Now, figure out what materials you could use to create your Science Fair project. If the materials are expensive or difficult to find, you may need to think of another way to answer your question. You may also go back to the section "Getting Started" and choose a different question from your list.

<u>For example:</u>

If your project is on the growth of plants, could you easily find the plants, soil, containers, light, water, and other materials you might need?

If you want to know how a musical instrument makes different pitches, could you find materials that would make musical sounds?

The Materials I Will Need Are:

____

____

____

FORMING A HYPOTHESIS

A hypothesis is an educated guess at an answer to your question. After you have done your research, you might know of a few possible answers to your question, but choose one as your hypothesis. It doesn't really matter whether your hypothesis is right or wrong once you do the experiment. The main reason for forming a hypothesis is that it will help you design and focus your experiment, so that it answers a specific question.

[Example: My hypothesis is that marigolds will grow best in store-bought potting soil.]

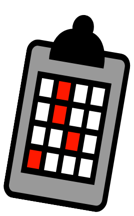
My hypothesis is:

____

DESIGNING AND CONDUCTING YOUR EXPERIMENT.

How you design your experiment will differ depending on the type of Investigational Project you chose (Observational verses Experimental). It will probably be helpful to refer to the examples of investigational experiments on pages 8, 10, and 11 as you try to put together your own experiment.

For an Observational Investigation: Using the materials you chose on the previous page, think about what type of information you want to collect to find out if your hypothesis is right or wrong.

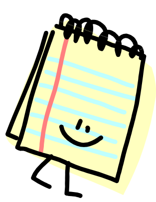


- For collecting information, it is often helpful to make a table using subheadings for the types of information you are going to collect.
- If you are conducting a survey with questions for other people to answer, write the questions out neatly. Also, you may want to make the answers multiple-choice. This will make it easier to analyze the data.
- Keep a log of all information you collect. Be sure to write down any errors that were made, along with anything unexpected that happened.

For an Experimental Investigation:
Using the materials you chose previously, think about what you want to do to test your hypothesis (to see if it is supported or not). A good way to start is to ask yourself, "what normally happens before anything else changes?" This condition could serve as your control. In the end, other samples will be compared to your control sample.

Next, decide on one thing that you are going to change among your experimental samples (you can have just one experimental sample, or you could have several). Remember, it is only a fair test (or a fair comparison) if you change ONE thing between your control and your experimental samples. *For example, if you want to vary the amount of light your plants are exposed to, all other factors need to stay the same, including the type of soil, the amount of water the plants get, etc.* Your experiment should have the following parts:

- **Control sample(s):** This is often the part of your experiment that will have normal conditions—before anything is changed. Other samples will be compared to this.
- **Experimental sample(s):** The part of the experiment that will have one feature that is different than the control sample.
- **Independent variable:** The factor that you choose to vary in the experimental samples.
- **Dependent variable:** The final process or "thing" that you expect to be affected when you change that one factor (your independent variable). We often think of it as a responding variable or the data we collect.



Once you know what samples you will have in your experiment, write them down. Next, imagine how your project will proceed. Write down how you will start, how long the experiment will take, and what you will need to do at different time points for your different samples. This is like designing a game that you are going to play!!!

When your design seems perfect, you are ready to play your game (or conduct your experiment). It might be helpful to make a Table in order to collect your data easily during the experiment (see the section of this handbook entitled "Keeping a Log Book." Keep notes on everything you do, and everything you observe (even mistakes are important). Make sure that you describe things with enough detail that someone else could understand and repeat your experiment.

If you wish, you can use the following worksheet to get you started:

MY SCIENCE PROJECT WORKSHEET

MY QUESTION IS:

MY MATERIALS ARE:

MY HYPOTHESIS IS:

MY CONTROL SAMPLE IS:

IN A FAIR TEST, YOU CAN ONLY CHANGE ONE THING AT A TIME. EVERYTHING ELSE MUST STAY THE SAME. IDENTIFY ONE THING THAT YOU ARE CHANGING (THIS IS YOUR INDEPENDENT VARIABLE).

WHAT THINGS WILL STAY THE SAME?

