The 2016 Amesbury PTA

Science Fair Survival Guide

Science Fair - *Saturday, February 27th at Amesbury High School. Family-friendly hands-on science activities going on anytime from 9am until 1 pm. Scientists will have their projects judged in the cafeteria from 9am-12pm. Mad Science will "edutain" with their "Up, Up & Away" show, followed by the presentation of awards in the auditorium from 1-2pm.*

2016 Science Fair Survival Guide Contents

Science Rocks!
Science Fair Saturday, February 27, 2016

Are you ready to show how Science Rocks?

Read on, young scientist, and find out!

Scientists are:

CURIOUS ☐ INNOVATIVE ☐ ORIGINAL
FEARLESS ☐ COURAGEOUS ☐ INQUISITIVE

How **YOU** can become a Scientist:

- You can enter a project in the Science Fair as an **Individual** or as a **Team**
- You can enter a project as an **experiment** (using the scientific method) or **demonstration** (not using the scientific method)
- You can enter as a **competitive participant** (your project *will* go through the judging process) or **non-competitive participant** (your project *will not* go through the judging process). All participants will receive a certificate for participating, but only those registered as competitive participants will go through the judging process and be eligible for ribbons.

Once you figure out what you want to do and how you want to do it, you will need to fill out a project proposal.

A proposal must be submitted by January 15th[th] in order to be registered to participate in the science fair. Please also have a parent fill out the media release form!

Both forms can be found in the school office, online at the Amesbury PTA group page on Facebook, or you can request a copy (paper or digital) by e-mailing mbossern@comcast.net. You can submit them in the Science Fair Box at your school's office. You will be receiving updates by email (so please remember to fill that in on your registration form), or in your Wednesday Poly.

Dates to Remember

Wednesday, January 6th: Science Fair Information Meeting, 7pm – 7:30pm in the CES Library. This is an optional meeting for potential participants and families.

Friday, January 15th: Project Proposals and media releases due in the Science Fair box in your school's office.

Wednesday, January 27th: Display board pick-up, 3 - 4:30pm in the AES Lobby.

Wednesday, January 27th: Display board pick-up, 6:30-8pm in the CES Library.

Saturday, February 27th: - THE BIG DAY - 15th Annual Science Fair at the High School Cafeteria, Classroom and Auditorium

What Scientists need to do:

All science fair projects should include these three things:

1. **Science Project Notebook**
2. **Display Board**
3. **Props to help teach people about your subject**

1. **Science Project Notebook**: All good scientific thinkers need to document their work. Here is what's involved:

- **Title Page** – Title of your project, your name, your teacher's name, your school name, and your grade.
- **Summary** (also called an *Abstract*) – The whole enchilada. Your whole project wrapped up in about a page. Check out the *Summary* section of this Guide for more info.
- **Big Question/Topic** – What do you want to find out? Choose a *Big Question* for experiment projects, or *Topic* for demonstration projects.
- **Background Research** – Tell what information you gathered about your big question or topic.
- **Hypothesis** (experiment projects) – Predict what you think will happen.
- **Experiment** (experiment projects) – A step-by-step description of your procedure.
- **Data Collection** (experiment projects) *or* **Observations** (demonstration projects) – Show what happened during your project (you can use charts, tables, graphs, etc…), or describe what you observed from your demonstration.
- **Data Analysis and Conclusions**– What happened after your investigations? *Was your hypothesis correct or incorrect?* (experiment projects) or *What did you observe?* (demonstration projects)
- **Materials** – List everything you used for your experiment or demonstration.
- **Illustrations and Photos** – You can also use pictures that your create or take to show how you worked on your project.
- **References and Acknowledgements** - List the sources you used for information on your topic- like books, websites, etc. *and any help you received from any helpers!*

2. **DISPLAY BOARD**: A three-sided project display board will be provided for you to show off your work (and photos, illustrations, charts, graphs, models, etc…). This is your very own exhibit space to share with people what you have learned. **To guarantee that everyone has equal space to show their work, the display boards must be used.** Check out the display board tips later on in the Guide.

3. **PROPS**: If you are you planning to come as Ben Franklin to demonstrate your experiment with static electricity, then by all means, knock yourself out. This is your

time to shine and dazzle and share what you know! Have fun. Be creative. Just don't forget that we only have the high school cafeteria to use for project displays and that means you are limited to the 30" X 36" cafeteria table space provided. If you do need more space, please let us know so we can do the best we can to accommodate your project. Scientists who need access to electric outlets need to note that on their proposal form and also bring their own extension cord.

