INTRODUCTION

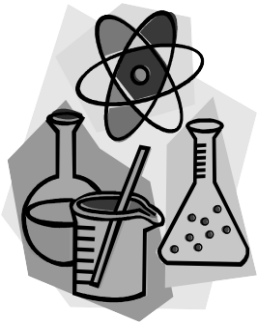
A Scientific, Helpful, and Kid Friendly Science Fair Project Pre-Planner:

The Granville Wells Elementary Science Fair Pre-Planning Guide

These easy steps have been created to help you get started toward a wonderful science project, thought up entirely by you!!!

VERY IMPORTANT: Recruit an adult to help you. They come in very handy, especially if you

#1) are nice to them
#2) say please
#3) let them know you appreciate their time and advice
#4) tell them you won't blow up any- thing

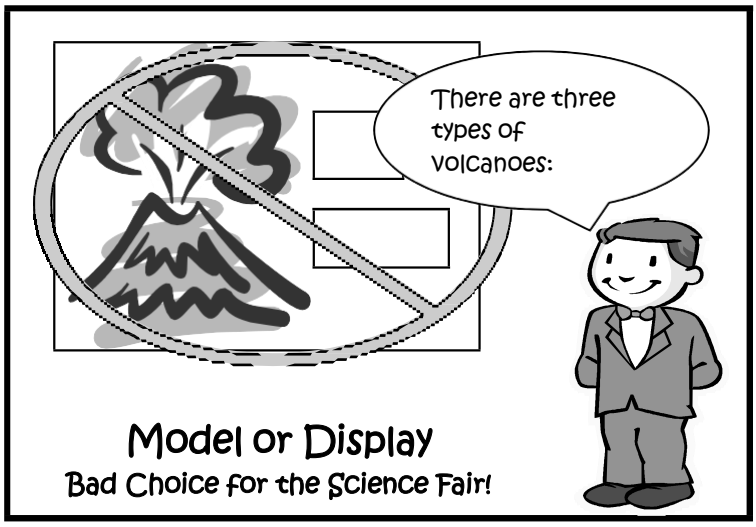


From this point forward you are now… A SCIENTIST!!

Adapted from: Lora Holt and Tim Holt two pretty cool science and technology teachers

Types of Science Projects:

There are two types of science type projects: Models and Experiments. Here is the difference between the two:



Models and Reactions are NOT science fair projects. DON'T DO THESE!!!

~~A Model, Display~~ or Collection:

Shows how something works in the real world, but doesn't test anything

Examples of display or collection projects can be: "The Solar System", "Types of Dinosaurs" , "Types of Rocks", "My gum collection…"
Examples of models might be: "The solar system" or "How an Electric Motor Works", "Tornado in a Bottle"

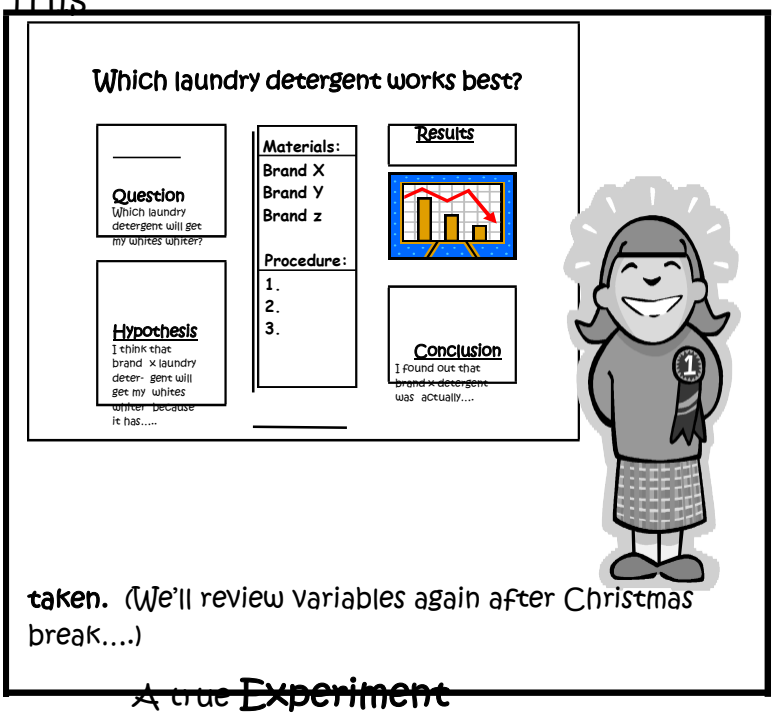
COOL!!!!! DO something like THIS

An Experiment:

