

NSF AT WORK

A Glimpse of Our Ancestors

A research effort, funded for nearly 30 years by the National Science Foundation (NSF), has culminated in a major discovery about early human evolution. In a special Oct. 2 issue of the journal *Science*, [NSF-funded researcher](#) Tim D. White of the University of California, Berkeley along with 46 other scientists, describes the discovery of 4.4 million-year-old fossils of an early hominid species, *Ardipithecus ramidus*. Until now, a different hominid species, *Australopithecus afarensis*, which lived 3 to 4 million years ago, was believed to be the oldest hominid ancestor that could be directly linked to modern-day humans.



Portion of *A. ramidus* jawbone. Credit: Tim White

The discovery of *Ardipithecus* extends the range of knowledge of the last common ancestor shared by chimpanzees and modern humans thought to have lived at least 6 million years ago, and reveals important details about the nature of this ancestor and the transition to upright walking. These new fossils and other evidence about the habitat that *Ardipithecus* lived in show that many earlier hypotheses about the last common ancestor of humans and chimpanzees were incorrect. This new discovery suggests that the last common ancestor had limb proportions and feet more like monkeys than like great apes. The lower back was quite mobile and may have had as many as six lumbar vertebrae, instead of the three to four found in African apes. This suggests that *Ardipithecus* could walk upright, although it did so on feet with a grasping big toe. Read more about this major discovery [here](#).

Teaching the Teachers



Anita Edwards, middle school teacher and CUSRP participant. Credit: Columbia University

Research experiences for science teachers can have a direct impact on the achievement of their students, increasing their performance significantly on state assessments. There are also economic benefits—to the schools and to society at large—in having science teachers take part in research experiences. These findings are reported by Samuel C. Silverstein of Columbia University and colleagues in the Oct. 16 issue of the journal *Science*. Dr. Silverstein is the founder and director of Columbia University's Summer Research Program for Secondary School Science Teachers (CUSRP).

CUSRP brings middle and high school science teachers from the New York City metropolitan area to Columbia's campuses to work on research projects, under the guidance of faculty mentors, for two successive summers. Funded in part by NSF, the teachers work in all scientific disciplines from biology and medical sciences to chemistry, physics, astronomy, engineering and earth sciences.

The *Science* paper describes how, over time, students of teachers who participated in CUSRP outperformed other students in New York State's Science Regents examinations (the state's annual assessment) by 10 percentage points.

Silverstein and his co-authors document the economic benefits of this program to students, state and federal departments of education, and society at large. They estimate that CUSRP returns to New York City's Department of Education \$1.14 for every dollar invested. These savings are realized from increased teacher retention and decreased need for students to repeat coursework. Read more about the project and view a video interview with Dr. Silverstein [here](#).

Funding Innovation

The Institute for Disabilities Research and Training, Inc. ([IDRT](#)) of Wheaton, Md., has developed a low-cost, sensor-equipped system for translating hand and finger motion into information. The device, known as the AcceleGlove, went to market this year and was developed with the support of [funding](#) from NSF's Small Business Innovation Research (SBIR) program.

The AcceleGlove has a range of applications, including translation of sign language. This could help first responders and health providers communicate with individuals who are deaf or hard of hearing. Military applications are also possible, as the device would allow soldiers to silently communicate through hand signals.

IDRT just received its first patent on the technology and is working with [AnthroTronix](#) of Silver Spring, Md., also an NSF SBIR [awardee](#), to further develop AcceleGlove. New applications include augmented and virtual reality, and gaming.

Two other SBIR projects have recently borne fruit. Magnetic Development, Inc., of Madison, Conn., is developing industrial refrigerators that will run 30 to 40 percent more efficiently than current systems. With SBIR [funding](#), Magnetic Development was able to recruit two high school students to assist with the research and development. Read more [here](#).

