that causes blast disease. First seen in Brazil, wheat blast last year caused devastating crop losses in Bangladesh. Inoue et al. tracked down the shifting genetics that have allowed the emergence of this potentially global threat to wheat crops (see the Perspective by Maekawa and Schulze-Lefert). Wheat varieties with a disabled resistance gene were susceptible to pathogen strains that affected oat and ryegrass crops. Subsequent genetic changes in the pathogen amped up the virulence in wheat. —PJH
Science, this issue p. 80; see also p. 31

MICROBIOME
Diving into the depths of atopic dermatitis
The genus Staphylococcus is a known driver of atopic dermatitis. Byrd et al. used shotgun metagenomic sequencing to analyze the specific species and strains present at baseline and during flares in pediatric atopic dermatitis. Patients with more mild disease had more S. epidermidis in flares, and those with severe disease were dominantly colonized by clonal S. aureus strains. Bacterial strains from the patients were applied to mouse skin, and strains from severe flares induced T cell differentiation and epidermal thickening. Thus, not all Staphylococcus are equal when it comes to atopic dermatitis. —LP

ECONOMICS
How to make traffic worse everywhere
One policy aimed at improving traffic flows in large cities requires vehicles to carry two or three passengers, usually in lanes or roads set aside for high-occupancy vehicle (HOV) travel. Whether this actually increases speeds depends on how heavily the HOV roads are used and the availability of alternate routes. Hanna et al. took advantage of an abrupt policy change—the elimination of HOV rules—in Jakarta to collect the travel times from Google Maps for HOV and alternate routes before and after the change (see the Perspective by Anderson). They observed a serious worsening of traffic throughout the city. —GJC
Science, this issue p. 89; see also p. 36

SUPERCONDUCTIVITY
A deeper look into iron selenide
In the past 10 years, iron-based superconductors have shaped more puzzles than they have helped resolve. Some of the most fundamental outstanding questions are how strong the interactions are and what the electron pairing mechanism is. Now two groups have made contributions toward resolving these questions in the intriguing compound iron selenide (FeSe) (see the Perspective by Lee). Gerber et al. used photoemission spectroscopy coupled with x-ray diffraction to find that FeSe has a very sizable electron-phonon interaction. Quasiparticle interference imaging helped Sprau et al. determine the shape of the superconducting gap and find that the electron pairing in FeSe is orbital-selective. —JS
Science, this issue p. 71, p. 75; see also p. 36

IN OTHER JOURNALS
Edited by Caroline Ash and Jesse Smith

GEOCHEMISTRY
A sizzling mantle under the Galapagos
The temperature of Earth’s mantle is relatively uniform, but certain “hot spots” responsible for some surface volcanism require locally hotter regions. Trela et al. find evidence for a much hotter mantle region by looking at the chemistry of a recent Tongalava suite from the Galapagos hot spot. The chemistry requires mantle temperatures that are a surprising 400°C higher than average. The result indicates a very hot region isolated from mantle convection, likely preserved from many billions of years ago. —BG
Nat. Geosci. 10.1038/Ngeo2954 (2017).

NONLINEAR OPTICS
The interaction of solitons
As light propagates through a medium such as a lens or window, scattering and dispersion processes usually result in the light diffusing. In a nonlinear medium, however, the dispersion processes can be balanced by nonlinearities to produce localized structures known as solitons, or optical bullets. Krupa et al. find that when pairs of solitons propagate in an optic fiber, they can interact, attracting and repelling each other. Liking the interactions to those of molecules, the authors suggest that the temporal motion of the solitons and the energetics associated with the interactions could be exploited for new optical effects in different classes of laser systems. The enhanced interactions could also possibly be used to increase the capacity of optical communication networks. —ISO

TUBERCULOSIS
Metabolic memory in Mycobacterium
Tuberculosis is a slow disease. Replication of the pathogen, Mycobacterium tuberculosis, can be arrested for decades within hypoxic tubercles. Eoh et al. show that hypoxia shifts the metabolism of M. tuberculosis into the pentose phosphate pathway (PPP) by depleting stores of trehalose. This disaccharide is essential for the mycolyl glycolipids that wax the surface of the bacterium’s cell. The PPP intermediates provide precursors for nucleotide and peptidoglycan synthesis. The pathogen is thus retuned during latency to poised for immediate action when immunocompromise has crept up on the aging host; the tubercles start breaking down, and exposure to oxygen allows the pathogen to restart replication. —CA
Bees also like a sticky mess

Flowers produce all kinds of cues that attract bees and alert them to the presence of nectar, indicating that bees are highly attuned to flower signals. But contrary to expectations, bees do not solely rely on flower signals to look for nectar. Meiners et al. found that bee’s ability to find resources is likely much more flexible than we have realized. After observing large numbers of bees visiting nonflowering chamise shrubs, they discovered that 42 bee species were collecting honeydew produced by scale insects found on the shrubs. Bees also swiftly located sugar daubed on shrub limbs. As for how they locate an unadvertised resource such as honeydew, the authors suggest that they may be using social cues from other foraging bees. —SNV


In cancer, it’s not just about the genes

After a decade of productive cancer genome projects, few experts would question the role of genetics in human cancer. Yet environmental factors also contribute. One intriguing hypothesis is that carriers of certain genetic alterations develop cancer because they are less able to cope with environmental or endogenous carcinogens. Tan et al. identified a gene-environment interaction involving BRCA2, a protein that functions to maintain genomic integrity. Inherited mutations in one copy of BRCA2 confer susceptibility to several cancers, including breast cancer. The authors found that exposure of cultured cells to naturally occurring levels of formaldehyde or acetaldehyde induces selective degradation of wild-type BRCA2 protein. This could exacerbate the effect of heterozygous BRCA2 mutations and result in the accumulation of cancer-causing mutations. —PAK


All’s fair in love and war

Ejaculates not only deliver sperm; other components promote sperm survival and control female reproductive physiology. Insects produce complex ejaculates in packages called spermatophores, which also act as plugs to prevent sneaky mating by rival males. Meslin et al. discovered that spermatophores are the object of an evolutionary arms race in cabbage white butterflies. These plugs have tough outer proline-rich capsules, but the female butterflies have evolved a range of proteases that can digest them and thus hasten the time when she can become receptive again. This butterfly has taken back control of her reproduction. —CA


Female cabbage white butterflies have evolved methods to break down spermatophore plugs, thus hijacking control of when they can mate again.

A volcanic caldera on Isabela Island, Galapagos Islands, Ecuador

FORAGING ECOLOGY

CANCER ETIOLOGY

MATERIALS SCIENCE

Framework materials can dew it

Although filtration or distillation can desalinate water, these approaches can require large amounts of energy, great quantities of saline water, and extensive piping and distribution networks. They are thus impractical in a desert setting where extraction from the atmosphere is the primary source of water. Rieth et al. constructed a metal–organic framework (MOF) material that can pull 0.8 grams of water per gram of MOF from air at only 30% humidity, using the day-to-night temperature swing to drive adsorption and desorption. The key to the design was having pores wider than the critical diameter for capillary action to allow free flow of the water molecules. —MSL

All's fair in love and war
Caroline Ash

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