Lots of information is given, **but it also has a project that shows testing being done and the gathering of data.**

Examples of experiments can be: "The Effects of Detergent on the Growth of Plants", "Which Paper Towel is more Absorbent" or "What Structure can Withstand the Most Amount of Weight"

You can tell you have an experiment if you are testing something several times and changing a single variable to see what will happen. **Then a PRECISE measurement is taken.** (We'll review variables again after Christmas break….)



~~A true~~ **~~Experiment~~ Is a Great Choice for the science fair!**

Precise measurements are
key to GREAT
experiments!

So What Type of Project Should You Do?

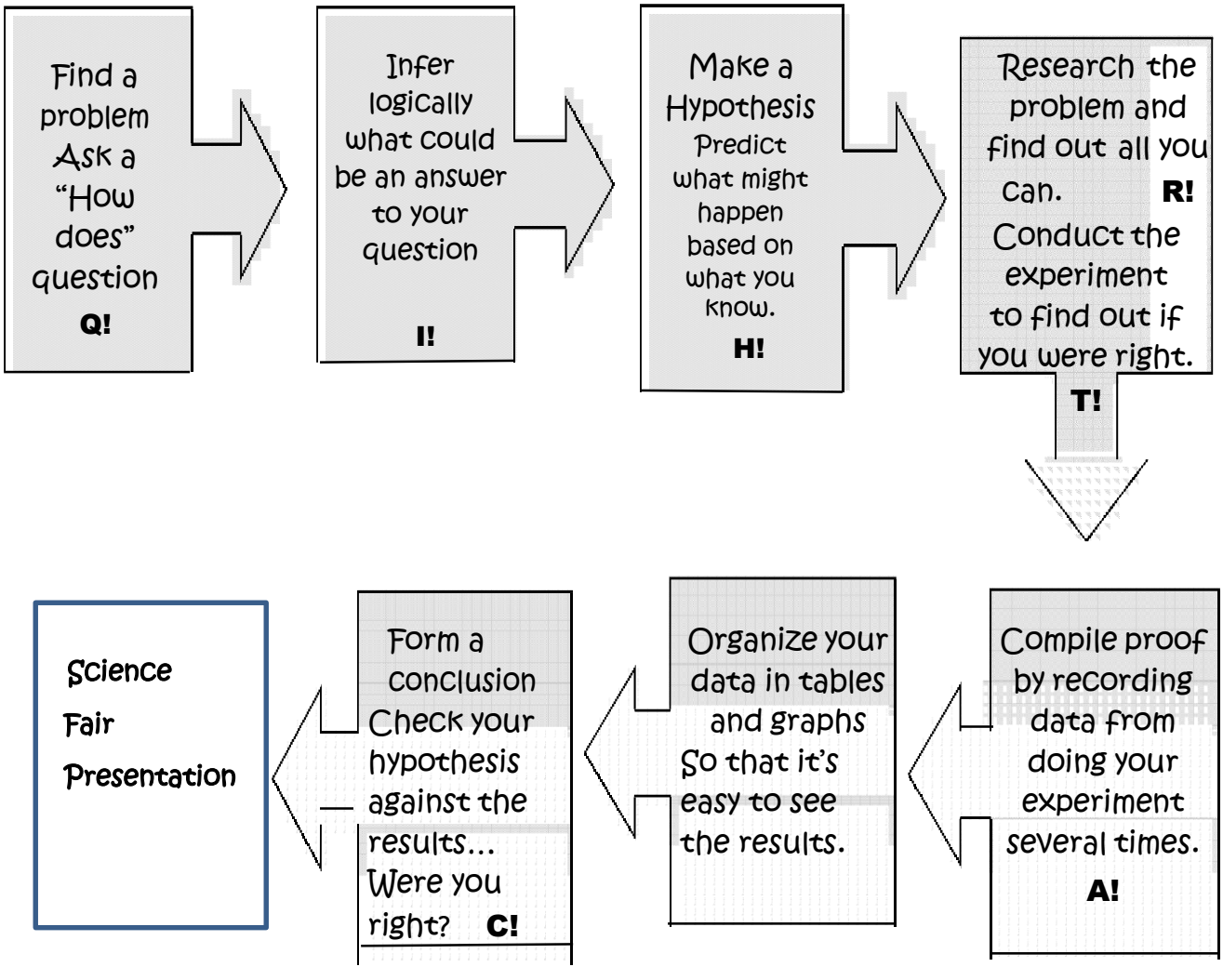
Even though you can learn a lot from building a model or display, it's required that you do an **Experiment!!!** Why? Well, they are fun, they are more interesting and most of all, they take you through the **SCIENTIFIC METHOD.** **The scientific method** is the way real scientists investigate in real science labs… Besides that, the **scientific method** is what the judges are looking for!!!

