the weekly anthropocene

dispatches from the wild, weird world of humanity and its biosphere

By Sam Matey

Tanzania. Dar es Salaam is the most populous city in Tanzania and one of the fastest-growing cities in the world, home to over 5 million people (more than Maine, New Hampshire, Vermont, and Rhode Island combined). It's also a low-lying city in the Anthropocene, and has unsurprisingly been having severe problems with sea level rise. Until recently, Dar es Salaam has been suffering from eroding coastlines, salt-poisoned vegetation, and the rise of disease-breeding pools of stagnant water in poorly drained neighborhoods. In 2007, a government action plan identified the construction of seawalls as a priority. Now, a UN program has completed the construction of seven massive seawalls along heavily eroded segments of coast (pictured). As a corollary, UN Environment restored over 1,000 hectares of mangrove forest to act as a living shield. Economic activity along the coastline is already recovering. Next up is completing a network of drainage systems for the waterlogged neighborhoods. "Through the construction of these walls in the various parts of the country, we see the importance of the project." said Samia Suluhu, Vice President of Tanzania. "Kisiwa Panza [northern Tanzania] was sinking but now the residents are living well and in peace." These proactive, farsighted actions serve as a model for coastal cities in developing nations around the world. This is what surviving the Anthropocene looks like. Spectacular work! Thanks to UNOPS for the picture. For more, see goo.gl/SDEHi9 and goo.gl/ui75HN.

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New Solutions: Ocean Cleanup System 001.

The world's first ocean cleanup system launched from San Francisco on September 8th, and it's on a mission to get rid of the Great Pacific Garbage Patch. The Ocean Cleanup, the company behind this enterprise, is the brainchild of young entrepreneur Boyan Slat and is funded by an array of donors, including Silicon Valley leader Peter Thiel and the government of the Netherlands. OCS 001 (familiarly known as Wilson, after the volleyball in *Cast Away*) is a 600-meter long flexible boom (pictured above, leaving San Francisco Bay) that will essentially function as an "artificial coastline," accumulating plastic pushed into its embrace by the winds and waves. Every so often, the Ocean Cleanup will send a "garbage truck ship" to collect that plastic and sell it to recyclers. The system is entirely solar-powered and has been projected to have no problematic effects on marine life, as it will move slowly enough to allow fish and marine mammals to easily move out of the way. The Ocean Cleanup's long-term goal is to build a fleet of OCSs and deploy them in garbage patches around the world's oceans. Their projections show that a full fleet of 60 OCSs should be able to clean up 50% of the entire Great Pacific Garbage Patch in just five years (assuming that on-land regulations stop the outflow of new plastic pollution). Let's hope this trial run works! For more information and updates on this amazing project, check out theoceancleanup.com.

New Biotechnology: Carboxysome Crops.

In a fascinating breakthrough, scientists at The Australian National University (pictured, researchers Eng Kee Au and Nghiem D. Nguyen) have introduced carboxysomes from blue-green algae (another name for cyanobacteria) into plants. This is important because of a quirk in a vital enzyme: rubisco. Rubisco, the enzyme used in photosynthesis to grab carbon dioxide from the atmosphere, finds it hard to distinguish between CO_2 and oxygen. In plants, this is just an unavoidable inefficiency. But blue-green algae keep their rubisco in carboxysomes, specialized organelles that keep capture and concentrate carbon dioxide so that the enzymes don't have to "waste their time." Now that this capability has been transferred to crops in the lab, the researchers project that this work could lead to a 60% increase in plant growth and yield. If this technology becomes widely used, it would revolutionize agriculture. If used in conjunction with other emerging technologies (such as several efforts to make it easier for major crops to fix their own nitrogen) the possibilities are limitless. Spectacular work! For more, check out goo.gl/PCyn6J.