Quick Tips for Budding Scientists:

- Keep a "question wall" at your house. Use a big sheet of paper and put it in your kitchen or room. When you or anyone in your family thinks of something they are curious about, add it to the question wall. This is one way to find your Big Question!

- Have someone take pictures of you while you work. The more the better. Add them to your display in your most creative way.

- Create your notebook *first* then make 2 copies or photocopy the pieces you want to add to your display board. Then use markers, colored paper, anything you can think of to dress up your display copy. Saves LOADS of time - you only have to write each piece once!

- Keep all of your stuff in one folder, and keep it in one spot. That way when inspiration strikes, you know where to go.

Are you a curious kid? Do you look at the world around you and ask a lot of questions?

Then you have the makings of a terrific Scientist!

Curiosity is what science is all about. The most amazing science projects are not about fancy thingamajigs or flashy what-zits zinging around judges' heads...

Great science projects are about doing science and communicating about what you did!

THE SCIENTIFIC METHOD

THE BIG QUESTION:

What do you want to know?

RESEARCH:

Gather more information about your Big Question

HYPOTHESIS:

What do you *predict* is the answer to your question?

EXPERIMENT:

Design & carry out a step-by-step test for your hypothesis

COLLECT YOUR DATA:

Keep track of what's happening during your experiment

OBSERVATIONS AND RESULTS:

What did you notice happened during your experiment?

CONCLUSION:

Was your hypothesis correct or incorrect?

Now roll up your sleeves, it's time to DO SOME SCIENCE! Read on for a review of the scientific method…

You can use these pages as a resource to help you get organized. Have no fear… ***The scientific method is not scary!*** It's really just a plan for investigating the world around you. You use the scientific method to create an experiment to test your ideas. If you follow the steps as best you can, you will be asking questions, doing science, and communicating about what you did. You can also read this and adapt some ideas for demonstration projects. So get your scientific thinking caps on and jump into step one!

FIRST: **Be curious and observant**

See, hear, touch, taste, smell things in the world around you. Scientist Rachel Carson once said, "*If I had influence with the good fairy who is supposed to preside over the christening of all children, I should ask that her gift to each child in the world be a sense of wonder so indestructible that it would last throughout life.*" What do you wonder about? Write some ideas down here:

See, you are already thinking like a Scientist!

Step ONE: THE BIG QUESTION

What do you want to know?

Are you curious about life on other planets? Great. Is that a question that you, yourself can answer? Mmm, maybe not so much. A great Big Question is one that you can actually find an answer to. Let me repeat that, **A great Big Question is one that you can actually find an answer to.** This is also known in some scientific circles as a *testable question*. Right now, ask yourself if your idea can be turned into a question that *you*, yourself can answer, by conducting an experiment. Once you have a question that you think you can answer by conducting an experiment, you have just completed the most difficult step of the scientific method. The rest is cake – a large cake yes, but still tasty!

Write your Big Question here:

Step TWO: REseaRCH

Gather more information about your Big Question

Read up a little bit on your big question. Go to the library. Have your family help you with an internet search. (You can also check out the resources in this guide). This information will help you predict the answer to your big question.

Step THREE: Formulate Your Hypothesis

What do you *predict* is the answer to your question?

Formulate your hypothesis is science speak for predicting the answer to your Big Question. What do you guess will happen when you test your idea? Super fancy scientists often make their hypothesis into an "If I do _____, then _____ will happen." But you don't need to be a super fancy scientist, unless you want to☐

Write your Hypothesis here:

Excellent work! **From here on in, your job is to find out whether your guess is right or wrong.** *You can do it!*

Step FOUR: EXPERIMENT

Design & carry out a step-by-step test for your hypothesis

Now the going gets good (and sometimes a little messy!) – This is where you test your idea to figure out if your guess was right or wrong. Make a plan. Your plan for testing your guess is your *experiment.*

Design your experiment step-by-step

Collect all the materials you need

Follow the steps of your plan at least a three times (over and over) – good scientists like to repeat an experiment in order to confirm their results.

Step FIVE: COLLECT YOUR DATA

Keep track of what's happening during your experiment

Take careful notes on everything you do (these can also include drawings & sketches – like the notebooks of Leonardo da Vinci's, only you might not want to write everything in mirror writing like he did - why complicate things???).

