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NSF CURRENT
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NSF AT WORK

Report Highlights the Extended Impact of Teen Driver Accidents

An inaugural research report on teen driving in the United States shows that the impact of teen driver crashes extends well past the teen driver. In 2008, over half a million people were involved in crashes where a teen driver was behind the wheel, and 4,358 deaths occurred as a result of these crashes. Furthermore, nearly 30 percent of these fatalities were people who were not in the cars driven by teens.

A new report addresses teen driver safety and includes 11 key benchmarks to assess safety programs. Credit: © 2011 Jupiter Images Corporation.

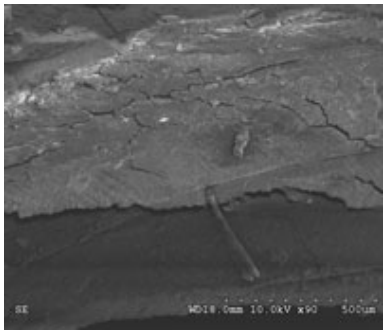
The report also shows that teen driver and peer passenger deaths account for 24 percent of total teen deaths from any cause, more than either cancer, homicide and suicide. This report is the first of its kind in compiling teen driving data with 11 key benchmarks to help policymakers and safety practitioners assess programs in teen driving safety. Researchers focused on four key behaviors among teen drivers that contribute to crashes or crash fatalities, which can also be tracked using federal sources: failure to use seat belts, speeding, alcohol use and distracted driving.

The work was conducted by researchers supported by NSF's Industry/University Cooperative Research Center program, and located at the Center for Child Injury Prevention Studies (CChIPS) at the Children's Hospital of Philadelphia (CHOP) (award number **1034593**). In addition, funding for the work was provided by an NSF Center Industry Advisory Board (IAB) member, State Farm.

"The research we're doing at CHOP to better understand teen driver safety has provided evidence to support stronger graduated driver licensing laws and increased parental involvement in the learning-to-drive process," Flaura Winston, director of the CChIPS. "Thanks to support from NSF, our CChIPS IAB members, and additional private funding from State Farm, we've seen major strides in support for teen driving programs. Safety advocacy groups, legislators, educators and teens are rallying to reduce teen car crashes and save lives, and we are helping to provide the evidence-based research to support them. This annual report is the next step in supporting continued improvements that will help keep teen drivers safe, and those who share the road with them."

The full report, "**Miles to Go: Establishing Benchmarks for Teen Driver Safety** " can be found online, along with other teen driver safety resources on the **TeenDriverSource.org** website.

Researchers Identify Microscopic Bone Fractures Following High-speed Collisions



Scanning electron microscopic image shows significant cracking at high deformation rates. A network of microscopic cracks is seen in the picture. Credit: Vasanth C. Shunmugasamay at NYU.

When two professional football players collide at full speed, it has been compared to experiencing a head-on car collision at 30 miles per hour. Even with all their padding, players still break bones and wear down over time. It turns out that the speed of the collision is not just bone-breaking on TV but also bone chipping at the microscopic level, according to researchers at New York University (NYU). Nikhil Gupta, associate professor of mechanical and aerospace engineering at the Polytechnic Institute of NYU, and Paulo Coelho, professor of biomaterials and biomimetics at the NYU College of Dentistry, have used a unique bone-crushing machine (the "Kolsky Bar") and scanning electron microscopy to examine how compression speed affects bone and material properties. With support from NSF, the research team recently showed that micro-fractures appear in bones after high-speed collisions. These fractures, which can critically weaken the bone, have gone unnoticed in clinical settings due to limited diagnostic technology. In addition to observing fractures with increasing crushing speed, they noted that direction of the cracks also changes with the compression speed. Building on these results, the team wondered if the speed of compression also affected materials used for military body armor, since they often incur high speed bullets and shrapnel. To their surprise, they discovered that body armor foams substantially stiffen when compressed at higher speeds. To follow up on this work, the team plans to formulate next-generation materials that can reduce bone injury from high-speed compression and hopes to stimulate development of more sensitive clinical imaging instruments so that doctors can see these micro-fractures in the clinic.

