

# *Excellence*

Center for Excellence in Education



## 2009 RSI Brochure

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Center for Excellence in Education  
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# **The Research Science Institute**

is sponsored by the

## **Center for Excellence in Education**

in collaboration with the

## **Massachusetts Institute of Technology**

### **cost**

The program is offered  
at no cost to participants

### **dates**

June 21 - August 1, 2009

### **application deadline**

January 16, 2009

**On June 21, 2009** approximately 80 high school students will gather for six of the most stimulating weeks of their young lives. Selected from the United States and several nations, these students will participate in a rigorous academic program which emphasizes advanced theory and research in mathematics, the sciences, technology, and engineering. It is known as the Research Science Institute (RSI).

**The students attend** college-level classes taught by distinguished professors from leading universities. Nationally recognized high school teachers and doctoral level RSI alumni conduct classes designed to sharpen research skills. In addition, the students complete hands-on research with selected mentors at universities, research organizations, and corporations.

**RSI students** master each step of the research cycle. Beginning their projects with a review of the current literature in their fields, they plan, execute, and analyze original experiments. They conclude their projects by reporting their results in the form of a scientific paper and in a plenary session. These research skills have helped alumni to garner top awards in the annual Siemens and Intel competitions.

**The uniqueness of CEE** lies in its commitment to help RSI alumni throughout their academic careers – from college selection through graduate studies – to foster camaraderie and intellect. CEE's follow-up program includes helping alumni with college and university selection, finding suitable summer employment, sponsoring trips to other nations for alumni as Junior Ambassadors of math and science, and keeping in touch with other alumni through activities.

**The Research Science Institute** is open to students who have completed their third year of high school or the equivalent, by the summer of 2009, and plan to matriculate to a college or university in 2010. The twenty-sixth annual summer session of RSI will be held at the Massachusetts Institute of Technology from 21 June to 1 August, 2009.

Applicants will have demonstrated superior scholastic achievement in mathematics, the sciences, and in verbal arts. They will have shown the potential for leadership in science and mathematics. They will have sufficient computer skills to model complex systems and analyze scientific data.

There is no cost to students for tuition, room, or board. The only expense is for transportation to and from MIT. Support for RSI comes from individuals, corporations, foundations, and U.S. governmental agencies. CEE has received grants from the National Science Foundation, U.S. Department of State, U.S. Agency for International Development, the Department of Defense, the Department of Energy, the Department of Agriculture, the National Endowment for the Humanities, the Bureau of Indian Affairs, the National Security Agency, the Small Business Administration, and the Commonwealth of Virginia.

**The RSI Student Selection Committee** selects scholars for RSI on a competitive basis. The committee is made up of educators, scientists, and RSI staff. Candidacy is assessed on intellectual merit and the potential for leadership in science and technology. Domestic applicants must be US citizens or permanent residents (Green Card holders) intending to become citizens. International applicants must contact CEE to determine if their country is a participating partner. Please direct inquiries to: [rsi@cee.org](mailto:rsi@cee.org).

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**“RSI is a chance to go through the true academic and research environment.” - RSI Student**

## Work and Research On and Off Campus

The Research Science Institute is the first summer science program to combine on-campus course work in scientific theory with off-campus work in scientific research. Students work under mentors who are scientists, mathematicians, and engineers.

On-campus classes are offered during the first week of the Institute. These are followed by four weeks of research internships. During the final week, oral and written presentations are made by all participants. An eminent panel of judges selects five participants for their outstanding oral presentations and five for their research papers.

**Research Skills** – Active research scientists and doctoral level alumni of the RSI expose students to technical skills required for research and provide training for the students' research projects. These classes include:

- **Computer Skills for Scientific Research**
- **Research Design**
- **Oral and Written Communications Skills**
- **Statistics**

Students' research internships are the core of the academic experience of RSI. Courses during the first week augment these internships. In no way are the classes surrogates for high school or college courses. Academic credit is neither given nor transferred.

