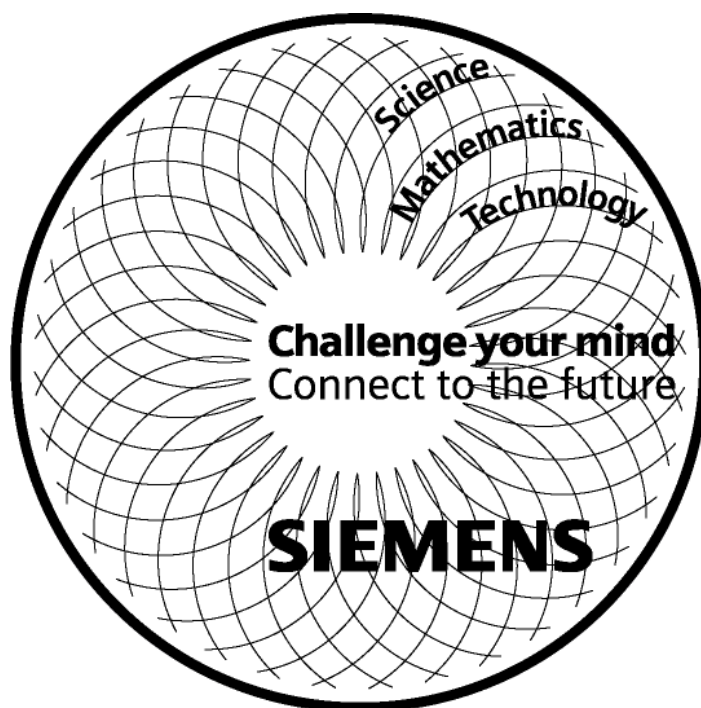


SIEMENS COMPETITION

Math : Science : Technology



2013 SIEMENS COMPETITION GUIDELINES

**SUBMISSION DEADLINE: ALL COMPETITION MATERIALS MUST BE RECEIVED BY
MONDAY, SEPTEMBER 30, 2013, 5 P.M. ET**

Siemens Competition
Math : Science : Technology

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Siemens Competition

Math : Science : Technology

2013 SIEMENS COMPETITION GUIDELINES

What's New – 2013

- **Research Reports and all Additional Required Materials must be received by Monday, September 30, 2013, 5 p.m. ET.**
- **Projects will no longer be accepted by hand delivery.**

It is your responsibility to carefully review and adhere to all 2013 Siemens Competition Guidelines.

I. OVERVIEW

The Siemens Foundation (the “Foundation”), in partnership with the College Board, established the Siemens Competition in Math, Science & Technology (“Siemens Competition” or “Competition”) and the Siemens Awards for Advanced Placement. The Foundation is a not-for-profit corporation dedicated to providing scholarships and increasing access to higher education for talented mathematics, science, engineering and technology students in the United States.

The Siemens Competition seeks to promote excellence by encouraging students to undertake individual or team research projects. It fosters intensive research that improves students' understanding of the value of scientific study and informs their consideration of future careers in these disciplines.

You can compete as an individual or as a member of a team. Individual projects promote independent research. Team projects foster collaborative research efforts, as well as individual contributions to the cooperative endeavor.

Scholarships for winning projects range from \$1,000 to \$100,000.

The Advantage of Participating

Participating in the leading science and mathematics research-based competition for high school students in the United States:

- Expands your inquiry-based research skills.
- Challenges you to solve some of the world's toughest problems.
- Opens new doors in pursuit of your educational and career objectives.
- Provides the opportunity to meet other students who share your interest in research.
- Allows you to engage with distinguished scientists.
- Offers you a chance to win a college scholarship.

II. ABOUT THE SIEMENS COMPETITION

A. Scholarship Awards

College scholarships are awarded to all students who are selected to attend and compete in the regional and national events.

Regional Awards (in six regions)		
Category	Individual	Team
Finalists	\$1,000 and a bronze medal	\$1,000 and a bronze medal for each team member
Winners	\$3,000 and a silver medal	\$6,000 divided equally among team members and a silver medal for each member

The winners of the individual and team regional awards advance to compete at the national level. The national awards are announced at a special event hosted by the Siemens Foundation in Washington, D.C.

National Awards		
Standing	Individual	Team (divided equally among members)
1st Place	\$100,000	\$100,000
2nd Place	\$50,000	\$50,000
3rd Place	\$40,000	\$40,000
4th Place	\$30,000	\$30,000
5th Place	\$20,000	\$20,000
6th Place	\$10,000	\$10,000

Scholarship award money is sent directly to the accredited college or university the winning students select. In order to continue receiving the scholarship, students must be enrolled full-time and making satisfactory academic progress toward a degree.

Your scholarship can be used for:

- Tuition and fees required for enrollment.
- Fees, books, supplies, and equipment required for any courses of instruction at the school that are required for graduation.
- On-campus room and board.
- Costs associated with your participation in scientific or mathematical research (only) at the institution in which you are enrolled, within, or beyond your regular courses of curriculum.

Students should be prepared to participate in all aspects of the Competition. This includes being available to attend regional and national levels of the Competition if you are selected as a finalist.

B. Competition Schedule

Wednesday, May 1, 2013	2013 Registration Opens 2013 Competition Guidelines and Forms Posted at http://siemens.collegeboard.org
Monday, September 30, 2013, 5 p.m. ET	All Competition Materials Due (Research Report and all Additional Required Materials)
October 18, 2013	Announcement of Regional Finalists and Semifinalists
Regional Competition	
November 1-2, 2013	Georgia Institute of Technology , Atlanta, Georgia Massachusetts Institute of Technology , Cambridge, Massachusetts
November 8-9, 2013	University of Notre Dame , Notre Dame, Indiana The University of Texas at Austin , Austin, Texas
November 15-16, 2013	Carnegie Mellon University , Pittsburgh, Pennsylvania California Institute of Technology , Pasadena, California
National Competition	
December 6-10, 2013	The George Washington University , Washington, D.C.