Record the steps and outcomes of your experiment (also known as *collecting your data*) in your project notebook. You can also make pictures or take photographs of each step of the experiment to use for your project display board.

STEP SIX: **OBSERVATIONS AND RESULTS**

What did you notice happened during your experiment?

Look at your data and think about what happened in your experiment. Make a chart, table, or graph to show the results of the data you collected (Be creative!)

Step Seven: **Conclusion**

Was your hypothesis correct or incorrect?

Look at the results of your experiment and think about what happened. Was it what you expected? Explain your thinking. Remember, the conclusion is *not* the same as the results – your hypothesis could have been wrong.

Actually, making an incorrect hypothesis can be the best possible mistake – many important discoveries are made this way (Penicillin for instance!). In science, it's okay to be wrong (unless you're working with weird chemicals or nuclear reactors, then being wrong can really be a bummer).

Still not quite sure what to do? *Have no fear! Read on...*

To get a better idea of how to use the Scientific Method to investigate, it might be easier to see a short version of the scientific method in action... (The following section is adapted from the website: www.nceas.ucsb.edu/nceasweb/kids/experiments/scimethod/hypothesis.html)

Start with your Big Question: "Which falls faster, a feather or a bowling ball?"

Make your Hypothesis: Suppose a person is holding a bowling ball and a feather, and wants to find out which one will hit the ground first if both are dropped from the same height at the same time. First, the person would develop a hypothesis... *"I believe that the bowling ball will hit the ground before the feather if I drop them both from the same height at the same time."*

Experiment and Data Collection: Next, the person would drop the bowling ball and the feather at least 3 times, collecting data by keeping track of which item hit the ground first each time. After dropping the ball and the feather 5 times, the person would then calculate the number of times each item hit the ground first, something like:

Bowling Ball	Feather
1	0
1	0
1	0
1	0
1	0
5	0

Data Analysis and Conclusions: Finally, after demonstrating that the ball hit first each of the five times, the person could conclude that their hypothesis appears correct, the bowling ball DOES hit the ground first!!

So, often data is collected to test a hypothesis, and the analysis of the data is used to prove or disprove the hypothesis.

Still feeling a little confused? Not convinced to try your hand at the scientific method? Then try a **demonstration project** instead.

Demonstration projects can include models you build of things, pictures, and notes, but you are not making a prediction, testing your hypothesis, and following the Scientific method to investigate something. You will still need to keep a notebook and create a display, and you can still learn loads of science stuff and have fun.

Experiment or Demonstration, it's up to you!
Challenge yourself but still keep it fun.

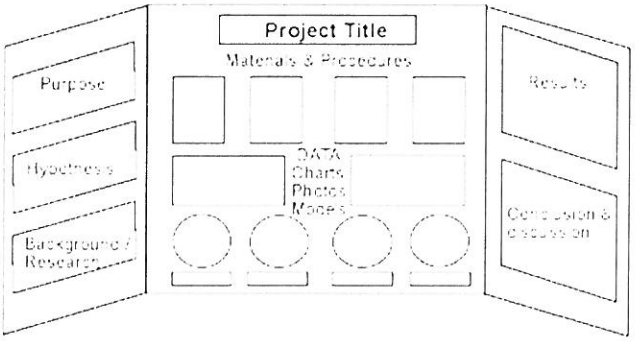
What do you do next?
Communicate ABOUT What You Did

Create your Summary

This is your chance to tell the world (or at least the folks looking at your science fair project) about your brilliant ideas and show off your great scientific thinking! It's like writing the short story of your project. Many judges and science fair visitors won't get much beyond your summary, so make it good! It's the whole enchilada- the most important information you learned throughout your whole project, all summed up in about a page. Don't forget to include:

- How you came up with the idea and why you chose to do this experiment
- Your **Big Question**
- Your **Hypothesis**
- A quick version of **your experiment** (so someone else can try it at home)
- The **Results** of your experiment
- Your **Conclusion**

Create Your Display Board



The display board is your tool for communicating about what you did when you did science. You will be provided one, so you don't need to get your own. Display board pick-up dates and times will be emailed to registered participants.

Some display board tips:

- Make your display board colorful, neat, and pleasing to look at.
- Be sure to include all the important parts of your science fair project, and try to keep it organized. Does your display board have to look exactly like the one above? NO! – but this is an example of what one *can* look like. Be creative and make it your own!

