change. Wang et al. explored the temporal dynamics of CFE on vegetation photosynthesis at the global scale. There has been a decline over recent decades in the contribution of CFE to vegetation photosynthesis, perhaps owing to the limiting effects of plant nutrients such as nitrogen and phosphorus. This declining trend has not been adequately accounted for in carbon cycle models. CFE thus has limitations for long-term mitigation of climate change, and future warming may currently be underestimated. —AMS

Science, this issue p. 1295

INTRACELLULAR IMAGING
Subcellular map of vesicle maturation
Insulin-containing vesicles in pancreatic β cells must migrate from the cell interior to the cell surface after stimulation by glucose. Two studies now use related whole-cell imaging techniques, soft x-ray tomography, and cryo-electron tomography to resolve the distribution, size, density, and location of insulin-containing vesicles as a function of time. White et al. visualized a mesoscale map of whole cells, and Zhang et al. provided higher-resolution structural information in specific “neighborhoods” of the cell. Understanding insulin regulation of circulating glucose by β cells will be advanced by this global picture of intracellular dynamics along the insulin secretion pathway. —PLY

Science, this issue p. 1309

QUANTUM INFORMATION
Molecular qubits that respond to light
Spins in solid-state systems such as quantum dots and defect centers in diamond can easily be controlled by light for use in quantum information processing. More challenging is tuning their properties and making large arrays, something that can be done more easily with spins in molecules. Bayliss et al. combined the advantages of the two approaches by designing and characterizing three related molecular species that are optically addressable. The molecules consist of a central chromium ion surrounded by organic ligands, and their spin and optical properties can be tailored by simply changing the positions of methyl groups on the ligands. —YS

Science, this issue p. 1309

ULTRACOLD CHEMISTRY
Electric field shielding of ultracold molecules
Because reactive collisions limit the lifetime of ultracold molecular ensembles, controlling chemical reactivity at ultralow temperatures has been a long-standing goal. Using large electric fields that trigger resonant dipolar interactions between potassium-rubidium molecules trapped in a quasi-two-dimensional geometry, Matsuda et al. report suppression of the reactive loss rate in the vicinity of the dipolar-mediated resonances by up to an order of magnitude below the background value. The proposed shielding mechanism is general and is expected to be effective in three-dimensional geometry. It could also be used for creating long-lived quantum molecular gases of other polar molecules under strong electric fields. —JS


RADIATIVE COOLING
A smarter radiative cooler
Passive daytime radiative cooling materials allow heat to be transported into outer space through Earth’s atmospheric infrared transparency window. Xue et al. focus on engineering inexpensive coating materials for buildings, which take advantage of daytime radiative cooling but suppress it in the night when cooling no longer is needed. This is accomplished by widening the emissivity spectrum over the entire mid-infrared range. The strategy also uses common materials for the coatings that are more likely to withstand long-term weathering. —BG

False-colored scanning electron microscope image of a coating for cooling buildings, containing hollow glass microspheres (red) and fluorescent pigment (green)

CANCER
Alleviating side effects
Platinum-based chemotherapy drugs, such as cisplatin and oxaliplatin, are commonly used to treat diverse cancer types. However, their use is limited by side effects, particularly vomiting, anorexia, muscle wasting, and weight loss. Breen et al. show that the amounts of the cytokine growth differentiation factor 15 (GDF15) increase in the circulation of patients with colorectal cancer, non–small cell lung cancer (NSCLC), and ovarian cancer who were treated with platinum chemotherapy. Moreover, the amount of circulating GDF15 was correlated with weight loss in metastatic colorectal cancer patients receiving oxaliplatin. Neutralization of GDF15 using monoclonal antibodies in nonhuman primates treated with cisplatin attenuated vomiting and anorexia. GDF15 also reversed weight loss in mice with NSCLC treated with cisplatin. This work shows that GDF15 has
HEMATopoiesis

Fetal versus adult hematopoiesis

Development of an organism over time requires a multitude of factors, cells, and movements. The fetal-to-adult transition is a time of major transformation. The hematopoietic system is one development process that sees important changes to enable differential cell composition and activity. Li et al. used single-cell RNA-seq, ATAC-seq, and ChIP-seq in mice and observed a gradual, rather than an abrupt, shift in gene expression and the epigenetic mechanism for hematopoietic stem cells and hematopoietic progenitor cells. Indeed, neonatal and adult expression can occur at the same time and the changes seem to occur in an uncoordinated manner rather than following a strict gene regulatory network. Just before birth, type I interferon is activated and plays a specific role at the perinatal to postnatal hematopoietic system switch. —BAP


TOPOLOGICAL OPTICS

Confining light—bound and protected

The traditional method of confining light does so within the cavity formed by two mirrored surfaces. Cerjan et al. explored another form of light confinement using the higher-order topological insulating states of crystals. They show that these features provide protection against defects and chiral light propagation. Controlling the symmetry of artificial crystal structures to produce topologically protected bound states could prove a flexible route to fabricate devices from materials where the usual methods to confine and manipulate light fail. —ISO


HIV

Wheeling out HIV elimination

Several sub-Saharan countries have been prioritized by the Joint United Nations Programme on HIV/AIDS (UNAIDS) for HIV elimination. This will require 90% treatment coverage by the end of 2030, but poor transport infrastructure means incomplete access to medication in some countries. Palk et al. developed a geospatial model for understanding the difficulties of reaching health care facilities in Malawi, a country severely affected by HIV. They mapped health care facilities with the density of HIV prevalence and quantified the difficulty of travel across Malawi’s landscape by a friction surface raster map. If bicycles are used, then the catchment size for a health care facility is substantially larger than if people walk, and the required 90% treatment coverage for elimination becomes achievable. Bicycles are already used as “ambulances” in rural areas, but Malawi’s bicycle fleet is small and in poor repair. One straightforward route for beating HIV (and many other health conditions) here and in similar countries could lie simply in boosting the supply of bicycles, an established and well-tested technology. —CA


MEDICAL SCREENING

Who is getting mammograms?

Whether and when to recommended medical screening can be contentious. Einav et al. suggest that too little is known about how women who only seek mammograms in response to recommendations at age 40 (“compliers”) might differ from women who don’t wait for recommendations (“always-takers”) or who never get mammograms (“never-takers”). They estimate that always-takers have higher rates of in situ and invasive cancer than the general population, whereas compliers are less likely to have invasive cancer and no more likely to have in situ cancer than never-takers. Screening debates must consider such selection effects because the typical woman who responds to the recommendation appears to be distinct from the broader population of women covered by the recommendation. —BW

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Wheeling out HIV elimination

Caroline Ash

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