C. Student Eligibility

- The Siemens Competition is open to high school students who are citizens or permanent residents (green card holders) of the United States. Students must be in good standing, enrolled in and attending one of the following (during the 2013-14 school year):
 - High school (grades 9-12) in the United States, Puerto Rico, Guam, U.S. Virgin Islands, American Samoa, Wake and Midway Islands, or the Marianas.
 - Department of Defense Education Activity (DoDEA) school.
 - Foreign school as an exchange student or because your parent or guardian lives and works abroad.
 - Homeschool, provided that signatures are obtained from the school district responsible for such programs on the student's Confirmation Page. If your state does not require district supervision, the parent or guardian responsible for the homeschooling must sign it.
- Students must be enrolled in high school (grades 9-12) during the 2013-14 school year.
- Students submitting **individual projects** must be in good standing, enrolled in and attending their last year of high school (grade 12). Students must complete all high school courses required for college admissions no later than September 1, 2014.
- **Team projects** may have two or three members and do not need to include a senior (grade 12). All team members must be in good standing, enrolled in and attending high school (grades 9-12), although team members may be from different schools. Each team must designate a team leader who serves as the communication liaison between the Siemens Competition and the other members of the team. All team members must have active roles in the design, execution, and delivery of results of the research submitted to the Siemens Competition and have made a substantial contribution to the effort.
- Competition entrants who have parents, guardians, or Competition mentors employed at, or otherwise affiliated with, the Siemens Foundation's university partners (Carnegie Mellon University; Georgia Institute of Technology; Massachusetts Institute of Technology; The University of Texas at Austin; California Institute of Technology; and University of Notre Dame) **may enter** the Competition but may **not be permitted** to compete at the partner university

where the parent, guardian, or mentor is employed or otherwise affiliated. Furthermore, if lab or research work for the project was performed at any of these six universities, students may enter the Competition but may not be able to compete at that university site.

- Children of employees of either the College Board or the Educational Testing Service **are not eligible** to enter the Competition.

D. Siemens Scholar Network and Future Communications

The Siemens Foundation maintains an alumni network, offering information and potential opportunities to Semifinalists, Regional and National Finalists that may include:

- Alumni newsletters.
- Leading-edge technological and scientific innovation updates.
- Invitations to participate in future recruiting activities.
- Access to potential opportunities with internship programs of Siemens affiliate companies.
- Participation in future research and other programs or initiatives of the Siemens Foundation, its affiliates, or partner universities.

To receive this information, you must grant the Siemens Foundation permission to include you by **completing the authorization section when you register**. This also allows the partner universities and relevant Siemens affiliates to notify you of these types of opportunities.

III. ABOUT YOUR PROJECT

A. Project Eligibility

Before you begin, you must determine that your project is eligible for the Competition.

- Each student can submit **only one** Research Project which will include all of the materials set forth in these Competition Guidelines (collectively, the “Research Report”, “report” or “project”), either as an individual competitor or as a member of a team.
- You may submit a Research Report that has been or will be submitted to other science competitions.
- You may submit a Research Report that has been or will be published, as long as you retain the rights.
- Projects with Human Subjects and Other Vertebrates are allowed; however students must follow the guidelines noted in Section III.C.
- To resubmit a project that already has been submitted to the Siemens Competition in the past, you must be able to clearly demonstrate how the research has been advanced since such prior submission. This information is required during registration.
- Projects that violate any laws, school or Competition regulations or that may potentially place any student, judge, or observer in danger are not eligible.

B. Project Topics

Research Reports may be submitted on projects in the fields of mathematics, engineering, biological and physical sciences. They may also involve combinations of disciplines such as:

- | | |
|---------------------------------|---|
| ▪ Astrophysics | ▪ Electrical Engineering |
| ▪ Biochemistry | ▪ Environmental Science and Engineering |
| ▪ Bioengineering | ▪ Genetics |
| ▪ Biology | ▪ Geology |
| ▪ Biophysics | ▪ Materials Science/Nanoscience |
| ▪ Botany | ▪ Mathematics |
| ▪ Chemical Engineering | ▪ Mechanical Engineering |
| ▪ Chemistry | ▪ Microbiology |
| ▪ Civil Engineering | ▪ Nutritional Science |
| ▪ Computer Science | ▪ Physics |
| ▪ Earth and Atmospheric Science | ▪ Toxicology |

Social and behavioral science research projects are not eligible. Social science is considered to be the study of society or social behavior. Behavioral science is considered any project that involves the study of the actions and reactions of humans and animals through observation and experimental methods.

Neuroscience projects - based on the underlying sciences of biology, chemistry, and physics - are allowed.

C. Human Subjects and Other Vertebrates

The Siemens Competition recognizes that laboratory research using animals and/or human subjects has led to important discoveries. Because this is a high school competition, however, the program has set guidelines as to what is and is not allowable for purposes of entering this Competition. Therefore, students must understand and follow the guidelines below, and mentors must clearly document the use of human subjects and other vertebrates to be eligible for the Competition.

For the purpose of this Competition, **live vertebrates** include humans, mammalian embryos or fetuses, bird eggs within three days (72 hours) of hatching, and all other vertebrates at hatching or birth. **Section V of the Mentor Form, Human Subjects and Other Vertebrate Certification**, must be completed by the advisor, mentor, or supervising scientist. In addition, the student must complete the **Qualification Questions for Vertebrate Animals/Human Subjects Form** as explained in **Section V.E.** of the Competition Guidelines.