MY EXPERIMENTAL SAMPLES ARE (list one or more samples):

WHAT TYPE OF CHANGE ARE YOU LOOKING FOR BETWEEN YOUR CONTROL AND EXPERIMENTAL SAMPLES (THIS IS YOUR DEPENDENT VARIABLE):

DATA ANALYSIS

For an Observational Investigation Project: Look carefully at the information you collected from your experiment. Write down a brief summary of what happened, and what you learned. Are there any patterns that you see? Did things turn out as expected? *Unexpected results are sometimes the hidden treasures that can change the way we think about our world!*

It is usually helpful to organize the data in a table form, tally, or graph. Photographs may also be helpful. Show your data in way that is easy for people to see what happened, and include this data in your final display.

For an Experimental Investigation Project: Look at your data carefully. Tell us what happened or what you noticed about your control sample. Describe how things changed in your experimental samples (compare them to the control, and to each other). If you see a pattern to how things change, describe it. Also, this is where you can mention anything unexpected that happened (whether it was a problem with your experiment, or something interesting that you noticed). *Unexpected results are VERY important to scientists! They can often help us to redesign the experiment in a better way to answer our question…. Or, sometimes unexpected results are the hidden treasures that can change the way we think about our world!*

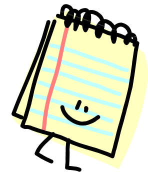
CONCLUSION

This is where you tell us the answer to your initial question, and what you learned from your experiment. Also mention whether your hypothesis was supported or not. *Don't worry—when scientists do REAL research about things they don't understand, their hypotheses are OFTEN not supported. The important thing is that you found out more about your topic than you knew before you performed the experiment!*

To make your concluding paragraph interesting, you might also mention any of the following:

- If you noticed any problems with your experiment that affected your data, describe how you could repeat the experiment differently to fix this problem.
- Did you think of any additional questions that you would ask if you were going to do another experiment? Tell us about them in a brief sentence or two. It is this process of repeated questioning that scientists use for discovery.
- Tell us why your findings are important to you, or other people. While all scientific investigation can be fun and challenging, good science is often judged by how it can help someone.

KEEPING A LOGBOOK



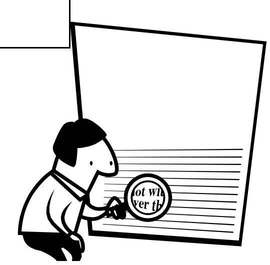
Both Scientists and Inventors use a notebook or an Inventor's Log to keep an accurate record of all their ideas, questions, research and experiments from the beginning to the end of their project. Sometimes when a project is finished, it is difficult to remember the details of the observations and measurements if you haven't made notes along the way. It also helps to write down the date each time you make a note so you will know *when* something happened. Making a table is a great way to organize data that you collect during an experiment.

You should include your LOGBOOK when displaying your Science or Invention Fair project. Write down everything that you find interesting as you do your project. Here are some examples of ways to organize your results.

Date	Time	Liquid Absorbed Group A	Liquid Absorbed Group B	Comments
1/27	5:53 am	6 ml	5 ml	Change in color, group B

	Growth (cm) Seed A	Growth (cm) Seed B	Comments
Day 1	-	-	
Day 2	-	-	
Day 3	Sprout	-	
Day 4	2	Sprout	
Day 5	5	2	
Day 6	6	3	
Day 7	8	4	
Day 8	10	6	
Day 9	11	8	

DISPLAYING YOUR PROJECT



Displays of **DEMONSTRATION** projects should include:

--Title of your project (and your name and grade)
--Any background information that you have found that will help explain the topic
--Your collection, poster, charts, illustrations, photos, models or diorama
--Your sources of information or bibliography

Displays of **INVESTIGATION** projects should include:

--Title of your project (and your name and grade)
--Your purpose or question you are answering
--Your background research (include your notes and logbook)
--Hypothesis (what you think the answer might be)
--List of materials
--Experimental procedure or methods
--Analysis of your results (your measurements and observations)
--Conclusion
--Your sources of information or bibliography

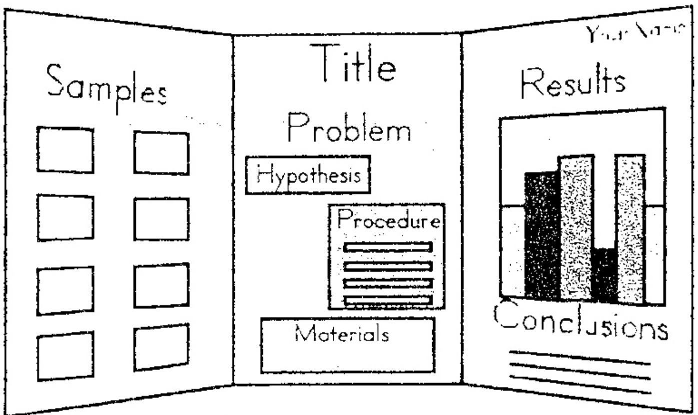
Displays of **INVENTION** projects should include:

