

A tale of two states

On 20 July 2015, the United States reopened its embassy in Havana, Cuba, after more than 50 years, creating a spirit of engagement between the two Cold War adversaries. This is a welcome addition to the 285 U.S. embassies and consulates in 190 other countries and should encourage Cuban and American scientists to practice “science diplomacy.” Sadly, however, U.S. diplomacy has rarely paid enough attention to science. Given that science and technology (S&T) capabilities affect diplomatic agendas on a global scale, the powerful S&T base of the United States must be better linked to its foreign policy goals.

The 2015 U.S. National Research Council (NRC) report *Diplomacy for the 21st Century* makes a convincing case to “embed a culture of science and technology throughout the U.S. Department of State.” The report underscores many obstacles to achieving an S&T culture. One glaring problem is the thin S&T workforce at the State Department. Although it employs a small core of S&T professionals in Washington, DC (at the Bureau of Oceans and International Environmental and Scientific Affairs and in the Office of the Science and Technology Adviser), there are too few scientists among the rest of the diplomatic staff, and those few are overburdened. Of the roughly 14,000 Foreign Service Officers worldwide, only about 100 are full-time Science Counselors posted abroad. This increase from a mere 57 in 1999 is hardly sufficient. The NRC committee wisely characterized the situation as a “tale of two States”: S&T is alive in Washington, but starving in U.S. foreign missions.

Why should this be a concern to the United States as well as to other countries? Consider health. Long before the Ebola virus hit the front pages, Nobel Laureate Joshua Lederberg said, “The microbe that felled one child in a distant continent yesterday can reach yours today and seed a global pandemic tomorrow.” America’s S&T strengths span academic research supported by the National Institutes of Health and the National

Science Foundation, the pharmaceutical industry, the Centers for Disease Control and Prevention, many universities, and a powerful global network of health care workers and nonprofit organizations. But these assets can only be orchestrated to address global health crises if diplomats understand these resources fully and help to deploy them appropriately.

The broader case for building competency in science diplomacy rests on a fundamental principle: Diplomats and the S&T community are partners. Scientists and engineers aid diplomats in negotiating international agreements, as in the recent negotiations with Iran over limits to its nuclear program, in which the U.S. Secretary of Energy, physicist Ernest Moniz, has had a central role. Diplomats, in turn, assist scientists in implementing S&T projects, from “big science” endeavors such as the International Space Station to smaller-scale projects, such as biological and seismological surveys. And when nations are in conflict, cooperation among S&T specialists from those nations often opens channels to improve understanding.

Enhancing science diplomacy requires closing the gap between the S&T and foreign policy communities. The NRC report suggests creating a new Science and Technology Advisory Board in the State Department to advise the Secretary and increasing the number of S&T Policy Fellows supported by the American Association for the Advancement of Science (AAAS, the publisher of *Science*) who work in the State Department. Courses in science diplomacy, such as those offered at The Rockefeller University and sponsored by AAAS and The World Academy of Sciences, serve as good models to educate scientists and engineers about foreign affairs and increase the S&T literacy of diplomats.

Diplomacy is like a 10-speed bicycle—most gears never get used. The scientific and diplomatic communities should shift science diplomacy into a higher gear so that nations can confront the many daunting challenges ahead.

—Mandë Holford and Rodney Nichols



“Diplomacy is like a 10-speed bicycle—most gears never get used.”



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IN BRIEF

A hazy ring around Pluto



Since the New Horizons spacecraft began taking close-up pictures of Pluto more than 2 weeks ago, the mission team has rolled out image after fascinating image, offering new insights into the once-mysterious dwarf planet. One image, revealed last week, was taken by the spacecraft when it passed behind Pluto, which blocked the sun. The image showed a ring of haze, created in the thin atmosphere as ultraviolet light strikes molecules of methane and nitrogen and turns them into small smoglike particles (shown). The haze particles were found as much as 130 kilometers above Pluto's surface. New images also reveal that Pluto's bright, icy "heart" isn't a static feature; nitrogen ice is flowing out from the edge of the heart, appearing to curl around obstacles and fill up old craters. "We interpret them to be just like glacial flows on Earth," says William McKinnon, a mission co-investigator from Washington University in St. Louis, Missouri. The flows occurred recently, geologically speaking, within the past few tens of millions of years—further fueling discussion over whether residual heat in the planet's interior is driving surface activity.

AROUND THE WORLD

Malaria vaccine clears hurdle

LONDON | The first-ever vaccine against malaria, which claims about 600,000 lives a year, has gotten a key endorsement on the complicated path to approval. The vaccine, known as RTS,S and made by GlaxoSmithKline (GSK), provides only modest protection. But last week, the European Medicines Agency (EMA) concluded that the vaccine's benefits outweigh its risks; in a large trial among young children in Africa, the vaccine reduced malaria cases by about one-third. Individual countries must still decide whether to approve the drug, but EMA's "scientific opinion" paves the way for a World Health Organization (WHO) recommendation on whether and how to use it. If WHO gives it the green light, poor countries would then face a tough financial decision; bed nets and antimalarial drugs already provide substantial protection. Still, with any other vaccine 5 to 10 years away, says co-developer Moncef Slaoui of GSK, even an imperfect vaccine could "transform" child health in Africa.