Projects that involve in any way, including testing and questioning, the use of **live human subjects or other live vertebrates or the fluids, cells, tissues, or organs from vertebrates** are accepted only under the following conditions:

- The research project is conducted in a registered institution or laboratory in the United States where human or animal experimentation is authorized. The mentor(s) is required to provide the following information on the certification form:
 - Name of the research institution.
 - Title of the study.
 - In the case of human subjects, Institutional Review Board (IRB) approval number and approval date. A high school IRB **is not permitted**.
 - In the case of other vertebrate animals, Institutional Animal Care and Use Committee (IACUC) approval number and approval date.
- The vertebrate animals **cannot be euthanized** for the sole purpose of the student's research project. Fluids, cells, tissues, and organs may be used only if the animals were euthanized for another purpose.
- Projects using commercially purchased human or animal cell lines **ONLY** do not require IACUC or IRB approval. However, the student must complete the Qualification Questions for Vertebrate Animal/Human Subjects Form.

Research projects conducted outside of the United States must follow the same guidelines listed above when using **live human subjects or other live vertebrates or the fluids, cells, tissues, or organs from vertebrates** in accordance with the following:

- The research must be done in an institution that is affiliated with a U.S. registered institution or laboratory. The mentor must provide an IRB or IACUC approval number, or
- The country where the research is done must have, at a minimum, guidelines equivalent to the United States. The mentor must provide evidence of this. In place of an IRB or IACUC approval number, the mentor must provide a copy of the official certification used in that country and specifically for that research project. If the country or affiliate institution has a federal-wide assurance number, please provide. The documentation must be in English.

D. Academic Integrity

Academic integrity is a fundamental value of the Siemens Competition and scientific research. We expect the Research Report, presentation slides, poster and any other materials submitted to the Competition to be your own work. If you are using text or images from someone else, you are expected to ensure that all facts, techniques, images, and information (including the Internet) are properly cited. It is not sufficient to simply modify the words of an original source. If you have used the essential idea, you must properly cite the source.

In addition, all of the materials submitted to the Siemens Competition, including without limitation the findings, results, conclusions, discoveries, research, data, software, code and all other matters related to the materials, must satisfy the

principles of academic and scientific honesty and integrity and cannot be designed, engineered, altered or modified in any way to fraudulently or illegitimately produce (whether intentionally or unintentionally) a dishonest result.

Documentation may be requested at any time (including after the Competition, after winners have been selected, and after awards have been provided) including, but not limited to computer source code, software, lab journals, cited references, and/or underlying mathematical formulas, to support the research submission and any unsubstantiated claims.

The Competition uses specific procedures, as part of the judging process, to detect plagiarized or dishonest materials. If a Research Report or other materials are found to have improper citations, if citations are omitted, intentionally or unintentionally, or if the materials fail to satisfy in any way the principles of academic and scientific honesty and integrity, the College Board and the Siemens Foundation, at their sole discretion, will **disqualify** you from the Competition and notify your high school about the disqualification. Grounds for disqualification may include, but are not limited to plagiarism, claims of novelty and/or substantial significance that cannot be supported, and improper use of vertebrates (if applicable). Disqualification may occur after the end of the Competition, after winners are selected, and after scholarship awards have been provided.

The integrity of the research project is the responsibility of the author (student) and violations of academic integrity will result in disqualification.

E. Citing Your Sources

Any piece of information that is not your own original text or is not common knowledge must be properly cited and quoted within the Research Report. This includes facts, techniques and information from other sources (e.g., print, web-based, oral). It is not sufficient to simply modify the words of an original source. All images, figures, histograms, diagrams, graphs, data, must be cited. If you used the essential idea (whether a primary or secondary source), you must properly cite the source. You must also cite and quote any text from other published papers where you are an author.

- **What is the difference between a primary and secondary source?** A primary source comes directly from the researcher. Examples are research articles in journals, patents, or reports. A secondary source comes from information that was originally collected elsewhere by someone other than the researcher. Examples are review articles and books. Both types of sources must be cited.
- **Am I required to cite a photograph or graph that was created by someone else in the lab where I am doing research?** Yes. This is not your own original work and must be properly cited. Examples include images and other graphical materials that have previously appeared in publications or other documents, whether or not they come from the same lab. This requirement also applies even if you were an author of these earlier materials. Failure to properly cite one's own previous work is regarded as self-plagiarism.
- **What is a peer-reviewed source?** Professional journal articles are almost always reviewed by 'peers' or experts to help ensure that the material submitted is legitimate and original. Whether the information comes from a peer-reviewed source or not, it must be cited if you take information from the source.

F. Sharing Your Results

Research Reports and findings are the property of the students. However, the Research Reports and all Additional Required Materials submitted to the Competition are not returned. You agree to permit the Siemens Foundation and the College Board to utilize and share the reports, including any parts and any other documents or corroborating materials (in any form or medium) submitted to supplement the original report, with third parties as it deems appropriate in their respective sole discretion.

Students selected as Regional or National Finalists grant the Siemens Foundation and the College Board nonexclusive, non-royalty bearing worldwide rights to showcase the project design, results, and findings, as well as the student(s) themselves who worked on the project.

By participating in the Competition, the competitors agree to have their photos taken and used publicly and to have their names and images used publicly with respect to the Competition.

IV. RESEARCH REPORT

The Research Report enables the judges to evaluate the scientific work completed as part of the Competition. Semifinalists and Regional Finalists are selected on the basis of their Research Report. To ensure that the judges focus on the quality of the work completed, rather than on the manner of presentation, strict requirements for the Research Report must be followed. **Research Reports that do not adhere to these guidelines may be disqualified from the Competition.**

A. Overall Report Requirements

One color original and two color copies of the Research Report must be submitted, so that all graphics and colors are clear on all copies.

The Research Report must be written by the student(s). To ensure fairness, Research Reports are initially evaluated without reference to any personal information about the students.

Absolutely no student names or references to gender ("he" or "she"), high schools, school officials, advisors, mentors, affiliated research organizations, acknowledgements, or any other identifying information of the entrants are to appear anywhere in the Research Report. These references may only appear on the **Supplemental Form** and **Confirmation Page**.

