Intel International Science and Engineering Fair

Encouraging Youth in Scientific Discovery and Innovation
Great ideas start with opportunities. At the Intel International Science and Engineering Fair (Intel ISEF), a program of Society for Science & the Public , the world's largest pre-college science competition, students have a chance to dream and create big ideas like: a better way to get fresh water to victims of natural disasters, a way to help the blind and disabled access the Internet, or illustrate ground-breaking mathematical theory. These innovations, and more than a thousand like them, are on display every year at Intel ISEF, a global celebration of scientific excellence.

Intel ISEF brings together over 1,500 leading young scientists from more than 50 countries, regions and territories to compete for more than USD 4 million in scholarships and prizes.

Students' projects encompass a wide range of issues and disciplines, often addressing issues that have stumped scientists for years. In 2008, more than 20 percent of the young scientists competing at Intel ISEF either had or had applied for a patent for their work.

Intel ISEF finalists come from a field of more than 65,000 students who participated in more than 550 regional Intel ISEF-affiliated science fairs around the world.

Every year, more than 1,200 science, engineering, and industry professionals volunteer to travel to Intel ISEF to judge the projects and determine the winners.

Participating in Intel ISEF provides a pathway to science innovation and self discovery. Students begin by developing a science research project and participating in their local Intel ISEF affiliated science fair. They learn to collaborate with others and articulate their scientific findings through projects.

Enter an Intel ISEF-Affiliated Science Fair
All participants attend Intel ISEF annually after being selected by their local Intel ISEF-affiliated fair. The affiliated fairs are conducted at local, regional, and national levels. Each affiliated fair is permitted to send two individual project finalists and one team project to compete in the Intel ISEF. Affiliated fairs in your area*.

How to Start Your Project
The earlier you start your project, the better. Many students begin planning their research at the end of the school year so that they can conduct research during the summer and fall. See the Rules and Guidelines*.

Support and Encourage Students in Science Fairs
Science fairs depend upon the support, encouragement, and volunteer efforts of teachers, parents, and communities. If you are the parent of a student interested in participating, see Tips for Parents*.

If you are a teacher who has a student interested in entering a science fair, see the Teacher Checklist*. In an effort to share good ideas worldwide, learn from other teachers whose students have participated in Intel ISEF and affiliated fairs in several countries describe their strategies. Read more. (PDF; 6 pages)

Science Training Programs for Teachers and Students
Many of the Intel ISEF participants take part in a science training program to help them with their projects. There are more than 300 training programs that take place throughout the year at a variety of institutions, predominately at U.S. colleges and universities.
Directory of Science Training Programs*

Intel ISEF Projects Reflect Range of Interests

Of the millions of young innovators who enter local science fairs around the globe each year, only a fraction make it to the world's largest pre-collegiate competition, the Intel International Science and Engineering Fair, a program of Society for Science & the Public. This year, 1,557 finalists from 51 countries, regions and territories were selected to meet in Atlanta, Georgia, to present original research projects to panels of esteemed judges and compete for nearly $4 million in scholarships and awards.

Of course, the prizes are motivating, but so too are the issues these young scientists and mathematicians probe: potential treatments and cures for medical diseases, ideas on alternative energy sources and ways to combat global warming, and a range of discoveries and inventions that may just improve the human experience for us all.

Take a look at some of the people and projects at Intel ISEF 2008.

Frantisek Kolek Vaclav Kocian Chrudim, Czech Republic	Frantisek Kolek and Vaclav Kocian targeted their research toward developing a specialized first-aid kit specifically for amputation traumas.
Tobias Maduro Noerbo Ishoj, Denmark	Having been treated for a serious illness when he was a child, Tobias Maduro Noerbo, built a safe tricycle for sick youngsters confined to hospitals. Watch video ›
Bradley Pieter Rautenbach Sean Daly Johannesburg, South Africa	Bradley Pieter Rautenbach and Sean Daly developed a recycling plan that takes rubber from discarded tires to create inexpensive roof tiles and mulch. Watch video ›
Sarah Stahl Huntsville, Alabama, USA	Inspired by her grandfather interest in alternative fuels, Sarah Stahl was interested in researching a solution to help lower the cost of production for bio-diesel.
Morgan Walti Hillsboro, Oregon, USA	Inspired by sci-fi classics like The Terminator, Morgan Walti took on the task of building a bio-mechatronic - a.k.a. "bionic" - arm. His goal: to make a prosthetic arm better, stronger, and faster.

