



U.S. Army, Navy & Air Force Sponsored

National Junior Science and Humanities Symposia Program--

Program fact sheet and guidelines for students - Regional and National Symposia

Each year over 8,000 talented high school students and their teachers participate in JSHS at each of forty-eight Regional Symposia held on university campuses nationwide by presenting the results of their scientific, engineering, or mathematics research. Progressing from the Regional Symposia, 230 student delegates advance to the National JSHS and may compete for significant military-sponsored scholarships and other awards.

The primary aims of JSHS are to promote original research and experimentation in the sciences, engineering, and mathematics at the high school level, and to publicly recognize students for outstanding achievement. By involving talented students and their teachers in affiliated symposia, and by recognizing students' research endeavors through scholarships and other awards, JSHS aims to encourage continued interest and participation in the sciences and ultimately to widen the pool of trained scientific and engineering talent prepared to conduct research and development vital to our nation.

### Sponsorship

The Junior Science and Humanities Symposia (JSHS) Program has been sponsored by the United States Department of the Army since its inception in 1958, and additionally joined by the Departments of the Navy and Air Force after 1995. Resulting from this sponsorship and the cooperative efforts of universities throughout the nation, JSHS encompasses forty-eight Regional Symposia reaching high schools throughout the United States, Puerto Rico, and in cooperation with the Department of Defense Schools of Europe and the Pacific, and the annual National JSHS.

The Academy of Applied Science, a non-profit educational organization in Concord, New Hampshire, administers the National JSHS Program in cooperation with universities or other educational institutions.

### Why participate?

JSHS participation in Regional and National Symposia affords participants the opportunity to...

- Participate in a forum honoring exceptional work and encouraging personal and academic growth.
- Interact with practicing researchers who offer a look beyond high school to opportunities in post secondary education and to academic and career development in the sciences, engineering, and mathematics.

- Develop higher-order thinking skills and integrated learning across disciplines through the process of scientific inquiry, writing a scientific paper, and delivering a presentation -- all skills that will benefit future post secondary and graduate pursuits.
- Participate in a scientific conference, take field trips, and have their work published.
- Gain self-confidence not only through the experience of the research investigation but also through networking among participants of similar interests.

## Awards

Significant awards are available to JSHS Regional and National student finalists. University contributed scholarships or other awards are sponsored by many Regional Symposia. The availability of these additional awards, type of award, and value vary by region. The Departments of the Army, Navy, and Air Force jointly sponsor the following awards (subject to the availability and release of government funding)...

For students who participate in Regional and National symposia...

- Public recognition and certificates, honoring achievement and interest in research pursuits
- Attain a sense of achievement and self-confidence resulting from interaction with students from other schools and regions and with professional researchers and educators. To quote a former JSHS alumnus, [At JSHS] "I learned a tremendous amount of science, got to meet other high school students who shared my interests in science, and learned that I could succeed at any program that I chose to pursue."

For 48 teachers...

A \$500 award to one teacher at each of the 48 Regionals, honoring the individual teacher's and his or her school's contributions to advancing student participation in research. The teacher award may be used to partially defray costs for National JSHS attendance.

For the regional finalists...

- An expense-paid trip to the National JSHS, awarded to five finalists at each regional symposium; two oral presenters and up to three poster presenters will be invited to participate in the National JSHS. The National brings together over 360 participants in a program of educational and scientific exchange.
- A total \$4,5000 undergraduate, tuition scholarships, awarded at \$2000, \$1500, and \$1000 to each of three Regional Symposium finalists. (scholarship payable upon matriculation to college and upon meeting the JSHS scholarship conditions).

For the national finalists...

- Eight \$12,000 undergraduate, tuition scholarships, awarded to each of the 1st place category finalists in the National research paper competition.
- Eight \$8,000 undergraduate, tuition scholarships, awarded to each of the 2nd place category finalists in the National research paper competition.
- Eight \$4,000 undergraduate, tuition scholarships, awarded to each of the 3rd place category finalists in the National research paper competition.