--The name of your invention (and your name and grade)
--The original problem that your invention addresses
--A brief description of any relevant research that you did (including other existing products or methods that attempt to solve the same problem)
--A drawing or diagram of your invention
--A model or photograph of your invention; you may also include photographs of all major prototypes made (and their problems) before achieving your final model
--A description of how it works
--Your Inventor's Log
--Your sources of information or bibliography

See next page for some examples of how you can construct your display. Your display must be free standing and **your space is limited to 3 feet in width and 2-1/2 feet in depth**. If you require more space, please email Robin Chalker at rochalker@comcast.net. Please indicate on your Final Registration Form if you will need electricity. Pre-made displays boards can be purchased at hobby or home office supply stores.

Possible ways to display your Science Fair Project

Flat poster board folded into 3 for display

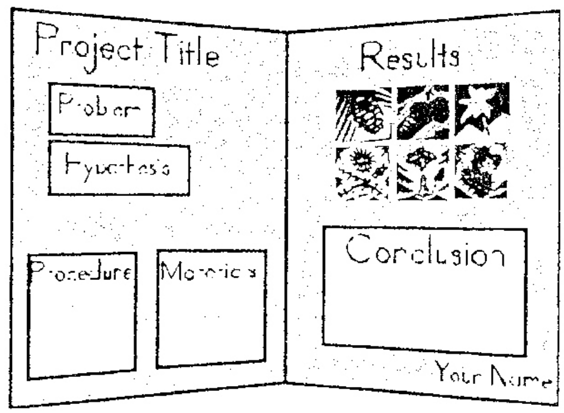


Bring your log book

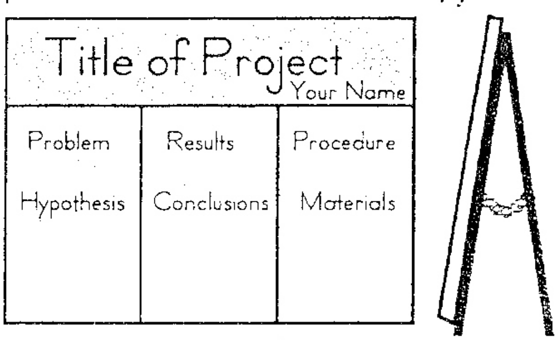
Displays can be a maximum of 3 feet in width and 2.5 feet in depth.

Bring your supplies

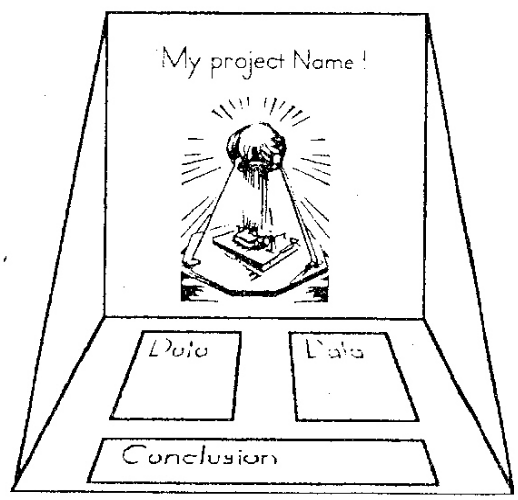
Flat poster board folded into 2 for display



poster board with easel support



big box cut out to show project



For the Science Fair:

Bring in things you used for your project, like your log books, your models, any supplies, and make a display so that people can learn about what you learned about.

RULES

1. The final registration form must be filled out, signed by a parent and returned to school by Tuesday, April 14, 2015.

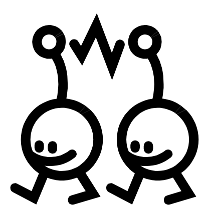
2. Students are encouraged to do as much of the project on their own as possible. The project should be done at home.

3. Displays must be free standing and are limited to 3 ft. wide by 2-1/2 ft. deep.

4. Projects MAY NOT include toxic chemicals, live animals, high voltage, explosives, open flames, or running water (may include static water if exhibitor takes responsibility for clean up).