Evaluation of Your Work

Reflecting On Your Own Work

Good Scientists look at their work and think about it. Before you present your project at the science fair, answer the following questions <u>for yourself</u> to make sure that you have done your best work:

1. **Evaluate your scientific method**. Was your plan the best way to prove or disprove the hypothesis? *If you answered no, what would you change about way you tried to prove you hypothesis?* Add this to your conclusion.

2. **Evaluate all of your work on the project**. Would you be proud for anyone to view this project?

Yes? Then... 

Wow, you did it! Give yourself a giant pat on the back. You've just gone where fewer people than you think have gone before – to the land of scientific thinking!

You are now a great Scientist!!!

(Insert your own theme music here □□ □□□□)

Science Fair Project Checklist

Keep your project on track and stay organized! (Please keep in mind that some parts are especially for experiments, some are for demonstrations, others are for both.)

Things To Do	Done!
Be curious and observant – list at least three ideas that interest you	
Do a Little Topic Investigating – Narrow it down to your most brilliant idea	
Choose your Big Question *(Experiments)* or **Topic** *(Demonstrations)*	
Make your Hypothesis *(Experiments only)*	
Research your Big Question or Topic	
Remember to **complete your project proposal and media release form** and turn them into the science fair box in the AES or Cashman office **by Friday, February 14th**!	
Test your Hypothesis - Design and Do your Experiment, gather your materials needed to do the experiment, collect your data *(Experiments only)*	
Data analysis and Results *(Experiments)* **or Observations** *(Demonstrations)*	
Create your model or demonstration *(Demonstrations only)*	
Conclusion	
Summary/Abstract	
Design and create your display board	
Complete your Science Project Notebook	
Complete any additional props or illustrations	
Practice your science fair presentation *(Competitive projects only)*	
Evaluate your own project before the Science Fair – Did you do your bestwork?	

For Competitive Projects: Presenting Your Work to the Judges

Each Competitive project entry will get a judging time on Saturday morning, sometime between 9AM and Noon. As in years past, judges will be working together in teams as they talk to students about their projects, but each judge will score the projects they review individually. Judge's scores will be added together and then the highest ranking projects will be awarded 1st, 2nd, and 3rd place ribbons, but everyone participating will receive a certificate and honorable mention ribbon. I will be asking all judges to keep an eye out for a particular project that just knocks their socks off – and collectively they will help decide who gets awarded the Mad Scientist of the Fair. We have a special kid-size lab coat ready for the one who just knocks the ball out of the park with their scientific thinking. Please see the following judging rubrics for more specifics…

PTA Science Fair Evaluation Rubric
Demonstration Projects

	9-11 points Exceptional (Exceeds Expectations)	6-8 points Accomplished (Meets Expectations)	3-5 points Developing (Approaching Expectations)	0-2 points Beginning (Not Yet Meets Expectations)	Score
Doing Science (Original Thinking)	Exceptional original thinking. Unique and/or unusual for a scientist of this age.	Accomplished original thinking. Unique perspective on a traditional project.	Developing original thinking. Embellished an existing idea.	Minimal original thinking.	
Doing Science (Topic/Subject Knowledge)	Exceptional background research and subject-matter knowledge	Appropriate background research and subject-matter knowledge	Some background research and partial subject-matter knowledge	Minimal background research and subject-matter knowledge	
Doing Science (Clarity)	Scientific element/process being demonstrated is presented in a very clear/logical order	Scientific element/process being demonstrated is presented in a mostly clear/logical order	Scientific element/process being demonstrated is presented in a partially clear/logical order	Scientific element/process being demonstrated is not presented in a clear/logical order	
Doing Science (Purpose)	Project presents exceptional motivation and purpose for demonstration	Project presents accomplished motivation and purpose for demonstration	Project presents developing motivation and purpose for demonstration	Project presents minimal motivation and purpose for demonstration	
Doing Science (Observations & Conclusions)	Conclusions are logical and directly relate to observations.	Conclusions are logical and most relate to observations.	Conclusions are somewhat logical and relate to observations.	Conclusions are incomplete and/or do not relate to observations.	
Communicating What You Learned (Display Board & Props)	Exceptionally well-organized & colorful. It includes all important parts of science project and at least 5 photos or pictures.	Well-organized & colorful. It includes most important parts of science project and at least 3 photos or pictures.	Somewhat organized & colorful. It includes some important parts of science project and at least 1 photo or picture.	Not very organized or colorful. Missing important parts of science project and there are no photos or pictures.	
Communicating What You Learned (Presentation)	Scientist communicates extraordinary enthusiasm and exceptional understanding of the project. Can fully answer questions when prompted.	Scientist communicates enthusiasm and accomplished understanding of the project. Can answer most questions when prompted.	Scientist communicates enthusiasm and a developing understanding of the project. Can answer some questions when prompted.	Scientist communicates minimal enthusiasm and a beginning understanding of the project. Can answer few questions when prompted.	
Communicating What You Learned (Notebook)	All elements of notebook are included. It is neat and project is very clearly documented.	Most elements of notebook included. It is neat and project is adequately documented.	Some elements of notebook are missing. It is mostly nest and project is partially documented.	Most elements of notebook are missing. It is messy and project is inadequately documented.	

