Efficient high-harmonic generation in the ultraviolet
Popmintchev et al., p. 1225

SOLAR PHYSICS
Electron acceleration in solar flares
Magnetic reconnection during a solar flare releases energy into the Sun’s atmosphere, some of which is converted into accelerated particles in the plasma. Chen et al. combined radio and ultraviolet observations of a solar flare to identify the termination shock region where electrons are accelerated to relativistic speeds. They confirmed these results with magneto-hydrodynamic simulations. This improved knowledge of the mechanism behind flares improves our understanding of the solar wind and space weather.
— KTS
Science, this issue p. 1238

PROTECTED AREAS
Not enough protection for migrating birds
Animals that migrate pass through a varying number of regions. Each of these regions contributes to a different component of their life cycles. Runge et al. looked at the degree of protection migratory birds receive, globally, across their breeding and wintering ranges. A remarkably low percentage of migratory birds receive adequate protection across their entire ranges. Given that over half the world’s migratory bird populations are declining, these results emphasize the urgency with which we must act to protect birds across their entire migratory cycle.
— SNV
Science, this issue p. 1255

CATALYSIS
Faster elimination inside a cavity
Metals are adept at shuffling molecular bonds. They pry apart two atoms and then pair each one with a different partner. Sometimes the atoms get stuck on the metal, though, and the newly partnered products aren’t released. Kaphan et al. designed a strategy for accelerating this elimination process (see the Perspective by Yan and Fujita). A hollow supramolecular capsule captured a gold or platinum complex and induced rapid bond formation between the carbon atoms in methyl groups bound to the metal. Generalization of this strategy could open the door to a wide range of chemical transformations that are currently held up by slow eliminations.
— JSY
Science, this issue p. 1235; see also p. 1165

PALEOCLIMATOLOGY
Climate change and Norse migration patterns
It has been suggested that conditions of the Medieval Warm Period (~950–1250 CE) enabled the westward expansion of the Norse from Europe to Greenland and North America. The subsequent Little Ice Age (~1300–1850 CE) eventually drove their retreat from the western North Atlantic. Young et al. present chronological data for alpine glacial moraines on Baffin Island and western Greenland. Their findings suggest that cold conditions prevailed during the Medieval Warm Period in the eastern North Atlantic. This calls into question the notion that climate change alone led...
to the retreat of the Norse from Greenland. — KKH

**NEURODEVELOPMENT**

**Maturation of olfactory neurons**
The sense of smell depends on neurons in the olfactory epithelium to perceive chemical scents. Each neuron specializes with one receptor. Hanchate et al. now show that the one-for-one relationship is not as simple as thought. As new neurons develop to replenish the olfactory epithelium, they initially express several different alleles of olfactory receptors. Then, as each neuron matures, they specialize to express a single receptor. — PJH
Science, this issue p. 1251

**HUMAN GENETICS**

**Putting both heart and brain at risk**
For reasons that are unclear, newborns with congenital heart disease (CHD) have a high risk of neurodevelopmental disabilities. Hornsy et al. performed exome sequence analysis of 1200 CHD patients and their parents to identify spontaneously arising (de novo) mutations. Patients with both CHD and neurodevelopmental disorders had a much higher burden of damaging de novo mutations, particularly in genes with likely roles in both heart and brain development. Thus, clinical genotyping of patients with CHD may help to identify those at greatest risk of neurodevelopmental disabilities, allowing surveillance and early intervention. — PAK
Science, this issue p. 1262

**EDUCATION**

**Toward a level playing field?**
Do free learning resources benefit the disadvantaged and decrease gaps between rich and poor? Hansen and Reich studied the relationships between socioeconomic status (SES) and enrollment in and completion of free Massive Open Online Courses (MOOCs) offered by Harvard and MIT. Students from low-SES backgrounds were less likely to enroll in MOOCs and earn a certificate than their high-SES peers. Thus, although there are many free online learning opportunities, it is not safe to assume that they will “level the playing field.” — BJ
Science, this issue p. 1245

**WATER RESOURCES**

**Local decisions with global consequences**
Some estimates suggest that humanity has already exceeded our sustainable global water footprint: the balance between fresh water use and supply. It seems that the situation may be more unsustainable than we realize. Jaramillo and Destouni analyzed hydroclimatic data for 100 large basins dating back to 1901. Better accounting of local water use revealed larger than anticipated effects on the global water cycle. For example, local regulation of surface water flow and expanded regional irrigation activities have increased global evapotranspiration rates. — NW
Science, this issue p. 1248

**METABOLIC DISEASE**

**Inflammation improves insulin resistance**
One of the hallmarks of diabetes is insulin resistance, a condition in which insulin accumulates because the body cannot effectively use it. Although insulin resistance occurs in both age- and obesity-associated diabetes, Bapat et al. now report that the underlying cellular mechanisms that drive these diseases differ. An overzealous inflammatory response contributes to obesity-associated insulin resistance. In contrast, an immunosuppressive subset of T cells, called regulatory T cells (T_{reg}), promoted insulin resistance in aging mice. Aged but not obese mice that lacked these cells experienced improvement in