Any piece of information that is not your own original text or common knowledge must be properly cited and quoted within the Research Report. You must also cite and quote any text from other published papers where you are an author. See Section III.E. for additional information.

All claims of novelty and/or substantial significance must be documented. If you choose to use superlatives such as "never before discovered," "state of the art," "best study to date," "new and novel idea," and similar superlatives, be prepared to provide extensive detail to support these statements.

B. Format Requirements

The Research Report must:

- Be written in English.
- Adhere to an 18-page limit. This limit includes the introduction, text, tables, data, illustrations, and appendices. **References are not included in the 18-page limit.**
- Be submitted on 8-1/2 X 11 inch single-sided sheets of paper, double-spaced, with page numbers at the bottom.
- Have page margins of at least 1 inch.
- Use 12 point or larger **Arial** or **Times New Roman** font for the body of the report. Captions accompanying pictures and graphs, as well as citations for references, may be single-spaced and in a smaller point size.

C. Content Requirements

These guidelines are provided to help you understand the goals of each section of the Research Report. While the overall Research Report should provide the content as outlined under the following headings, the specifics stated below may vary slightly from one discipline to another. Subheadings should be used in Materials and Methods, Results, and Discussion to clarify the content, but sections such as Results and Discussion may be combined. The pages noted for each section are suggestions only, but the Research Report may be a maximum of 18 pages.

Introduction: the "why" section (2-3 pages)

- Start with a broad picture of the problem you have chosen to study and why it is interesting. Provide a brief review of pertinent scientific literature, describe what information is missing and how your work addresses this gap in the literature. Previous relevant publications and patents must be properly cited in the text of the Research Report and included in the Reference section of your report.

- Describe the specific problem to be solved, the research question to be answered, the hypothesis(es) to be tested, or the product to be developed (if any). Provide a brief rationale for the research and why the work is important.

Materials & Methods: the "how" section (2-5 pages)

- Describe how you performed your work, giving sufficient detail so that someone trained in the field is able to understand what you did and can replicate it.
- Include the methods you used, written in a format commonly used in publications in your field of study. Do not merely restate a protocol or copy blocks of text; instead, use your own words to describe what you did, referencing key papers where appropriate.
- Explain your personal role in the work and the roles played by others in supporting this work. Include, for example, acknowledgments to others in the laboratory for running key instrumentation or other protocols. You may refer to others who assisted you by title but do not include any specific names in the body of your Research Report.
- Mention common procedures but there is no need to describe them in detail; provide references to where the method is published. All modifications of existing methods should be described.

Results: what did you find? (4-5 pages)

- Present your findings in sufficient detail so that the reader understands the results that were obtained or can follow each step of a mathematical proof.
- Describe how the results address the problem to be solved, the research question to be answered, or the hypothesis to be tested.
- Present all experiments, controls and statistical tests that show the results are reliable and statistically significant. In theoretical work, present the experimental findings against which the work was tested, the extent to which it was validated, or both.

Illustrations: documenting your findings (2-4 pages)

- Use illustrations to document the textual description of your results. Each illustration should be numbered in sequence and should be accompanied by its own legend. The illustration plus its legend should stand alone — the reader should understand it without having to read the text of the paper.

Discussion: what do your results mean? (3-4 pages)

- Provide readers with an interpretation of the results, enabling them to understand the implication(s) of your findings.
- Describe what makes your work unique in the context of published findings and what distinguishes it from that of others in the field, or in your laboratory. In other words, put the work in context with other reports that ask the same or related questions, and address whether or not your observations are consistent with or enhance other findings in the field.

Conclusions and Future Work: what did you learn and what's next? (1-3 pages)

- Recap briefly what was learned from your research and how your work addresses the unanswered question(s) that you posed in the introduction.
- Assess the validity of the conclusions, which is an important component of any scientific report. In particular, are your conclusions fully supported by the results described in the report alone or in conjunction with prior literature? Are there alternative explanations for your observations that cannot be ruled out?
- Determine what experiments could be performed in the future to refine your conclusions.
- Indicate what you would do next if you had more time, and what you would do differently if you were to start the work today.

- Consider what questions still remain to be answered.

D. References (not included in 18-page limit)

Citations and references must be in complete and correct standard format for the discipline. Consult with a teacher in your science or math department, or your mentor for assistance. You may also refer to *The Mayfield Handbook of Technical & Scientific Writing*, on the Siemens Foundation website (www.siemens-foundation.org).

Reference pages must be contained in the same size font as the body of the Research Report (12 point or larger). Each individual reference should be single-spaced with a double space between references.

Any piece of information that is not your own original text or is not common knowledge must be properly cited and quoted within the Research Report. This includes facts, techniques and information from other sources (e.g., print, web-based, oral). It is not sufficient to simply modify the words of an original source. All images, figures, histograms, diagrams, graphs, data, must be cited. If you used the essential idea (whether a primary or secondary source), you must properly cite the source. You must also cite and quote any text from other published papers where you are an author. See Section III.E. for additional information.

V. ADDITIONAL REQUIRED MATERIALS

In addition to your Research Report and References, your Research Project submission must include **one original and two copies** of each of the following items (unless otherwise noted):

A. Confirmation Page

Research Projects **MUST** include the Confirmation Page with all required signatures. The Confirmation Page lists all of the registration information provided by the individual or team leader and is available **ONLY** after the online registration is submitted. You must complete the online registration early enough to print the Confirmation Page and obtain the required signatures.

Print the Confirmation Page. It is your responsibility to review the Confirmation Page for accuracy and to ensure that all information is printed and legible. Depending on your printer, you may need to print the Confirmation Page in "Landscape" orientation. Make any necessary corrections (spelling of names, etc.) on the original, prior to making copies.