## How to apply – The Regional Symposia

JSHS invites the participation of all high school students who have completed an original research investigation in STEM. All students in grades 9-12, enrolled in a public, private, or home school within the area served by the JSHS Regional Symposium are eligible. Students must also be a citizen or permanent resident of the United States or U.S. territory. Experimental research, field research, observational research, and applied research are eligible. While review or library research is a part of the research process, these investigations alone are not sufficient. (See [www.jshs.org](http://www.jshs.org), Guidelines section, for additional descriptive reviews of the types of research.)

Interested students and their teachers are encouraged to contact the JSHS Regional Symposium director in their area to obtain application guidelines and materials and be prepared to:

- (1) submit a written report (e.g. abstract and/or paper) prepared in accordance with the Regional Symposium's guidelines;
- (2) deliver a concise oral presentation to the symposium;
- (3) complete registration and/or application materials; and
- (4) comply with Regional and National rules and policies that apply to the preparation of the written reports and the oral presentations.

The written and oral reports should present the results of original research carried out by the student. Students are encouraged to obtain assistance from teachers, mentors, parents, or other students. Students can best demonstrate original work through oral and written research presentations made at JSHS by reporting on their contributions to the research problem and their approach to undertaking the investigation. The overall test is that students demonstrate valid investigation and experimentation aimed at discovery of knowledge.

## Eligibility Rules -- Regional and National Symposia

**Team projects.** A student may present a report on work done as part of a class project, or as a science fair project, or summer research project. If a presenter is part of a larger group, the presentation should focus on the larger research project and properly acknowledge the contributions of other students, mentors, and/or teachers. A team leader should be selected to present the results of the group work. In this case, all JSHS directives applying to individual research investigations will apply to group research investigations. If an individual presenter from a group project is selected as a Regional finalist and is invited to present at the National JSHS, the same presenter must present at the National Symposium. Scholarships and other awards available at Regional and National Symposia are awarded to the presenter.

**Continuation projects.** Students may continue a research investigation; however, a study which merely adds data from a previous year's project is not considered a strong continuation project. If a continuation project is submitted, the student must discuss how the project was expanded (i.e. methodology, new variables) and the significance of the results. All JSHS Regional Symposia bear the responsibility during the review and judging process to determine if the project has been substantially expanded.

Research involving vertebrate animals or human subjects.

Research involving vertebrate animals or human subjects must be conducted under the direct supervision of a qualified teacher or mentor with an approved active protocol which complies with local, state, or federal regulations for such research. The JSHS requires students to acknowledge in their written research report, and in the "Statement on Outside Assistance," that proper procedures and protocols were followed. Projects which were conducted without proper supervision will be disqualified from both Regional and National competition.

The JSHS Program recognizes that students may conduct research in a high school setting, and both students and teachers may have questions on how to obtain proper approvals if the research is conducted in a school, home, or field research setting versus in a university laboratory.

General guidelines follow on experimentation involving vertebrate animals (adapted from Bonkalski et al, 1994):

- Only animals that are lawfully acquired shall be used in experimentation and their retention and use shall be in every case in strict compliance with state and local laws and regulations.
- Animals used in experimentation must receive every consideration for their bodily comfort; they must be kindly treated, properly fed, and their surroundings kept in a sanitary condition.
- No intrusive techniques may be used, including surgery, injections, or taking of blood.
- When animals are used by students for their education or the advancement of science, such work shall be under the direct supervision of a committee of individuals knowledgeable of applicable regulations governing the care and animal of animals in the conduct of the project.
- At no time should a student do harm to a vertebrate animal in the conduct of the research.

General guidelines follow on research involving human subjects (adapted from Bonkalski et al., 1994).

- No project may use drugs, food, or beverages in order to measure their effect on a person.
- Projects that involve exercise and its effect on pulse, respiration rate, blood pressure, and so on are approved if a valid normal physical examination is on file and provided the exercise is not carried to the extreme.
- If your research involves administration of questionnaires or surveys, a proper consent from subjects must be obtained.
- No human cultures of any type—mouth, throat, skin, or otherwise—will be allowed.
- Tissue cultures purchased from reputable biological supply houses or research facilities are suitable.
- The only human blood that may be used is that which is either purchased or obtained from a blood bank, hospital, or laboratory. No blood may be drawn by any person or from any person specifically for a science project. This rule does not preclude a student making use of data collected from blood tests not made exclusively for a science project. Blood may not be drawn exclusively for a science project.
- Experimentation involving human subjects requires direct supervision of a committee of individuals knowledgeable of applicable regulations governing the conduct of such research. Non-regulated research institutions (i.e. high schools) should establish a committee of knowledgeable teachers and other mentors to view the research plan prior to the conduct of the research.