And, with the support of an SBIR [award](#), [NoblePeak](#) of Wakefield, Mass., developed advanced infrared imaging technology using new materials that integrate germanium pixels with standard silicon components. The result is a low-cost, high-resolution short-wave infrared (SWIR) imaging technology that can be integrated into a range of devices to assist with security, research and other applications. Building from initial NSF support, NoblePeak now has a range of supporters and has grown from two employees to 20.



The AcceleGlove. Credit: Mike Tillman



Gentoo penguins watch the Research Vessel *Laurence M. Gould* near Petermann Island. The *Gould* is one of two research vessels operated by NSF in Antarctica. Credit: Christine Hush, NSF

Antarctic Research Season Ramps Up

For the U.S. Antarctic Program (USAP), conducting scientific research at the bottom of the world is a year-round affair, but during the brief Antarctic summer, weather conditions make it possible for hundreds of researchers and support staff to conduct additional experiments and expeditions around the continent.

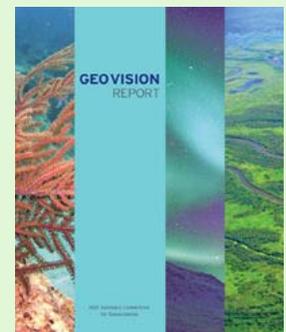
This year's research season is already underway, and will explore how climate change is impacting the melting of glaciers and ice sheets. Additional studies are aimed at unraveling the mysteries of how the universe was formed in the moments after the Big Bang.

Antarctica provides a unique platform for these types of research endeavors, and the USAP fosters U.S. leadership in scientific research on the continent.

DID YOU KNOW?

NSF's Advisory Committee for Geosciences has released a new report, "*GEOVISION: Unraveling Earth's Complexities Through the Geosciences.*" The report, which is an update of an earlier report published in 2000, provides a blueprint to guide basic research needed to address global climate change.

The authors provide a vision for the future of research in the geosciences as focused on fostering a sustainable future through a better understanding of our complex and changing planet. The report recommends a new emphasis on interdisciplinary research in order to achieve reasoned and scientifically sound insights for policy makers. A copy of the report can be [downloaded](#) from NSF's Web site.



FACES OF NSF RESEARCH

Nobel Prize in Economics



Elinor Ostrom. Credit: Indiana University

This year's Nobel Prize in Economics is shared by two NSF-funded researchers, [Elinor Ostrom](#) of Indiana University (IU) and Oliver E. Williamson of the University of California, Berkeley.

Ostrom is the first woman to win the Nobel award in Economics and is one of a record five women to win Nobel prizes this year. Ostrom is the Arthur F. Bentley Professor of Political Science in the College of Arts and Sciences and a professor in the School of Public and Environmental Affairs at IU—Bloomington. She is co-founder and senior research director of the Workshop in Political Theory and Policy Analysis at IU. She served as president of the American Political Science Association in 1996-97 and was the first woman to chair IU's Department of Political Science, a post she held from 1980 to 1984.

In announcing this year's Nobel laureates, the Royal Swedish Academy of Sciences wrote: "Elinor Ostrom has challenged the conventional wisdom that common property is poorly managed and should be either regulated by central authorities or privatized. Based on numerous studies of user-managed fish stocks, pastures, woods, lakes and groundwater basins, Ostrom concludes that the outcomes are, more often than not, better than predicted by standard theories. She observes that resource users frequently develop sophisticated mechanisms for decision-making and rule enforcement to handle conflicts of interest, and she characterizes the rules that promote successful outcomes."

Ostrom's approach to research in economics differs from the norm in that she investigates how cooperation between people, rather than self-interest, leads to economic benefits. Ostrom's work is aimed at finding ways to manage resources in the face of population growth and increasing prosperity. As the Nobel judges noted, her work puts her outside the mainstream of economic thought and raises questions about widely-held assumptions in the field of economics.

Read more about this Nobel prize-winning work and that of other NSF-funded Nobel laureates [here](#).

NSF IN THE NEWS

[Burst of Technology Helps Blind to See](#) (*The New York Times*) Scientists are developing an artificial retina that is allowing the blind to see for the first time. The device consists of electrodes implanted in the eye and a tiny camera mounted on the bridge of the nose. The work was partially funded by NSF.