…AND it's a state standard. YEAH!!!

Queens In Hawaii Receive Treasures And Chocolates

Question Inference Hypothesis Research Test Analyze Conclude

So What in the world is the Scientific Method? *Quick Review*



Choosing a category that interests you…

All Great Projects start with great questions but before you get started on a great question you need to pick a subject or topic that you like. There are three different categories of the Science Fair to choose from. They are:

Life science: This category deals with all animal, plant and human body questions that you might have and want to do an experiment about. Remember that it is against Science Fair Rules to intentionally hurt an animal during an experiment. If you are dealing with animals, please let an adult assist you. It is okay to do experiment on plants, as long as they don't belong to someone else, like don't do an experiment on your mom's rose bushes unless you ask her first…

Life science also includes studying behaviors; however, taste tests, opinion surveys, animal behaviors training, or even training behavior of siblings are ***NOT*** scientific experiments.

Physical Science: If you like trying to figure out how things work, then this is the category for you! It includes topics about matter and structure, as well as electricity, magnetism, sound, light or any- thing else that you might question, "How does it work and what if I do this to it, will it still work?" *But remember, you always need to ask an adult first (and always make sure there is one of those adult guys with you when you try it.)*

Physical Science also includes the composition of matter and how it reacts to each other. These are the science experiments that may have bubbling and oozing going on, like figuring out what is an acid and what is a base. This would be considered CHEMISTRY, and though very cool, it is beyond our purpose of the science fair. Dealing with the mixing of chemicals to create new substances can be ***very dangerous***; therefore, ***we do not allow these to be done as science fair projects***.

Earth and Space Sciences: This category is really awesome because it covers all sorts of topics that deal with the Earth or objects in space. This includes studying weather, Geology (which is the study of everything that makes up the Earth, like rocks, fossils, volcanoes, etc..), and the study of all that is in space, including the stars, our sun and our planets. Unfortunately this topic is also where most kids mess up and do a collection or model project instead of an "Experiment," so be careful!!!

Make sure it is an experiment using the scientific method!

Now It's Your Turn:

Write down your favorite Science Fair Category and what it is you want to learn more about:

My favorite Category was _____

(Life Science, Physical Science, Earth and Space Science)

I want to do an experiment involving: _____

_____

_____

_____

Step 1: Coming up with a Good Question…

Now that you have picked out a topic that you like and that you are interested in, it's time to write a question or identify a problem within that topic. To give you an idea of what we mean you can start off by filling in the question blanks with the following list of words:

The Effect Question:

What is the effect of_____on_____?

sunlight	on the growth of plants
eye color	pupil dilation
brands of soda	a piece of meat
temperature	the size of a balloon
oil	a ramp

The How Does Affect Question:

How does the _____ affect_____?

color of light	the growth of plants
humidity	the growth of fungi
color of a material	its absorption of heat

The Which/What and Verb Question

Which/What_____(verb)_____?

paper towel	is	most absorbent
foods	do	meal worms
detergent	makes	the most bubbles
paper towel	is	strongest
peanut butter	tastes	the best

Now its your turn:

Create your Science Fair question using either the "Effect Question", the "How does Affect Question" or the "Which/What and Verb Question":

_____

_____

_____

_____

Step 2 : Doing the Research and forming a Hypothesis

So you've picked your category and you've chosen a topic. You even wrote a question using our cool fill in the blank template. Now it is time to research your problem as much as possible. Becoming an expert at your topic is what real scientists do in real labs.

