2014 INTERMOUNTAIN JUNIOR SCIENCE AND HUMANITIES SYMPOSIUM (IJSHS)

GENERAL INFORMATION AND GUIDELINES PACKET

Registration Deadline:
December 17, 2013

Research Paper Submission Deadline:
January 9, 2014

Symposium Dates:
March 5-8, 2014
Hundreds of volunteers, including teachers, mentors, university faculty administration, representatives of the Army, Navy and Air Force, and others, contribute their time and talent to the JSHS program and the encouragement of science among the nation’s best and brightest secondary school students. More information about the national and regional symposiums can be found at:

National Junior Science & Humanities Symposium (JSHS) Website  
http://www.jshs.org

Intermountain Junior Science & Humanities (IJSHS) Website  
http://admissions.utah.edu/events/ijshs/

The IJSHS is sponsored by:
The U.S. Army, Navy and Air Force, and

THE UNIVERSITY OF UTAH

IJSHS Staff

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Sponsorship
The Academy of Applied Science, a non-profit educational organization, administers the National Junior Science and Humanities Symposium (JSHS) in cooperation with other educational institutions throughout the United States, as well as Department of Defense Schools of Europe and the Pacific. JSHS annually reaches about 10,000 high school students and teachers at regional and national symposia. As a member of this national symposia, the Intermountain Junior Science and Humanities Symposium (IJSHS) has been sponsored by the United States Department of the Army since its inception, and was joined by the Departments of the Navy and Air Force after 1995.

Program Objectives
The primary aim of the IJSHS is to promote original research and experimentation in the Sciences, Engineering, and Mathematics at high school level, and to publicly recognize students for outstanding achievements. Each of the forty eight regional symposia, as well as the National Program, provide a forum for high school students to present the results of their original research in the Sciences, Engineering, Mathematics, Psychology and the Social Sciences. Students who participate in the symposium also have the opportunity to meet and exchange ideas, interact with practicing researchers, and explore future academic and career opportunities.

Intermountain Region and Symposium
The Intermountain Region consists of 5 states: Utah, Idaho, Montana, Western Colorado and Nevada. The symposium provides its participating students and accompanying chaperones with three night accommodations, meals and local transportation. Travel expenses to and from Salt Lake City, and registration fees are the responsibility of the student/teacher participant, their school, school district, or other private agency.

Symposium Participants
Students: High School students from grades 9 through 12 are eligible to participate. Preference will be given to those students who plan to submit a research paper and have been nominated by an instructor and have completed the registration process by the stated deadline. Seniors and other students who have attended a previous IJSHS are required to submit a paper as a condition of their acceptance. Women and minority students are strongly encouraged to apply. Permission to attend may be granted to eligible persons only by the IJSHS Director upon receipt of the registration from the sponsoring high school.

Students who plan to submit a research paper must be prepared to submit a written report prepared in accordance with the symposium’s guidelines (see the national website www.jshs.org for oral and poster guidelines) in one of the disciplines listed in the “Competition” section below. If selected, the student will deliver a concise oral or
poster presentation during the symposium. The written and oral reports should present the results of the student’s own work including ideas and data obtained by the student.

Students are encouraged to obtain assistance from teachers, mentors, parents, or other students. If outside assistance is rendered, it should be properly acknowledged and clearly stated. Winning students may be asked to provide notebooks and/or other documentation detailing their research.

Sponsoring Instructors/Chaperones: Each student participant must be accompanied by their sponsoring instructor or a designated chaperone (i.e. another instructor or a parent). Multiple students from the same high school may have the same sponsoring instructor or designated chaperone.

Paying Participants: Based on the availability of space, students who are not submitting a research project, teachers that are not supporting a student research project from their school, or a parent(s) may be able to attend as a paying participant. Permission of the IJSHS Director will be required upon receipt of registration from the sponsoring high school. These spaces will only be given if there is room available once the registrations from the students submitting research papers and their sponsoring instructors/chaperones have been received.