Senate boosts DOE research

WASHINGTON, D.C. | A bipartisan energy bill scheduled for markup in the U.S. Senate this week would authorize a strong 4% boost to the budget of the Department of Energy's (DOE's) Office of Science. Sponsored by Lisa Murkowski (R-AK) and Maria Cantwell (D-WA), the bill avoids many areas of controversy, including any mention of offshore drilling for oil and gas; its authors hope that this will speed its passage through the Senate. The bill would also authorize a 4% increase for the Advanced Research Projects Agency-Energy and establish an energy-water "nexus" between DOE and the Department of the Interior to coordinate related activities. Other provisions include creating a DOE research program that includes industry and academia partnerships to develop at least two approaches to exascale computing systems. The bill also pushes

for alternative energy research, including large-scale geothermal energy technologies and ocean wave, tidal, and other marine hydrokinetic technologies.

Cholesterol drugs to market

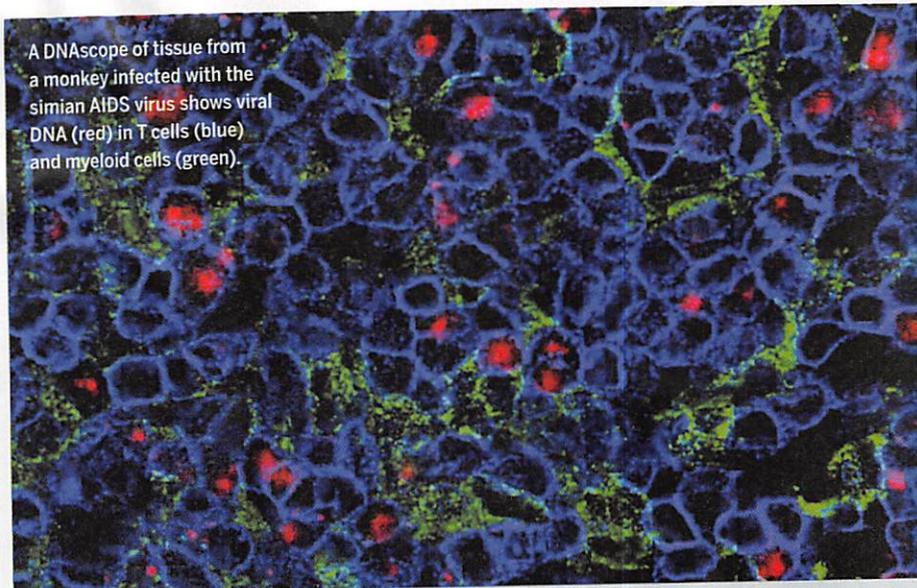
SILVER SPRING, MARYLAND | A much-heralded new class of cholesterol-lowering agents won their first approvals in the United States and the European Union last week. The injectable treatments, called PCSK9 inhibitors, silence a protein that normally prevents the liver from eliminating low-density lipoprotein (LDL) cholesterol in blood. On 24 July, the U.S. Food and Drug Administration (FDA) approved alirocumab (Praluent), developed by Regeneron and Sanofi, for patients with cardiovascular disease or a genetic condition called familial hypercholesterolemia, and who are unable to reduce their cholesterol with statin drugs. Meanwhile, Amgen won approval for its rival drug, evolocumab (Repatha), in Europe and expects an FDA decision in late August. In clinical trials, both drugs dramatically reduced LDL levels in those at high risk for heart attack or stroke, but have yet to demonstrate a long-term reduction in risk. The cost of the new drugs—Praluent is listed at about \$14,600 per year—has raised concerns about the burden on insurers if they are prescribed broadly.

Most Earth-like planet yet

MOUNTAIN VIEW, CALIFORNIA | The prolific exoplanets-hunting satellite Kepler has found its strongest candidate yet for an Earth-like planet in a life-friendly orbit around a sunlike star, scientists announced last week at NASA's Ames Research Center. Known as Kepler 452b, the world is estimated to be a bit on the hefty side, at five times the mass of Earth



Earth 2.0? An artist's conception of exoplanet Kepler-452b, which may—like Earth—be a rocky world.



A DNAscope of tissue from a monkey infected with the simian AIDS virus shows viral DNA (red) in T cells (blue) and myeloid cells (green).