5. Projects are entered at the risk of the students. Although care will be given and the fair will be supervised, the Science & Invention Fair volunteers, Prospect Valley, and PTA assume no responsibility for loss or damage.

6. Students should be available to present their projects the evening of Monday, April 20, 2015.



JUDGING

The Science and Invention Fair at PV is a NON-COMPETITIVE event. However, a scientist/mentor will provide positive feedback and suggestions for improvement. Students will be expected to have a good understanding of their project or invention and be able to answer questions about it at the Spring Fling on Monday evening, April 20, 2015.

Science fair projects will be evaluated on:

1. **ORIGINALITY and CREATIVITY**
   Does it demonstrate a unique point of view?

2. **PRESENTATION**
   Is the display neat and easy to follow?

3. **STUDENT'S UNDERSTANDING OF THE PROJECT**
   Can the student explain the project's theory or the invention process? Can the student describe how the results were achieved and what was learned?

4. **THOROUGHNESS**

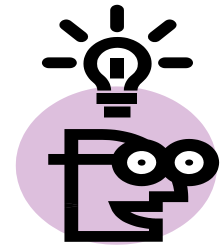
   For **DEMONSTRATION PROJECTS**
   Is the information correct? Does the display prove a point, answer a question or demonstrate a scientific theory? Did the student keep a notebook? Are the research sources listed?

   FOR **INVESTIGATION PROJECTS**
   Did the student use the Scientific Method of investigation? If the project is an experimental investigation, are the controls and variables identified and explained? Did the student keep a notebook? Are the research sources listed?

   FOR **INVENTION PROJECTS**
   Did the student follow the 8 steps of Inventing? Does the invention work and fill a need or solve a problem?

IDEAS TO GET YOU STARTED

THESE ARE JUST IDEAS…BE CREATIVE AND THINK OF WHAT YOU ARE INTERESTED IN!



DEMONSTRATION PROJECTS
Rock collections (where they are from & how they were formed)
Shell collections (how each animal used its shell to survive)
Casts of animal tracks (compare the differences between species)
Pressed flowers (show what determines a classification of flower)
Computers (chart and diagram the history)
Television (discuss the evolution of technology& who was involved)
Thomas Edison (make a poster showing his inventions & how they are used)
Eyeball (build a model of the inside of an eye)
A tongue (build a model showing the taste buds & how they work)
Solar system (build a model showing how the planets rotate around the sun)
A zipper (build a model showing how it works and tell who invented it)

INVESTIGATION PROJECTS
Cereal (which cereal gets soggy the quickest or the slowest?)
Pizza (what type of pizza do most adults like best?)
Stoplights (how many cars run red lights?)
Dog food (which dog food do dogs really like best?)
Weather (how often are weather predictions correct?)
Mold (what makes different colors of molds?)
Car speed (which lubricant makes a toy car go faster down a ramp?)
Boat sail (what material makes the best sail on a toy boat?)
Freezing liquids (do freezing temperatures change with different solutions?)
Noise (can noise be reduced by the material covering walls & floors?)
Dust (show if you should dust before or after you vacuum?)
Moths (do moths prefer one color of light over another?)

INVENTION PROJECTS
What will make your Mom's job easier?
What will help you clean up your room?
How can you make your chores go faster?
What new game can you invent?
What will make riding in the car more fun?

