



the weekly anthropocene

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

by Sam Matey

Colombia. In a historic moment, the president of Colombia has announced that his nation will protect 8 million hectares (31,000 square miles) of the Amazon rainforest, and, on the same day, signed a decree giving indigenous communities new autonomy over their lands. The Colombian government will spend the next few weeks defining the boundaries of the new protected areas and granting land titles to indigenous communities that give them the right to manage their forest holdings. This is a



huge step forward for conservation: for comparison, the entire state of Maine's land area is 30,843 square miles. Furthermore, studies have shown that indigenous peoples are excellent at protecting forests from deforestation, better than governments or private groups. This endeavor is partially funded by the kingdom of Norway, which seeks to offset its own carbon emissions by preventing deforestation elsewhere. This project is also made possible by the recent end to Colombia's long-running civil war, and was made urgent by the threat of agriculture and logging destroying rainforest that was long inaccessible. President Juan Manuel Santos said that "once and for all, we (will) know where we can farm, produce – and from what boundary we will protect all the forests and the entire Amazon." (Pictured: President Santos shaking hands with Norwegian Prime Minister Erna Solberg, with indigenous leaders in the background). This is absolutely spectacular news, and exactly the kind of proactive, future-forward step nations need to be taking to preserve their natural and cultural resources in the Anthropocene. For more information, see goo.gl/6jdRce. More news as it develops!

Madagascar. In the forests of Madagascar, an expedition by a German zoo has discovered three new species of chameleon. One of the new species, *Calumma lefona*, is only known from a single male specimen, while for another, *Calumma juliae*, only females have been found. *C. juliae* is known only from a tiny, isolated forest fragment. We know more about the third new species, *Calumma uetzi* (pictured). Known as the "rainbow chameleon," the male has been recorded as trying to impress the female with a display of vibrant colors, while the female, if unimpressed, warns the male off by darkening her own skin. For more information on these fascinating new species, check out goo.gl/gJ6JDL Photo credit: Frank Glaw (ZSM/LMU).





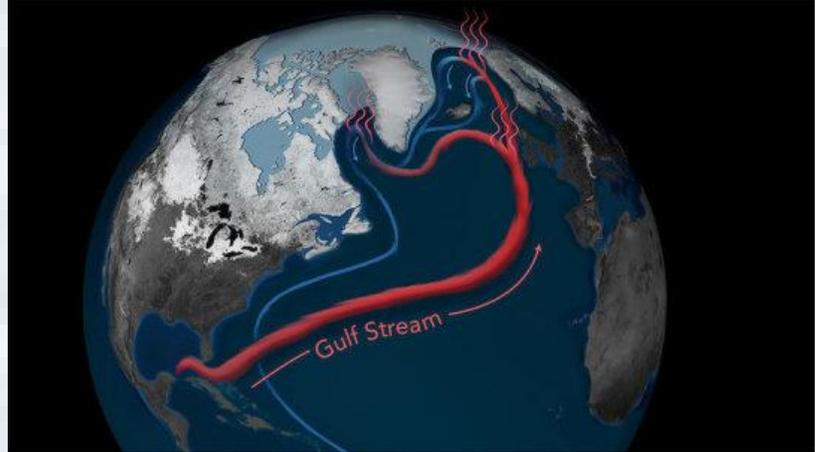
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The Oceans (1): Atlantic

Circulation. New research from the Woods Hole Oceanographic Institution has shown that the Atlantic Ocean circulation, a vital cog in global climate regulation, is at its weakest point in 1,600 years. In the Atlantic, the Gulf Stream takes warm and salty surface water to the North Atlantic, where it warms Europe by releasing its heat to the atmosphere. The newly cold water then sinks and travels down to Antarctica, where it



eventually circulates back around. This system, known as the Atlantic Meridional Overturning Circulation (AMOC, pictured), can be weakened down by injections of freshwater into the North Atlantic, which dilutes the cold seawater and makes it less able to sink, slowing down the entire AMOC. The WHOI researchers examined sediments records (the larger the grains, the stronger the current) to examine the strength of the AMOC over time. They found that the AMOC has weakened over the last 150 years by approximately 15 to 20 percent, since the end of the “Little Ice Age” contributed to ice melt in the North Atlantic. A second study found that the pace of the weakening has increased since 1950 due to climate change. "What is common to the two periods of AMOC weakening -- the end of the Little Ice Age and recent decades -- is that they were both times of warming and melting," said Dr. David Thornalley, lead author of the WHOI study. "Warming and melting are predicted to continue in the future due to continued carbon dioxide emissions." This could have potentially far-reaching impacts, from changing continental weather patterns to speeding up sea level rise on North America's east coast. For more information, see goo.gl/Y5c8v7. Photo credit: Illustration by Natalie Renier, Woods Hole Oceanographic Institution.

The Oceans (2): Acidification and Fish. A new study from the University of Adelaide has found that ocean acidification confuses baby fish. In normal conditions, the larvae of barramundi (*Lates calcarifer*, the study animal) find their way to suitable habitats by listening to their characteristic sounds. The researchers wondered how ocean acidification (due to higher atmospheric CO₂ levels) would affect this. "In our study we found that while larvae of barramundi are attracted to the sounds of tropical estuaries, larvae raised under future ocean conditions with elevated CO₂ were deterred by these natural sounds," said Professor Ivan Nagelkerken, leader of the project. "Moreover, under elevated CO₂, larval barramundi were attracted to the wrong sounds." The “wrong sounds” included artificial white noise and the sounds of cold water reef, unsuitable habitat for barramundi. This is a new way that ocean acidification could harm marine species, as well as potentially harming humans by disturbing fisheries. For more information, check out goo.gl/o6Bv9E.