New probe finds hidden HIV

Researchers have developed a sophisticated new probe, called a "DNAscope," that detects HIV's hiding places inside and outside of cells. To date, assessments of HIV in tissue have been hampered by one major difficulty. Traditional methods for mapping HIV genetic material use long strings of DNA or RNA nucleotides, called oligomers, to find and bind to complementary strands of DNA or RNA in sample tissues. These oligomers are labeled with a marker; they send a signal when they hit their target so researchers can track them. But the large, clumsy oligomers sometimes bind to cellular components other than the target sequence, creating background noise that throws off the analysis. The new technique, revealed at an international AIDS conference this month, avoids this error by chopping an oligomer in two and sending both halves out to find the target sequence; the probability is extremely low that the two probes would land next to each other on anything other than HIV.

and 1.6 times its diameter. Its star is a G-type like our sun, but it is 1.5 billion years older, providing the planet with just 10% more heat and light than we receive. "It would feel a lot like home in terms of the sunshine you would experience," says Jon Jenkins, who leads Kepler data analysis. "This is the closest we have ... to another place someone might call home." NASA also announced the latest edition of Kepler's catalog of exoplanet candidates, adding 500 new possible planets for a total of 4175. http://scim.ag/_Kepler452b

Faulty anthrax tests

WASHINGTON, D.C. | A Department of Defense (DOD) report released last week has unraveled the events that led to a U.S. Army biodefense lab's inadvertent shipping of live anthrax spores to other labs for a decade. The DOD review, triggered by the discovery in May that Dugway Proving Ground in Utah

had recently shipped live anthrax to a company, identified faulty procedures or killing and testing samples. Further investigation revealed that the lab had unintentionally sent live samples to at least 86 government, academic, and private labs over the years. The DOD report finds that workers were only checking 5% of an irradiated batch of anthrax, not enough to ensure that all spores are dead. The revelations follow several mishaps last year with risky pathogens at federal labs.

House bill blocks GM food labels

WASHINGTON, D.C. | The U.S. House of Representatives last week approved a bill that would block states and localities from requiring mandatory labeling of food made from genetically modified organisms (GMOs). It would also set up a voluntary federal program for manufacturers to certify foods that don't contain GMOs. The bill's supporters—Republicans, some Democrats, and the food industry—call the bill a science-based effort to balance

consumer right-to-know concerns with the need for a uniform national policy. Opponents of the bill, including environmental and food activists and liberal Democrats, argue that it would deny people the right to know what is in their food. The bill's future in the Senate is unclear and the White House has yet to weigh in. <http://scim.ag/GMlabeling>

South Korea declares MERS over

SEOUL | Noting that the country had gone 23 days without a new case of Middle East respiratory virus (MERS), South Korean Prime Minister Hwang Kyo-ahn on 28 July declared a “de facto end” to the outbreak. (The World Health Organization called the pronouncement premature, as 28 days had

not passed since the last case appeared.) The outbreak was sparked by a traveler returning from the Middle East who passed the infection to hospital workers and patients who then went “doctor shopping,” carrying the virus to yet other hospitals. The outbreak, the largest outside the Middle East, sickened 186, claimed 36 lives, and required quarantining more than 16,000 contacts.

NEWSMAKERS

Math star demoted

Manuel de León, one of Spain's star mathematicians, was removed from the head of a national research institute over accusations that the center had mismanaged public funds. De León remains a professor of the Spanish National Research Council (CSIC), but has lost the directorship of the Institute of Mathematical Sciences, a research center run jointly by CSIC and three universities in Madrid. Although he says the institute had spent funds “in a way that the administration may dislike,” de León says these practices remained within the law and that no public money was ever stolen. He says he was a “scapegoat,” and that the internal audit that caused his demise was prompted by envious rivals from the Institute of Theoretical Physics, which shares a building with the math center. <http://scim.ag/deLeonICMAT>

FINDINGS

Study questions deworming

An unusual reexamination of an influential study from more than a decade ago has challenged some of the benefits of massive campaigns to give inexpensive deworming medication to children. Researchers from the London School of Hygiene & Tropical Medicine reanalyzed trial data from a study carried out in Kenya from 1998 to 1999; the study had reported that deworming improved attendance in the treated children's schools as well as in other schools because of an apparent decrease in transmission. Granted access to the original trial's data and computer programs used to analyze them, the team identified missing data, mistakes in the statistical analyses, and other problems that led them to conclude that although the antiparasite pills did provide health benefits, they did not improve overall education attainment among the treated children, they reported in the *International Journal of Epidemiology*.

Weinberg's musical robots play with human musicians.



Three Q's

Gil Weinberg, founding director of the Georgia Tech Center for Music Technology, has pioneered artificially intelligent (AI) robots that can detect musical rhythms, tempos, and genres—and even play music. In 2013, he used a National Science Foundation (NSF) grant to create a robotic drumming prosthesis for Jason Barnes (pictured below), an aspiring drummer who lost his arm. Last week, Barnes performed with Weinberg's band Musicians and Musical Cyborgs at the John F. Kennedy Center for the Performing Arts in Washington, D.C., to celebrate the 25th anniversary of the Americans with Disabilities Act.

Q: Why robots and music?

A: The idea was to develop robots that listen like humans but play music like machines and use algorithms only machines can use to create music humans will never be able to create. ... It might lead to aesthetic results that are interesting.



Q: How can AI technology help people with disabilities?

A: I try to blur the lines between creating technology specifically for people with disabilities versus technology for anyone else. I want to see people with disabilities using technology not only to partly bring them back to how they were before, but also to enhance and extend their abilities beyond and above what humans can.

Q: What are your plans for the future?

A: I want to explore how people respond to a body they are not controlling, so I'm creating a third arm for able-bodied people. I'm also trying to get funding from NSF to continue to work with Jason for a robotic prosthetic arm that not only gets signals from the muscles, but also the brain.