TO: High School Math, Science, and Technology Teachers  
FROM: Jean Patrick Antoine, Assistant Dean, Rutgers University, School of Engineering  
SUBJECT: 2020 New Jersey Junior Science & Humanities Symposium at Rutgers University

We are pleased to invite you and your school to participate in the Rutgers University Junior Science and Humanities Symposium, a science fair for high school students interested in science, mathematics, and technology research. Students who have undertaken their own scientific research, underclassmen who intend to conduct research in the future, and high school teachers are invited to attend our symposium at Rutgers University's School of Engineering in Piscataway, NJ on March 2, 2020.

To participate in the competitive portion of our program, students must have conducted STEM-related research and have elicited comprehensive and viable results and findings from their work. Teachers must register school and nominate students by November 29th, 2019. Students intending to apply must submit abstracts of 200 words or less giving an overview of their research by December 6, 2019. See the NJ JSHS at Rutgers Guidelines for more information on the presentation format. Students also must submit full research papers detailing their findings, in addition to a link to an "unlisted" YouTube link of their video presentation by January 8, 2020. Based on the research papers and videos, our committee of judges will select up to 5 of the top students, as Finalists, to give oral presentations of their work at our symposium in March. The judges will also select up to 50-70 other students, as Poster Finalists, to give poster presentation of their work at our symposium. All applicants will be notified of their status by February 14, 2020.

Finalists compete for up to 3 expense paid trips to the 2020 National Symposium on April 15-18, 2020, in Norfolk, Virginia, as well as scholarships of $2,000; $1,500; or $1,000. Poster finalists compete for 2 expense paid trips to nationals and additional prizes.

Students who have not yet conducted research or are just beginning their projects are welcome to attend the symposium as observers. On the day of the symposium, all student researchers and sponsoring teachers participate in a series of events designed to cultivate their interests in the STEM field. Also on that day, all student researchers, observers, and sponsoring teachers participate in the symposium. The day will consist of presentations from researchers at Rutgers, exhibits, and college & career focus groups. In the evening, students will attend a formal dinner recognizing their scientific achievements, hear from a keynote speaker, and possibly take part in team based math, science, and engineering challenges.
WHO IS ELIGIBLE?: Any student attending a high school in Northern or Central New Jersey is eligible to participate. There is no registration fee to participate, and all program costs and meals during the symposium are covered for **up to 5 students (as observers/presenters), and up to 1 chaperone per school**. Additional observers are welcome to attend but will have to contact Jean Patrick Antoine through j.antoine@rutgers.edu.

PROGRAM OBJECTIVES: The primary motives of JSHS are to promote research and experimentation in the sciences, engineering, and mathematics at the high school level, and to publicly recognize students for their outstanding achievements. At the Symposium, students will have the chance to meet like-minded, dedicated and enthusiastic students from other schools, learn about future careers in science and engineering, and be inspired by other students’ research and ideas.

AWARDS:
Students participating in our “Oral Competition” are competing for
1. three expenses paid trips to the National JSHS.
2. three scholarships ranging from $1,000 to $2,000
3. three opportunities to present their work at Nationals, competing for up to $16,000 in scholarship money.
4. additional prizes such as t-shirts, books, etc.

Students participating in our “Poster Competition” are competing for
a) two expenses paid trip to the National JSHS.
b) additional prizes such as t-shirts, books, etc.

Steps to Participation:
STEP 1: HOW DO I REGISTER?: Teachers who will be chaperoning their students should register for the symposium via Cvent by clicking on the appropriate link on the following website: http://soe.rutgers.edu/jshs

Students who would like to register for the symposium independently (i.e. no other students from their school plan to attend, and they will be chaperoned by a parent rather than a teacher), need approval by their High School, and from the Director of the Rutgers JSHS, should also register via Cvent by clicking on the appropriate link on the following website: http://soe.rutgers.edu/jshs

Along with the online Cvent Registration form, all students who will be submitting their research for the competitive portion of our program must submit an abstract of 200 words or less giving the overview of their research by December 6, 2019. The abstracts must be uploaded directly in pdf format to their Cvent accounts.