### Scholarship eligibility.

- Students must be a citizen or permanent resident of the United States or U.S. territory to present and to be eligible for the Government-sponsored scholarship awards. Regional Symposia directors are responsible for monitoring citizenship status of student applicants.
- The total scholarship awards available through JSHS are capped at a maximum total of \$30,000 per individual student winner.
- Scholarships are awarded to only one student.

### Scholarship conditions. Student scholarship recipients must...

- Demonstrate full-time enrollment as an undergraduate student at an accredited institution;
- Pursue an undergraduate degree in a science, technology, engineering or mathematics discipline, as defined by the National Academy of Sciences, National Academy of Engineering, Institute of Medicine, and National Research Council in their combined directory titled Organization and Members;
- Maintain at least a B (3.0) equivalent grade average;

### The Judging process.

At the Regional Symposia, the first round of judging will occur where the students' written reports are reviewed by a scientist or expert in the field. Resulting from this review, selected students are invited to orally deliver their research before the Regional Symposium. Selected presentations will represent the finest efforts of high school students in the state or region toward either original laboratory research, field research, or applied research. Judging of the oral presentations is the final step to select student delegates who will advance to the National JSHS.

At National, student research presentations will be organized in concurrent sessions by discipline. Military-sponsored undergraduate, tuition-based scholarships and other awards will be made to 1<sup>st</sup> place finalists and runner-up finalists from each of eight (8) final sessions.

### Judging criteria.

Regional and National judges evaluate the oral presentations using the below criteria. National judges rank each of the presentations based on the criteria and using a scale from 1 to 5. The scores are tallied for each presenter and used as the basis for discussion among judging team members where each criterion is considered.

- Statement and identification of research problem
- Scientific thought, creativity/innovation, appropriate duration
- Research or engineering design and procedures
- Logical conclusion relevant to the research problem. What was learned? Did student recognize contribution to the field?
- Skill in communicating results
- References stated

The National JSHS Judging Team and Process. The National JSHS Judging Team includes individuals 1) who hold either a Ph.D. or equivalent experience, or 2) who are actively engaged in research. Judges will have experience in the general fields of research that are represented by the National student presenters. Specialized experience in each field delivered at the National JSHS may not be represented by each and every one of the judges. Therefore, student presenters are reminded of their responsibility to communicate their results so that they may be understood by both the non-specialized audience and by the judges. Judges are selected also for their interest in encouraging the students' interests and future development in the sciences, engineering, or mathematics. The judges review the National student presentations as follows...

- All of the written reports (e.g. abstract and paper) are read. The paper is used as supporting documentation during the judging process.
- The oral presentations are evaluated by each member of the assigned session judging team.
- The questioning period which follows the oral presentations aids judges in clarifying the student's depth of understanding, the amount of work and level of effort, and the individual contributions to the research problem.
- Following the sessions, the individual session judging teams meet and deliberate to select finalists from each session.
- Judges utilize the "National JSHS Judges Score Sheet" as a tool and consider the weight of each factor during their deliberations.

The National JSHS Office, Academy of Applied Science; and the National JSHS Judging Panel recognize the enormous effort that students undertake in conducting their research. Therefore, our objective is to ensure an equitable competition by selecting qualified judges and by communicating the rules of competition to both students and judges. We realize that in any competition of this nature, differences of opinion about the judges interpretations may occur. It is the policy of the sponsors of the JSHS Program (e.g. the Army, Navy, and Air Force) to support the interpretations and final decisions of the judges panel. Recommendations regarding the future conduct of the National JSHS judging process, or requests to clarify the rules of competition can be directed to the attention of the Director, National JSHS Program, Academy of Applied Science, 24 Warren St., Concord, NH 03301.

