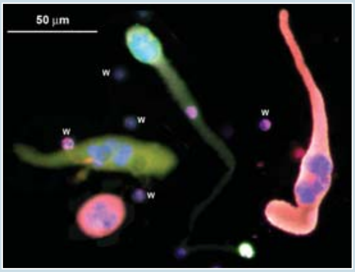
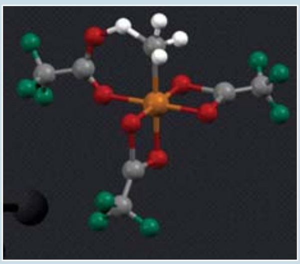
The gelatinous and fragile CAMLs, like the four shown in the figure, are gargantuan compared with white blood cells



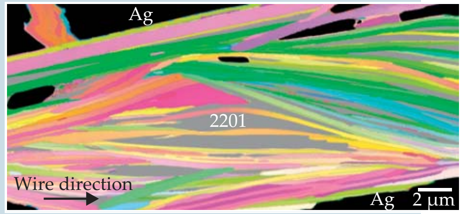
(labeled W). Thus far, the researchers have seen CAMLs in the blood of almost all cancer patients and in none of the healthy individuals they have studied. Further, they find that CAMLs interact with CTCs and respond to chemotherapy. Those findings suggest the possible usefulness of CAMLs for monitoring cancer metastasis and tracking treatment. (D. L. Adams et al., *Proc. Natl. Acad. Sci. USA* **111**, 3514, 2014.) —SGB

Liquid chemicals and fuels from natural gas. Natural gas is mostly methane, but it also contains significant amounts of ethane and propane. Those three hydrocarbons are raw materials for easily transportable liquid commodities such as methanol. A key step in making those compounds is to break a strong carbon–hydrogen bond and attach an oxygen atom to the carbon. Current processes require high temperatures (up to 900 °C) that lead to low reaction efficiencies and high carbon dioxide emissions. For decades now, chemists have worked to enable oxygenation at lower temperatures, mostly using scarce and expensive precious metals such as platinum or palladium. Now scientists from the Scripps Research Institute and Brigham Young University, led by Roy Periana, have discovered that salts of abundant elements like thallium and lead can activate and oxygenate C–H bonds of methane, ethane, and propane. The work could be the first step toward an inexpensive and practical conversion of natural gas into other fuels and chemicals. In experiments run under a variety of conditions but always at temperatures below 200 °C, the Periana group achieved oxygenated product yields



often exceeding 70%. The figure (courtesy of the Scripps Energy and Materials Center) shows an intermediate state for the reaction of methane with thallium trifluoroacetate [$Tl(CF_3COO)_3$]. As the thallium (orange) grabs onto the methane carbon atom above it (gray), an oxygen (red) from an acetate group prepares to pluck off one of the methane's hydrogen atoms (white). An acetate group from the reaction solvent replaces the removed hydrogen; then the newly oxygenated methane disengages from the complex. (B. G. Hashiguchi et al., *Science* **343**, 1232, 2014.) —SKB

Better superconducting wires. Magnets are the biggest market for superconducting wire, and the favored wire for generating high fields is round and contains multiple filaments. The round geometry enables flexible conductor designs that support high magnetic stresses and can be wound in complex patterns to precisely shape the field. Although wires made from $YBa_2Cu_3O_{7-x}$ (YBCO) and other high-temperature cuprate superconductors offer the allure of high current densities, that goal has been realized primarily only in broad, flat, single-filament "tape" geometries that reduce the prevalence of current-limiting misalignments between crystal grains (see the article by Alex Malozemoff, Jochen Mannhart, and Doug Scalapino, Physics Today, April 2005, page 41, and also January 2008, page 30). Now David



Larbalestier (National High Magnetic Field Laboratory) and colleagues have found a way to make round, multifilament wire out of the superconductor $Bi_2Sr_2Ca_1Cu_2O_{8-x}$ (Bi-2212). The team's key observation is that the usual wire fabrication process, which involves melting Bi-2212 powder packed inside a long silver tube, introduces bubbles that compromise the superconductor's connectivity, and those voids, not grain boundaries, are what place the dominant constraint on the current density. By applying a pressure of 100 bar during the heat treatment, the researchers could suppress the bubble formation. The resulting wires are denser and better connected, and despite having numerous grain boundaries (colors in this wire image reveal the significant grain misorientation), at liquid-helium temperatures they can carry a higher current density in strong fields than cuprate tapes. The wires open up new opportunities for 20- to 30-tesla magnets for nuclear magnetic resonance spectrometry and other applications, from physics labs to particle accelerators. The incorporation of similar improvements into YBCO wires could yield a transformational technology for helium-free high-field magnets. (D. Larbalestier et al., *Nat. Mater.* **13**, 375, 2014.) —RJF

Fewer large waves for eastern Australia. For about 36 days each year, Australia's east coast is battered by storms whose waves top 4 meters. That average rate, which pertains to 1992–2010, was derived from meteorological data. How the number of such storms could change as Earth's climate warms is the subject of a new computational study led by Andrew Dowdy of Australia's Bureau of Meteorology. Because climate models do not directly predict wave activity, Dowdy first had to identify a proxy. Large waves on the east coast are typically caused by midlatitude cyclones (like the example in the figure) that develop over the Pacific Ocean. Dowdy found that the occurrence of large waves is strongly related to the curvature of the region's atmospheric pressure contours—specifically, of the height above mean sea level at which the pressure is 500 hectopascals (0.49 atm). He and his team ran 18 different models for the years 2006–2100 under two scenarios: By 2100, greenhouse gas concentrations could be about 50% higher than today (the realistic scenario) or risen to about three times the current levels (the pessimistic scenario). All the models predicted a decrease in the annual number of large-wave days. For the realistic scenario, the all-

model average fell to 27 days by the year 2100; for the pessimistic scenario, it fell by 2100 to 22 days. The physical origin of the decrease is uncertain, as is the likely economic impact. On the one hand, large waves exacerbate the damage caused by rising sea levels. On the other, the waves attract money-spending surfers. (A. J. Dowdy et al., *Nat. Clim. Change* **4**, 283, 2014.) —CD