Signatures are required from:

- Each student participant.
- Parent or guardian of each student participant.
- School administrator of the individual's or team leader's high school.

For homeschooled students, obtain the signature of the school district official responsible for such programs. If your state does not require district supervision, the parent or guardian responsible for homeschooling must sign the Confirmation Page.

If you lose your Confirmation Page, or need to reprint it for any reason, log back into your registration. Select the red "Print Confirmation Page" link in the upper right-hand corner of the screen.

The Confirmation Page is **not included** in the 18-page limit for the Research Report.

B. Supplemental Form

The purpose of the Supplemental Form is to collect the identifying information that students are not permitted to provide in the body of the Research Report. This form includes student name, high school, information on publications, and acknowledgements of all people and affiliated research institutions involved with your project. The accuracy of this document is vital to the academic integrity of your Research Project.

You are required to complete the Acknowledgements section and must include the name, title, institution, and role of any individuals who assisted with the Research Project, including family members. Receiving assistance from family members does not affect the judging in any way, but you must acknowledge their support. Failure to identify others who assisted you with any aspect of your research may result in disqualification.

The Supplemental Form is **not included** in the 18-page limit for the Research Report.

C. Abstract

The Abstract is a technical synopsis of the problem, methods, results and conclusions. It should be double-spaced using 12 point or larger Arial or Times New Roman font, 100-200 words long, include the research project title, and be printed on its own page.

No identifying information, such as name, high school, or references to gender or research facilities should be included in the Abstract.

Sample Abstracts from previous winners can be found on the Siemens Foundation website (www.siemens-foundation.org).

The Abstract is **not included** in the 18-page limit for the Research Report.

D. Executive Summary

The Executive Summary presents the question asked, the methods used and the lessons learned. The summary on its own, separate from the Research Report, should convey the essence of your project and should be understood by someone without scientific expertise. **Do not simply replicate what you wrote in your Abstract.** The difference between the Abstract and the Executive Summary is that the Executive Summary must be written in layperson (non-specialist) language. The summary will be used to explain your project to the general public and in preparing press releases for the media.

The Executive Summary must be double-spaced and use 12 point or larger Arial or Times New Roman font. No identifying information, such as name, high school, or references to gender or research facilities should be included.

The Executive Summary may not exceed one page and is **not included** in the 18-page limit for the Research Report.

E. Qualification Questions for Vertebrate Animals/Human Subjects Form

If your Research Project uses vertebrate animals and/or human subjects, including projects using commercially purchased human or animal cell lines, you must complete this form. Your response provides you an opportunity to describe your use of vertebrates to the judges. Like the Research Report, the responses must be written by the student(s) and **no** student names or reference to gender, high schools, school officials, advisors, mentors, affiliated research organizations, or acknowledgements of the entrants are to appear anywhere in the answers below. The form asks the following questions:

- Why was it necessary for you to use live animals and/or humans or fluids, cells, tissues, or organs from vertebrates in your research? Justify the species used.
- Describe how you used the animals and/or humans in the research. Further, describe whether the animals were euthanized before or after your experiments and for what purpose.

The Qualification Questions for Vertebrate Animals/Human Subjects Form is **not included** in the 18-page limit for the Research Report.

F. CD-ROM (one original only)

A copy of your Supplemental Form, Abstract, Executive Summary, Research Report with References, and Qualification Questions for Vertebrate Animals/Human Subjects Form (if applicable), must be saved to a CD-ROM and submitted with your report. Save all required items as ONE Word or PDF document. All required materials saved on the CD-ROM must be identical to the printed copy. The individual or team leader's name and the project confirmation number must be noted directly on the CD-ROM. Please print legibly with a permanent marker or affix a typed label.

G. Mentor Form (one original and three copies)

Individuals and teams must have their mentor complete the Mentor Form. The mentor is the individual most closely associated with the Research Project, such as the student's research supervisor or another qualified scientist who gave support throughout the course of the Research Project.

If a student or team does not have a mentor, a teacher or other high school administrator must complete the form.

Additionally, if any of the research was conducted at a university or other registered laboratory facility, the signature of the lab director or head of the research group is required.

If the Research Project involves vertebrate animals and/or human subjects, **Section V of the Mentor Form, Human Subjects and Other Vertebrate Certification**, is required and must be completed and signed by the advisor, mentor, or supervising scientist. This section of the form is carefully reviewed to determine the project's eligibility, in accordance with the Competition Guidelines.

Signatures are required from:

- Mentor.
- Lab director or head of the research group (if research conducted at a university or registered laboratory/institution).
- High school administrator (if no mentor).

You are required to submit **one original and three copies** of the Mentor Form. The Mentor Form may be submitted separately from the Research Project or placed in a sealed envelope and mailed with it. If mailed separately, both must be received by the deadline for the Competition.

The Mentor Form is **not included** in the 18-page limit for the Research Report.

VI. REGISTRATION AND SUBMITTING YOUR PROJECT

A. Registration

Registration opens Wednesday, May 1, 2013 at <http://siemens.collegeboard.org>.

- Follow the instructions carefully when registering.
- Every individual or team submitting a Research Project in the Competition must register online prior to the project submission deadline of Monday, September 30, 2013, 5p.m. ET.
- For team projects, the team leader must register online for each of the other team members.
- **REGISTER EARLY!** The Confirmation Page lists all of the registration information provided by the individual or team leader and is available ONLY after the online registration is submitted. You must complete the online registration early enough to print the Confirmation Page and obtain all required signatures. Research Projects MUST include one original and two copies of the Confirmation Page with all required signatures; otherwise the project will **not** be accepted.
- Registering does not guarantee your entry into the Competition. Research Reports and all Additional Required Materials MUST be received by Monday, September 30, 2013 at 5 p.m. ET. See Section VI.B. for more information.
- If you do not have access to the Internet, experience technical difficulties, or have questions, please contact the College Board at (877) 358-6777.