Research Competition
Students submitting papers must state on their registration the major discipline and the sub-discipline of their research. The designation will be used to place the student in the correct judging category for the competition. If no discipline is designated, the executive judges will determine which discipline the paper will be placed in the competition. The major disciplines and sub-disciplines include but are not restricted to:

- Earth and Space Science, including: astronomy, environmental science, geology, marine science, meteorology
- Engineering or Technology
- Physical Sciences, including: chemistry, energy, engineering, and physics
- Behavioral Science
- Mathematics and Computer Science
- Biological Sciences, including: biochemistry, general biology, forestry, genetics, medicine and health, microbiology and physiology

Paper Readers and Presentation Judging Panel
The IJSHS Paper Readers and Presentation Judging Panel includes individuals who hold either a Ph.D. or equivalent experience in the general fields of research that are represented by the student presenters. Judges are selected also for their interest in encouraging the students’ interests and future development in the Sciences, Engineering, Mathematics, and Social Sciences.
Research Paper Review and Symposium Presenter Selection
All of the written reports (e.g. abstract and paper) are read by at least two research specialists to determine which students will present their research in the oral presentations, the competitive poster presentation, or the non-competitive poster presentation. In the event that the two research specialists reviewing a research paper do not agree, then the Executive Judges will review the paper and make the final determination on how the research will be presented during the symposium and in which sessions (groupings).

Symposium Presenter Assignments
In an attempt to achieve a balance in the number of presenters in each session, it may be necessary to organize sessions that encompass more than one of the above disciplines. Once Executive Judging Committee determine the oral, competitive poster, and non-competitive poster presenters the nominating instructors will be notified by email the presenter status for each of their students no later than February 11, 2014. All reviewed papers will be then be mailed back to the nominating instructors to be returned to the students.

If a student presenter does not agree with their presentation session assignment, then he or she may follow the appeals procedure shown below. The student’s appeal must be made prior no later than 5 pm on February 18, 2014.

Presentation Session Assignments Appeals Procedures
If the student presenter disagrees with the session assignment, he or she must immediately contact the IJSHS office at 801-581-8761 to request reconsideration. The IJSHS office will request that the Chair of the Executive Judging Committee contact the student to discuss the request for reconsideration.

At the conclusion of the above discussion, the student must decide whether or not to pursue an appeal to the full Executive Judging Committee. If an appeal is requested, a conference call will then be scheduled between the student, the student’s teacher or mentor (if requested), and the Executive Judging Committee. The student must be prepared to verbally present their rationale for a change in the session assignment.

Within 24 hours of hearing the appeal, the Executive Judging Committee will reach a decision and contact the student, or the student’s teacher/mentor (as designated) with that decision.

If the student disagrees with the final decision of the Executive Judging Committee, he or she may choose not to compete at the IJSHS. If a student does not compete at the IJSHS, he or she should be advised that no further review would be conducted by the IJSHS judging panel. Therefore by not competing, the student relinquishes eligibility for any awards.
Preparing Your Research Paper
The chair of the executive judges offers the following suggestions to keep in mind as you write your research paper.

Your written report is a critical aspect of your success in the symposium. Without a good report even a great project may not be offered a chance to compete competitively. So, you should take some time to make sure it is as good as it can be.

An important aspect of the report is the formatting. Any format that meets the rule requirements is acceptable, but most of our readers are professional scientists who are accustomed to reading research in a standard format. Many students are not aware that professional research reports are often formatted very differently from the lab reports that you have written in school.

Before you start to prepare your report, I would advise taking a look at some scientific papers to get a feel for how reports are formatted. You can find a free online database of biological and medical literature at http://www.ncbi.nlm.nih.gov/pubmed/, and at http://arxiv.org/ is a preprint server for physics, math and computer science. Many of the articles in these archives are free for download to the public.

