## A Cool Way to Strip Hydrogen

Researchers have demonstrated a new laser-based technique for stripping hydrogen atoms from the surface of silicon -- an advance that could significantly reduce the cost and improve the quality of computer chips, solar cells and a wide variety of other semiconductor devices.

The laser technique addresses a key step in the production of microchips, which are typically built by laying down multiple layers of silicon in sequence. To keep each new surface from oxidizing, manufacturers routinely expose it to hydrogen atoms that attach to all available silicon bonds. They then remove the hydrogen atoms by applying heat before adding the next layer of silicon. Unfortunately, this approach can destroy the silicon's crystalline perfection and ruin the chip. By using lasers to strip the hydrogen, manufacturers could potentially work at much lower temperatures, which should dramatically improve yields.

The scientists' work was supported in part by NSF. For more information, see the NSF press release.
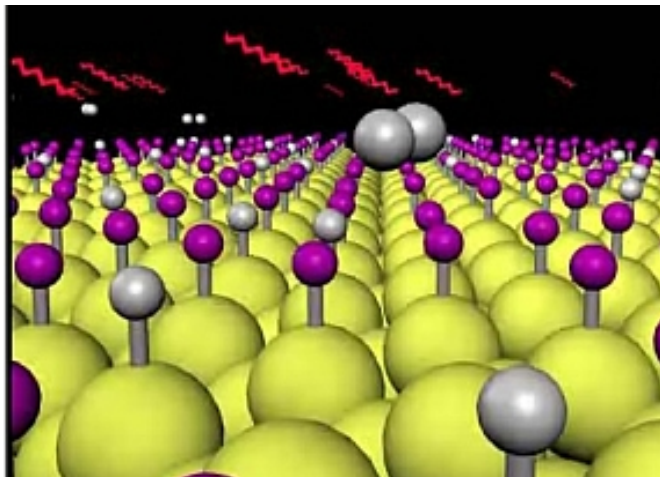
Laser light proved to be a gentle way to clear hydrogen from a silicon surface. Using lasers to clear silicon surfaces could make for cheaper, better computer chips and solar cells. Laser photons (wavy red lines) can clear hydrogen atoms (grey and purple) from the surface of silicon (yellow) at much lower temperatures than conventional techniques. Credit: Brian Muller, Vanderbilt University.

Novel Algorithm Improves the Detection of Cancer Genes
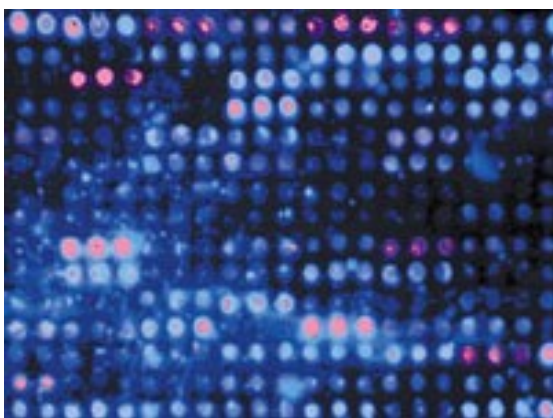
A new algorithm enhances the ability to detect cancer genes by combining and analyzing data generated by "gene chips." The dots show the results of a gene-chip experiment. Credit: ORNL Review.

Researchers at New York University's Courant Institute of Mathematical Sciences have developed a new algorithm that makes it much easier to detect certain cancer genes. As a test, the researchers applied the algorithm to currently available genetic information from lung cancer patients and discovered they could detect many cancer-related genes that were already known -- and several other genes that were not.

This new algorithm works by combining and analyzing data generated by "gene chips," which scan large swaths of a genome at once to find mutations or other changes in DNA.

This research was supported by grants from NSF, the Defense Advanced Research Projects Agency, the U.S. Army Medical Research and Materiel Command, and the New York State Office of Science, Technology and Academic Research. For more, see NSF's "A Better Algorithm for Detecting Cancer Genes."

NSF Supports Redesign of Advanced Placement Courses

NSF has awarded a $1.8-million grant to the College Board to redesign Advanced Placement (AP) courses in biology, chemistry, environmental science and physics. The latest scientific developments, the best practices in science teaching, and the latest research on how students learn will be incorporated into ongoing courses as part of the redesign.

The grant is timely in light of recent calls by President Bush and Congress to train 70,000 new AP science and math teachers and to triple the number of students who successfully complete AP science and math courses. For more on the redesign, which will begin this summer, see "NSF Awards $1.8 Million to Study High-School Advanced Placement Work in Math and Science."

Changes to Advanced Placement courses will reflect the latest research on how students learn. The long-term goal is to increase scientific literacy and encourage more students to pursue advanced-level study and science-related careers. Credit: AbelStock.

