

LETTERS

Edited by Jennifer Sills

Partnering with Cuba: Weather extremes

WE SUPPORT THE RECENT Editorial on “Science diplomacy with Cuba” (G. R. Fink, A. I. Leshner, V. C. Turekian, 6 June, p. 1065). Many groups in the United States seek greater cooperation with Cuba in the earth sciences. Similar to the disease mitigation discussed in the Editorial, there is a long history of scientific advances that could save lives and reduce losses with greater cooperation.

Cuban scientists did forecast the severity of the 1900 Galveston hurricane and could have helped the nascent U.S. Weather Bureau in Galveston mitigate fatalities and losses (1). More recently, after the devastating 2010 M_w 7.0 Haiti earthquake, the National Science Foundation supported the development of the Continuously Operating Caribbean Global Positioning System (GPS) Observational Network (COCONet) (2), a GPS and meteorological network in the circum-Caribbean designed to help understand tectonic and weather extremes in a complex geologic and atmospheric region. Partially facilitated by a previous AAAS delegation visit to Cuba in December 2011, a new GPS station was recently installed in Camagüey, Cuba, and is a critical component of COCONet. More broadly, COCONet involves more than 38 nations and everyone benefits from international cooperation and diplomacy that

revolve around research, education, and broader impacts such as risk resiliency and enhancing the quality of life.

We encourage easing restrictions so that government science agencies may cooperate more fully on science and education. For example, the Cuban Meteorological Institute, Cuban Nuclear Agency, the National Seismological Center, and the Astronomical and Geophysical Institute could then cooperate with their U.S. counterparts on natural hazards research.

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Partnering with Cuba: Earthquake hazards

THE 6 JUNE EDITORIAL BY G. R. Fink, A. I. Leshner, and V. C. Turekian advocates “Science diplomacy with Cuba” (p. 1065). I agree. Both countries could benefit from a joint evaluation of earthquake hazards in southeastern Cuba.

The cities of Santiago de Cuba and Guantánamo, including the U.S. base and prison, are close to the offshore, seismically active Oriente plate-boundary fault (1), but the earthquake danger from this fault has not been studied. The fault occupies the narrow Oriente Deep (1, 2) and skims the northern boundary of Haiti into the Dominican Republic, where paleoseismic analysis of the Septentrional fault shows evidence of earthquakes and a slip rate of 6 to 12 mm/year (3). This is about half of the total slip rate between the North American and Caribbean plates and serves as a proxy for the slip rate estimated for the Oriente fault off the coast of Cuba. No historical earthquake has ruptured the Oriente fault, indicating that the fault may be in a seismic gap. The United States has the expertise to help Cuba respond to its earthquake hazard by upgrading their seismic and global positioning system (GPS) networks, conducting paleoseismic studies along the coast to learn the earthquake history of the Oriente fault, and upgrading buildings at risk from an Oriente fault earthquake.

Robert S. Yeats

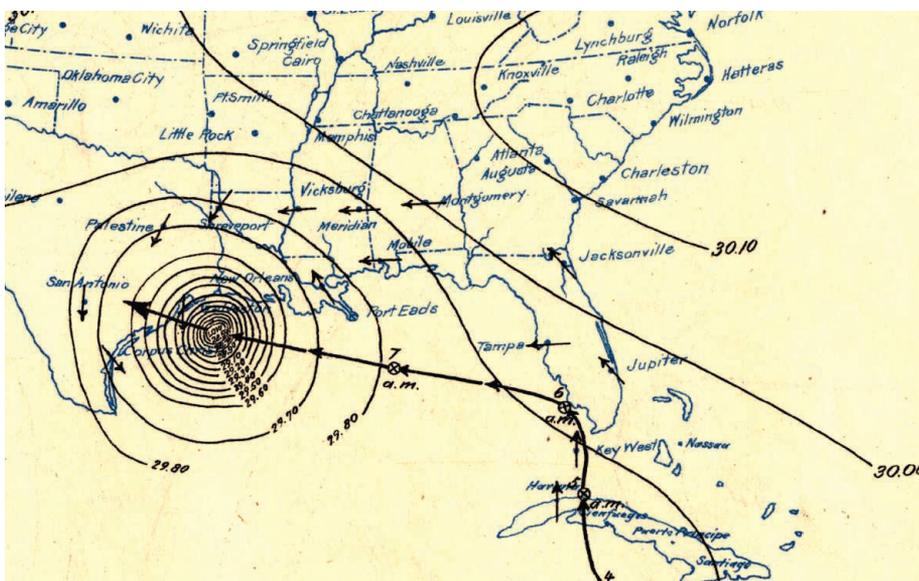
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Delisted whales good news for pipeline