PTA Science Fair Evaluation Rubric
EXPERIMENT Projects

	9-11 points Exceptional (Exceeds Expectations)	6-8 points Accomplished (Meets Expectations)	3-5 points Developing (Approaching Expectations)	0-2 points Beginning (Not Yet Meets Expectations)	Score
Doing Science (Original Thinking)	Exceptional original thinking. Unique and/or unusual for a scientist of this age.	Accomplished original thinking. Unique perspective on a traditional project.	Developing original thinking. Embellished an existing idea.	Minimal original thinking.	
Doing Science (Big Question & Hypothesis)	Exceptionally clear and well-developed.	Clear and sufficiently developed.	Insufficiently developed.	Incomplete or missing.	
Doing Science (Procedure & Organization)	Very well-designed. Easy to follow sequence of the Scientific Method.	Well-designed. Easy to follow sequence of the Scientific Method.	Adequately designed. Somewhat difficult to follow the sequence of the Scientific Method.	Poorly designed, difficult to follow – incomplete sequence of the Scientific Method.	
Doing Science (Investigation)	Experiment was performed more than 2 times. Data is clearly presented and directly relates to hypothesis.	Experiment was performed 2 times. Data is reasonably presented and shows good relationship to hypothesis.	Experiment was performed 1 time. Data is partially presented and shows some relationship to hypothesis.	Experiment was performed incompletely. Data is not presented/no relationship to hypothesis is evident.	
Doing Science (Conclusion)	Conclusion is logical, based on data, and relevant to the Hypothesis/Big Question.	Conclusion is mostly logical and relevant to the Hypothesis/Big Question.	Conclusion is somewhat relevant to the Hypothesis/Big Question.	Conclusion is incomplete and/or not related to Hypothesis/Big Question.	
Communicating What You Learned (Display Board & Props)	Exceptionally well-organized & colorful. It includes all important parts of science project and at least 5 photos or pictures.	Well-organized & colorful. It includes most important parts of science project and at least 3 photos or pictures.	Somewhat organized & colorful. It includes some important parts of science project and at least 1 photo or picture.	Not very organized or colorful. Missing important parts of science project and there are no photos or pictures.	
Communicating What You Learned (Presentation)	Scientist communicates extraordinary enthusiasm and exceptional understanding of the project. Can fully answer questions when prompted.	Scientist communicates enthusiasm and accomplished understanding of the project. Can answer most questions when prompted.	Scientist communicates enthusiasm and a developing understanding of the project. Can answer some questions when prompted.	Scientist communicates minimal enthusiasm and a beginning understanding of the project. Can answer few questions when prompted.	
Communicating What You Learned (Notebook)	All elements of notebook are included. It is neat and project is very clearly documented.	Most elements of notebook included. It is neat and project is adequately documented.	Some elements of notebook are missing. It is mostly nest and project is partially documented.	Most elements of notebook are missing. It is messy and project is inadequately documented.	

Some of the best places in the world to ask why and find out more about science... your school or local town library!

Ms. McGrath at Cashman, Ms. Byman at AES school libraries, and Mrs. Dombrowski in the Children's Room at Amesbury Public Library are great resources to help get you on the right track with your research. Plus they are friendly and know lots of stuff.