You need the following to begin your registration. If you are a team leader, you need the information for each team member:

- Name, address, home telephone number, cell phone number, and email address.
- Date of birth.
- Citizenship Status (U.S. Citizen or Permanent Resident). For Permanent Residents, Alien Number is required.
- Official high school name, address, telephone number, and principal's name.
- Mentor's name, address, telephone number, and email address.
- If your project involves Human Subjects and/or Other Vertebrates, carefully review Section III.C. prior to submitting your registration online.
- If you or your team members have submitted a project(s) to the Competition in the past, you must provide detailed information about the prior year project as requested on the Registration Page.
- Permission to release information concerning future educational and career opportunities. See Section II.D. for additional information.

B. Submitting Your Project

Your Research Report and all Additional Required Materials must be **received** by Monday, September 30, 5 p.m. ET. **Submissions are not accepted by fax or email.**

New for 2013: Research Projects will no longer be accepted by hand delivery. All projects must be sent by regular mail or overnight/express delivery (e.g., FedEx, UPS) and arrive on or before Monday, September 30, 2013, 5 p.m. ET.

If sending a project via regular mail, the U.S. Postal Service (USPS) provides services that allow you track the shipment and confirm delivery for a minimal fee. Visit <https://www.usps.com/ship/insurance-and-extra-services.htm> to learn more. The student is responsible for providing proof of delivery in the event the Research Project is not received. Due to the large volume of projects received, confirmation of receipt of Research Project is not possible by telephone or email.

Address for USPS mail:

Siemens Competition
Educational Testing Service
P.O. Box 6730
Princeton, NJ 08541

Address for overnight mail/express delivery (e.g., FedEx, UPS):

Siemens Competition
Educational Testing Service
1425 Lower Ferry Road, Room Q220
Trenton, NJ 08618*
Phone: (609) 771-7878

*The zip code 08618 may list Ewing or Trenton. Both cities are correct.

VII. JUDGING

The Siemens Competition recognizes student Research Projects that display originality, creativity, academic rigor, and clarity of communication. The College Board assembles a panel of research scientists to conduct the initial review of all project submissions.

Judges identify projects that exhibit not only scientific excellence, but also the collaborative teamwork that is often characteristic of successful scientific and technological endeavors.

Students should consider the audience who is judging the Research Projects. For the initial review and for the national level of the Competition, judges are selected by their field of expertise and come from both academic and laboratory settings. For the regional level, judges are selected by the Siemens Foundation's partner universities.

Team projects are evaluated separately from individual projects, using the same criteria. Additional attention is given to the collaboration among team members and to each team member's contribution to the project effort.

A. Judging Process

Initial Judging

During the initial judging, only the Research Reports are evaluated. These Research Reports are judged solely on project merits. The initial judges do not have any information about you (name, gender, school, age, or state).

Semifinalists

Up to 300 outstanding projects are selected as finalists. From those 300 projects, up to 60 will advance to the Regional Finalist stage of the Competition and the others will be honored as Semifinalists. Students chosen as Semifinalists receive a special recognition package; their names are announced in an advertisement in *USA Today* and posted on the Siemens Foundation website (www.siemens-foundation.org).

Regional Finals

Up to 10 projects (up to five individual and up to five team projects) from each of six geographic regions are selected to compete at the regional level of the Competition.

At the regional and national levels of the Competition, judges evaluate the Research Report, the References cited in the Research Report, poster display, oral presentation, and private question-and-answer session. Factors such as knowledge of the science involved, your role in the project, and ideas extending from the work are also considered.

National Finals

The six individual and six team regional winners compete at the national level. National Finalists are required to display their posters, make oral presentations, and respond to questions before a national panel of judges.

B. Judging Criteria

The regional and national judges use these criteria to evaluate all aspects of the projects and presentations.

- **Creativity:** Is the project original and imaginative? What is the origin of the student's interest in the topic? Did the student develop new solutions or procedures? To what extent were the student's talent and insight incorporated into the project? How did the student address any surprising or unforeseen developments?
- **Field knowledge:** Does the student demonstrate strong knowledge of the area of inquiry and the underlying scientific or mathematical issues?
- **Comprehensiveness:** Are sufficient details given so that others can replicate the work? If the work is experimental, are the variables and controls clearly defined? Did the student use the correct quantitative measures? Are the

procedures well-defined? Were measuring tools chosen and used appropriately? Does the Research Report fully explain the project itself or is further explanation needed?

- **Interpretation:** Has the student stated the interpretations and conclusions clearly? How scientifically reasonable and credible are the data, interpretations, and conclusions? Do the conclusions and interpretations follow from the results presented? Can claims of novelty or improvement be justified? What are the limits of the interpretations and the conclusions? Are there alternative conclusions that fit the results?
- **Literature review:** Does the report reference appropriate related works and place the study in a proper context? Are all sources used in the research listed as references? Are the references cited within the text?
- **Scientific importance:** Does the project address an important scientific, technical, or mathematical question or major issue? Does the student's work demonstrate a high level of intellectual input, and is it innovative? Do the findings substantially add to the understanding of the area investigated?
- **Future work:** Is there a discussion of future or follow-up research? If so, what further data would be needed? What are possible applications of the work?
- **Clarity of expression:** Is the project understandable? Is the material presented logically and coherently? Are the key points, problems, and solutions stated clearly and precisely? Does the student use tables and figures appropriately? Was the Research Report carefully proofread for spelling and grammar?
- **Presentation:** Is the method of presentation consistent with the nature of the work and with scientific practice in the discipline involved?

Additional Criteria for Team Projects

- **Teamwork:** Is it clear how each member contributed? Was there an appropriate distribution of workload and responsibilities? All team members must have active roles in the design, execution and delivery of results of the research submitted to the Siemens Competition and have made a substantial contribution to the effort.

