

PERSPECTIVES

SCIENCE DIPLOMACY

Reboot Gitmo for U.S.-Cuba research diplomacy

Transform Guantánamo into a peace park and ecological research center

By Joe Roman¹ and James Kraska²

Cuba has about 5000 km of coastline, including coral reefs, mangrove wetlands, seagrass beds, and tropical wet forests. Long stretches of coast remain undeveloped, with relatively high levels of fish biomass and marine biodiversity in marine parks that are unparalleled in the Caribbean (1, 2). But on the eve of President Obama's visit to Cuba, we must consider whether normalization of relations between the United States and Cuba, with anticipated expansion of coastal

development and return of industrial agriculture, might reverse Cuba's advances in ecological conservation. We propose an approach to protect Cuba's coastal ecosystems and enhance conservation and ecological research throughout the Caribbean.

POLICY The United States should deliver on President Obama's recent plan to close the military prison at U.S. Naval Station Guantánamo Bay and repurpose the facilities into a state-of-the-art marine research institution and peace park, a conservation zone to help resolve conflicts between the two countries. This model, de-

signed to attract both sides [similarly, see (3)], could unite Cuba and the United States in joint management, rather than serve as a wedge between them, while helping meet the challenges of climate change, mass extinction, and declining coral reefs.

The U.S. presence at Guantánamo dates back more than a hundred years. The United States helped Cuba fight for independence from Spain in the 1890s and then occupied the island in 1898. As part of the Cuban-American Treaty, Cuba was granted independence in 1902, but the U.S. Platt Amendment required Cuba to rent Guan-



Final approach? Mangroves dot Guantánamo Bay with the U.S. naval base airstrip seen in the distance. Might the contentious base become a research and diplomatic centerpiece in U.S.-Cuba relations?

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tánamo Bay to the United States as a coal-
ing and naval station, a perpetual lease that
could be broken only by mutual consent.
Since the 1960s, the Cuban government has
regarded the U.S. presence as illegal, refus-
ing to cash the annual \$4085 rent check.
The Community of Latin American and Car-
ibbean States recently called for returning
the base to Cuba.

The Obama Administration has made it
clear that diplomatic relations with Cuba
and the transfer of detainees do not mean
that it is willing to discuss the return of the
117 km² Guantánamo base to Cuba anytime
soon (4, 5). Although we believe that even-
tually giving the land back to Cuba would
be a good outcome, we take the Administra-
tion at its word and propose a third path
that would benefit Cuba, the United States,
and beyond. The November 2015 agreement
between the United States and Cuba on sis-
ter sanctuaries, including the Florida Keys
National Marine Sanctuary and Guanaha-
cabibes National Park on the west coast of
Cuba, illustrates the current goodwill be-
tween the countries and could help foster
dialogue to consider our proposal.

“WOODS HOLE” OF THE CARIBBEAN.

Why would Cuba accept anything short of
an immediate return of the base? A park
that commemorates the history of the
area and uses existing infrastructure for a
research center would give global recogni-
tion to the country’s conservation efforts. It

would provide financial support, up-to-date
facilities for ecological and environmental
work, and an opportunity to build capacity
and train Cuban scientists and students, es-
pecially those from the surrounding eastern
provinces. A parcel of the land, perhaps on
the developed southeastern side of the base,
could become a “Woods Hole of the Carib-
bean,” housing research and educational
facilities dedicated to addressing climate
change, ocean conservation, and biodiver-
sity loss. With genetics laboratories, geo-
graphic information systems laboratories,
videoconference rooms—even art, music,
and design studios—scientists, scholars,
and artists from Cuba, the United States,
and around the world could gather and
study. The new facilities could strive to be
carbon neutral, with four 80-meter wind
turbines having been installed on the base
in 2005, and designed to minimize ecologi-
cal damage to the surrounding marine and
terrestrial ecosystems.

