NSF Highlights

Examples of template use, December 2011

Soft Glacier Beds Can Act Tough

Outcome: Detailed observations of ice motion and the underlying geology at an Iceland glacier show that a layer of glacially-transported sediments at the glacier's toe provides extra resistance to ice flow. The sediments, called "till," act as a barrier, holding back the ice behind it. Previously, scientists thought till was too weak to provide such resistance.

Impact/ benefits: The flow of glaciers and ice sheets, and their responses to climate change, are largely controlled by processes at the base of the glacier--processes that are poorly understood by scientists. The finding that till can provide extra resistance to flow overturns conventional wisdom and will help guide future modeling efforts.

Explanation: Computer models that predict how ice sheets and glaciers will change in the future currently don't include a realistic treatment of basal motion, partly because it is difficult to observe processes occurring beneath hundreds of meters of ice. Scientists are particularly concerned about glaciers with thick till at their bases, because of the possibility that till could help ice slip along the bed, making those glaciers more sensitive to changes in ambient conditions. The Iceland findings suggest that till may play the opposite role.

The study used a large network of global positioning system receivers, ice-penetrating radar systems and mathematical models to determine how forces in the glacier changed over time.

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Smartphone Technology Improves Opportunities for Deaf Science Students

Outcome: Deaf and hard-of-hearing college students can now use smartphones in science labs and at field sites to read written translations of their professor's instruction, thanks to an inexpensive technology created by researchers at the Rochester Institute of Technology's National Technical Institute for the Deaf.

Impact/ benefit: The new smartphone application has the potential to revolutionize lab-based learning for the 24,000 deaf U.S. undergraduates studying science, technology, engineering, and math. The breakthrough learning tool is providing greater access to both learning opportunities and career advancement.

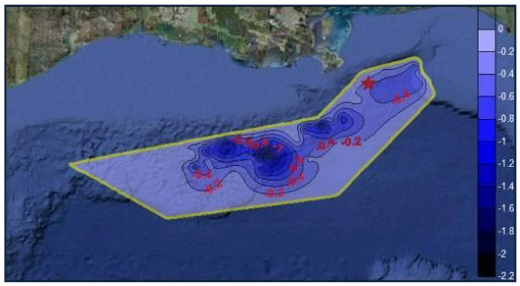
Explanation: For decades students have relied on costly sign language interpreters who struggle to learn complex scientific vocabularies. Now, advances in remote, real-time, speech-to-text translation technology, including *C-Print*® captioning, allow hearing professors and deaf students to communicate more effectively. The Rochester researchers paired *C-Print* applications with smartphone technology developed by Samsung, Verizon, Windows, and Google.

Bacteria Consumed Methane Released From Deepwater Spill

Outcome: Researchers have determined that bacteria consumed the vast majority of methane released during the Deepwater Horizon oil spill in 2010.

Impact/ benefit: A study by researchers at Texas A&M University, the University of California-Santa Barbara and the University of New Hampshire suggests that methane-eating bacteria can efficiently consume the methane released during an intense acute event, and should be able to do so under other conditions, such as the slow, steady methane release that occurs naturally.

Explanation: Methane escapes continually from the seafloor in many parts of the world's oceans. In addition, large-scale methane releases have occurred from ocean sediments in concert with past climate changes. This study helps quantify the ocean's capacity to respond to both kinds of events.



A powerful greenhouse gas, methane was the single most abundant component of the mixture of material released following the rupture of the Deepwater Horizon oil well in April 2010. The researchers were able to determine that the vast majority of methane was not released to the atmosphere. Instead, it dissolved in the deep water, where bacteria responded quickly, consuming it within months.

Because sediments in many areas of the world ocean release methane regularly, a secondary but important benefit of the study is the knowledge that resident microbes are easily capable of destroying these slow but steady emissions before they enter the atmosphere.

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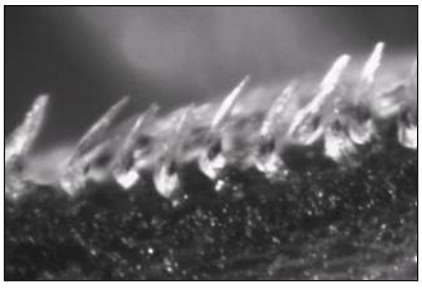
Shark Skin Inspires New Designs

Outcome: Researchers from the University of Alabama, University of South Florida and Mote Marine Laboratory have identified skin characteristics that propel and turn fast-moving sharks through the water.

Impact/ benefits: Shark skin provides a model for the design of more efficient aircraft, submarines and helicopters. These advanced, nature-inspired designs could ultimately help us conserve energy and enhance our national security efforts.

Explanation: The skin and denticles (scales) of sharks represent more than 400 million years of natural selection for swimming efficiency. The researchers found that sharks have developed unique mechanisms--including scale flexibility and bristling--that decrease drag, increase fin performance (e.g., turning control, assisting in thrust) and enhance turning agility at fast speeds.



The scientists used fast-swimming sharks such as the shortfin mako (*Isurus oxyrinchus*) to conduct their analyses. Their findings may help spur the design of civilian and military aircraft, rotorcraft and underwater vehicles that feature decreased drag, increased speed and maneuverability, and reduced noise, as well as fuel savings.