Frantisek Kolek and Vaclav Kocian
Chrudim, Czech Republic

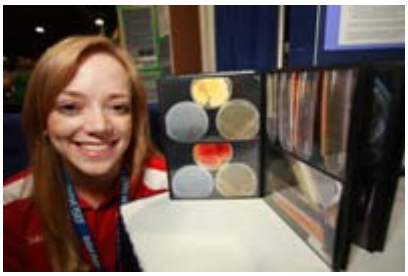
Industrial, farming and motor vehicle accidents, as well as war, are major causes of amputations around the world. When these traumas occur, reattachment is only an option if both victim and the severed body part receive quick and appropriate medical care. Unfortunately, in many cases, especially when mass casualties occur, appropriate assistance often comes too late. For that reason, Gymnazium Josefa Ressela students Frantisek Kolek and Vaclav Kocian targeted their research toward developing a specialized first-aid kit specifically for amputation traumas. One of the most important elements of their research involved finding a way to pack severed body parts at the accident site and preserve them during transport to a medical facility. To address this need, Kolek and Kocian designed a special container made with low-density polyethylene sheeting which stabilizes when filled with water, along with an effective urea-water reaction cooling system. They also equipped the kit with other necessary medical supplies.

Because the amputation-rescue kit is compact and easy to use, it can be transported practically anywhere and used by laymen as well as trained medical personnel. It is now being tested by paramedics in the Czech Republic.

Kolek and Kocian hope that their kit will result in improved reattachment success rates for amputees.

Tobias Maduro Noerbo, Ishoj, Denmark
Having been treated for a serious illness when he was a child, Tobias Maduro Noerbo, is well aware of the difficulties hospitalization can pose for youngsters. So the Ishoj Technical High School senior didn't have to look far for inspiration for his research project. As Noerbo points out, more than 160,000 children will be diagnosed with cancer this year alone, and 70 percent of those will suffer from physical and/or psychological side effects. One of the most effective deterrents to some of these side effects is physical activity, especially during the treatment process. However, the majority of cancer-stricken children are connected to medical drip stands during treatments such as chemotherapy, severely limiting their mobility.
To help such children, Noerbo developed a series of ultra-stable tricycles he calls DripDrops, designed with a secure, rear hitch for drip stands. The result is that hospitalized children can hop on the tricycles, hook up their drips, and go for a spin, engaging in exercise and reducing the risk of side effects in the process. What's more, the tricycles actually add a bit of fun to an often stressful experience.
Noerbo's DripDrop prototypes are currently being tested at a children's cancer ward in Denmark.

Bradley Pieter Rautenbach and Sean Daly
Johannesburg, South Africa
With piles of discarded tires mounting in dumps around the world and in their home country of South Africa, St. Johns College students Bradley Pieter Rautenbach and Sean Daly decided to take action. Old tires are an environmental hazard, explain the students. When tires pile up, they collect rainwater and become a breeding ground for disease-carrying mosquitoes. When fires occur, hazardous gases are released into the atmosphere. To address these issues, the students came up with a recycling plan that involves using rubber from discarded tires to create inexpensive roof tiles and mulch.
In designing the roof tiles, Rautenbach and Daly considered tile shape, positioning, and angle. Additionally, they tested fire preventative solutions on the rubber, eventually settling on a fire retardant that not only reduced flammability, but also strengthened the material. The result: a viable roofing option for people in need of affordable housing.
The team created mulch by shredding rubber tires for use as ground cover. The rubber mulch proved very effective at retaining soil moisture, a real advantage for rural South African farmers who may have to carry water long distances to tend their crops.
In the end, Rautenbach and Daly's research not only offers solutions for recycling tires and reducing environmental hazards, but may also make life a bit easier for others.



Sarah Stahl, Alabama, USA
With growing interest in alternative energy sources, bio-diesel fuel production is on the rise. However, existing bio-diesels are costly to produce. One way to lower the cost, posits Huntsville High School student Sarah Stahl, is to convert crude Glycerol, the largest byproduct of bio-diesel production, into a compound with commercial value. As a result, Stahl's project focused on finding a naturally-occurring microbe capable of breaking down Glycerol.
Stahl's research, conducted at the University of Alabama in Huntsville, revealed three substances - two bacteria and one fungus - which may hold promise, though final results were inconclusive.
The senior from Huntsville, Alabama, says she was inspired to pursue bio-diesel research because of her grandfather's interest in alternative fuels from a farming perspective and her own concerns for the environment. She plans to continue her research following Intel ISEF, and pursue studies in biology and chemistry at Ohio's Denison University.