### JSHS Categories of Competition

The organization of the final eight (8) sessions at the National JSHS is based upon a review of all abstracts and the area of research suggested by the student. Student presenters must state on the abstract the major discipline and the sub-discipline of their research. The eight major disciplines in which military-sponsored scholarship awards may be made are:

#### Environmental Science

Environmental Science/Engineering (Bioremediation, Ecosystems management, Environmental engineering, Land Resource Management, Pollution, toxicity; impact upon ecosystem)

#### Biomedical Sciences; Molecular/cellular

(Biomedical medicine, Microbiology, Molecular/cellular, Genetics, Immunology, Pharmacology, Virology)

#### Life Sciences

(Developmental Biology, Plant Physiology, Population Genetics, General Biochemistry, Microbiology)

#### Medicine & Health/Behavioral sciences

(Behavioral sciences, Biochemistry, Bioengineering, Disease Diagnosis and Treatment, Epidemiology, Immunology, Neuroscience, Physiology, Pathology)

Engineering and Technology

(Aerospace, Aerodynamics, Electrical Engineering, Energy - Solar, Vehicle Development, Devices, Mechanical Engineering, Robotics)

Math and Computer Science, Computer Engineering

(Probability and Statistics, Math, Computer Science - Algorithms, Databases, Networking, Computer Engineering)

Physical sciences, including Physics, Astronomy, Internet of Things

(Astronomy, Physics-theoretical, Physics-Solid state, Acoustics, Optics, Thermodynamics, Particle physics, Quantum physics, Nuclear); Internet of things--network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity

Chemistry, including physical chemistry, materials science, alternative fuels, geochemistry

Physical Chemistry, Materials, Alternative Fuels, Organic Chemistry (possibly in life science), Chemical Engineering, Earth Science--Geochemistry, Energy--Alternative Fuels, Material Science)

The National Symposium – Registration requirements for all student delegates

All student delegates who advance to the National JSHS are required to complete their registration on-line at [www.jshs.org](http://www.jshs.org). If the regional symposium is held after April 1, the regional symposium director must contact the National JSHS Office to coordinate an acceptable submission date.

Registration requirements for all attending student delegates include:

1. National JSHS Registration — Upon completing registration, the National JSHS Office will coordinate travel reservations, reserve hotel accommodations, and assign tour preferences. Immediately following the regional symposium, students must confirm their participation with the JSHS regional director and complete the registration process at [www.jshs.org](http://www.jshs.org), National symposium.
2. National JSHS consent form providing consent for participation from your school and parent/guardian. This is a paper form requiring signatures and receipt by the National JSHS Office prior to April 6.
3. 200-word abstract in electronic format . (See [www.jshs.org](http://www.jshs.org), National symposium section for instructions on electronic submission of the abstract. The **format** for the 200-word abstract includes: 1 inch margins, keyed in 10 or 12 point font (Times or Times New Roman). Abstracts must be adequate in length but not exceed these specifications. The header preceding the abstract text includes:
  - ❑ Title of the research
  - ❑ Your name
  - ❑ Name of your high school, high school city, and state
  - ❑ Name of your teacher/sponsor/mentor and his or her organization. Precede the person's name with a subheading (i.e. teacher, mentor, sponsor:)
  - ❑ Include one line of space between the heading and the body of the abstract.

Abstracts are **published** as submitted in the National JSHS publication, "Abstracts of the Research Finalists," and distributed to all symposium attendees. A good abstract is written to summarize the research paper. The abstract should accurately convey the essential nature of the research conducted and the most significant conclusions reached. A further purpose of the abstract is to attract the interest and curiosity of the non-specialist reader and thus encourage exchange, discussion, and elaboration between various authors and between authors and readers.

All National JSHS oral presenters are required to prepare and submit a research paper and the following supplementary forms.