STEP 2: HOW DO I SUBMIT RESEARCH PAPERS?: Students who wish for their research to be considered for the competitive portion of our program must additionally submit full research papers describing their work by January 8, 2020. All papers should be uploaded in .pdf format directly to the Cvent accounts. The format and guidelines for research papers are available at http://soe.rutgers.edu/jshs under the forms section.

Our judges will read these papers and choose up to twenty finalists to compete in the “Oral Competition” at our Symposium. The authors of all papers that demonstrate excellent work and understanding but are not selected for the “Oral Competition” will be invited for our “Poster Competition.” Students whose work does not meet the standard for selection will still be eligible to attend the Symposium as an observer. All applicants will be notified of the judges’ decisions by February 14, 2020.
Event Logistics:

For the Symposium itself on **March 2, 2020**, please plan to arrive at the Rutgers Busch Student Center by 7:45am on **March 2, 2020**. The event will conclude no later than 6pm, the same day, on **March 2, 2020**. Attendees are responsible for their own transportation to and from the event.

QUESTIONS?

If you have any questions about the JSHS program, please feel free to contact JSHS Director:

Mr. Jean Patrick Antoine,
j.antoine@rutgers.edu
848-445-4753
** IMPORTANT DATES AND DEADLINES **

Teacher/School Registration are due **November 29, 2019**.
Student Registration and Abstract are due **December 6, 2019**.
Student Full Papers and Video are due **January 8, 2020**.
Announce Finalists for NJ JSHS at Rutgers will be announced on **February 14, 2020**.
NJ JSHS at Rutgers University will be on **March 2, 2020**.

**SPONSORSHIP:** The Junior Science and Humanities Symposia (JSHS) Program is a tri-service – U.S. Army, Navy, and Air Force – sponsored STEM competition which promotes original research and experimentation in the sciences, technology, engineering, and mathematics (STEM) at the high school level and publicly recognizes students for outstanding achievement. By connecting talented students, their teachers, and research professionals at affiliated symposia and by rewarding research excellence, JSHS aims to widen the pool of trained talent prepared to conduct research and development vital to our nation.

Endorsed by the National Association of Secondary School Principals (NASSP), JSHS regional and national symposium are held during the academic year and reach more than 8,000 high school students and teachers throughout the United States, Puerto Rico, and the Department of Defense Schools of Europe and the Pacific Rim. Students must first participate in their regional symposia where they compete for selection to present at the national symposium each year. National Website: http://www.jshs.org
Abstract Guidelines

The abstract should provide a concise yet descriptive overview of your research project in no more than 200 words. A good abstract briefly states the research problem or purpose of the research, how the problem was studied, what was found, and what the findings mean (conclusions). A properly written abstract presents a summary of the research conducted and the most significant conclusions reached. No pictures, charts, graphs or attachments may accompany the abstract.

Format for the 200-word abstract: The header preceding the abstract body must include:
1. Title of the research;
2. Name(s) of Author(s);
3. High school, high school city, high school state;
4. Name of teacher/mentor/sponsor. Precede the individual's name with a subheading (i.e. teacher, mentor, sponsor);
5. Include one line of space between the heading and the abstract body. (taken from http://www.jshs.org/Abstract_Submission.html)

Writing the Body of the Abstract

Abstracts are the chief means by which scientists decide which research reports to read. The abstract is a very brief overview of your ENTIRE research project. The abstract tells the reader WHAT you did, WHY you did it, WHAT you found and WHAT it means. The sequence of sentences is ordered in a logical fashion, beginning with an introduction that includes your hypothesis and proceeding to your test (e.g. materials, methods and procedures used), results (data or findings), discussion and conclusions.
Distill the most important items of your research project, and leave out unimportant details. As a first draft, write one or two sentences that summarize each section. For your final draft, make sure the abstract flows logically. Give it to a friend, teacher, parent, mentor, etc., to read. Ask them to tell you what they think you actually did and what you found. Revise as necessary.
**Research Paper Guidelines**

**A. Preparation of Student Research Papers**

1. **General** - All papers must be prepared according to the following:
   a. Be typed, double-spaced, one side only, on 8½” by 11” paper with one-inch margins.
   b. The paper should be a minimum of 5-6 pages and a maximum of 20 pages, including appendices. When submitting electronically, be sure that the paper is in PDF format. Include only 1 copy if submitting by postal mail.
   c. Cite all references, sources of information, and include a bibliography.
   d. Include a Title Page that includes the Student's Name, Title of Paper, and High School.
   e. Include a page detailing any major assistance received, as well as an acknowledgement of your research mentors. This should come directly after your title page.
   f. Use your paper's title as a header on all pages. Do not put your name on these pages.