With a reduced U.S. footprint at Guantá-
namo, most of the land and sea could be re-
turned to native wildlife. The area provides
habitat for many endemic species, such as
the vulnerable Cuban iguana (*Cyclura nu-
bila*), and it may be a critical refuge for the
West Indian manatee (*Trichechus manatus*)
(6). It is an important nesting area for the
endangered green turtle (*Chelonia mydas*)
and critically endangered hawksbill turtle
(*Eretmochelys imbricata*). The tropical
dry forests on the base are relatively rare
in Cuba, and the station hosts important
Caribbean coastal habitats, such as sandy
beaches, mangroves, coral reefs, and sea-
grass beds. The granadillo tree (*Brya eb-
enus*), spiny lobster (*Panulirus argus*), and
several reef fishes have been overharvested
and require better management. The two
countries could work together to restore
native species and fight noxious invasives,
such as lionfish (*Pterois* spp.), African cat-
fish (*Clarius gariepinus*), and marabou (*Di-
chroptachys cinerea*).

There are signs of progress in protecting
Caribbean coastal ecosystems. Islands like
Bermuda and Bonaire have moved forward
on coral reef conservation, largely by protect-
ing their reef fishes (7). After the 1992 Earth
Summit in Rio de Janeiro, Cuba developed a
strong tradition of environmental protection.
More than an “accidental Eden” (8), Cuba has
extensive protected areas, a constitution with
strong environmental provisions, and an ag-
gressive stance on climate change, putting it
at the center of Caribbean conservation ef-

forts. It has established the largest marine
park in the Caribbean, the Jardines de la
Reina (Gardens of the Queen), with abun-
dant sharks and groupers (9).

CONVERSION AND REDEMPTION. The
Guantánamo Naval Base serves the U.S.
Fourth Fleet and is a hub for law enforce-
ment and mass migration operations. Yet,
as early as the 1970s, the base has been pro-
posed as a bargaining chip to help normal-
ize U.S. relations with Havana (10). By the
end of the Cold War, the U.S. Department of
Defense considered closing the base (11). As
U.S. involvement in wars in Afghanistan and
Iraq winds down and detainees are released
or subject to criminal trial, perhaps the
most compelling reason for the Pentagon to
possess the base disappears. Although the
station supports other missions, including
regional counterdrug operations, maritime
migration interdiction, search and rescue,
and humanitarian assistance, Naval Air Sta-
tion Key West, only 90 miles away, can meet
most of these needs. Because Guantánamo
is not in any U.S. congressional district,

**“...the name Guantánamo
could become associated
with...efforts to preserve
and repair...the planet.”**

there would not be a fight over jobs at risk
of being lost.

The move would extend a long tradition
of U.S. naval support of marine scientific re-
search and operational oceanography. More
important, opening up Guantánamo would
facilitate exchange, the two countries learn-
ing from each other. The peace park and
research center would enhance capacity,
technological transfer, and scientific facili-
ties for Cuban researchers.

The world’s first peace park is the Water-
ton-Glacier International Peace Park on the
border of Canada and the United States, a
symbol of goodwill between the countries
(12). There have been successful transitions
from military bases and conflict zones in
other countries. After the United States left
Fort Clayton to Panama, for example, part
of the base was transformed into Ciudad de
Saber (City of Knowledge), a government-
sponsored complex that has attracted inter-
national scholars and the United Nations
Development Program. Although the future
of land along the corridor of the former
Iron Curtain is uncertain, the European
Green Belt initiative could transform the
continent and help species such as lynx,



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brown bears, and imperial eagles recover (13). Such international parks are signs that humans can respect each other, even after conflicts, and protect other species that share our planet. In transforming the base, we should not forget the past. Efforts such as the Guantánamo Public Memory Project (gitmomemory.org), which seeks to build awareness of U.S. history in the area, should be supported.

We hope that Pope Francis, who played an essential role in restoring relations between Cuba and the United States, will contribute to advancing a peaceful future for Guantánamo, in which both countries benefit. In the first papal encyclical on the environment, *Laudato Si'*, he called for an ecological conversion and the widespread protection of biodiversity, remarking on the decline of coral reefs, "Who turned the wonderworld of the seas into underwater cemeteries bereft of colour and life?" (14). Humans did, of course, through overfishing, deforestation, pollution, and burning fossil fuels (15). And humans can turn it around.

