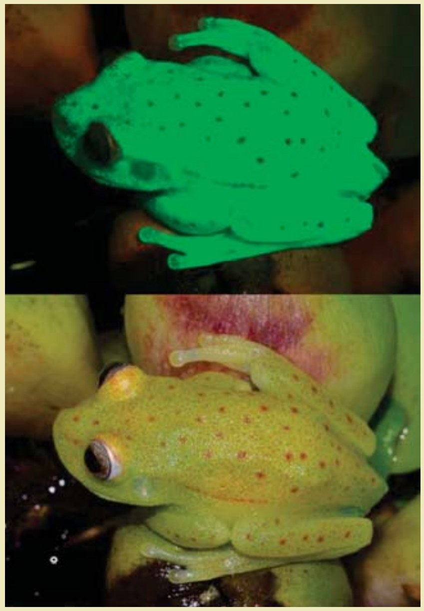
FROG FLUORESCENCE

Biofluorescence, the re-emission of electromagnetic radiation at a wavelength longer than that at which an organism initially absorbed it, occurs widely in nature—in flora and fauna, on land and in the ocean. But among vertebrates, almost all known biofluorescent species—which include sharks, surgeonfish, and sea turtles—are aquatic; parrots had been the sole terrestrial exception. A team of researchers from Buenos Aires, Argentina, and São Paulo, Brazil, now report the first observation of naturally occurring fluorescence in an amphibian: the polka-dot tree frog, *Hypsiboas punctatus*. Under white light the frog's skin appears translucent (bottom photo), but when illuminated with 400 nm UV light, the frog gives off bright blue-green light (top). The team traced that glow to a class of fluorescent



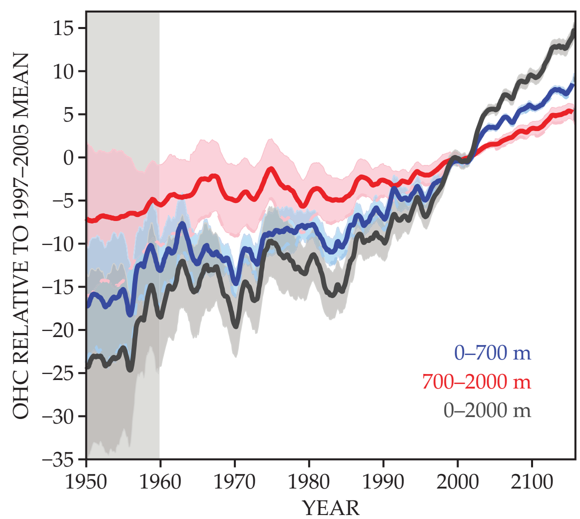
compounds located in the frog's lymph and skin glands, with the emission filtered by pigments in the translucent skin. The polka-dot frog is active primarily between dusk and dawn, so the researchers analyzed the relative contributions of fluorescence and reflection to the frog's visibility in low-light conditions. They estimate that at night under a full moon, fluorescence accounts for 18% of the light emerging from the frog; at twilight, the contribution approaches 30%. Moreover, the spectrum of the emitted fluorescence is well matched to the peak sensitivity of amphibian night vision, which suggests that the phenomenon plays an important role in the visual perception of fellow frogs in the chromatically complex terrestrial environment. (C. Taboada et al., *Proc. Natl. Acad. Sci. USA* **114**, 3672, 2017.) —RJF

ized plasma. As each wave zoomed through the column at more than 0.1*c*, a pair of detectors recorded pulses of high-frequency radiation that manifested the shifting distribution of electrons in the plasma. The measurements revealed that the Alfvén waves triggered oscillations of the highest-energy electrons.

The observed oscillations are fundamentally related to the mechanism that's thought to drive auroras: resonant electron acceleration. If electrons can be jolted by passing Alfvén waves, then they should be able to get picked up and boosted by the plasma disturbances as well. Schroeder and colleagues are designing follow-up experiments at UCLA to hunt for electrons surfing Alfvén waves. (J. W. R. Schroeder et al., *Phys. Plasmas* **24**, 032902, 2017.) —AG

RISING HEAT CONTENT OF EARTH'S OCEANS

Earth's Sun-warmed surface radiates heat into the atmosphere. As the concentration of carbon dioxide and other greenhouse gases increases, more of that extra heat fails to escape into space. Although the trapped heat warms Earth's lower atmosphere and land surface, more than 90% of it ends up in the ocean. How the ocean heat content (OHC) has changed over the past half century is the subject of a new study led by Lijing Cheng of the Institute of Atmospheric Physics in Beijing. Resolving OHC across time and space is challenging. Since 2005, a network of autonomous floats called Argo has continuously profiled the ocean's temperature at depths down to 2000 m with steadily increasing spatial coverage (see the article by Karim Sabra, Bruce Cornuelle, and Bill Kuperman, Physics Today, February 2016, page 32). Before then, and even in Argo's early years, measurements were less frequent, more sparse, and unevenly distributed. Cheng and his collaborators tackled the challenge through an interpolation scheme that took advantage of oceanographers' understanding of how the ocean's behavior is correlated through space and time. To validate the scheme, they demonstrated that they could reproduce data from recent, densely sampled observations by interpolating from a sparser sampling of those same observations. Among the findings: OHC remained fairly steady from 1960 through 1980; there-



after, it increased significantly. What's more, the study found that OHC is 13% higher than the value cited in the most recent (2014) report of the Intergovernmental Panel on Climate Change. As the figure shows, increases in OHC extended to lower depths mainly after 1990. The study by Cheng and colleagues also revealed that Earth's five oceans are sequestering heat at different rates. The Atlantic Ocean had the largest OHC increase from 1960 to 2015; it was 3.5 times as high as that of the Pacific Ocean, which covers twice the area. Circulation within and between oceans is the likely cause of the differences, which may themselves change if global warming alters circulation patterns. (L. Cheng et al., *Sci. Adv.* **3**, e1601545, 2017.) —CD PT