2. **Paper Content** – we suggest organizing the paper as follows:
   a. **Abstract** – concise descriptive overview of paper *Follow Abstract guideline on [http://soe.rutgers.edu/jshs](http://soe.rutgers.edu/jshs)*
   b. **Introduction** - a clear and concise statement of the purpose or objective.
   c. **Procedure/Materials and Methods** - described in sufficient detail to permit a reviewer or listener to understand how the results or data were obtained.
   d. **Results** - stated clearly and concisely. This section should state what you observed (facts). Analysis of these results is left to the following section.
   e. **Discussion and Conclusions** - stated clearly and concisely, and based upon the material presented in the results section.
   f. **Related Work** – If appropriate, a student may wish to describe work done by other researchers on similar problems and topics.
   g. **Future Work** - Plans and directions for continued research may also be included.
   h. **Literature Cited** - We suggest using in-line citations i.e. [3] throughout the paper. These numbers correspond to literature (research papers or books) cited in this final section.

While this method of organization is flexible, we recommend that it be followed as is appropriate to your research. For instance, research which creates a novel design for a system should spend more time detailing and evaluating design decisions. Overall, clarity and a logical argument should be your overriding goals.

3. **Preparation of Illustrations**
   a. Art work and illustrations must be of high quality, neat, and legible.
   b. All diagrams and illustrations will be clearly referenced in the research paper (e.g., Fig. 2, etc.) and should include descriptive captions describing what is shown.
YouTube Video Guidelines

As part of your submission, you will need to create and post a video that answers the ten questions listed below. Please use a formal presentation or an interview format (some stylistic samples are linked at the end). Please find someone to ask you each of these questions so that you can answer them in a recorded video. The entire video should be no longer than 5 to 6 minutes, but the amount of time you spend on each question is up to you.

1. Please introduce yourself with the title of your research.
2. What is the problem being investigated and the hypothesis of the study?
3. Why is your research study novel or innovative?
4. What are the key results of your study and how are they applicable?

To make the video, there are many ways to record and edit the interview. However you choose to do this, you will need to post it in a way that you can obtain a streamable link to submit for our judges to review. Two common means of doing this are Youtube (which can also be used to record the video directly and then post as unlisted) and Google Drive (which allows you to post and share a link).

Sample Videos:

These are examples of styles of presentation rather than quality examples for the content we desire:

- https://www.youtube.com/watch?v=8fDFIIUGboY
- https://www.youtube.com/watch?v=KUT8Bha7wpY
- https://www.youtube.com/watch?time_continue=6&v=VE6Ge-ImO2Q
- https://www.youtube.com/watch?v=lOm_JHB44Fs
ORAL Presentation Guidelines

Please note: We anticipate that students will use PowerPoint or equivalent for their presentation. Please contact us if you would prefer a different means of delivery.

1. Timing
   a. The presentation may not exceed 12 minutes and will be followed by a 6 minute question-and-answer period. At 10 minutes and at 11 minutes, the presenter will be notified of the remaining time via a hand signal from the session moderator. 12 minutes is a hard cutoff time; if the student has not finished presenting at the 12 minute mark, she will be given 15 seconds to complete her thought.
   b. The session moderator will field questions from the judges only during the Q&A period.
   c. Before answering each question, the presenter must repeat or paraphrase the question that has been asked so that everyone in the audience can follow the response.