VIII. REGIONAL AND NATIONAL FINALISTS

The College Board will assign students to compete at one of the six regional competitions. The Siemens Competition uses the regional structure shown in the regional map. This map can be viewed at <http://siemens.collegeboard.org> by clicking on the “Regional and National Finalists” tab. The Competition selects up to 10 projects (up to five individuals and up to five teams) from each of the six geographic regions. Finalists (including **all** team members) must attend and participate in all required Competition events.

If you are chosen, you receive an expense-paid trip, with a chaperone, to the campus of a university partner. A panel of judges appointed by the host institution reviews the projects.

Students who win at the regional level compete at the national level. The National Finalists receive an expense-paid trip, with a chaperone, to Washington, D.C.

Regional and National Finalists are required to:

- Prepare a poster display of the Research Project.
- Deliver a 12-minute oral presentation about the research and findings.
- Participate in a private question-and-answer session with the judges (14 minutes at Regional Competition; 12 minutes at National Competition).

Judges expect to hear concise presentations and responses to their questions during the question-and-answer session. You must also be able to describe further aspects of your project, including the fundamental science behind what you have done. All aspects of the projects and presentations inform the final decisions of the judges.

Research completed after the original submission may not be presented during the oral presentation or included in the poster. Corrections are permitted (e.g., fixing a typo in the report) as long as the correction does not reflect new data or findings.

Finalists are evaluated on these items, in addition to the Research Report and References cited. The Regional and National Poster, Oral Presentation and Q&A Guidelines can be found on the College Board’s Siemens Competition website (<http://siemens.collegeboard.org>) under the “Regional and National Finalists” tab.

IX. FAQs

Abstract

How do I create an Abstract?

The Abstract is a synopsis of the problem, methods, results, and conclusions in your Research Report. It should be 100-200 words long, include the project title, and stand alone on a page. Do not include identifying information, such as your name, high school, research facilities, mentors, or advisors. Do not use gender ("he" or "she") in the abstract. The Abstract is not counted as part of the 18-page report. Sample Abstracts from previous winners are on the Siemens Foundation website.

Acknowledgements

Why can't we use names or acknowledgements in our Research Report?

This ensures that the projects are judged on the quality of your research. Do not include identifying information, such as your name, high school, research facilities, mentors, or advisors. Do not use gender ("he" or "she"). Research Reports that include identifying information may be disqualified.

Acknowledgements must be listed on the Supplemental Form. List any individuals that assisted you with your Research Report, including family members.

I want to reference certain individuals or institutions in my Research Report. How can I do so without mentioning a name?

You may use a generic expression to distinguish your references. For example, if you are citing the work you performed in a research institution, your Report could read "research facility." If you wish to cite an individual, such as your advisor, you may substitute the word "advisor." Specific names must only be listed on the Supplemental Form, under Acknowledgements, and on the Confirmation Page.

Behavioral Science Topics

What type of project would be considered behavioral science and thus, ineligible?

Any project that involves the study of the actions and reactions of humans or animals, through observation, experimental methods, or both is ineligible. Social science projects, the study of society or social behavior, are also ineligible.

Categorization

I don't know how to categorize my project. Does this matter?

Your Research Project must be categorized as accurately as possible, so the appropriate judges can be assigned. Consult a teacher in your science or math department, or your mentor, to help you. If your project crosses several disciplines, place it in the one where you feel it best belongs. If necessary, the judges reassign projects to ensure qualified judges review your work.

Citations and References

I don't know how to format my citations and references. What is acceptable?

Citations and references should be in complete and correct standard format for the discipline. Consult a teacher in your science or math department, or your mentor. You may also refer to *The Mayfield Handbook of Technical & Scientific Writing*, on the Siemens Foundation website (www.siemens-foundation.org).

Eligibility

I am not a citizen of the United States and do not hold a green card. May I still apply for the Competition?

No. You must be a U.S. Citizen or Permanent Resident (holding a green card). The Siemens Foundation established this program to close the growing skills gap we have in math, science, and technology here in the United States.

I have applied for a green card, but have not received it yet. Can I still enter the Competition?

No. All individuals or team members must first obtain green cards or permanent resident status before registering for the Competition and submitting a Research Report. You need to obtain a green card before the Competition deadline in order to be eligible.

Are exceptions made for non-seniors to submit individual projects?

No. Exceptions are not made. Students submitting **individual** projects must be in good standing, enrolled in, and attending their last year of high school. You must complete all high school courses required for college admissions no later than September 1, 2014. Team projects may include seniors, but are not required to do so.

Are exceptions made for teams with more than three students?

No. Exceptions are not made. Teams may have only two or three students.

Are we allowed to submit a research project again?

Yes. You may resubmit a project. However, you are required to demonstrate that you have substantially advanced the project and must provide this information during registration.

I will not be 13 years old by the Competition deadline and/or my birth year does not appear on the registration drop down. What should I do?

Please email the College Board at spro@collegeboard.org.

Mentors

What if I don't have a mentor or advisor?

If you do not have a mentor or advisor, a teacher or high school administrator must complete the Mentor Form. If your project utilized any vertebrates, including human subjects, **Section V of the Mentor Form, Human Subjects and Other Vertebrate Certification**, must be completed by the supervising scientist at the lab where the experiment was performed.

When am I required to obtain the signature of the lab director on my Mentor Form?

If you are doing your research at a university, or other registered laboratory facility, the signature of the lab director is required. If you are doing your research at your high school, you are not required to obtain this signature.

Online Registration

I submitted my registration online and received my Confirmation Page. Then I realized that I had entered some incorrect information and misspelled words. How do I fix this?

Use a pen to make your corrections directly on the Confirmation Page. Once you mail your Research Report, the changes are corrected for you.

Publications

Can I submit my Research Report if I plan to submit it for publication or if it has already been published?