Approaches to Measuring Scientific Research Sought

Credit: © 2011 Jupiter Images Corporation

Julia Lane, Science of Science and Innovation Policy program director, NSF and her co-author Stefano Bertuzzi, Office of Science Policy at the National Institutes of Health (NIH), write about improving scientific research metrics in "Measuring the Results of Science Investments," a Policy Forum paper appearing in the journal *Science*.

Lane and Bertuzzi examine critical questions for measuring the effects of scientific research. Is it possible to create such a system to measure the effects of scientific research? What would be the inputs, outputs and structure of the system? What scientific disciplines should inform the formulation of such a model?

In the United States, the Science and Technology for America's Reinvestment: Measuring the Effects of Research on Innovation, Competitiveness, and Science (STAR METRICS) program is being developed by NIH and NSF with the backing of the White House Office of Science Technology and Policy. The Department of Energy and the Environmental Protection Agency are joining the consortium.

"This is a collaborative approach," said Lane. "The goal is to work together with research institutions to build a scientific data infrastructure that gathers inputs, outputs and outcomes from a variety of sources in an open a fashion as possible."

Did You Know?

A new study says writing about test-related worries for 10 minutes immediately before taking an exam is an effective way to improve test scores in classroom settings.

The work was funded by NSF's Directorate for Education and Human Resources, and was described in a *Science* magazine research report titled "Writing About Testing Worries Boosts Exam Performance in the Classroom."

The researchers concluded that the writing exercise provided students with an opportunity to

Credit: © 2011 JupiterImages Corporation

unload their anxieties before taking the test and thereby freed up brainpower needed to perform successfully--brainpower that is normally occupied by testing worries. The study's authors also say this type of writing may help people perform their best in a variety of pressure-filled situations--whether it is a speech to an audience or a job interview.

FACES OF NSF RESEARCH

NSF Grantees Recognized for Contributions to Engineering, Biology, Education

Frances H. Arnold, Edward Crawley and Leroy Hood (left to right) are three NSF grantees recognized by the National Academy of Engineering in February. Credits: Saul Sandra Photo, David White, Robin Layton.

On February 22, three NSF grantees--Frances H. Arnold, Edward Crawley, and Leroy Hood--were honored by the **National Academy of Engineering** for ground-breaking engineering achievements that have demonstrated significant benefits to society.

Frances H. Arnold and Willem P.C. Stemmer received the $500,000 Charles Stark Draper Prize "for directed evolution, a method used worldwide for engineering novel enzymes and biocatalytic processes for pharmaceutical and chemical products." Arnold and Stemmer came up with separate approaches to directed evolution, which take advantage of different aspects of natural mutation and selection processes. Their methods continue to enable advances in health care, agriculture and biofuels as well as other areas of biology, chemistry and engineering.

Arnold, of the California Institute of Technology (Caltech), has repeatedly received NSF support for her investigations into the engineering of biological systems, including a Presidential Young Investigator Award in 1989 (award number: **8957118**) and 11 additional awards. Stemmer is the chief executive officer of Amunix; he commercialized his method for directed evolution through Maxygen and two spin-out companies.

Edward Crawley was awarded the Bernard M. Gordon Prize "for leadership, creativity, and energy in defining and guiding the CDIO (Conceive-Design-Implement-Operate) Initiative, which has been widely adopted internationally for engineering education." The $500,000 prize will be shared by Crawley and his institution, the Massachusetts Institute of Technology (MIT), so that the educational innovation may continue to develop and spread.

NSF supported Crawley's early career, with a Presidential Young Investigator Award (award number: **8451627**) in 1985 to research practical design methods for creating structures with optimal dynamic properties. He later received NSF support (award number: **9872891**) to establish a hands-on design and fabrication facility for undergraduates in connection with MIT's Engineering Research Center in Innovation in Product Development.

Leroy Hood of the Institute for Systems Biology in Seattle, Wash., received the $500,000 Fritz J. and Dolores H. Russ Prize "for automating DNA sequencing that revolutionized biomedicine and forensic science." The speed of Hood's sequencer transformed the field of genomics--what took 30 years with manual sequencing can be done in less than an hour with automated sequencing. The invention enabled the mapping of the human genome and led to the ability to predict gene function and identify disease-causing genes.