### Research Internships

Internships emphasize original work on a question of current research interest. Eminent scientists and mathematicians supervise the projects. Research sites are located at MIT, Harvard University, Boston College, Boston University, Northeastern University, hospitals, and corporate research facilities in the Boston area.

Student-mentor matches are made by mutual interest and student ability. Each student becomes included in the mentor's research group, and each student conducts valuable research while contributing to the ongoing investigations of the group. RSI does not provide students an opportunity to continue previous research initiated during the high school years nor does the RSI research paper guarantee a project for national competitions.

Regardless of field, research internships require well-developed computer skills. Computational models play an important role in current biological and mathematical research.

### The RSI Community

RSI alumni maintain a tight-knit community throughout their academic and professional careers. Alumni from all years of the program stay in contact with one another through social, academic, and professional activities. Former RSI students also form an integral part of the program staff each summer.

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**“The world of science is far more vast than I could previously imagine.” - 2008 RSI Student**

## The RSI Academic Staff

The faculty of the Research Science Institute consists of professors, tutors, teaching assistants, and research mentors.

**Professorial Fellows** are distinguished university professors who offer science, mathematics, and humanities courses at the frontier of their fields. They are faculty members at leading universities, and many are RSI alumni.

**Tutors** include preeminent teachers and graduate-level alumni of the RSI who provide day-to-day academic support and supervision to students. Their specialties range through various disciplines in science and mathematics. All have firsthand research experience.

**Teaching Assistants** are RSI Alumni who collaborate with the faculty in technical classes and provide help with the preparation of scientific papers and presentations.

**Research Mentors** direct the work of research interns. They are selected from among the leading scientists, mathematicians, and engineers in the Boston area.

## Extracurricular Activities

RSI offers student scholars a variety of activities to foster camaraderie and students' intellectual development.

These activities include July 4th on the Esplanade, an ultimate frisbee "grudge match" against other Boston summer programs, and hiking in New Hampshire's White Mountains.

**Academic Program** – Professors from leading US universities, including RSI alumni holding Ph.D.s, offer RSI classes. Their purpose is to highlight current research areas in science, technology, engineering, and mathematics. These classes include:

- **Pure and Applied Mathematics** • **Physical Science**
- **Biological Science** • **Chemistry** • **Engineering**
- **Humanities**

**Guest Lectures** are presented by distinguished experts in science, mathematics, business, and the humanities. Past RSI sessions have included such figures as: Professor Philip Sharp, Nobel Laureate; Professor Dudley Herschbach, Nobel Laureate; David K. Rensin, President and CEO, Reality Mobile, LLC; Dr. Wolfgang Ketterle, Nobel Laureate; Dr. Tom Leighton, Co-Founder and Chief Scientist, Akamai Technologies; Dr. John Parmentola, Director for Research and Laboratory Management, U.S. Army; and Dr. John McQuade, Senior Vice President for Science and Technology, UTC Corp.

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**“The RSI experience is the one that will stay with me for the rest of my life” - RSI Student**

The Center for Excellence in Education (CEE) was co-founded by the late Admiral H.G. Rickover, the father of the nuclear Navy, and Joann P. DiGennaro, the Center's President. The mission of the Center for Excellence in Education is to nurture young scholars to careers of excellence and leadership in science and technology, and to promote international understanding among future scientific leaders in the global community. CEE is a private, non-profit organization. Its programs are open to students and teachers of all races, colors, creeds, and economic backgrounds. The criteria are academic excellence and the potential for leadership in science, technology, engineering, and mathematics. CEE sponsored its first summer Research Science Institute for students and teachers in 1984.