ON EARTH DAY (22 APRIL), the Canadian government removed the North Pacific humpback whale, which lives off British Columbia's coast, from the list of threatened species (1, 2). The delisting was based on sound scientific advice by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (3, 4), but the downgrading from threatened to a species of special concern occurred just before the federal decision to approve the development of the Enbridge's Northern Gateway pipeline mega-project in the humpbacks' habitat in the summer of 2014 (1, 2, 5). The delisting from threatened status raised concerns among environmental groups (4, 5), who viewed it as a fast-tracked political decision driven by economic factors (1, 2). The decision has implications for the whales' critical habitat, which does not have to be protected once the species is downlisted, and questions linger about whether whale



use of the habitat, an impediment for the Enbridge's project and maritime traffic of oil tankers, was suitably assessed (5).

After being decimated off British Columbia's coast by commercial whaling from the early 1900s to mid-1960s, the current North Pacific humpback whale population has bounced back to approximately 18,000 adult individuals (6–8). However, the local population using British Columbia's coastal waters as feeding and

migrating grounds is still small (2145 whales) relative to the estimated pre-whaling levels (about 4000 whales), and the whales face increasing anthropogenic impacts, including vessel strikes, underwater noise, oil spills, and prey reduction (3, 7–9). Because of the small population size and threats to its habitat in this region, British Columbia humpbacks should be designated as a special management unit. This management unit should

be defined in the context of risk management in a given region and season, which may or may not be equivalent to a single biological stock, and it should aim to avoid local extirpations and imply that local depletion will recover to healthy levels on a management time scale (10).

On 17 June 2014, the Enbridge's project was approved by Canada's Prime Minister (11). If this project proceeds, these whales will be exposed to increased risk from tanker traffic and oil spills. The Canadian government should stand by its responsibility to preserve marine mammals and their habitats.

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OUTSIDE THE TOWER

A night at the museum

At midnight I survey the scene. On the far end of the room, a levitating train makes circles by a whale exhibit, demonstrating exciting applications of superconductors. As it passes, nearby spectators in dinosaur pajamas learn about water bears. To my right, several adults giggle as they practice using hula hoops to demonstrate hypothesis-driven science. To my left, on the other end of the room, a woman in jeans holds a knife over a human brain, preparing to make a slice through the hippocampus. Throughout the room, speakers in red shirts are enthusiastically demonstrating science.

Science often requires lab work long after sunset, but tonight we've left the lab and our ivory tower behind and brought our most exciting research with us. Since 2011, the California Academy of Sciences has held Penguins and Pajamas Sleepover for grown-ups, an annual event in which the regular museum exhibits are open to the public overnight. This year, it became a public venue for science after sunset as I, along with Mary Cavanagh, invited 40 Stanford postdocs to don red shirts and bring interactive demonstrations of their current research to share (1, 2).

Our visitors seemed tentative at first, looking at the myriad exhibits but reluctant to approach us. We broke the ice by starting conversations, and suddenly everyone was visibly engaged in the cutting-edge science taking place right around the corner. Some people were interested in brain function and

peppered Viola Caretti with questions. Others wanted to know more about magnetism and superconductivity from Stefano Bonetti. A bar provided guests with drinks under the projection of artistic science images curated by Ermelinda Porpiglia, and late at night guests could find a unique place to sleep next to live penguins or by the light of glowing jellyfish.



Stefano Bonetti pours liquid nitrogen to cool a superconductor for a levitating train experiment.

At first light, the crowd dispersed and the postdocs packed up their materials and went home. In the months since that night, Stanford postdocs have continued to perform their science at museum events, satisfied in knowing they can make science come alive.

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