Morgan Walti, Oregon, USA
Inspired by sci-fi classics like *The Terminator*, Morgan Walti, a senior from Liberty High School in Hillsboro, Oregon, took on the task of building a bio-mechatronic - a.k.a. "bionic" - arm. His goal: to make a prosthetic arm better, stronger, and faster. Whereas some recent prostheses can be controlled by brain function, Walti explains, many lack the strength to perform desired functions. To overcome such issues, the young engineer developed a mechanically-correct model of the human arm, using an aluminum frame as the skeletal structure and electromagnetic solenoids as artificial muscles.

Despite challenges along the way, including blown resistors the night before the regional science competition, Walti succeeded in creating models capable of controlled finger and wrist movement. Walti believes his design, "the first bionic arm to use an endoskeletal frame," will allow for easier control by amputees. Additionally, the model may have applications in manufacturing processes and hazardous industries.
Aside from using a band-saw in his school engineering class, Walti completed the bulk of his project in his room at home, thanks to "a big table" and "a lot of superglue." He plans to attend Brown University to study mechanical engineering.

Intel ISEF in Atlanta, Georgia

In May, 2008, more than 1,500 of the world's most promising young scientists and innovators gathered in Atlanta, Georgia, to compete in the Intel International Science and Engineering Fair, a program of Society for Science & the Public. Representing 51 countries, regions and territories, each of these students earned top honors at local and regional competitions before being selected as finalists at the 2008 competition.

During the week in Atlanta, students converged on the Georgia World Congress Center, armed with presentation boards and three-dimensional models, to present original research projects to panels of esteemed judges and to the public at large, as they vied for nearly $4 million in scholarships and awards.

Many of this year's projects tackled issues relevant to people around the world, including research on global warming and alternative fuel sources, innovations in engineering resulting in increased robotic functionality and safer roads, and advancements in medicine that could improve the lives of disabled people everywhere.

Beyond the rigors of the research competition, students had the opportunity to chat with distinguished professionals in their fields and bond with other budding scientists and mathematicians from around the globe. Additionally, they participated in a flurry of event activities, including the annual Intel ISEF pin exchange and visits to local sites, including the Coca Cola Museum and the Atlanta Aquarium.

Here is a look at their week in pictures.

Intel ISEF participants set up their science projects.

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A Canadian participant shares her country's spirit at the traditional Intel ISEF pin exchange.

Number of Pictures: 2 of 16

Two Intel ISEF participants catch-up at the Internet Café.
Number of Pictures: 3 of 16

Students from China show their sign for the 2008 Intel ISEF opening ceremony.
Number of Pictures: 4 of 16

Intel ISEF participants proudly represent their country at the opening ceremony.
Number of Pictures: 5 of 16

A local drum core provides some upbeat entertainment at the opening ceremony.
Number of Pictures: 6 of 16

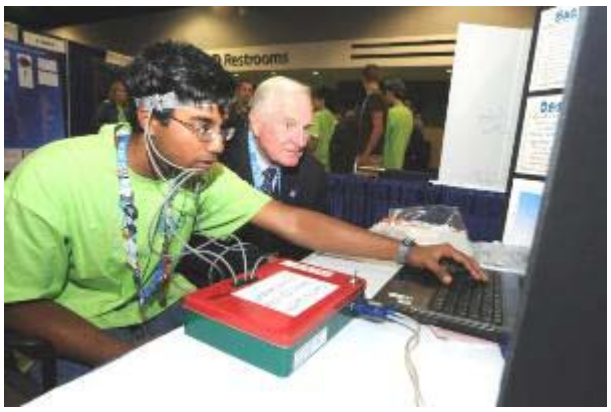
Participants take a break to immerse themselves in the African penguin exhibit at the Georgia Aquarium.
Number of Pictures: 7 of 16

Intel ISEF participants engage with sea anemones and sea stars.
Number of Pictures: 8 of 16

2008 Intel ISEF Exhibit Floor.
Number of Pictures: 9 of 16

Team from Brazil share their more cost efficient bread dough mixer to help the less fortunate and hungry.
Number of Pictures: 10 of 16

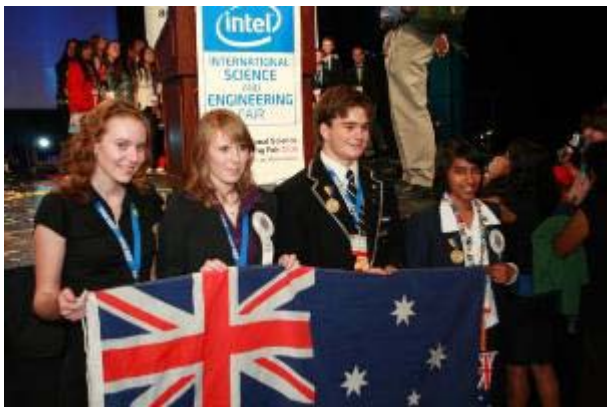
Intel's Chairman Craig Barrett experiences an immersive, simulated amusement park ride developed by a team from North Carolina, USA.
Number of Pictures: 11 of 16



