the weekly anthropocene

Dispatches From The Wild, Weird World Of Humanity And Its Biosphere

October 13 2021

Human Innovation: Mosquirix the Malaria Vaccine, and Quantum Dot Solar Panels.

One of the most amazing things in the world (the universe, really) is human innovation, the capacity of scientists, engineers, and inventors to create amazing new things that help solve problems. Recently, two new examples of science, technology, and human creativity's extraordinary potential have gained the spotlight.

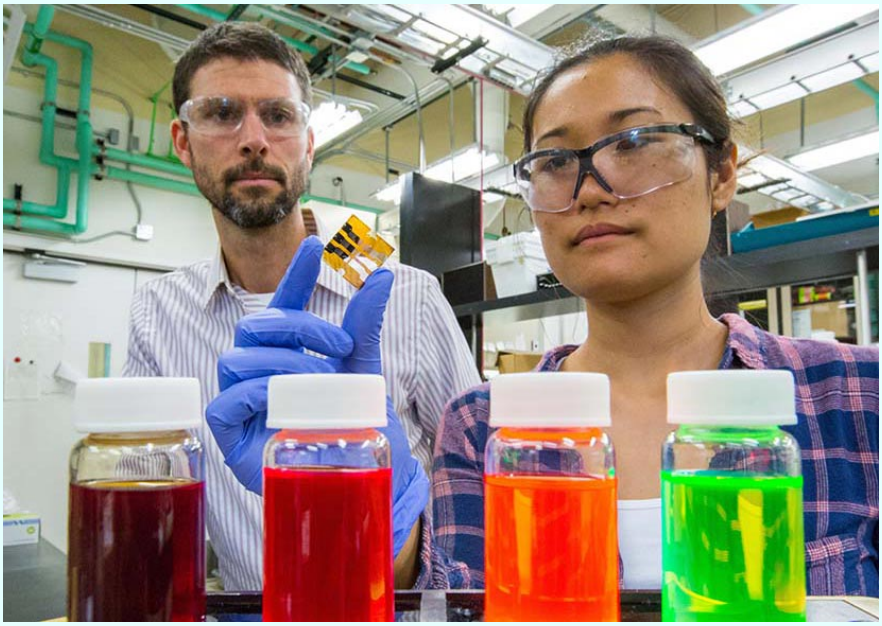
First, and by far the most consequential in the near term: after six years of successful pilot programs around the world, the WHO has approved the world's first malaria vaccine for general use. Known under the brand name Mosquirix, it was developed as a childhood vaccine by pharmaceutical giant GSK, costs only $5 a dose, and requires four doses before two years of age to be fully effective. (Pictured: vaccinating a child in Kenya with Mosquirix in 2019).

As malaria is spread by parasites, much more complex organisms than viruses, Mosquirix is not as effective as most vaccines, preventing only 40% of malaria cases (i.e. "40% efficacy") and 30% of the most severe cases. (For comparison, common measles vaccine, also administered in early childhood, has 97% efficacy, while Pfizer and Moderna's COVID vaccines have a 94-95% efficacy rate. For more on how vaccine efficacy is calculated, see this Lancet article).

However, this is still a *huge victory* for several reasons. Malaria is one of the biggest global contributors to human suffering. 220 million people get it every year (94% of them in Africa) and about 400,000 of those die-that's a New Orleans-worth of malaria deaths annually. If we can get Mosquirix to just the 30 million people most at risk every year, even with just 40% efficacy, "5.3 million cases and 24,000 deaths could be averted."

That's more than enough reason to celebrate. However, Mosquirix is also the first-ever vaccine developed against a parasitic disease, as malaria is caused by *Plasmodium* parasites spread by mosquitoes, not a bacteria or virus. This breakthrough opens up a lot of new possibilities for future anti-parasite vaccines-indeed, there's another malaria vaccine candidate in clinical trials right now that's showing 77% efficacy!

