which revealed changes in gene regulation in biological pathways associated with cortical development. — LMZ
Science, this issue p. 1155

**ASTROPHYSICS**

**Finding four for the light of one**

Seeing double may cause concern for some, but seeing quadruple? It’s just what astronomers have been hoping for. Kelly et al. have now detected four images of the same distant supernova with the sharp eye of a space telescope. The supernova shines brightly from the arm of a spiral galaxy that lies far beyond another galaxy between it and us. This intervening galaxy is massive enough to bend the light from the supernova and its host galaxy into multiple images. This behavior relies on the curvature of spacetime and will provide insight into the luminous and dark matter in the lensing galaxy. — MMM
Science, this issue p. 1123

**REPELLENT MATERIALS**

**A robust paintlike repellent coating**

Superhydrophobic materials often depend on a particular surface patterning or an applied coating. However, these surfaces can be damaged by wear or fouled by oily materials. Lu et al. devised a suspension of coated titanium dioxide nanoparticles that can be spray-painted or dip-coated onto a range of hard and soft surfaces, including paper, cloth, and glass. The coatings resisted rubbing, scratching, and surface contamination. — MSL
Science, this issue p. 1132

**POLITICAL ECONOMY**

**Political preferences provide economic capital**

Longer periods of democratic government favor economic growth, which in turn stabilizes democracy. But is this relationship a given? Fuchs-Schündeln and Schündeln collected individual-level data from more than 100 countries over two decades. Support for democracy did indeed increase as the length of time lived in a democratic system increased. — GJC
Science, this issue p. 1145

**INFLAMMATION**

**Interpreting immune signals in the CNS**

Mice with experimental autoimmune encephalomyelitis (EAE) provide a model of multiple sclerosis. In these mice, a subset of T helper cells that secrete the proinflammatory cytokine interleukin-17 (IL-17) are among the first immune cells to infiltrate the central nervous system (CNS). Huang et al. found that the kinase p38α mediated IL-17–dependent signaling in mice with EAE (see the Focus by Gaffen and McGeachy). Disease symptoms were reduced in mice lacking p38α in CNS cells such as astrocytes but were exacerbated in mice deficient in a phosphatase that inhibits p38α. — JFF
Sci. Signal. 8, ra24; see also fs5 (2015).

**METABOLIC ENGINEERING**

**Making biofuels greener**

Plant biomass, rich in hemicellulose, can be converted by microorganisms into ethanol for use as biofuel. However, some materials derived from plant cell walls, including sugars such as xylose, are more difficult for microorganisms to metabolize, making the overall biofuel production process less efficient. Li et al. characterized a widely distributed xylose metabolism pathway from the fungus Neurospora crassa that is required for its growth on hemicellulose. Engineering this pathway into yeast produces previously unknown intermediate metabolites from xylose that are then broken down to xylose and xyitol and fermented to ethanol. — NW

**EYE DEVELOPMENT**

**Eye development from both sides**

In vertebrates, eye development begins with the outgrowth of the optic vesicle from the brain. The optic vesicle then transforms into a bilayered structure called the optic cup after extensive morphological movements, which scientists do not completely understand. In order to visualize these events, Heermann et al. used four-dimensional in vivo microscopy to track the movements of cells in the eyes of developing zebrafish. They found that cells from both sides of the optic vesicle generate the neuroretinal layer of the optic cup, rather than just the side that faces the lens as previously thought. The growth factor bone morphogenic protein facilitated this process. — BAP
EVOLUTION

Wisdom of the elders

Menopause is something that humans share with only two other mammal species: killer whales and pilot whales. Menopause is at odds with classic evolutionary theory, which posits that once animals stop reproducing, natural selection stops too. However, Brent et al. now demonstrate the importance of keeping elders around. They found that older female killer whales lead their pods to salmon feeding grounds and that this leadership is especially important in years when food is scarce. Thus, older females can act as crucial repositories of ecological knowledge, improving their own inclusive fitness and the fitness of their younger relatives. — SNV

VIRAL SPREAD

Enteroviruses have got to hitch a ride...

Viruses are thought to come in two flavors: enveloped—surrounded with a membrane like the cells they infect, or non-enveloped—naked protein and nucleic acid particles that can invade target cells. However, it now seems that non-enveloped viruses might nevertheless sneakily co-opt host cell membranes to help them spread from cell to cell. Chen et al. now show that cells release clusters of newly synthesized enteroviruses, including poliovirus, coxsackievirus B3, and rhinovirus, into the extracellular environment within lipid vesicles. Compared with free viruses, the enclosed viruses do a better job of infecting new cells. — SMH

BIOFUELS

Starting out by making the most of lignin

The woody lignin component of biomass, rich in aromatic carbon rings, ultimately could prove a cost-effective source of numerous commodity chemicals. Parsell et al. make a step in that direction with a zinc and palladium catalyst that transforms lignin into a tractable product stream composed predominantly of two phenol derivatives. These in turn can be further transformed by downstream chemistry. The method does not require preliminary isolation of the lignin; rather, it works on minimally pretreated biomass and leaves behind a cellulose component that’s easily broken down into fermentable sugars for biofuels production. — JSY

MEDICAL IMAGING

A clearer view of type 1 diabetes

Pancreatic beta cells keep blood glucose levels in check by secreting insulin, which removes glucose from blood. In type 1 diabetes, beta cells stop functioning because the immune system destroys them. Noninvasive imaging of pancreatic inflammation—an early sign of this immune attack—could provide scientists with new insights into how the disease begins and progresses. In a pilot study, Gaglia et al. used magnetic resonance imaging to generate three-dimensional high-resolution maps of pancreatic inflammation in patients with recent-onset type 1 diabetes. Key to their success was an imaging agent called ferumoxytol, a clinically approved magnetic nanoparticle taken up by macrophages. — PAK

CLIMATE CHANGE ECOLOGY

Long-term warming and vegetation change

How climate change specifically affects ecosystems can be difficult to sort out. To determine cause and effect, Harte et al. examined changes to vegetation and soil in plots of land in the U.S. Rocky Mountains that they either warmed experimentally or left untouched (ambient) over 23 years. They found that both experimental warming and the natural warming of the Rockies over that time period led to a shift from herbaceous meadow to woody shrub vegetation. Soil carbon declined, too (although in both cases more slowly in the ambient plots). These results demonstrate that climate change caused the observed vegetation and soil changes. — AMS