Nitin Kitchley Egbert from California show Intel's Craig Barrett his MindMouse project.
Number of Pictures: 12 of 16

A student scientist from Malaysia demonstrates his project.
Number of Pictures: 13 of 16

Multitalented student who enjoys science and hip hop dancing.
Number of Pictures: 14 of 16



Student scientists from Great Britain pose for a picture after the Intel ISEF award ceremony.
Number of Pictures: 15 of 16

2008 Intel ISEF top three winners (left to right: Sana Raoof of Muttontown, N.Y., Yi-Han Su of Chinese Taipei and Natalie Saranga Omattage of Cleveland, Miss.)
Number of Pictures: 16 of 16

Meet the Intel Foundation Young Scientist Award Winners

Three high school students earned top honors at the Intel International Science and Engineering Fair, a program of Society for Science & the Public, when they each received an Intel Foundation Young Scientist Award and a $50,000 college scholarship.

In addition to these Intel Foundation Young Scientist Award winners, more than 500 Intel ISEF participants received scholarships and prizes for their groundbreaking work. Intel awards included the 18 "Best of Category" winners, selected from the categories, who each received a $5,000 Intel scholarship and an Intel® Centrino® Duo Mobile Technology-based notebook.

Learn more ›

Sana Raoof

Watch video ›

Sana Raoof, a senior at Jericho High School in Jericho, New York, conducted research on a branch of topology called knot theory. The central question in knot theory involves how to prove that two knots are the same or different. The reason this is difficult is that a knot can be drawn in an infinite number of ways, yet it is still the same knot. Mathematicians use knot invariants to assign consistent values to knots; however, every invariant so far has generated false positive results, meaning that knot equivalents cannot be guaranteed. Until now, that is, since Raoof recently proved that a preexisting invariant, the Alexander-Conway polynomial, can guarantee knot equivalents on all knots corresponding to lattice chord diagrams.

Because knot theory has applications in biochemistry, Raoof's research may shed new light on a problem plaguing scientists for decades: the protein folding problem, or how proteins from amino acids fold up three-dimensionally in nature. Since there is a direct relationship between the structure and function of organic molecules, Raoof's work could provide insight into the workings of the basic machinery of life.

Natalie Saranga Omattage

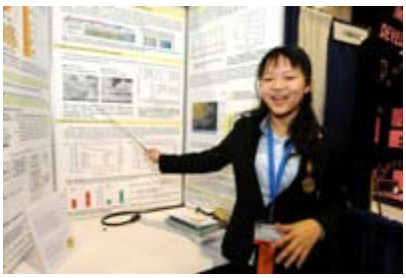
Watch video ›

In 2007, deadly contaminants penetrated the pet food supply in the United States, causing the deaths of hundreds of animals. Food additives contaminated with a toxic combination of melamine and cyanuric acid were found to be the cause. Though food imports are currently screened via chromatographic and mass spectrometric methods, the instruments, as well as the reagents, are expensive. Additionally, implementation of these methods requires highly trained personnel.

In her search for a better solution, Natalie Saranga Omattage, a student at The Mississippi School for Mathematics and Science in Columbus, Mississippi, explored alternative methods of detecting melamine and cyanuric acid in food. Using peptides with a high affinity to these chemicals, Omattage developed an effective quartz crystal microbalance-based biosensor capable of detecting melamine and cyanuric acid at low concentrations and in just a matter of minutes. Further, the biosensor is portable, less expensive than current screening methods, and does not require highly trained personnel to operate.

Omattage's biosensor is not only applicable to screening for food contaminants, it may also be used to detect other harmful chemicals.

Yi-Han Su



With growing global interest in hydrogen, science and industry are looking for ways to produce it more efficiently. One of the ways to produce hydrogen involves using a catalytic process with a methanol-reforming reaction. In order to generate hydrogen more efficiently, a high-activity catalyst is desirable.

For her chemistry project, Yi-Han Su, a student at Taipei First Girls High School in Chinese Taipei, developed a process to improve the activity of a catalyst, resulting in an improved process for generating hydrogen.

This method can be generalized for the synthesis of other multi-composition materials to achieve high homogeneity.