I would add a few further suggestions to improve your writing:

- Use spell checkers and get others to proofread for grammatical and homophone errors.
- A professional research report is not a recipe of what you did and a list of raw data; instead it is a narrative that guides the reader through the process of discovery.
- Another common mistake is to think of the narrative as an epic tale centered on yourself and your trial and tribulations in the project. While you will describe what you did, the narrative is based around your project and your results—it is an intellectual journey, not a personal one.
- Use primary literature references when you can (see above for public databases, Google Scholar is also an excellent resource). Web pages are generally not good sources.
- Use graphs to present numerical data—line graph or bar graphs are usually the most relevant. Include error bars, if possible.
- Do proper statistical test to determine whether your data support your hypothesis with statistical significance.
- Use first person and active voice whenever possible.
IJSHS Research Reports Structure and Content Requirements
This section is intended to help students with the preparation of their research reports. These guidelines also constitute the template used in the evaluation of the reports. It is the student’s responsibility to ensure his/her report follows these guidelines. Failure to follow these guidelines may result in the paper not being accepted for consideration.

General Paper Formatting Guidelines
• Left, right, upper and lower margins should be set to 1 inch.
• Text should be in Times Roman, 12pt font with single line spacing.
• Section headings should be in bold.
• There should be an indentation at the beginning of each paragraph.

Content Guidelines
The report should contain the different sections listed below and in the order in which they should appear. This uniform structure is standard for most scientific research publications. We feel that this will help the readers follow your report more easily and will make their evaluation less subjective. The posters and presentations will contain the same sections. Although this structure may not correspond to your personal approach to the problem you decided to study, we believe that any research project can be presented within this structure. Any format that meets the rule requirements is acceptable, but most of our readers are professional scientists who are accustomed to reading research in a standard format. Many students are not aware that professional research reports are often formatted very differently from the lab reports that you have written in school. More basic information on the parts of a scientific article can be found at [http://en.wikipedia.org/wiki/IMRAD](http://en.wikipedia.org/wiki/IMRAD). Further suggestions can be found at [http://www.ruf.rice.edu/~bioslabs/tools/report/reportform.html](http://www.ruf.rice.edu/~bioslabs/tools/report/reportform.html).

1. Abstract:
The cover page should include the title of your report, the names of the author(s), school, mentor and an abstract. The abstract is a short summary of your project report. One way to obtain a good abstract is to have it include one sentence for each key idea with at least one key idea from each section of the report. This does not mean that you should strictly stick to that rule, but you should tend to it. Additional abstract guidelines include:

• The heading and abstract are single spaced, flush left.
• The heading includes:
  • 1st line – your name, home address, city, state, zip
  • 2nd line – name of your school, city, state, zip
  • 3rd line – title of your abstract – the title should be in upper and lower case
  • 4th line – teacher/mentor name, and his/her organization if different than your high school. Precede the person’s name with their role in your project – i.e. teacher and/or mentor
• Return twice after the heading section and begin your abstract. Return twice after each paragraph. There is 175 words maximum for the abstract text only.
2. **Introduction:**
   a. **Background** - This section provides background information for your research project. It may be historical in nature or it may provide a broad overview of a field of research. Report readers may not be experts in your field of investigation. This section should cultivate their interest and educate them so they have the required elements to understand your specific project in a broader context (no more than two pages).

   b. **Problem and Hypothesis** - In this section, you bring the reader’s attention to the specific, well defined, and isolated problem you have decided to investigate. This is the heart of your research project. It can often be formulated as a question: the question you asked yourself and decided to answer: “How come some tree leaves turn yellow in the fall while others turn red?” Depending on the nature of the question, you may develop a hypothesis that will be tested later in the paper. This section should make use of the more general concepts presented in the introduction and anticipate the difficulties your methods of investigation have to circumvent.

3. **Methods:**
   In this section, you present your line of approach. It typically begins with a discussion of the relationship between different parameters of the system being investigated, independent from your particular experiments. The section should then describe your experimental system. You may describe the specific aspects of what you did using text, but also drawings and pictures. This section should describe how the various aspects of the experimental design are motivated by the different parameters of the problem being investigated. This section should also describe the kind of data you can obtain from your set up and include a discussion of the precision and possible sources of error. In some cases, the raw data has to be compared to a model by means of a statistical method or test, all of which should be described in this section. This is an important part of your experiment and should be described in this section.

