ECOLOGY

Desert Invaders

The popular conception of an invasive plant species is of one that rapidly achieves abundance or even dominance after its introduction into a new region. However, in natural communities, many native species can persist at low population densities, reaching greater abundance only when changes occur in ecological factors such as resource abundance, competitors, or herbivores. This could be a feature of some invasive species too. A decade ago, Shea and Chesson advanced the notion of "niche opportunities" for invasive species, whereby such a species might be able to occupy a new habitat at low density, biding its time until conditions become right for more rapid expansion and spread. Observation of such behavior requires long-term monitoring. Allington *et al*. have now documented a case of niche opportunity in an invasive herbaceous annual, *Erodium cicutarium*, in the Chihuahuan desert. For the first two of three decades of monitoring, *E. cicutarium* remained at low densities. After 20 years, however, a coincidental decrease in the abundance of rodents and a shift in the precipitation regime combined to create an opportunity for populations of *E. cicutarium* to increase rapidly, outcompeting native species and becoming the dominant plant in the community. — AMS

Ecol. Lett. 10.1111/ele.12023 (2012).

PHYSICS

A Topo-Superconducting Hybrid

Soon after the discovery of topological insulators (TIs)—exotic materials that have a surface state similar to graphene's—physicists conjectured that "mating" a TI with a superconductor would give rise to an even more exotic state dubbed the topological superconductor (TSC); such a material might support Majorana states, thought to be a promising platform for quantum computing. A bulk TI can be doped until it becomes superconducting, while preserving its signature surface states. This approach led to the discovery of $Cu_xBi_2Se_3$, a possible TSC, but intrinsic inhomogeneities in that material made progress difficult. Now, Sasaki *et al.* observe a possible TSC state in $Sn_{1-x}In_xTe$ by point-contact spectroscopy, which shows a signature peak in the density of states at the Fermi energy instead of the gap expected in an ordinary superconductor. Coupled with theoretical considerations, this result indicates that the material is an unconventional superconductor. The similarity in the band structure and the spin-orbit coupling strength in the two materials ($Cu_xBi_2Se_3$ and $Sn_{1-x}In_xTe$) suggests a more general approach in the search for topological superconductivity. — JS

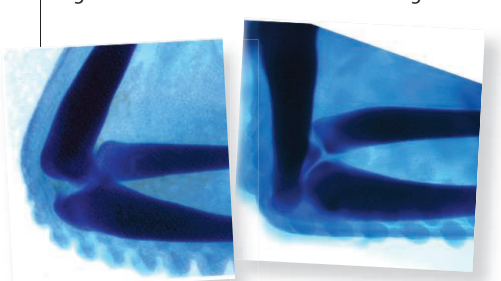
Phys. Rev. Lett. **109**, 217004 (2012).

DEVELOPMENTAL BIOLOGY

Chick Limb Regeneration

Classic regeneration experiments with planaria and newts have demonstrated the amazing abilities of some animals to regrow amputated parts. Unfortunately, such phenomena are generally not possible in birds and mammals. The chicken limb does not normally regenerate; however, regeneration can occur after fibroblast growth factor is added or a limited part of the mesenchyme is removed. With this limited regenerative potential in mind, Özpolat *et al.* examined the elbow joint. The joint was identified by histological and cell-fate mapping, and a section of tissue containing the joint was excised. When the two ends were placed together, the bones fused without generation of a joint. However, if a "window" of space was maintained after excision, the elbow joint regenerated. Regeneration followed the same molecular program as that taken during normal embryonic development. Furthermore, cell labeling experiments revealed that posterior cells migrated to the site of injury. Chick limb regeneration thus resembles that of amphibian limbs, where cells migrate to a wounded area and reinitiate the normal developmental program. — BAP

Dev. Biol. **372**, 229 (2012).