In the inset photo  
*The late Admiral H.G. Rickover,  
 CEE founder, with CEE  
 President, Joann P. DiGennaro*

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 Petroleum Service Company*

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**Dr. Jon P. Wade**  
*President  
 AgilePower Systems, Inc.*



# RESEARCH SCIENCE INSTITUTE 2009

## STUDENT APPLICATION

*Excellence*  
Center for Excellence in Education

The application is designed to show the candidate's academic, leadership, and service background, as well as personal achievements and goals which are important to becoming a leader in science, technology, engineering, or mathematics. The student and two teachers must be sure that all the information requested is given accurately and completely.

The application has three parts. Part I must be completed by the student and a parent/guardian. Part II must be completed by the student and should be reviewed by his/her teachers to ensure accuracy and completeness of information. Part III must be completed by the candidate's math or science teachers after the student has completed Parts I and II.

A certified copy of the student's high school record must be included with the application packet. This record should include a transcript of courses and the student's standardized test scores.

The *complete* set of application materials **must** be mailed to the **Center for Excellence in Education** in an envelope large enough to accommodate an original unfolded application. Please do not staple or fold the pages of the application. Applicants must follow the instructions to ensure the completion of each part of the application. Applicants who do not conform to the requirements will not be considered.

### **Each student's application must include:**

- The applicant's self-nomination with essay responses to the questions detailing his or her goals in science and/or mathematics
- Recommendations by two teachers familiar with the candidate and the candidate's scholastic record.
- The applicant's official high school transcript
- PSAT math, verbal and writing scores (or SAT or ACT test results) showing evidence of exceptional intellectual performance and potential

PSAT math scores should be at least 75, and combined math, verbal, and writing PSAT scores should be at least 220. ACT minimum math scores should be 33 and reading, 34. Lower scores must be offset by strong indications of mathematical, scientific, and academic potential exemplified in recommendations, high school grades, and science activities.

### **Schedule**

#### **January 16, 2009**

Deadline for receiving all completed application materials at the CEE office. This is not the postmarked date.

#### **Mid-March, 2009**

Students notified of selection by mail

#### **June 21, 2009**

RSI summer program at MIT opens

#### **August 1, 2009**

RSI summer program closes

**The RSI application should be mailed to:**

**Center for Excellence in Education  
8201 Greensboro Drive  
Suite 215  
McLean, VA 22102**



# RESEARCH SCIENCE INSTITUTE 2009 STUDENT APPLICATION



please type or  
print neatly

Deadline: January 16, 2009

to be completed by student and  
parent/guardian

## STUDENT INFORMATION

\_\_\_\_\_  
Last Name

\_\_\_\_\_  
First Name

\_\_\_\_\_  
Middle  
Initial

\_\_\_\_\_  
Street Address

\_\_\_\_\_  
City

\_\_\_\_\_  
State

Female  
 Male

\_\_\_\_\_  
Zip

\_\_\_\_\_  
Country

\_\_\_\_\_  
Social Security

\_\_\_\_\_  
Birthdate (M/D/Y) Age

\_\_\_\_\_  
Home Phone Number

\_\_\_\_\_  
Email

\_\_\_\_\_  
Country of  
Citizenship

\_\_\_\_\_  
Immigration Status  
(if not US Citizen)

\_\_\_\_\_  
PSAT Math

\_\_\_\_\_  
PSAT Verbal

\_\_\_\_\_  
PSAT Writing

\_\_\_\_\_  
SAT I Math  
(if taken)

\_\_\_\_\_  
SAT I Reading  
(if taken)

\_\_\_\_\_  
SAT I Writing  
(if taken)

\_\_\_\_\_  
ACT English

\_\_\_\_\_  
ACT Math

\_\_\_\_\_  
ACT Science

\_\_\_\_\_  
ACT Reading

\_\_\_\_\_  
Grade Enrolled  
(Fall 2008)

\_\_\_\_\_  
College Start  
Date (M/Y)