Some Possible Book Ideas:

- There are many cool and funky science project books by **author Robert Gardner** (you can do an author search on him)
- **365 More Simple Science Experiments with Everyday Materials** by E. Richard Churchill, Louis V. Loeschnig, and Muriel Mandell
- **The First-Timers Guide to Science Experiments** by Natalie Goldstein
- **How to Do a Science Fair Project** by Salvatore Tocci
- **Science Fair Success Secrets: How to Win Prizes, Have Fun, and Think Like A Scientist** by Bill Haduch
- **Kidsource: Science Fair Handbook** by Danna Voth

Some Interesting Websites (Remember to check with your adult first):

www.stevespanglerscience.com – Fabulous and fun science fair ideas

http://pbskids.org/dragonflytv/scifair/index.html - Check Out These Discover Investigations for Super Science Fair Ideas

www.sciencebuddies.org - Free Science Fair Project Ideas, Answers, & Tools for Serious Students

www.ipl.org/div/projectguide/gettingstarted.html - Before you get started, you probably need to know more about what a science fair or project is all about.

http://school.discoveryeducation.com/sciencefaircentral/?pID=fair - What Topic Interests You Most?

www.juliantrubin.com/sciencefairprojectsaz.html - Science Fair Projects A-Z - Topics, Ideas, Resources and Sample Projects

Over 500 Science Fair Project Ideas! www.all-science-fair-projects.com/category57.html

Some ideas that come from things you are learning about in school:

Science Scope and Sequence for Amesbury Students

	Kindergarten	1st grade	2nd grade	3rd grade	4th grade
Life Science	Living and Non Living Things	Plants & Animals	Habitats	Life Cycles	Plant & Animal Adaptations
Earth Science	Patterns in the World Around You	The Sun	Structure of Earth's Systems	Rocks and Minerals	Land and Water
Physical Science	Ways Objects Move	Motion of Objects	Weather including States of Matter	Simple Machine Magnets	Matter
Applied Technology	Tools and Materials	Tools and Materials	Tools and Materials	Simple Machine	TBA

Parent and Family Survival Tips

As a Parent, what can you do to help your scientist?

- Be your child's coach and cheerleader

  What Does A Coach Do? A coach asks great questions.

  What are Great Questions? Questions that start with the words "what", "how," or "why" are a great way to go. Asking your child questions helps them refine and focus their ideas, and it puts the responsibility on them to keep thinking.

  What does a coach <u>not</u> do? Finish their child's science project at 2AM the night before the science fair. *Really.* It's not easy to step back and let your child make mistakes – but actually doing science is not really about perfection. Mistakes are great learning opportunities, plus potentially it saves you from waging World War III over a white board and a tube of glue. Help your child stay organized by encouraging them to utilize the Science Fair Project Checklist.

  Help your scientist with some website research, and/or take them to the library. I f you have a library card, you can also request books from any library in the *Merrimack Valley Library Consortium* system and they will come to you at Amesbury Public Library. You can even do it online (www.amesburylibrary.org)!

- Parents of especially the smaller scientists can help with reading, explaining, typing, cutting, pasting, etc. Have them be the Boss and the Brains but assign you to do some of the smaller "grunt work."

Science Fair projects can take a long, long time to complete. With other school and family obligations, even the most enthusiastic scientists can get overwhelmed. You know your kid best. Help foster the fun of science and if you have any questions at all, please do not hesitate to contact Michelle Parsons at mbossern@comcast.net

2016 PTA Science Fair Project Proposal

Please return to Science Fair box in your school office, by Friday January 15thth.

Name: _____ Grade: _____

Teacher: _____ School: AES or CES?

Email: _____ Phone: _____

Entry category: (Please mark one in each column):

_____ Competitive Participant	_____ Individual	_____ Experiment
_____ Non-Competitive Participant	_____ Team	_____ Demonstration

If you are working as part of a team, you only need to fill out ONE proposal sheet. Teams can have up to 5 members, and members can be in different grades. List team members here (include name/grade/teacher/school/e-mail information for each team member):

_____

_____

_____

My (our) project title is:

Will your project have any special requirements (like having an electrical outlet near your display)?

_____

2016 PTA Science Fair Media Release form

Throughout the Science Fair, video and photos will be taken. Selected works may be published in area newspapers, newsletters or the PTA Website. The video will be shown on local cable TV. Without written consent, we cannot use images of your child in any publication. All participants need to return a completed media release form. Thank you for your consideration and cooperation!

YES, my child _____ **may** have his/her work appear in public print, and **is allowed** to be photographed and/or videotaped for local cable TV.

NO, my child _____ **may not** have his/her work appear in public print, and **is not allowed** to be photographed and/or videotaped for local cable TV.

Parent Signature: _____

Please print your name: _____

Date: _____

Please sign and return this with your project proposal by January 15th. Thank You!