4. **Results:**
   a. **Data: Tables and Figures** - In this section, you provide the results you obtained under the various conditions you investigated. It can include comments about limitations or difficulties you encountered. Numerical data should be presented in tables and/or graphs that are easy to understand, and that clearly show the relationships between the data. Photographs or drawings that represent the results of an experiment (not an experimental set up as this goes in the Methods section) should be included in this section. If the raw data has to be used in some calculation, that should be done in this section. The results of any raw data analysis also should be presented in this section. Figures and tables with their caption should leave no doubt as the nature of the quantities represented and of the units used. If it ever happens that you have to provide a numerical result not accompanied by an error, a clear justification should be provided.
b. Interpretation - In this section, you comment on the results obtained and presented in the previous section. It can include comments about limitations or difficulties you encountered. You should compare the results to your various expectations under different hypothesis making clear references to tables and/or graphs in the previous section. This section should be centered on global trends and features emerging from your data with statements such as “On Figure 1, it appears that the average length of the roots decreased with the amount of water provided in our first sample. However Figure 2 shows that in our second sample, it is the number of roots that decreased with watering while the length did not seem to be affected”. In some cases, when the results turn out to be different from your expectations, you may be driven to develop or investigate a model that you had not envisioned in the first place. You may then have statements like: “The model described in section 3 does not provide a valid account of our data. We then applied the theory exposed in such paper and which provides a better agreement. However…”.

5. Conclusion:
In this section, you bring your results and observations from the previous section in a broader context of the properties and various models describing the phenomenon investigated. This is the section in which you would describe what you just discovered, or where you would describe the extent to which your hypothesis is validated or invalidated. An important thing to realize is that it may be possible to prove a theory wrong by observation of a fact that contradicts the prediction of that theory. It is however, impossible to prove a theory is right. You may only report your failure at finding a counter example that would have invalidated that theory. This is not a problem and this type of result is very much worth reporting. It is in this section that you have this type of broad discussion regarding the implications of your observations. The conclusion section has a second role. It is sometimes said a conclusion closes a door and opens a window. Indeed, at the end of your conclusion it is generally good to broaden the discussion. You can describe something else you could have done, something you could have done differently, as well as how you or others could extend the work. You can then risk some conjectures as to how the results and conclusions might be different. This last part of your conclusion may be a hint at the different ways along which you are going to continue investigating this brilliant topic you just uncovered in your research project.

6. Acknowledgements:
In this section, you acknowledge the help, support and guidance you received while working on the project described by your report.
7. References:
In this section, you list the sources you have been using: articles, books, web-pages, personal communication, etc. Web-page references should be avoided as much as possible. One exception is the use of open source software you may be using. Each listed reference in this section should be cited at least once in the text of your report. You can format your references using the citation format of any journal in the field you are working in. The reference formats can usually be found on the journal website under “Instructions for Authors”. Citation management software (ex. Endnote, LaTeX or Zotero) can automatically format your references into many acceptable styles.

Additional Suggestions for Preparing Your Research Report
We suggest that you respect the section numberings, order and titles, adding your own description for each one. For example, if your project concerns physics and chaotic systems, your first section could be: “1.) Introduction: From deterministic Newtonian mechanics to dynamical chaos”. You may consider subdividing any of these sections into subsections covering specific elements. For example your section “3) Methods” could be subdivided into subsections “a) Construction of the measuring device”, “b) Recording of raw data” and “c) Error propagation and analysis of the raw data”.
It is very important that figures and tables should all be numbered, referenced in the text and accompanied by a detailed caption. Each table and figure should be numbered and labeled (Table 1, Table 2, etc.; Figure 1, Figure 2, etc.) directly beneath the figure or table. Each table or figure should describe any symbols used in a legend. Large data sets should be included as an appendix to the report and referenced in the data section.

Oral and Competitive Poster Judging
There will be multiple judges in each oral and competitive poster presentation who will listen to and evaluate each presentation within the judges’ assigned session. Following each presentation there will be a question and answer session that 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 assessments are used by the Executive Judging Committee to select symposium finalists.