Yes. You must retain the full rights to your research. Indicate where your research was submitted or published on the Supplemental Form. Your mentor should also include this information on the Mentor Form.

Research Report/Research Project Defined

What is the difference between the Research Report and the Research Project?

The Research Report is the written 18-page paper and References describing your research. The Research Project contains your Research Report, plus all Additional Required Materials, or in other words, the entire project submission.

Research Report Requirements

Are my graphs and charts included in the 18-page limit?

Yes. The Confirmation Page, Supplemental Form, References, Abstract, Executive Summary, and Qualification Questions for Vertebrate Animals/Human Subjects Form are the only parts of the Research Project that **are not included** within the 18-page limit. The remaining text, tables, data, illustrations, and appendices are counted as part of the 18-page limit.

How many graphics and illustrations are allowed?

You may use as many as you would like. However, it is important to remember that all graphics are counted as part of the 18-page limit.

When should I start on my Research Project?

Start early! There is no time limit on the period of time spent on the Research Project. The number one reason students do not enter the Competition is they ran out of time.

When submitting the Research Reports, can the original signatures be photocopied?

You do not need to get all copies signed with an original signature. Get one form signed and then make photocopies.

Vertebrates

My Research Project involves working with live vertebrates and/or human subjects. Is this allowed?

Research Projects involving live vertebrates are allowed **only** under the following conditions:

- The project is **not** behavioral science.
- The research must be approved by an Institutional Animal Care and Use Committee (IACUC) or Institutional Review Board (IRB). A high school IRB is not permitted.
- The research must be conducted in a registered institution or laboratory.

My Research Project involves examining tissue of a vertebrate that was initially collected for another research experiment. I was not involved in that experiment. Tissues were provided to me. Is my project allowed?

You may examine fluids, cells, tissues, or organs if the materials were supplied to you by the supervising scientist and any animal that was euthanized for a purpose other than your research. Your research must be conducted in a registered institution or laboratory where this type of experimentation is authorized. The supervising scientist is required to complete Section V of the Mentor Form. The form requires the Institutional Animal Care and Use Committee (IACUC) approval or Institution Review Board (IRB) approval, when applicable.

Competition Facts and Information

Is the deadline when the Research Project must be received or when it must be postmarked?

Monday, September 30, 2013, 5 p.m. ET is when your Research Report and all Additional Required Materials **must be received**.

How many Research Projects are received each year?

We receive approximately 1, 500 projects from individuals and teams.

How many finalists are chosen?

Up to 300 outstanding projects (a maximum of 50 in each of the six geographic regions) are selected as finalists, including both regional and semifinalists.

How many regional finalists are chosen?

Up to 10 projects (five individual projects and up to five team projects in each of the six geographic regions) are selected to compete at the regional level of the Competition.

Which university do I compete at if I advance to the regional level?

The College Board will assign students to compete at one of the six regional competitions. The Siemens Competition utilizes the regional structure shown in the regional map, which can be found on the College Board website. Assignments will be based on a number of factors including the location of the student's school, where the student conducted his/her research, and/or whether there is any potential conflict of interest including if the parent or mentor works at or attends one of the partner universities. Students will not be reassigned due to personal schedule conflicts.

I still have questions. Whom do I contact?**The College Board – Siemens Competition**

Email: spro@collegeboard.org

Phone: (877) 358-6777

Fax: (703) 935-7795

X. SIEMENS COMPETITION CHECKLIST

☐ **Register Online**

REGISTER EARLY! You must complete the online registration early enough to print the Confirmation Page and obtain all required signatures. The Confirmation Page is only available after the online registration is submitted.

- Review registration Review Page for accuracy before submitting the online registration.
- Print Confirmation Page. It is your responsibility to review the Confirmation Page for accuracy and to ensure that all information is printed and legible. Depending on your printer, you may need to print the Confirmation Page in "Landscape" orientation. Acquire the required signatures (each student participant, parent or guardian for each student participant, and school administrator). Make corrections in ink, prior to making copies.

☐ **Write Abstract and Executive Summary**

☐ **Complete Supplemental Form**

☐ **Complete Qualification Questions for Vertebrate Animals/Human Subjects Form**

Required if your project used vertebrate animals (including materials from vertebrates or human subjects) or commercially purchased cell lines.

☐ **Provide the Mentor Form to your mentor to complete**

The Mentor Form must also be received on or before Monday, September 30, 2013 at 5 p.m. ET and may be sent with the Research Project or separately. See section V.G. for additional information.

☐ **Review Research Report for the following:**

- No names of student(s), high school(s), mentor/advisor(s), affiliated research organization(s), acknowledgements(s), or terminology that depicts your gender (e.g. "he" or "she")
- Review citations and references to ensure proper format for the discipline.
- Spelling and grammatical errors. Project does not exceed 18-page maximum limit that includes the introduction, data, illustrations, text, and appendices.

☐ **Assemble three sets of your Research Project** (one original and two copies) of the following documents, in this order:

- Confirmation Page
- Supplemental Form
- Abstract
- Executive Summary
- Qualification Questions for Vertebrate Animals/Human Subjects Form (if applicable)
- Research Report (one **color** original and two **color** copies) – all graphics, colors and images must be clear on all copies
- References

☐ **Create One CD-ROM**

Copy of Abstract, Executive Summary, Supplemental Form, Qualification Questions for Vertebrate Animals/Human Subjects, Research Report, and References. The individual or team leader's name and the project confirmation number must be noted directly on the CD-ROM. Please print legibly with a permanent marker or affix a typed label.

☐ **Determine if Mentor Form (1 original and three copies) will be submitted with research project or separately.** See section V.G. for more information.

☐ **Mail three sets of your project, CD-ROM and Mentor Form (if sending with project) to be received Monday, September 30, 2013, 5 p.m. ET.**