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The Oceans (3): Hidden Treasures. Two miles under the sea and a hundred miles off the Pacific coast of Costa Rica, an astonishing biological treasure has been found. A team of scientists was visiting the Dorado Outcrop region of seafloor to investigate the hydrothermal properties of the area. When they sent a submersible to explore the liquid-leaking cracks in the rocks, they found hundreds of octopuses of an unknown species, most of them guarding clutches of eggs. The octopuses (pictured),



identified as belonging to the genus *Muusoctopus*, were living at incredibly high densities in conditions previously thought uninhabitable for octopuses. The water leaking from the cracks is too warm and poor in oxygen to provide good habitat for young octopuses to grow in. Due to this, the scientists hypothesize that there must be even more octopuses existing in cool, oxygen rich crevices in the rocks, at densities high enough to push these octopuses out into a "bad neighborhood." This hypothesis is supported by observations of octopus arms emerging from deep cracks in the rock. For more on this astounding discovery, see goo.gl/Kg8yAA. Photo credit: Credit: Phil Torres and Geoff Wheat.

Canada. A radar survey has discovered two super-salty lakes deep beneath Canada's Devon Ice Cap. Anja Rutishauser, PhD student at the University of Alberta, was shocked to find signals indicating water in radar data describing the bedrock of the Devon Ice Cap. As the temperature under the ice cap is well below freezing, the lakes remain liquid due to their hypersalinity; they are estimated to be four to five times saltier than seawater. If these lakes sustain life (as similar lakes in Antarctica do) their ecosystems have been completely isolated since the area was glaciated 120,000 years ago. "We think they can serve as a good analogue for Europa, one of Jupiter's icy moons, which has similar conditions of salty liquid water underneath -- and maybe within -- an ice shell," said Ms. Rutishauser. Scientists are already hoping to drill into the ice to collect a sample of this tantalizing new environment. For more on this amazing ecological discovery, check out goo.gl/M4ZhJF.

Phones. Researchers at the University of British Columbia have made a breakthrough in recycling used cell phones. Currently, e-waste recycling focuses on valuable metals, as the circuit boards' nonmetal components (a mix of fiberglass and resin) are difficult to process. Now, a UBC team has invented a new process to separate fiberglass and resin, a vital step towards creating a zero-waste phone. "The key here is gravity separation, which efficiently separates the fiberglass from the resin by using the differences in their densities. The separated fiberglass can then be used as a raw material for construction and insulation. In the future, if we can find a way to improve the quality of the recycled fiberglass, it may even be suitable for manufacturing new circuit boards," said Amit Kumar, a PhD student on the research team. Great work! For more information, see goo.gl/cyWv59.



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Italy. Archaeologists have discovered evidence that humans' ability to adapt to climate change may have helped them outlast the Neanderthals and survive to become the dominant species on Earth. Approximately 40,000 years ago, a giant volcanic eruption in the Phlegraean Fields (in the modern day Campania region) changed the local climate, leading to the disappearance of Neanderthals from the region. Now, archaeologists have found that early humans living in the Liguria region used cooperation to adapt to the changes. "Liguria is where some of the first *Homo sapiens*, more or less our direct ancestors, lived in Europe," said Professor Julien Riel-Salvatore, coauthor of the study. "They came after the Neanderthals, and unlike them, when they were faced with sudden changes in their climate they didn't go locally extinct or abandon the region -- they adapted." The



archaeologists found flint tools made from flint that only occurs hundreds of kilometers away, indicating complex social and trade networks. "They had a link to people living far away, so that if things went haywire in the territory where they lived, they had the social option of depending on people they'd built relationships with -- the broader the network, the easier it was to survive," said Professor Riel-Salvatore. For the full incredible story, see goo.gl/WWhTnU.

Plastics. Research teams from the UK's University of Portsmouth and the USA's National Renewable Energy Laboratory have inadvertently created an enzyme that digests a common type of plastic. The researchers were originally analyzing a bacterial enzyme dubbed "PETase" for its ability to digest PET, a kind of plastic used in products from water bottles to frozen dinner packaging. In an attempt to determine its structure, they mutated the enzyme's active sites. Surprisingly, they found that their mutated PETase was even better than the natural enzyme at digesting plastic. "Serendipity often plays a significant role in fundamental scientific research and our discovery here is no exception," said Professor John McGeehan of the University of Portsmouth. "Although the improvement is modest, this unanticipated discovery suggests that there is room to further improve these enzymes, moving us closer to a recycling solution for the ever-growing mountain of discarded plastics." The researchers are now planning to improve the enzyme's plastic-munching powers still more. For more information on this fascinating discovery, check out goo.gl/FDbk3w.

West Papua. A new species of bird-of-paradise has been identified in the Indonesian province of West Papua. The Vogelkop Superb Bird-of-paradise was classified as a distinct species due to its unique courtship display and mating dance. For more info, see goo.gl/tWwgLX.