Earth's Biodiversity Now on Your Desktop
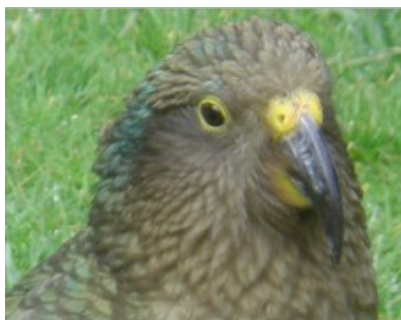
The Global Biodiversity Information Facility provides access to information, including images, on the vast array of Earth's living species. Here, we see a Kea, New Zealand's mountain parrot. Credit: GBIF; Per de Place Bjørn.

Thanks to the Global Biodiversity Information Facility (GBIF), anyone in the world with an Internet connection and an interest in the Earth's living species can now access worldwide networks of biodiversity data.

The GBIF data portal provides access to information, including images, on the vast array of microbial, animal and plant life. GBIF data providers openly share biodiversity data through GBIF Web interfaces, which simplify search procedures and data sharing. Scientists, natural history museums, governments and policy makers are the primary users of the GBIF, although it is equally valuable and accessible to many others, including teachers, horticulturists and nature enthusiasts.

The GBIF is supported by financial contributions from 26 countries. NSF's Office of International Science and Engineering funds the United States' contribution, which constitutes about 20 percent of the total GBIF budget. For more, see the NSF press release.

DID YOU KNOW?

In less than a decade, Google has revolutionized the way the world accesses information on the Web. The search engine is now widely recognized as the world's largest, easy-to-use free service. It returns results in seconds based on a PageRank method, which ranks a particular Web page highly if many other highly ranked Web pages are linked to it.

Google's co-founders Larry Page and Sergey Brin developed the PageRank technology while they were Stanford University graduate students supported by NSF's Digital Libraries Initiative. Together, Page and Brin constructed an ambitious Google-prototype, BackRub, in their university offices based on their PageRank method. PageRank still survives as one of the main components of today's Google search service. See the NSF Discovery for more.

On March 31, 2006, Google reported revenues of $2.25 billion for the first quarter of 2006 – a 79 percent increase over the first quarter of 2005. An NSF investment in basic research helped spawn its creation. Credit: Nicolle Rager Fuller, NSF.

Ucko, Informal Science Education and NSF

When NSF was asked to provide a witness to testify before Congress on museums and federal funding, David Ucko was a natural for the Foundation to "put on exhibit" as he has been in the museum business for almost thirty years. Ucko currently heads NSF's Science Literacy Section and Informal Science Education Program -- the primary source of federal funding for projects that promote public interest, engagement and understanding of science and technology through self-directed learning. The program provides $63 million in grants to more than 200 exhibition, media, community and research projects devoted to informal science and engineering education. We recently talked with Ucko to learn about him and the NSF program he leads.

What attracted you to the field?

I fell into a position at Chicago's Museum of Science and Industry (MSI) in 1979. I had been teaching chemistry at Antioch College in Ohio, but it went bankrupt (and since recovered).

What I enjoyed most about teaching was learning new aspects of science and finding creative ways to help students understand them. Developing exhibits offered a similar challenge for a much larger audience.

I ultimately became Vice President for Programs at MSI, then Deputy Director of the California Museum of Science & Industry in L.A., and President of the Kansas City Museum, where I founded Science City at Union Station.

What (if anything) do all Informal Science Education projects have in common?

Our projects are based on voluntary, self-directed learning that takes place outside the classroom.

That is how the majority of people learn most of what they know. These projects develop rich learning resources for children and adults such as interactive museum exhibitions, television and radio series, after-school programs, the Web, and other approaches.

We reach some 150 million people each year in science museums, community centers, giant-screen theaters, outdoor settings, and homes. The greatest impacts are often on attitudes, motivating interest in science and technology.

How does your program relate to formal education?

Although students and teachers are considered secondary audiences for this program, nearly every project includes linkages to K-12 education. For example, most align science, technology, engineering, and mathematics content with national standards and develop complementary resources for classroom use. Many incorporate programs for parents and teachers, too.

What do you enjoy the most at NSF?

Two things. One is being able to move the field forward. We require all projects to demonstrate innovation and how they will advance the practice or knowledge of informal science education. The other is working with a group of really smart people.

What's your favorite museum exhibit or program?

It would be like choosing a favorite child. I'd get into lots of trouble picking one!

> *"We reach some 150 million people each year in science museums, community centers, giant-screen theaters, outdoor settings, and homes. The greatest impacts are often on attitudes, motivating interest in science and technology."*

See Ucko's complete testimony before the U.S. Senate Committee on Homeland Security and Governmental Affairs Subcommittee on Federal Financial Management, Government Information, and International Security.