So How do you become an expert?

YOU READ!!!!

READ about your topic. READ encyclopedias. READ magazine articles and books from the library. READ articles from the internet. Take note of any new science words you learn and use them. It makes you sound more like a real scientist. Keep Track of all the books and articles you read.

You'll need that list for later.

YOU DISCUSS!!

Talk about it with your parents. Talk about it with your teachers. Talk about it with experts like Veterinarians, Doctors, Weathermen or others who work with the things you are studying. Sometimes websites will give you e-mail addresses to experts who can answer questions…. ***But again, do not write to anyone on the internet without letting an adult supervise it.*** (*hint: take pictures of yourself interviewing people)

Whew…..

Then when you think that you can't possibly learn anymore and the information just keeps repeating itself.. You are ready to…

Write a Hypothesis

Now it is the time to PREDICT what you think will happen if you test your problem. This type of "SMART GUESS" or PREDICTION is what real scientists call A HYPOTHESIS. Using this fancy word will amaze your friends and will have you thinking like a full-fledged scientist.

So how do you begin? Well, just answer this very simple question:

What do you think will happen, (even before you start your experiment) ?

Example Problem: *Which Paper Towel is more absorbent?*

Example Hypothesis: *I think Brand X will be more absorbent because it's a more popular brand, it is thicker and the people I interviewed said that the more expensive brands would work better*

(This hypothesis not only predicts what will happen in the experiment, but also shows that the "Scientist" used research to back up his prediction.)

(The above are just suggestions.)

Now it's your turn:

Write down the problem and create a Hypothesis based on what you have researched.

Problem: _____

_____

Research: My problem is about this subject: _____

(sample topics could be magnetism, electricity, buoyancy, absorbency, taste, plant growth, simple machines or other scientific topics that relate to your problem. If you are having problems finding out what the topic is, ask your teacher or an adult to help you on this one….)

Books I found in the library on my topic are:

Title: Author:

_____

_____

_____

Internet sites that I found on my topic are:

_____

_____

_____

People I talked to about my topic are:

_____

_____

_____

Some important points that I learned about my topic are

- _____
- _____
- _____
- _____

Hypothesis: I think that _____

(will happen) because (my research shows…)_____

_____

_____

_____

Step 3: Testing your Hypothesis by doing an experiment

Now we've come to the good part. The part that all scientists can't wait to get their grubby little hands on… you guessed it… **THE EXPERIMENT!**

Designing an experiment is really cool because you get to use your imagination to come up with a test for your problem, and most of all, you get to prove (or disprove) your Hypothesis. **Now Science Fair Rules state that you cannot perform your experiment live, so you'll have to take plenty of pictures as you go through these seven very simple steps.**

FIRST: ***Gather up your materials***: What will you need to perform your experiment? The safest way to do this is get that adult you recruited to help you get the stuff you need. Oh, did we mention to take pictures or draw pictures of your materials. This will come in handy when you are making your board display.

SECOND: ***Write a PROCEDURE.*** A procedure is a list of steps that you did to perform an experiment. Why do you need to write it down? Well it's like giving someone a recipe to your favorite dish. If they want to try it, they can follow your steps to test if it's true. Scientists do this so that people will believe that they did the experiment and also to let other people test what they found out. Did I mention to take pictures of yourself doing the steps?

THIRD: ***Identify your variables.*** The variables are any factors that can change in an experiment. Remember that when you are testing your experiment you should only **test one variable at a time** in order to get accurate results. In other words, if you want to test the affect that water has on plant growth, then all the plants you test should be in the same conditions, these are called **controlled variables:** same type of dirt, same type of plant, same type of location, same amount of sunlight, etc. The only variable you would change from plant to plant would be the amount of water it received. This is called the **independent or manipulated variable.** The independent variable is the factor you are testing. The results of the test that you do are called the **dependent or responding variables.** The responding variable is what happens as a result of your test. Knowing what your variables are is very important because if you don't know them you won't be able to collect your data or read your results.