CHEMISTRY

A Bit of Charge Is Plenty

For nanoparticles to find use in an array of applications, new techniques are needed to deposit and order the individual particles into large structures. Electrophoretic deposition, in which charged particles in a solution are exposed to a uniform electric field, has been used to close-pack spherical particles or deposit them into trenches or order a layer of nanocrystal rods. Singh *et al.* show that control over net particle charge and

CREDITS (TOP TO BOTTOM): MORGAN ERNEST/UTAH STATE UNIVERSITY; B. ÖZPOLAT *ET AL.*, *DEV. BIOL.*, **372**, 229 (2012)

dipole can lead to the formation of well-ordered, tightly packed multilayers of vertically aligned rods. The best ordering was obtained for CdS rods, where a low net charge (or zeta potential) on the as-synthesized rods facilitated the slow deposition necessary for good ordering. Increasing the zeta potential by ligand exchange led to much poorer ordering. In contrast to CdS, CdSe rods showed a tapered rice shape less amenable to close-packing. However, it was still possible to pack the rods in a vertical orientation at high density, an arrangement needed for application of this material as a solar cell photoabsorber. — MSL

J. Phys. Chem. B 10.1021/jp305184n (2012).

ENVIRONMENTAL MICROBIOLOGY

Programmed Death Machines All at Sea

The interaction between viruses and phytoplankton blooms can influence marine carbon export. In culture, it has been established that giant double-stranded DNA coccolithoviruses invoke glycosphingolipid synthesis to trigger programmed cell death in neighboring uninfected cells, thus amplifying lysis. Using mesocosm enclosures in a Norwegian fjord, Vardi *et al.* probed the dynamics of *Emiliania huxleyi* and its associated virus at sea. They discovered several conserved molecular correlates for concurrent ecological observations, including release of the same viral death-inducing lipids that had been observed in culture. The viral glycosphingolipids induce intracellular reactive oxygen species, which prompt the programmed cell death machinery in algal cells to assemble, providing an environment that includes everything the virus needs for successful replication. Furthermore, the stressed algal cells produce expolymer particles that form aggregates called marine snow, and it is this that accelerates carbon export to deep water. Finally, virus infection induces a subset of the algal cells to form haploid sexual stages that can evade infection and live to die another year. — CA

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1208895109 (2012).

CELL BIOLOGY

Smell of Genes Packed Away

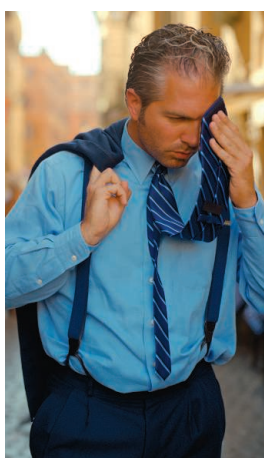
To allow responses to specific odorants, mammalian olfactory sensory neurons form clusters that express just 1 of almost 3000 olfactory receptor alleles. Clowney *et al.* explored the mechanism by which the promoters of all the rest of these genes are maintained in an inactive state. In mouse olfactory sensory neurons, the unused promoters were spatially organized in about five large foci from which the active gene was excluded. Unlike most cells, where inactive heterochromatin is localized to the periphery of the nucleus, the olfactory receptor genes were located near the center of the nuclei. This "inside-out" morphology is similar to that observed in mice lacking functional lamin b receptor, a protein of the nuclear envelope that interacts with lamins and heterochromatin. Indeed, lamin b receptor was down-regulated during sensory neuron differentiation. Forced expression of the lamin b receptor reversed the morphological sequestration of the olfactory receptor genes and also decreased the expression of the chosen active allele, probably because the thousands of transcription factor binding sites of the normally sequestered olfactory receptor genes were now competing for binding of activating factors. Thus, spatial organization in the nucleus appears to have an essential role in control of this extreme example of monoallelic gene expression. — LBR

Cell **151**, 724 (2012).

CLIMATE SCIENCE

Feeling Is Believing

Weather is generally much more variable than climate, and a single person's experience of either is restricted in both space and time. Still, at some point, or even right now, it is expected that climate change will become more apparent even to an average person, at least in some regions. Mahlstein *et al.* point out that the locations that will provide the earliest individually apparent evidence are those where the magnitude of some manifestation of climate change is greater than local weather variability: presently, that means lower latitudes, where the annual range of seasonal temperatures is the smallest. They therefore use observational temperature data from every longitude to investigate if and where emergent local warming signals are apparent and when those warming trends became clear. They find that some locations, mainly at low latitudes, began to reveal rising temperatures as early as during the 1960s, but that far more areas still do not show a clear local signal. However, the frequency of emerging signals is increasing with time, and it is clear that the pattern of emergence reflects a steadily warming climate. — HJS



Geophys. Res. Lett. **39**, L21711 (2012).

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Feeling Is Believing

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