Oral and Competitive Poster Judging Criteria
Below are the general criteria used to judge the research presentations:

1. Statement and identification of research problem
   - Clarity in stating problem under study
   - Demonstrated understanding of research problem
   - Understanding of background information relevant to research problem

2. Acknowledgement of sources and major assistance received
   - Did student use resources besides the internet?
3. Creativity and originality
   • Student demonstrates originality, or creativity in approach to research or engineering study
   • Student demonstrates problem-solving skills

4. Research design, procedures (materials & methods), and results
   a. For science related research
      • Student’s involvement in designing the investigation
      • Appropriateness of research design and procedures
      • Identification and control of variables
      • Reproducibility
      • Level of effort

   b. For engineering, computer science, or technology related research
      • Workable solution that is acceptable to a potential user
      • Recognition of economic feasibility of solution
      • Recognition of relationship between design and end product
      • Tested for performance under conditions of use
      • Results offer a significant improvement over previous alternatives
      • Level of effort

5. Discussion/Conclusions
   • Clarity in stating conclusion; conclusions are supported by 1) data (science), or 2) results of testing of design (engineering)
   • Recognizes limitations and significance of results
   • Evidence of student’s understanding of the scientific or technological principles
   • Theoretical or practical implications recognized or understood
   • What was learned? New questions introduced? Future research needed?

6. Oral Presentation and written report
   • Skill in communicating research results to non-specialized audience and to judges
   • Definition of terms as necessary
   • Appropriate use of audio-visuals
   • Response to questions from audience and judges

Criteria are added together to equal a maximum total of 100 points.

Awards
Significant awards are available to IJSHS student finalists. The Department of the Army, Navy and Air Force jointly sponsor the following awards (subject to the availability and release of government funding). The University of Utah sponsors particular awards for the Intermountain Region contingent upon available funding.
All students who participate in the symposium receive certificates honoring their achievement and interest in research pursuits.

Teachers who participate in the symposium are considered for a $500 award honoring an individual teacher and his or her school’s contribution to advancing student’s participation in research.

The top five regional finalists will be announced at the awards banquet and receive an expense-paid trip to the National JSHS in late April or early May. An invitation to present original research at the National JSHS oral competitions is awarded to the regional 1st and 2nd place oral finalists. The 3rd place finalist will receive an invitation to present during the National JSHS poster competition. A total of $4,500 in undergraduate, tuition scholarships, awarded at $2000, $1500, and $1000 to each of top three regional symposium finalists (scholarship payable upon matriculation and upon meeting the JSHS scholarship conditions). Additionally, the top junior oral presenter will receive a four-year, renewable, resident tuition scholarship to the University of Utah.

Awards at the National level include tuition scholarship award levels of $12,000, $8,000, and $4,000, respectively, for each 1st place, 2nd place, and 3rd place National winner in each category.

Students must be a citizen or permanent resident of the United States to be eligible for the government-sponsored scholarship awards. Additionally, scholarships are awarded to only one student. Student presenters who are part of a team must notify the JSHS of which student finalist will receive scholarship funding should the team presenter earn regional or national awards.

Complaints

The IJSHS office and the Executive Judging Committee 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 the 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 IJSHS, as well as the Academy of Applied Science, and the sponsors of the JSHS Program (e.g. the Army, Navy, and Air Force) to support the interpretations and final decisions of the judges. Recommendations regarding the future conduct of the IJSHS judging process, or requests to clarify the rules of competition can be directed to the attention of the IJSHS Regional Director, Mateo Remsburg, University of Utah, 200 S Central Campus Dr. Rm 80, SLC, UT 84112.
Intermountain Region Specifics

Deadlines

- Completed registration form and payment received or postmarked by: 12/17/13
- Three (3) copies of your research papers with abstracts and Research Application Form attached to each copy are required. Papers must be in Coordinator’s office no later than 5:00 pm on 1/9/14 - No exceptions.
- Notification of presenter status to teachers: 2/11/14
- An electronic version of abstract in the proper format must be sent in Word Document format to IJSHS@sa.utah.edu no later than 2/14/14. If not received in the proper formats by that deadline, student will be disqualified from competing; no exceptions.