A first step in returning the land to Cuba, the Guantánamo peace park and research center would encourage nations to convert military bases and conflict zones into areas of creativity, cooperation, and biodiversity conservation. For the next generation, the name Guantánamo could become associated with redemption and efforts to preserve and repair international relations and the planet. ■

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PHYSICS

Squeezing into superconductivity

Synchrotron light sources can be used to probe superconductivity at extreme pressures

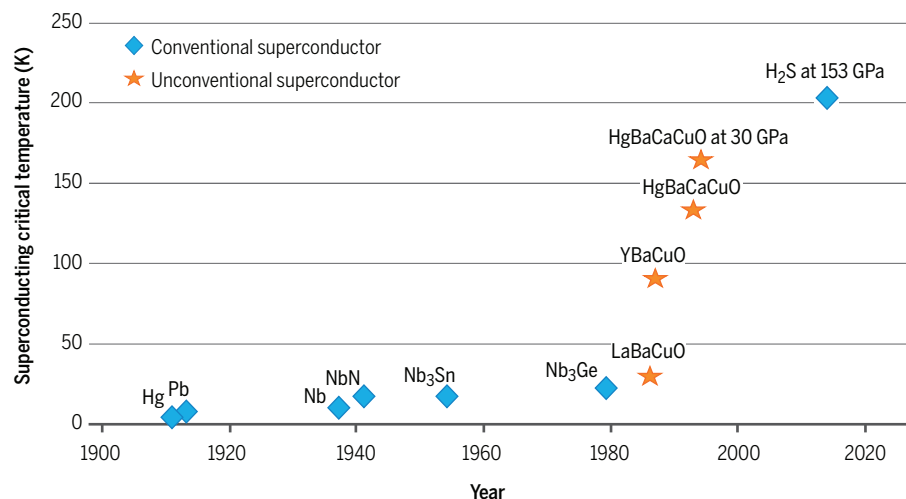
By Viktor Struzhkin

The recent report of superconductivity in hydrogen sulfide (H_2S) by Drozdov *et al.* (1) at a record high superconducting critical temperature T_c of 203 K and at high pressure (153 GPa) triggered excitement from both a fundamental and technological perspective. On page 1303 of this issue, Troyan *et al.* (2) confirm the finding by using an elegant and unexpected implementation of the Mössbauer technique at the third-generation synchrotron facility in Grenoble, France. They measured the Meissner effect (3)—the expulsion of magnetic field from the sample—thereby unequivocally confirming the existence of superconductivity. The new superconductor is believed to have a simple chemical formula, H_3S . The superconductivity in H_2S was predicted theoretically by Duan *et al.* (4) before the first experimental findings were reported. The technique has great potential for future studies of tiny samples squeezed to extremely high pressure. This experimental advance paves the road to probing superconductivity in metallic hydrogen, which is expected to be a room-temperature super-

conductor above 500 GPa (5).

To understand the impact of the report by Troyan *et al.*, we should look deeper into the decades-long quest for a room-temperature superconductor. The most exciting development in superconductivity since its discovery by Kamerlingh Onnes in 1911 (see the figure) happened in 1987, when Bednorz and Müller found high-temperature superconductivity in materials based on copper-oxygen (CuO_x) layers, the layered structure being a necessary structural property of this new "unconventional" family of superconductors. The discovery of these so-called high- T_c cuprate materials led to a stunning $T_c = 165$ K at 30 GPa in a mercury-based cuprate material (6), which is higher than in a previous record-holding material (Nb_3Ge) by almost a factor of 7. The superconductivity mechanism in cuprates still defies theoretical understanding and remains the focus of intense research efforts by scientists around the world. This absence of theoretical understanding is a handicap preventing a guided search for new superconductors with even higher critical temperatures.

In contrast to the cuprate situation, there is a wealth of conventional superconducting



Raising the critical temperature. The highest- T_c materials over the years since the discovery of superconductivity in mercury by Kamerlingh Onnes in 1911. The unconventional cuprate superconductors are marked by orange stars, the conventional ones by blue diamonds. Note that the highest T_c values are observed in a compressed state at very high pressures. For useful applications, the effect of pressure must be understood theoretically, and this understanding should be used to design new materials with favorable parameters close to ambient conditions.