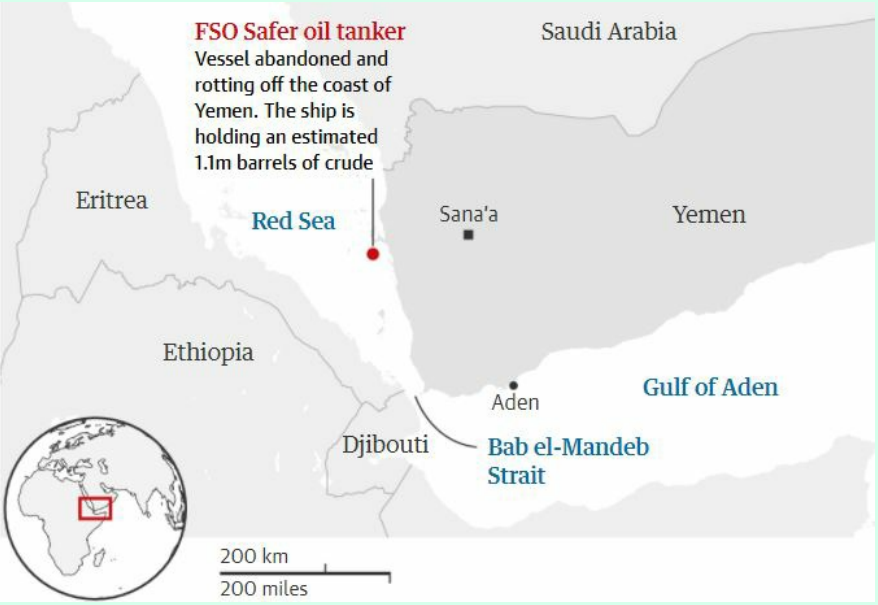
And finally, like everything else, this is connected to climate change. Scientists have long worried that higher temperatures and erratic heavy rains will lead to a mosquito boom that could threaten or even reverse the world's progress against malaria. A decent malaria vaccine-along with some of the other amazing progress in mosquito-borne disease control, like the incredible use of the *Wolbachia* bacteria to stop zika, dengue, chikungunya, and yellow fever-will make the Anthropocene a much safer, healthier, and happier time to live in. Superb news!



Second, America's National Renewable Energy Laboratory (NREL) is developing the solar panels of the future. Solar panel technology has already advanced immensely in the past decade, and along with wind power is becoming incredibly cheap, incredibly fast. Even given this already-excellent trajectory of progress, the NREL is kicking it up a notch by experimenting with nanomaterials in solar panels. "Quantum dots," tiny artificial particles a few nanometers in size (made of as few as 100 to 100,000 atoms!) are already often used in semiconductors and have the potential to transform solar panel technology. They're so small that they're governed more by quantum mechanics than by regular physics, so their physical properties, the way their matter interacts with light, can be "tuned" by scientists to absorb different wavelengths of light, potentially leading to "layered" solar panels able to draw more much energy from the same amount of solar radiation. (Pictured above: NREL scientist holding an experimental, record-efficiency quantum dot solar cell, with solutions of different quantum dots in the foreground). This'll likely take years more to bring into production, but it's yet another sign that we've only begun to scratch the surface of the incredible potential of renewable energy!

Yemen

Yemen is already the center of several interconnected humanitarian disasters, adding up to what the UN called "the worst [situation] in the world": a complex multi-sided seven-year-long civil war, with Iran, Saudi Arabia, and al-Qaeda all involved, a cholera outbreak, widespread hunger, medicine shortages and alleged war crimes perpetrated by multiple sides. Now, it unfortunately looks like things might get even worse, with a potential massive environmental disaster in the making.



The *FSO Safer*, an oil tanker, was abandoned in a hurry in 2017 when Yemen's civil war got worse. Since then, it's been sitting off the coast of Yemen (see map), unmaintained, with all of its equipment slowly degrading and its hull rotting. Water was reported to have entered the engine room in May 2020.
The dangerous part is that it was abandoned when it was full, and it currently contains 1.1 million barrels of crude oil, or four times the amount the *Exxon Valdez* had before its infamous oil spill in 1989. If the *FSO Safer* sinks, catches fire, or explodes-all increasingly probable as the ship degrades-the resulting gigantic oil spill would wreak havoc across the Red Sea and Horn of Africa region. As a newly published study modelling the potential impacts found, such a spill could block international commerce into and out of the sea, force the closure of key Yemeni ports (which could in turn make Yemen's food, fuel, and medicine shortage even worse), cause oil slicks on beaches across the region, create massive air pollution from volatilizing oil, kill off the unique Red Sea coral reefs as well as the local fisheries, and cause a massive water shortage (potentially impacting the supply of 9 million people, when you add this together with a fuel shortage for water pumps!) if it gets into nearby desalinization plants.

The obvious solution is to offload the oil, or at least repair the ship (pictured) to reduce the chances of a spill. Unfortunately it's accessible only from the territory in northern Yemen currently under the control of the Houthis, an Iran-backed Islamist faction. They don't have the technical expertise to run or repair the ship, and United Nations attempts to negotiate access for a foreign repair crew have stalled after the Houthis