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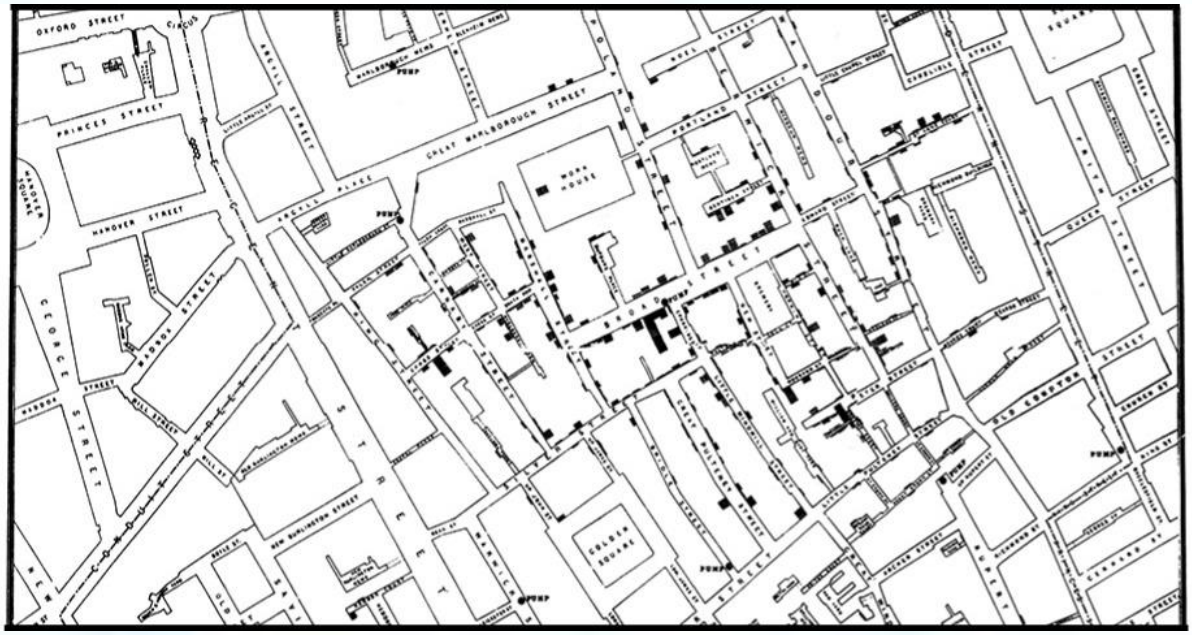
Science Spotlight #2: The Mental Magic of Maps.



In 1854, the Soho district of London was being ravaged by cholera, a deadly bacterial disease. Cholera is spread through feces-contaminated water and is now very rare in developed nations. However, in 1854, the theory of waterborne disease was not yet widely accepted, with the prevailing wisdom being that diseases were spread through "miasmas" or "bad air." (Interestingly, this is the origin of the custom of wearing a flower in one's lapel, to ward off the miasma with "good air."). However, Dr. John Snow (an innovative physician already well-known for his pioneering work with early anesthetics) suspected the existence of cholera's waterborne transmission pathway. To find the source of the outbreak, Dr. Snow decided to use an unorthodox tool: a map (a segment of which is pictured above). Dr. Snow plotted the cholera deaths (black bars) over a map of the Soho He found that they clustered around a pump on Broad Street from which nearly all of the cholera-infected houses obtained their water. The idea that the pump was the source of the outbreak was bolstered by the fact that two buildings near the pump that had their own drinking supplies (a workhouse with its own well and a brewery) had few to no cholera cases. On September 8th, 1854, after considerable difficulty in overcoming the resistance of the local government, Dr. Snow tested his hypothesis by removing the pump's handle, making it impossible to draw more water from the contaminated source. The outbreak immediately stopped.

It is difficult to overstate the importance of this event in the history of science-and, indeed, humanity. At a stroke, Dr. Snow founded the field of epidemiology (the study of how diseases spread) and popularized the vital new scientific tool of spatial analysis. Although it seems obvious in hindsight, this was a quantum leap in scientific investigation. Maps are far more intuitive than a spreadsheet or list and make it much easier to see patterns in the data Now, maps are a standard tool across scientific endeavors, from tracking down arsenic pollution in Bangladeshi wells to locating sources of unhealthy food that contribute to a city's obesity epidemic. And we all have Dr. Snow to thank for it.