Over three decades, NSF supported Hood's numerous research and education activities, including his leadership of the Science and Technology Center (STC) for the Development of an

Integrated Protein and Nucleic Acid Biotechnology (award number: **8809710**) at Caltech and the STC for Molecular Biotechnology (award number: **9214821**) at the University of Washington.

NSF in the News

A Light on Black Scientists (*The Philadelphia Inquirer*) NSF supported a special program at the Franklin Institute on the significant scientific and technological contributions of African Americans.

'**Not Many Countries Offer Someone Who Comes for Education, an Opportunity to Lead**' (*The Hindu*) NSF Director Subra Suresh is interviewed in one of India's leading newspapers, and discusses priorities for NSF, the role of scientific education in the 21st-century technology landscape, and his specific area of research.

The Ripple Effect

New York Times technology reporter David Pogue travels the globe to examine the latest advancements in materials research and to find out what the future might hold. Here he examines the strength of steel. Credit: Courtesy of WGBH Boston

Materials Research Highlighted in Making Stuff Series

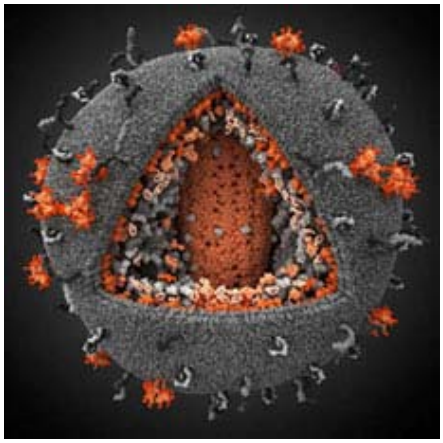
Airplanes that change shape in flight, invisibility cloaks or an Army tanker truck that could heal itself following bullet damage are the tip of the iceberg of creative innovations that may become realities, thanks to materials research.

In the four-part NOVA series, ***Making Stuff: Stronger, Smaller, Cleaner, Smarter***, *New York Times* technology reporter David Pogue traveled the globe to explore the latest advancements in materials research and to find out what the future might hold in this field. The series recently aired on local PBS stations. View the following videos to learn more about the **series** and **where** it was filmed.

Major funding for *Making Stuff* is provided by the National Science Foundation Informal Science Education program with co-funding from the Division of Materials Research and the Directorate for Mathematical and Physical Sciences Office of Multidisciplinary Activities. Additional funding is provided by the Department of Energy. The NOVA team in association with the Materials Research Society produced the series.

Math and Science Teaching Award Nominations Due in May

The Presidential Awards for Excellence in Mathematics and Science Teaching (PAEMST) are the nation's highest honors for teachers of mathematics and science. NSF administers PAEMST on behalf of the White House Office of Science and Technology Policy. Nominations are now being accepted for the 2011 Awards, which will honor math and science teachers working in grades 7-12. Applications must be completed by May 2, 2011. Visit the PAEMST **website** for more information.



Science Visualization Challenge Winners Announced

As researchers gather and generate data, an important part of data analysis comes from visualization of their new information. Scientific visualization not only helps researchers make new discoveries, but also helps communicate science to students and the general public.

NSF and the American Association for the Advancement of Science (AAAS) sponsor an annual contest in science visualization. The winners and honorable mentions for this year's contest are featured in the Feb. 18 issue of the journal *Science*. A list of winners and winning entries can be found in a NSF **press release** and in the NSF **International Science & Engineering Visualization (SciVis) Challenge** Special Report.

This depiction of the Human Immunodeficiency Virus (HIV) took first place in the Illustrations category of the 2010 SciVis Challenge. Credit: Ivan Konstantinov, Yury Stefanov, Aleksander Kovalevsky, Yegor Voronin, Visual Science Company

*The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science and engineering. In fiscal year 2010, its budget is $6.9 billion. NSF funds reach all 50 states through grants to over 1,900 universities and institutions. Each year, NSF receives about 48,000 competitive requests for funding, and makes over 11,300 new funding awards. NSF also awards over $400 million in professional and service contracts yearly. Contact **NSF's Office of Legislative and Public Affairs** for more information or for permission to reuse newsletter images. Editor: Nicole J. Garbarini. Contributors: Ellen Ferrante, Cecile Gonzalez, Sapun Parekh.*

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