2. Suggestions for the Oral Presentation
   a. The overall outline for your presentation should be:
      - describe the problem/question you are investigating and why it is important (this may include briefly explaining related work by other scientists)
      - briefly discuss how you went about solving the problem (your procedure) and why you chose these steps
      - summarize and discuss what you found (your results)
      - critically discuss the conclusions you've made (this may include suggestions for future work)

      While the presentation format itself is up to you, a presentation that does not address these points will likely be incomplete.

   b. Clarity in your presentation is critically important. If the audience and judges have difficulty following your presentation, you will not receive a good score. You should assume that the audience and judges have a solid understanding of major concepts in science/engineering/mathematics, but that they are not experts in the particular field of your research. If you are using terminology that is specific to your research field, please remember to define these words. For instance, you can assume that your audience knows the function of mRNA or what spectroscopy is, but if you are discussing a specialized detection process or specific gene, you should explain/define it. Of course, being clear and comprehensible does not mean that you must reduce your scientific rigor; you must simply use the minimum amount of terminology necessary to explain what you did.

   c. Graphs, tables and other illustrations may help explain your results. Remember to name the variables on each axis of a graph and state the significance of the shape of the graph. Give your audience enough time to understand what you are trying to convey. Don't forget to explain the visuals.

   d. Deliver your presentation at a comfortable pace. You will do both yourself and the audience a great favor by thoroughly practicing your presentation and adhering to the time limit. It helps to practice your presentation before a non-specialized
audience. Practice will help perfect the presentation and the timing and help you enjoy your presentation experience. Aim for a 10 minute long presentation, leaving yourself 2 minutes of “breathing room” during the presentation itself. Acknowledgments are presented at the end of an oral presentation.

e. No written handouts are permitted.

f. Be tasteful and cognizant of the effect your PowerPoint slide layout and design choices will have on the audience. Be professional.

3. A/V Equipment

a. Available audio-visual equipment includes a laptop computer running Windows, a projector, a lectern, and a laser pointer. Please notify us well in advance if you will need sound or DVD playback from the computer. If a student would prefer to use her own laptop, that’s perfectly fine.

b. MS PowerPoint, and a PDF reader will be installed on the presentation computer.

c. Please bring at least two copies of your presentation with you, on either CDs or a USB Key/Thumb Drive. 24 hours in advance of the Symposium, please also email a backup copy of your presentation to nnj.jshs.rutgers@gmail.com.

d. Your first slide should include the title of your work, your name, and your school.

e. Use good judgment in determining the number of visuals and balance their contents. Although you do not want to quickly flash multiple visuals, you should not spend too much time on a single visual either.
**POSTER Presentation Guidelines**

During the poster sessions, all poster presenters will be expected to remain at their posters. Judges (and other JSHS staff members) will walk around. When the judges arrive, you will be expected to give a 4 minute overview of your research, which will be followed by a few minutes of questions. Judging will include the student’s knowledge of the research topic, ability to explain their work, and demonstrated understanding of the methods chosen.

**Preparation of the Poster**

1. **General** - All posters must be prepared as follows:
   a. Posters should not be larger than 30 in. (76 cm) deep, 36 in. wide, and 48 in. high.
   
   b. Headings [abstract, introduction, hypothesis(es), method, results, discussion and conclusion(s)] must stand out from the body of text.
   
   c. Keep the amount of text to a minimum. As a general guideline, consider using 24-pt font for all text on the poster, 48-pt font for headings, and 72-pt font for your title and name.
   
   d. **Photographs of human subjects are not permitted unless accompanied by a signed-consent form.** The student researcher should have the subject sign a letter stating that they (the subject) are freely giving their permission for their photograph to be used in the Rutgers Junior Science & Humanities Symposium. This permission form must be placed as part of the research poster display during the Symposium.

2. **Poster Content** - Included in the poster should be the following:
   a. **Title**
   
   b. **Student’s Name and School**
   
   c. **Abstract:** Briefly summarize your research: the purpose, method, findings, and major conclusions.
   
   d. **Introduction:** Provide background relating to your study topic. Provide the motivation for your study and present a clear description of the research project.
   
   e. **Methods**
   
   f. **Results:** Data is often included in chart or graph form. When applicable, some measurement of variability/error should accompany the mean or other summary statistics. Statistical analysis of the results should be presented by providing the name of the statistical test used, the resulting statistical value, and the probability of obtaining that value by chance. Remember, the probabilities associated with various statistical tests are found in tables at the back of introductory statistics books.
g. Conclusions: Briefly state the most important facts that were concluded from your research.

h. Acknowledgments