100-Plus Science Fair Project Ideas

- Food preference in gerbils
- Does adding salt to water change the temperature at which it boils?
- The effect of temperature on how long a soap bubble lasts
- The effect of different light intensities on the growth of sunflower plants
- The effect of light on the growth of bread molds
- Which bird feed to birds like best?
- A comparison of calories in five different kinds of peanuts
- The effect of acid rain on the growth of Wisconsin fast plants
- The effect of acid rain on the germination of apple seeds
- Using black walnut juice and marigolds to prevent weeds in your garden
- The effect of sugar water on the survival of cut flower stems
- The effect of salt on the growth of bean plants
- Hummingbird color preferences at feeders
- Bird feed consumption at different colored bird feeders
- Bacterial growth in apple juice and apple cider
- Does auxin affect seed germination?
- Can magnesium affect seed germination?
- Will acid rain affect the cell structure of spirogyra algae?
- The effect of surface area on burn time
- Does the life of a light bulb depend on its wattage?
- Sudsy soaps
- The effect of wire coils on the strength of an electromagnet
- Packaging eggs and shock resistance
- The effect of friction on velocity
- The effect of temperature on golf ball performance
- The effect of temperature on the rate of water absorption in cut carnations
- The antibiotic effects of bread mold on bacteria
- The effect of the color of light on the growth of sunflowers
- How changes in gravitropic responses affect plants
- A study of the abundance of prey available to arachnids through the use of artificial webs
- The feeding habits of winter birds
- The germination of gamma grass, *Tripsacum Dactyloides*
- Hydroponics: Growth for the future
- A comparison of the heat-conducing abilities of different metals
- Iron in your food
- Prejudices in children: When do they start?
- The effects of a classroom seating arrangement on student performance
- The golden ratio and its effect on heart rate
- The effects of a small magnetic field on the movement and behavior of laboratory mice
- The effect of paper airplane design on flight distance and flight time
- A comparison of the water content of different kinds of fruit
- The amount of fat in fast foods and store-bought hamburgers
- The effects of car exhaust fumes on the growth of plants
- An investigation of bacteria and fingernails
- The effects of the amount of water on the number of stomata in peas
- Acid rain: How it affects plant growth
- Using lichens to measure lead pollution along the Missouri River
- The effects of wing shape on lift
- An investigation of the mysteries of Fibonacci
- Does light affect population growth rate in euglena?
- The effects of radiation on pea seeds
- The effects of humidity on the behavior of isopods
- Are soap bubbles good for anything but a bath?
- Learning styles and memory retention

- The effects of car exhaust on seed germination
- Why do rocks sink and supertankers float?
- The effects of ultrasonic waves on the growth of peas
- A study of bridge construction
- Which brand of gum is the most viscous?
- The effect of design on the efficiency of a propeller
- The effects of heavy metals on the growth of Wisconsin fast plants
- The effects of ultraviolet light on the photosynthetic rate of soybeans
- The fermentation of yeast: optimal temperature and pH
- The effects of water flow on a water wheel
- Day or night: When do amaryllis plants grow more?
- The effects of stress on the germination of corn seedlings
- The effect of rotation on fruit fly development
- Comparing the tensile strength of different metals
- A study of a goldfish's ability to learn a maze
- The effects of microwave radiation on seed germination
- The effects of caffeine on the respiratory rate of cockroaches
- How does watching fish affect people's blood pressure?
- The effects of distractions on memory and learning
- The effects of music on the ability to memorize nonsense syllables
- The design and construction of a rigid sail model for all vessels
- An analysis of the nutrient content of breakfast cereals
- The use of pitfall traps to determine insect diversity
- The effects of fluorescent light on the learning abilities of white mice
- An analysis of the relationship between music and plant growth response
- An investigation into the effects of irradiation in the seed stage on the growth and development of marigolds
- Osage oranges: Determination of a natural cricket repellent
- The effects of nicotine on the cell shape and survival of euglena
- The amount of vitamin C present in ordinary foods
- The effects of electric currents on germinating seeds
- Comparing the effects of antibacterial soap on bacterial growth
- The antibacterial effect of common sauces
- Particulates in the air
- Is the purity of bottled water consistent with the claims that distributors make?
- A study of the effects of the plant hormone, auxin, on the growth of bean plants
- The effects of eye dominance on task performance
- The effect of age on successful mating in fruit flies
- Multiple intelligence in the career world
- The fungi around us
- The effects of acidity on metals
- Which form of insulation is most effective?
- How terraces help stop soil erosion
- Determination of vitamin C in aging fruit
- The effects of vitamin C on the visible characteristics of the wild-type fruit fly
- Gender-based memory
- An investigation of the lung capacity of smokers and nonsmokers

SCIENCE FAIR WEBSITES

******ALL SCIENCE FAIR PROJECTS******

With complete instructions

http://www.all-science-fair-projects.com

******SCIENCE BUDDIES******

Topic selection wizard, How-To Guide, many ideas

http://www.sciencebuddies.org/science-fair-projects/project_ideas.shtml

******SCIENCE FAIR PROJECTS AND EXPERIMENTS******

Hundreds of topics and ideas

http://www.juliantrubin.com/fairprojects.html

****Discovery Education's Science Fair Central****

Lots of topics, tips, and a sample timeline!

http://school.discoveryeducation.com/sciencefaircentral/?campaign=com_fspt_sfc

Just Google "Science Fair Projects" for lots more ideas.