**IMMUNOLOGY**

**When inhibitors don’t mimic knockouts**
The T helper 2 (T_{h2}) subset of lymphocytes releases cytokines implicated in the pathogenesis of asthma, a process that requires the kinase ITK. ITK-knockout mice are resistant to airway inflammation, suggesting that ITK inhibitors might be used to treat human asthma. However, Sun et al. found that an ITK-specific inhibitor aggravated disease symptoms in a mouse model of asthma. The airways of these mice had more T cells and higher levels of cytokines that are typically released by T_{h2} lymphocytes. Thus, targeting ITK activity in asthma patients may exacerbate disease. — JFF
HEART MITOCHONDRIA
A change of heart (mitochondria)
Mitochondria provide an essential source of energy to drive cellular processes and are particularly important in heart muscle cells (see the Perspective by Gottlieb and Bernstein). After birth, the availability of oxygen and nutrients to organs and tissues changes. This invokes changes in metabolism. Gong et al. studied the developmental transitions in mouse heart mitochondria soon after birth. Mitochondria were replaced wholesale via mitophagy in cardiomyocytes over the first 3 weeks after birth. Preventing this turnover by interfering with parkin-mediated mitophagy specifically in cardiomyocytes prevented the normal metabolic transition and caused heart failure. Thus, the heart has coopted a quality-control pathway to facilitate a major developmental transition after birth. Wai et al. examined the role of mitochondrial fission and fusion in mouse cardiomyocytes. Disruption of these processes led to “middle-aged” death from a form of dilated cardiomyopathy. Mice destined to develop cardiomyopathy were protected by feeding with a high-fat diet, which altered cardiac metabolism. — SMH

Science, this issue p. 1220, p. 1221; see also p. 1162

LASER PHYSICS
Short wavelengths birth shorter ones
The shortest laser pulses—with durations measured in attoseconds—arise from a process termed high-harmonic generation (HHG). Essentially, a longer, “driving” pulse draws electrons out of gaseous atoms like a slingshot, and, when they ricochet back, light emerges at shorter wavelengths. Most HHG has been carried out using light near the visible/infrared boundary for the driving pulse. Pompintchev et al. used an ultraviolet driving pulse instead, which yielded an unexpectedly efficient outcome. These results could presage a more generally efficient means of creating x-ray pulses for fundamental dynamics studies as well as technological applications. — JSY

Science, this issue p. 1242

BLACK HOLES
Magnetic fields near the event horizon
Astronomers have long sought to examine a black hole’s event horizon—the boundary around the black hole within which nothing can escape. Johnson et al. used sophisticated interferometry techniques to combine data from millimeter-wavelength telescopes around the world. They measured polarization just outside the event horizon of Sgr A*, the supermassive black hole at the center of our galaxy, the Milky Way. The polarization is a signature of ordered magnetic fields generated in the accretion disk around the black hole. The results help to explain how black holes accrete gas and launch jets of material into their surroundings. — KTS

Science, this issue p. 1231

GENE REGULATION
Broad versus restricted expression
Color vision in fruit flies requires the restricted expression of light-sensing rhodopsins with different wavelength sensitivities in subsets of photoreceptors. However, all photoreceptors express factors that transduce and amplify the visual signal. Rister et al. found that the distinct expression patterns are determined by a highly tunable regulatory motif. Genes that are broadly expressed have a palindromic variant of the motif. Spatially restricted rhodopsin genes display single–base-pair changes that alter the symmetry of the palindromic and are critical for subtype–specific expression. These findings on the differential regulation of gene expression in fly photoreceptors have implications for the evolution of neuronal subtype diversity. — BAP

Science, this issue p. 1258

INFLUENZA
Stalking a flu vaccine
A universal flu vaccine has been a Sisyphean trial—despite successful seasonal vaccines, the immune system must start over when meeting newly mutated influenza strains. Andrews et al. took an in-depth look, over time, at the B cell response to the pandemic 2009 H1N1 vaccine. People with low titers of preexisting antibodies were more likely to generate a broadly reactive response that targets the more conserved hemagglutinin (HA) stalk region, whereas those with higher levels of preexisting antibodies responded by targeting the more variable HA head. The preexisting head antibodies were immunodominant and prevented clear access.
to the stalk. These data suggest that recipients’ exposure history will be critical in designing a universal flu vaccine. — ACC

ECOLOGY
Roads, roads everywhere
Over the past century, an ever-expanding network of roads has spread over our planet. In a Perspective, Haddad considers the environmental impacts of this network. Roads often lead to land-use change as people clear newly accessible land for agriculture or housing. Roads also fragment ecosystems and cause widespread wildlife losses through collisions with vehicles. Road planning and construction can help to protect wildlife from the worst effects of roads; for example, through the construction of wildlife corridors. However, these measures are not enough to prevent the habitat fragmentation and land-use change that accompany the growing global road network. — JFU
Science, this issue p. 1166