[New Nanodots Could Lead to Improved Memory Chips](#) (*EE Times*) New magnetic nanodots developed by NSF-funded researchers can deliver 1 terabit of memory per square centimeter. This new material could potentially lead to ultra-dense memory chips.

[South Dakota Lab Receives \\$29 Million](#) (*Associated Press*) NSF has authorized \$29 million to develop a plan to convert a former gold mine in South Dakota into the world's deepest underground laboratory. The 8,000-foot-deep lab, shielded from cosmic radiation, will be used for high-energy physics experiments.

[The Big Muddy Can Save Coastal Louisiana](#) (*Houston Chronicle*) A recent study, funded by NSF, estimates that there is enough sediment in the Mississippi River to save large areas of coastal Louisiana from sinking into the Gulf of Mexico if half of the river's muddy waters were diverted into the disappearing wetlands on either side of the river.

[High Speed 'Other' Internet Goes Global](#) (*Yahoo News*) A super high-speed global Internet devoted solely to science and education has just expanded to include half the countries of the world. The Taj network, funded by NSF, now connects India, Singapore, Vietnam and Egypt to the larger Global Ring Network for Advanced Application Development and improves links to China and the Nordic region.

THE RIPPLE EFFECT

special report:

DEAD ZONES

The Earth currently has more than 400 "dead zones"—marine expanses covering hundreds, or even thousands, of square miles that periodically become virtually lifeless. An NSF [special report](#) explores the surprising causes of Oregon's dead zones, and the pioneering methods used to investigate them.

Winning (Linguistics) Gold



The 2009 IOL Team. Credit: NSF.

America didn't have to wait for this winter's games in Vancouver for Olympic glory. High school students from across the U.S. won individual and team honors

in August of this year at the seventh annual International Olympiad in Linguistics (IOL) held in Wroclaw, Poland. NSF provided financial support for the 2009 U.S. teams.

The U.S. fielded two teams at the 2009 Olympiad, which featured competitors from 17 countries, including Australia, Germany, India, South Korea and Russia. The results reflect U.S. leadership in computational linguistics, an emerging field that has applications in computer science, language processing, code breaking and other advanced arenas. This is the third straight year the U.S. has fielded successful teams in the IOL.

NSF Congratulates 2009 Nobel Laureates

Among this year's Nobel laureates are four individuals who have received support from NSF for their research: Jack W. Szostak, who shared the prize in physiology or medicine; Elinor Ostrom (whose work is profiled elsewhere in this issue) and Oliver E. Williamson, who shared this year's prize in economics; and Thomas A. Steitz, who shared the prize in chemistry.

"Through a highly competitive, merit-based system, NSF is in the business of identifying raw scientific talent early, funding promising research and fueling discovery," said Arden L. Bement, Jr., NSF director. "This year's Nobel Prize recipients embody the investment of America and of the NSF in talented and hardworking researchers whose contributions improve the global future for society and mankind."

This year's prizes bring the total number of Nobel laureates whose work has been supported by NSF to 187. Further information about their research is available in a [special report](#) on NSF's Web site.



NSF Briefing on the Hill

Future of Learning Education Technology Showcase

Date: Wednesday, November 4, 2009

Time: 10:00 a.m.—1:00 p.m.

Location: 902 Hart Senate Office Building



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 2009, its budget is \$9.5 billion, which includes \$3.0 billion provided through the American Recovery and Reinvestment Act. NSF funds reach all 50 states through grants to over 1,900 universities and institutions. Each year, NSF receives about 44,400 competitive requests for funding, and makes over 11,500 new funding awards. NSF also awards over \$400 million in professional and service contracts yearly. NSF expects to make an additional 3,000 awards with the Recovery Act funds. Contact [NSF's Office of Legislative and Public Affairs](#) for more information, to unsubscribe or for permission to reuse newsletter images.