Registration and Costs
All participants and paying guests must register for the IJSHS by submitting the appropriate registration for and $75 registration fee postmarked no later than 12/17/13. The registration fee which is non-refundable after 1/9/14. Registration forms are found on the IJSHS Web site. Once participants have registered and been accepted by the IJSHS Director, substitutions are discouraged. The IJSHS Director must approve all substitutions. Requests for substitutions must be in writing and sent to the Director and received by 2/12/14.

Accommodations & Meals
All participants must stay at the University Guest House, http://www.universityguesthouse.com/, the lodging provided by IJSHS. Meals will be provided by IJSHS beginning with dinner on Wednesday, March 5th and ending with breakfast, Saturday, March 8th. Meals on the way to and from the IJSHS will be at the expense of the delegate.

Student Accommodations: Up to four (4) students of the same gender will be assigned to each room. Each room has two queen size beds. Requests for roommates must be to the Coordinator no later than 2/13/14. However, depending on the number and gender of students per school, requests may not be honored. Once rooms have been assigned, participants may NOT switch rooms. IJSHS and hotel staff need to know where students are at all times in case of an emergency.

Teachers/Chaperone Accommodations: Two teachers of the same gender will be assigned to share a room. Each room will have two queen size beds. Teachers desiring a private room should indicate on the registration form, and depending on availability of rooms, we will attempt to accommodate these requests. Please note there is an additional charge of $100 for a private room.
Other Paying Participants: If a spouse or other guest will be attending who is not an official participant or chaperone and plans to attend any or all of the IJSHS functions they will be invited to participate as a paying guest for $200 and this must be arranged and paid for before January 9, 2014. They must also fill out a registration form for our records. These are on a space available basis only.

Parents and Guests are welcome to attend the awards banquet on Friday March 7, 2014; however they must inform the IJSHS office at least one week in advance and will need to pay $35 each for the meal in advance. No exceptions.

Travel
Travel expenses to and from the IJSHS must be paid by the individual delegate or sponsoring school. Please note; student participants may not drive individual automobiles during the IJSHS due to insurance liability. Parking is available for teachers/chaperones who plan to drive. While at the symposium, participants will be provided transportation for all scheduled activities.

Dress
In March, the weather in Salt Lake City is unpredictable. It can range from 70 degrees to blizzard snow conditions. Attendees should plan for inclement weather. Comfortable shoes, casual clothes, and a coat are recommended for most of the daytime activities. Everyone is encouraged to wear appropriate professional attire for the presentations. The awards banquet will be semi-formal, meaning no jeans or t-shirts.

Mandatory Attendance
All symposium participants (students, parents and teachers) are required to remain for the entire symposium, and to attend all meetings, and activities, unless prior arrangements have been made with the IJSHS Director or Coordinators.

For participants with a long distance to travel, we will allow for early departures, but attendees must notify the IJSHS office a week prior to symposium if they will be departing before the final Awards Banquet on Friday night. This is necessary to get an accurate meal count.

Teachers/Chaperones who accompany their students are expected to oversee student participation in ALL symposium activities. Presentations, scheduled group activities (including lectures, tours of research and educational facilities) will occupy the majority of the time. Your registration is your agreement to attend all scheduled activities while you are at the IJSHS. A detailed schedule will be sent in mid February before the symposium begins. Delegates wishing to sightsee on their own in Salt Lake City should plan to arrive before or stay after the symposium to do so.
**Notice of Non-Discrimination**

The Intermountain Junior Science and Humanities Symposium in conjunction with the University of Utah does not discriminate on the basis of race, color, religion, national origin, sex, age, status as a disabled individual, sexual orientation, gender identity/expression, genetic information or protected veteran’s status, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services.

Additionally, the University endeavors to provide reasonable accommodations and to ensure equal access to qualified persons with disabilities. Inquiries concerning perceived discrimination or requests for disability accommodations may be referred to the University’s Title IX/ADA/Section 504 Coordinator:

Director, Office of Equal Opportunity and Affirmative Action
201 South Presidents Circle, Rm.135
Salt Lake City, UT, 84112
801-581-8365 (voice/tdd)
801-585-5746 (fax)
www.oeo.utah.edu.