activates all 12 complexes (see the Perspective by Hardie). In animal models, MK-8722 ameliorated diabetes, but it also caused enlargement of the heart. MK-8722 may be a useful tool compound for laboratory research on AMPK function. —PAK

**FLUID MECHANICS**

**Linking fluids as they twist and writhe**

Helicity is a measure of corkscrew-like motion described by the amount of twisting, writhing, and linking in a fluid. Total helicity is conserved for ideal fluids, but how helicity changes in real fluids with even tiny amounts of viscosity has been an open question. Scheeler et al. provide a complete measurement of total helicity in a real fluid by using a set of hydrofoils to track linking, twisting, and writhing (see the Perspective by Moffatt). They show that twisting dissipates total helicity, whereas writhing and linking conserve it. This provides a fundamental insight into tornado genesis, atmospheric flows, and the formation of turbulence. —BG

**EVOLUTION**

**Extreme events bring rapid change**

Environmental adaptation is often considered a slow process. However, extreme events, such as heat waves or cold snaps, can produce rapid changes, both morphologically and genetically. Campbell-Staton et al. studied a population of green anole lizards during an extreme cold snap in the southern United States (see the Perspective by Grant). After the cold snap, the lizards showed greater cold resistance and displayed changes in six genomic regions that are important for regulation of function in the cold. Understanding how extreme climatic events influence adaptive potential will become increasingly important as the climate becomes more volatile. —SNV

Science, this issue p. 495; see also p. 451

**QUANTUM MAGNETISM**

**Spin-charge separation in atomic chains**

Strongly interacting electrons lined up along a string can experience the so-called spin-charge separation, where the electrons “split” into effective carriers of spin and charge, which then move independently. This phenomenon has been observed, somewhat indirectly, in solids. Hilker et al. show spin-charge separation in a direct way by using a one-dimensional (1D) array of cold atoms, playing the role of electrons, whose degrees of freedom of spin and charge can be monitored using a fermionic quantum gas microscope. Empty sites in the 1D lattice moved freely without disturbing the underlying antiferromagnetic order. —JS

Science, this issue p. 484

**CANCER THERAPY**

**Fixing with folate**

MicroRNAs (miRNAs), small noncoding nucleotides that regulate gene expression, are attractive therapeutic targets for cancer. The rapid degradation of miRNA mimics in vivo has spurred the use of protection strategies, including administration of liposomes and backbone modification. However, such interventions can hinder miRNA stability, activity, and uptake efficiency. Orellana et al. showed that vehicle-free miRNA could be targeted to cancer cells overexpressing the folate receptor. MiR-34a attached to folate, increased miR-34a copy number, and reduced tumor size when delivered to mice with lung and breast cancer tumors. —CC


**IN OTHER JOURNALS**

**Edited by Caroline Ash and Jesse Smith**

A third species of North American flying squirrel

New flier glides into the Pacific

Current news tends to be about species lost, not gained, so it is encouraging to discover a previously unknown species right under our noses. North American flying squirrels have long been considered to comprise just two species, one in the north and one in the south. Using a combination of genetic tools on museum specimens, Arbogast et al. found that there are in fact three species. No evidence of gene flow among populations was found, even where the species occur sympatrically. The newly identified Pacific coastal lineage is more closely related to the distant southern flying squirrel than it is to its close neighbor, the northern flying squirrel. This level of distinction could elevate the lineage to the status of a new species: Humboldt’s flying squirrel. —SNV


**DEMOCRACY DATA**

**E lecting the best and the broadest**

Can democracies elect leaders who are both highly capable and broadly representative of society? They can in Sweden. Dal Bó et al. used data on more than 200,000 candidates for national or municipal office, including 50,000 who were elected, from 1982 to 2010. These were combined with individual data on
cognitive and personality traits and socioeconomic information about candidates and their parents. Even when controlling for family background, politicians demonstrated better average cognitive and leadership skills than the broader population. But high quality was not exclusive: Politicians were drawn very evenly from across socioeconomic classes. —BW


MICROBIOLOGY
Changing ecosystems in cow stomachs
Cattle are able to metabolize otherwise indigestible plant materials with the help of methane-generating bacteria in their first stomach, called the rumen. Friedman et al. show that methane is generated in the rumen of newborn calves just 2 days after birth. However, the methanogens in the young calves’ rumen differ from those of mature animals. The bacterial taxa that dominate in the young calves require methylated compounds, whereas those in the mature animals mostly require dihydrogen and carbon dioxide. These shifts in observed taxa likely occur as a response to changing environmental conditions during different life stages. —JFU


ANTHROPOLOGY
Globalization is not recent
Ancestors are important on Madagascar, and the Malagasy worry about their origins. In an island-wide genomic study of maternal mitochondrial DNA and the paternal Y chromosome, Pierron et al. investigated the details of Malagasy descent. Sampling 2700 people from more than 250 villages across the island confirmed admixture of African Bantu and Austronesian ancestors. Maternal genes originating from southern Borneo predominate and Austronesian ancestors. admixture of African Bantu

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in the central highland regions of the island, and African genes dominate in coastal regions and the north. The Austronesians seem to have arrived about 2500 years before the present (the Malagasy language is Austronesian), and about 1000 years later, the Bantu landed on the northern tip of the island, having traveled from southern Africa. Whether this information will be considered helpful by the Malagasy in resolving disputes about ancestry is moot. —CA


TRANSCRIPTION
Mysterious Mediator multiprotein
Mediator is a multiprotein complex that physically connects transcription activators bound at enhancers and RNA polymerase II bound at promoters to initiate transcription. Petrenko et al. measured transcriptional activity after depleting Mediator in yeast. Instead of eliminating activity as expected, the depletion of individual subunits caused a modest decrease in transcription. Only when all three (head, middle, and tail) modules of Mediator were simultaneously inactivated was transcription abrogated. Furthermore, different Mediator modules promoted RNA polymerase II in different ways, and Mediator was not found in the preinitiation complex. This result questions the classic model of Mediator bridging enhancers and promoters and begs for answers about how Mediator activates transcription. —SYM


MICROBIOLOGY
Bacterial signals promote mosquito development
The ways of the microbiota are many and mysterious. All organisms have prokaryote partners that contribute to health, as well as disease. Coon et al. report that larval mosquitos require bacteria in their gut to complete development into an adult insect. In this case, the bacteria are not making a nutritional contribution, however. To be helpful to the insect, this strain of Escherichia coli has to supply cytochrome bd oxidase expression. The respiratory function of the oxidase causes hypoxia, which then acts as a signal to promote host development. The hypoxia initiates hypoxia-inducible transcription factors and promotes molting. Blocking such cues might be a strategy to interrupt the life cycle of disease-carrying mosquitos. —LBR


PLANAR OPTICS
Removing the rainbow from diffractive optics
When white light hits a structured surface, different wavelengths are diffracted in different directions, creating a rainbow of colors, as can be seen in opals or the strong iridescent colors of some insects and butterfly wings. In developing diffractive optical elements, such beauty seen in the natural world becomes a bug in terms of chromatic aberration. Using judiciously patterned dielectric surfaces, Arbabi et al. designed a metasurface so that the phase and wavelength of the diffracted light could be controlled, and they demonstrated the ability to fabricate focusing mirrors with reduced chromatic dispersion. Such control over the chromatic dispersion will be crucial in developing planar optical elements. —ISO

Changing ecosystems in cow stomachs
Julia Fahrenkamp-Uppenbrink

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