FOURTH: ***TEST, TEST, TEST.*** Remember that the judges expect your results to be consistent in order to be a good experiment; in other words, when you cook from a recipe you expect the outcomes to be the same if you followed the directions (or procedure) step by step. So that means you need to do the experiment more than once in order to test it properly. We recommend five times or more. More is better!
Don't forget to take pictures of the science project being done and the results.

FIFTH: ***Collect your DATA.*** This means write down or record the results of the experiment every time you test it. Be sure you also organize it in a way that it is easy to read the results. Most scientists use tables, graphs and other organizers to show their results. Organizing makes the results easy to read, and much easier to recognize patterns that might be occurring in your results. (Besides, it impresses the judges when you use them.) But don't just make a graph or table because we asked you to, use it to benefit your project and to ***help you*** make sense of the results. There is nothing worse than having graphs and tables that have nothing to do with answering the question of a science project.

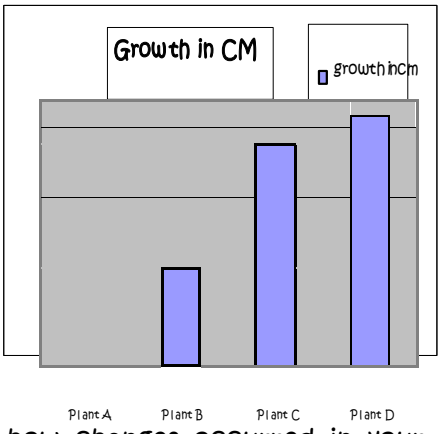
Time out: How Do You Collect Data? *Quick Review*

- **Keep a science journal:** A science journal is a type of science diary that you can keep especially if your experiment is taking place over a long period of time. We suggest you do that if your experiment is over a period of a week or more. In your journal you can record observations, collect re- search, draw and diagram pictures and jot down any additional questions you might have for later.
- **Have the right tools to do the job:** make sure you have the stuff you need to take accurate measurements like rulers, meter tapes, thermometers, graduated cylinders or measuring cups that measure volume. The recommended standard of measurement in science is metric so if you can keep your measurements in meters, liters, Celsius, grams, etc., you are doing great!
- **Tables, charts and diagrams** are generally the way a good scientist like you would keep track of your experiment trials. Remember you are testing at least 5 times or more. A table is organized in columns and rows and **ALWAYS** has labels or headings telling what the columns or rows mean. You will probably need a row for every time you did the experiment and a column telling what the independent variable was (what you tested) and the responding variable (the result that happened because of the independent variable)

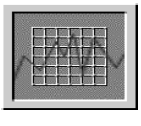
Plant	**Amount of water per day**	**Size it grew in two weeks**
(controlled variable)	(independent variable)	(responding variable)
Plant A	none	.5 cm
Plant B	5 ml	2 cm
Plant C	10 ml	5 cm
Plant D	20 ml	7 cm

  Be accurate and neat! When you are writing your tables and charts please make sure that you record your data in the correct column or row, that you write neatly, and most of all that you record your data as soon as you collect it **SO YOU DON'T FORGET WHAT HAPPENED!!!!** Sometimes an experiment might be hard to explain with just a table, so if you have to draw and label a diagram (or picture) to explain what happened, it is recommended that you do.
- **Use the right graph for your experiment.** There is nothing worse than a bad graph. There are all types of graph designs, but these seem to be easy to use for science fair experiments.
  - **Pie graphs** are good to use if you are showing percentages of groups. Remember that you can't have more than 100% and all the pieces need to add up to 100%. This type of graph is great if you are doing surveys

  - **Bar graphs** are good to use if you are comparing amounts of things because the bars show those amounts in an easy to read way. This way the judges will be able to tell your results at a glance. Usually the bars go up and down. The x axis (or horizontal axis) is where you label what is being measured, (like plant A, B, C and D) and the y axis (or vertical axis) is labeled to show the unit being measured (in this case it would be centimeters that the plant grew)



  - **Line graphs** are good to use if you are showing how changes occurred in your experiments over time. In this particular case you would be using the x axis to show the time increments (minutes, hours, days, weeks, months) and then you would use the Y axis to show what you were measuring at that point in time.