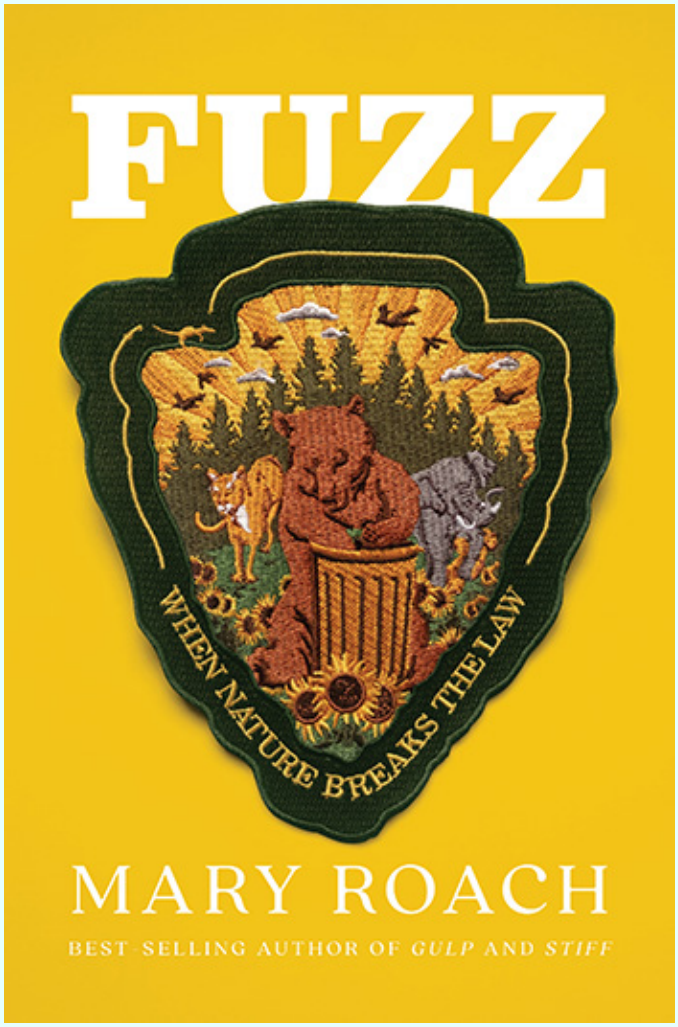
refused to guarantee their safety. It's looking more and more like an oil spill is imminent.

What's so frustrating about this is that it's entirely preventable, foreseeable, and absolutely clear what needs to be done to stop it. We know how to repair or drain oil tankers. We know every detail of where this ship is and what its specifications are. This is *really clearly* fixable, but it's just hard to make it happen.

Here's hoping the governments of the world figure this out, by whatever means necessary (pay off who you need to pay off!) to prevent a humanitarian and ecological disaster that could devastate the lives of millions.

The Weekly Anthropocene Book Review: "Fuzz" by Mary Roach

Mary Roach is a popular science writer with an extraordinary gift for finding an esoteric field, interviewing the scientists working in it, and interweaving her findings into enlightening, humane, and often hilarious stories of the strange corners of human civilization. Her previous works have covered everything from the uses of cadavers in research to the history of attempts to scientifically detect ghosts (spoiler alert: no ghosts detected) to the teams attempting to simulate space travel on Earth to the vagaries of the human digestive system and sense of taste. So imagine this writer's enthusiasm when finding out that her next book, now available in stores, covers a topic dear to this newsletter's metaphorical heart: the strange interactions between humans and wildlife in the Anthropocene.



Fuzz: When Nature Breaks the Law is a delightful read, traveling the world to explore the work of everyone from experts in removing bears from resort homes to researchers attempting to perfect birth control for monkeys to scientists who have tested the effects of stapling dead deer tails to cardboard cutouts by the side of highways. All of these people are broadly working for the greater good, trying to

help humans and animals coexist without extermination or property damage, but the unpredictable nature of their subject leads their work-and the book-to some strange, strange places.

Reading *Fuzz*, you find truly astonishing sentences, and what's really amazing is that they *make sense in context*. It's that kind of book. Verbatim sentences and sentence fragments from *Fuzz* include "On July 26, 2005, the space shuttle *Discovery* hit a turkey vulture." And "Science is here to tell you that starlings feel the same way about Febreze Extra Strength Fabric Refresher as they do about raccoon piss." And "On a tea estate in the Sonitpur district of Assam in 2017, three wild elephants broke into a workers' shop at 2:00 am and helped themselves to the cotton fiber product known as rupees. They broke open the cash box and consumed 26,000 rupees in large denominations." And "The Vatican City State is gearing up to be a nation with one grocery store, one pharmacy, no gas station, and two LaserOp Automatic 200 bird scaring units." And "One man told the New York Times that he had 65 langurs urinating on prominent homes." And "The other challenge was to get the bait where the tree snakes were…Now they use an 'aerial broadcast system', a sort of helicopter-mounted machine gun that shoots potted-meat baits with biodegradable cornstarch streamers that entangle them in the trees." *Helicopter-mounted machine gun that shoots potted-meat baits with biodegradable cornstarch streamers that entangle them in the trees*! The coexistence of wildlife and humanity in the Anthropocene can lead to some truly absurd and outlandish events, and chronicling these is where *Fuzz* shines.

Buy this book! It's funny, heartfelt, thought-provoking, and just plain awesome.

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