1. Statement on Outside Assistance, signed by the teacher and mentor and stating that proper protocols and procedures were followed in the conduct of research involving vertebrate animals or human subjects.
2. An electronic version of the research paper
  - The paper should be a minimum of 5-6 pages and a maximum of 20 pages, including appendices.
  - Photography, graphs, tables, diagrams, charts, or other graphic representation presented in the paper must be simply presented and comply with the maximum file size limit of 1.8 Mb.
  - A maximum size limit for the electronic research paper is 1.8 Mb.
  - A recommended outline for the research paper includes:
    - a title page, or cover page stating the student's name, school address, and title of the research;
    - acknowledgement of major assistance received;
    - as applicable, statement that "research involving non-human vertebrates or human subjects was conducted under the supervision of an experienced teacher or researcher and followed state and federal regulatory guidance applicable to the humane and ethical conduct of such research"
    - table of contents;
    - introduction;
    - materials and methods;
    - results (data or findings);
    - discussion and conclusions;
    - references, or literature cited;
    - and appendices (if necessary but please keep in mind that the introduction is far more valuable in the judging process than appendices of raw data)

The research paper is used as a supporting document to the abstract during the judging process. The judges read both the abstract and paper.



## The National Symposium - Requirements for the Oral Presentations

Session timing. The research presentation may not exceed 12 minutes, followed by a maximum 6-minute question period. A session moderator will aid the student speaker in maintaining this schedule and in fielding questions from the audience. The procedure for maintaining the time includes a 10-minute signal for the student, and finally a 12-minute signal. At the 12-minute point, the student speaker must stop the presentation even if he or she has not finished. Following the presentation, the session moderator will ask for audience questions. The speaker may entertain questions while the exchange appears interesting and relevant. Questions intended to harass the student speakers will not be allowed by the session moderator. The speaker should repeat a question before answering so the audience may understand the entire dialogue.

Use of Audio Visuals - Available equipment. Available audio-visual equipment in each session at National includes: (1) LCD projector; (2) projection screen; and (3) a laser pointer. Additionally, PC-based computers will be in each session room configured with Microsoft Powerpoint and Adobe Acrobat. The use of other software requires students to bring their own equipment. Mac users should plan to bring a Mac adapter to plug-in to available equipment.

Equipment operators will not be available in each session. Students should number visuals in sequence so the presenter can easily reshown one. Many times, visuals are re-shown during the questioning period.

Aids to the presentation. No written handouts or models are permitted. Powerpoint and computer action video may be used in the presentation. Please refer to the following section which limits the use of video to a maximum 1-minute time limit.

Powerpoint suggestions.

Student presenters are reminded to:

- Embed any video, or other presentation developed through other software, into Powerpoint.
- Save the Powerpoint presentation to an IBM-compatible thumb drive, and plug into available PC-based equipment with that thumb drive.
- Bring back-up media.
- If using video, students must comply with the following groundrules...
- The video component cannot make up more than one (1) minute of the presentation and must be directly relevant to the project.
- No audio or background music is permitted other than sounds that are an integral part of the research. Recorded or mechanically produced narration is not permitted. Narration must come from the speaker.
- Videos (and audio, if any) may be used only for those aspects of the presentation that cannot adequately be presented in a slide. Video material presented must be an integral part of the research and should not be a substitute for presentation of data. Videos must not be used for presentation of common procedures, illustrating equipment or showing laboratory facilities. Videos should illustrate work that was done and should not be used for stimulation or aesthetic value.

## The National Symposium-Suggestions to prepare for the oral presentations

Remember, you are the expert. No one in the audience knows as much about your research investigation as you. Therefore, remember to explain your research in enough detail so the audience will understand what you did, how you did it, and what you learned.

Whenever possible, avoid jargon or unnecessary terminology. If it is essential to use specialized terms, remember to explain the specialized term briefly. Give your audience enough time to understand what you are trying to convey.

Graphs, tables and other representation help explain your results. Keep them simple and uncluttered. Focus on important information; for example, remember to name the variables on both axes of a graph, and state the significance of the position and shape of the graph line.

Deliver your presentation at a comfortable pace. It helps to practice your presentation before a non-specialized audience. Practice will help perfect the presentation and the timing. Do listen to the advice of your non-specialized audience but also get help from a teacher or other advisors as needed.

*Hundreds of volunteers, including teachers, mentors, university faculty, representatives of the Department of Defense contribute their time and talent to JSHS and the encouragement of science among the nation's best and brightest secondary school students. If we can be of assistance, please contact the National JSHS Office or your regional symposium representative.*

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