….And Now back to the Experiment Steps

SIXTH: ***Write a Conclusion:*** tell us what happened. Was your hypothesis right or wrong or neither? Were you successful, did it turn out okay? Would you change anything about the experiment or are you curious about something else now that you've completed your experiment. And most of all, TELL WHAT YOU LEARNED FROM DOING THIS.

SEVENTH: ***Understand its Application***. Write about how this experiment can be used in a real life situation. Why was it important to know about it?

Now it's your turn

Materials: ***(take pictures!)***

List the Materials that you will need for your science experiment here:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Variables:

List the variables that you will control, the variable that you will change and the variables that will be the results of your experiment:

My controlled variables are (the stuff that will always stay the same): _____

_____

_____

My independent variable is (this is the thing that changes from one experiment to the next, it is what you are testing): _____

My responding variables might be (in other words, the results of the experiment)

Procedure: (the steps…. Don't forget to take pictures)

List the steps that you have to do in order to perform the experiment here:

1st….

2nd

3rd

4th

5th….

_____

_____

_____

If you still need more ideas, here is a list websites that you can check out about science fair projects to give you even more ideas.

I haven't updated this list in the past 2 years, so if one is not active, please let me know.

Discovery.com: Science Fair Central
http://school.discovery.com/sciencefaircentral/
"Creative investigations into the real world." This site provides a complete guide to science fair projects. Check out the 'Handbook' which features information from Janice VanCleave, a popular author who provides everything you need to know for success. You can even send her a question about your project.

Science Fair Idea Exchange
http://www.halcyon.com/sciclub/cgi-pvt/scifair/guestbook.html
This site has lists of science fair project ideas and a chance to share your ideas with others on the web!

Cyber-Fair
http://www.isd77.k12.mn.us/resources/cf/welcome.html
This site has one-sentence explanations of each part of a science fair. One of the steps described is presenting your project to judges. This may or may not be a part of your science fair. The site also has an explanation of what makes a good project and an explanation of how to come up with your own science fair project.

Try Science
http://tryscience.com
Science resource for home that gives you labs to try and 400 helpful links all related to science

The Yuckiest Site in the Internet
http://yucky.kids.discovery.com/
Brought to you by Discovery Kids, this site gives you lots of ideas on how to do the messiest yuckiest experiments

Experimental Science Projects: An Introductory Level Guide
http://www.isd77.k12.mn.us/resources/cf/SciProjIntro.html An excellent resource for students doing an experiment- based science fair project. There are links on this page to a more advanced guide and an example of an actual experiment-based project.

Gateway to Educational Materials: Science Fair Projects
http://members.ozemail.com.au/~macinnis/scifun/ projects.htm
The Gateway to Educational Materials extensive and detailed step-by-step guide to doing a science fair project.

Science Fair Primer
http://users.rcn.com/tedrowan/primer.html
A site to help students get started and run a science fair project.

Science Fair Project Guidebook
http://www.energy.sc.gov/K-12/science_fair.htm
The State of South Carolina publishes a K-12 science fair guidebook. It can be viewed using Adobe Acrobat Reader.

Science Project Guidelineshttp://www.thesciencefair.com/guidelines.html
The scientists at the Kennedy Space Center have participated in judging local school science fairs for many years and have some great suggestions for student research projects. This information by Elizabeth Stryjewski of the Kennedy Space Center is now provided on a commercial site.

The Ultimate Science Fair Resource
http://www.scifair.org/
A variety of resources and advice.

What Makes A Good Science Fair Project
http://www.usc.edu/CSSF/Resources/Good_Project.html
A website from USC that gives a lot of good tips and ideas to think about regarding what makes a good science fair project. Advice for students as well as teachers and parents is included.

Mr. McLaren's Science Fair Survival Page
http://www.ri.net/schools/East_Greenwich/Cole/sciencefair.html
Tips from Archie R. Cole Junior High school on what makes a good project.

Neuroscience for Kids: Successful Science Fair Projects
http://faculty.washington.edu/chudler/fair.html
Site made by Lynne Bleeker a former science teacher, science fair organizer, and judge. Gives a thorough and detailed description of the steps to a successful science fair project.