## SCHOOL INFORMATION

\_\_\_\_\_  
High School Name

\_\_\_\_\_  
School Address

\_\_\_\_\_  
City

\_\_\_\_\_  
State

\_\_\_\_\_  
Zip

\_\_\_\_\_  
School Phone Number

\_\_\_\_\_  
Principal's Name

\_\_\_\_\_  
Website/Email

The RSI application should be mailed to:  
**Center for Excellence in Education**  
8201 Greensboro Drive  
Suite 215  
McLean, VA 22102  
email: rsi@cee.org





# PART - I

Deadline: January 16, 2009

to be completed by  
student and parent/  
guardian

\_\_\_\_\_  
First Research Interest Field (as stated in part II, question #2)

\_\_\_\_\_  
Research Interest Sub Field (as stated in part II, question #2)

\_\_\_\_\_  
Second Research Interest Field (as stated in part II, question #2)

\_\_\_\_\_  
Research Interest Sub Field (as stated in part II, question #2)

I, \_\_\_\_\_, hereby grant permission for my name to be placed in candidacy for selection as an **RSI Scholar**. I request that all school data in support of my nomination be at the disposal of the Center for Excellence in Education.

\_\_\_\_\_  
Student Signature

\_\_\_\_\_  
Date

## PARENT/GUARDIAN

If our child is selected for RSI, we will urge him or her to participate in CEE activities through undergraduate and graduate years of study. We know our support is essential. We will support and consider volunteering for CEE on our child's behalf.

\_\_\_\_\_  
Parent/Guardian Signature

\_\_\_\_\_  
Parent/Guardian Last Name

\_\_\_\_\_  
Parent/Guardian First Name

\_\_\_\_\_  
Parent/Guardian Home Phone Number

\_\_\_\_\_  
Parent/Guardian Daytime Phone Number

\_\_\_\_\_  
Parent/Guardian E-mail

### Please attach:

- **\$50 Processing Fee** (Please make checks payable to CEE)  **Enclosed**  **Please waive the fee**
- **An official high school transcript**
- **Verification of standardized scores**
- **Teacher recommendations in sealed envelopes**

No application will be considered without these items.

If you want to verify receipt of your application, please enclose a self-addressed stamped postcard.

# PART - II

Deadline: January 16, 2009

to be completed by  
student

Please respond to the following questions on separate paper. It is important that you provide specific details to give evidence of your promise in the sciences and mathematics. Should you be accepted, this information will be used to place you with a research mentor. Limit your responses to one or two paragraphs per question, not to exceed a total of three typewritten pages for questions one through seven. (Please do not answer any question except number five on this sheet).

1. What are your long-range goals?
2. State your first and second choice of **field** and **subfield** of research in which you wish to work, for example: Biology, neuroscience; Chemistry, organic; Computer Science, artificial intelligence; Engineering, electrical/environmental; Physics, astronomy. Please specify two distinct fields (not two subfields of math, for example). In each of your fields of interest, please state what you see as the one or two most interesting questions/problems and why they are interesting to you.
3. What extracurricular activities and/or hobbies demonstrate your interest and ability to undertake scientific or mathematical research? (Give some measure to the extent of your participation and/or accomplishments in math or science competitions, research internships and awards received.)
4. Describe other extracurricular and community activities in which you have participated.
5. List below your technical skills level and academic background as of June 1, 2009.
6. Briefly describe any past experience with computer programming, modelling, and data analysis.
7. Where did you hear about RSI?
8. List SAT I, SAT II, and ACT test scores and date(s) taken.
9. List advanced placement courses, scores and dates taken.

## COURSE LEVEL

Subjects	Regular	Honors	College AP/IB	Date Completed /Expected
Calculus (Specify if AB/BC)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Linear Algebra	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Statistics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Biology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Chemistry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Computer Science (A/AB)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Environmental Science	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Physics (B/C)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

## SKILL LEVEL

Computer Platform	Beginning	Intermediate	Advanced
C / C++	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Java	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Perl	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
MATLAB	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mathematica/Maple	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unix/Linux	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