Corps' Levee Work Is Faulted *Los Angeles Times (05/22/06)* -- Report says barriers in New Orleans may fail again and mistakes by federal engineers raise questions about their competence nationwide. The mistakes raise concerns about whether the corps is competent to oversee public safety projects across the nation, said Raymond Seed, a UC Berkeley civil engineering professor who led the investigation, which the NSF sponsored shortly after Katrina struck.

Senate Bill Would Require Online Posting of Federal Research *Chronicle of Higher Education (05/03/06)* -- U.S. Sens. John Cornyn (R-Texas) and Joseph Lieberman (D-Conn.) have proposed legislation that would require federal agencies spending more than $100 million a year on research to create a freely accessible online repository of the results of research they funded within six months of publication. The measure would apply to work funded by the National Science Foundation.

The Next Bright Idea *Federal Computer Week (05/01/06)* -- President Bush's American Competitiveness Initiative will double the National Science Foundation budget within a decade.

NSF PERSPECTIVES

NSF Director Arden L. Bement, Jr., Speaks Out on Education and Cyberinfrastructure
Read excerpts from his latest editorials. . .

Ensuring the health and vitality of our nation's education

"An Invitation to Transform the Classroom"
by Arden L. Bement, Jr.

NSTA WebNews Digest
May 11, 2006

One of the pressing issues for those in the U.S. educational system is the need to attract and train a cadre of skilled workers who will maintain our prominence in science and technology.

The National Science Foundation (NSF), the federal agency responsible for funding fundamental research in the United States, also supports science and engineering education. At NSF, we believe that one of the best ways to train the workforce is to transform the classroom into a discovery-enriched setting that can empower you and your students.

NSF-funded programs provide a cornucopia of opportunities for teachers to explore new fields and to work side-by-side with professional scientists on cutting-edge research projects, such as the Research Experiences for Teachers program. Teachers receive ongoing support in transforming what they've learned into lesson plans.

As teachers and educators, you are on the front line of generating a high-quality workforce for the nation. You are supported both by NSF and by the vast network of research professionals eager to share their knowledge and resources. So as you step outside your classroom this summer, I invite you to step into the broader world of teaching and learning, and explore the enchanting possibilities for the upcoming season. *To see the complete editorial, visit NSTA Reports Vol. 17, No. 8.*

"Progress, Prosperity and the Cyberinfrastructure"
by Arden L. Bement, Jr.

Computerworld
May 08, 2006

Cyberinfrastructure - stimulating advances in 21st century science and engineering
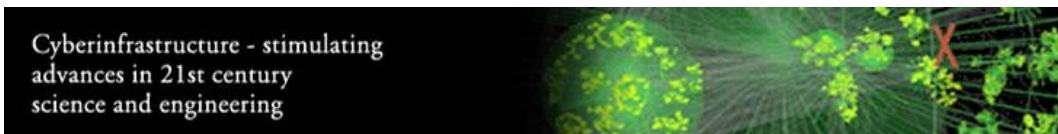
The term *cyberinfrastructure* resembles something from a William Gibson novel, but the National Science Foundation is working to make it a reality. Webster's New World College Dictionary defines *infrastructure* as the basic facilities needed for a society to survive and grow. Expanding this definition, cyberinfrastructure, or CI, is the essential IT infrastructure needed for the U.S. to prosper in a global knowledge economy.

The U.S. economy is inextricably linked to technological innovation and therefore to fundamental scientific research. CI is both an object of research and an enabler of research. As the object of research, CI programs will lead to a better understanding of the impact and use of advances in science, industry and academia. As an enabler of research, CI will help scientists answer today's complex questions, paving the way for future discovery.

By definition, CI represents collaboration and community. The NSF can't develop a national cyberinfrastructure in a vacuum. We absolutely need the ideas and talents of other federal agencies, industry and academia. Cooperation with other federal agencies will reduce duplication of effort and promote effective stewardship of tax dollars. Private-sector involvement will ensure that CI is built upon open standards for interoperability. Partnership with the research and education community will help the NSF balance efforts to meet the specific needs of the various disciplines with the development of shared CI components that are useful across the disciplines. Guidance from educators will help us position CI as a learning and workforce-development tool.

Learning and workforce development are critical. It is fruitless to produce new, nearly magical technologies without also creating an educated force of students, scientists and workers who can use and maintain those technologies. We need to develop workers who are as skilled with CI as they are with iPods. In the future, CI will be just as ubiquitous and as revolutionary. *For more on NSF and cyberinfrastructure, see the full editorial in Computerworld.*

The National Science Foundation (NSF) is an independent federal agency that supports fundamental research and education across all fields of science with an annual budget of nearly $5.58 billion. NSF funding reaches all 50 states through grants to roughly 1,700 universities and institutions. Each year, NSF receives about 40,000 competitive requests for funding and makes about 10,000 new funding awards. The NSF also awards over $400 million in professional and service contracts yearly. Contact NSF's Office of Legislative and Public Affairs for more information, to unsubscribe, or for permission to reuse newsletter images.