

ECOLOGY

## Bad Time for Rain

Understanding the balance between climatic changes and weather-driven mortality requires data on both long-term climate trends and the toll taken by extreme weather. Boersma and Rebstock looked at the cause of every recorded chick mortality in an Argentinian colony of Magellanic penguins, over a nearly 30-year period, and compared these with changes in temperature and precipitation over the same time. They found that the majority of deaths were due to predation and starvation, common causes of mortality in juvenile animals. However, in a few unusual years, where extreme storms occurred during the critical period after the young are protected by the brood pouch but before they develop protective plumage, large numbers of chicks were killed by weather. Although looking at the rarity of these events one might presume that weather extremes have little effect, the number of animals killed in the storms left a persistent recruitment legacy. Rainstorms increased in frequency over the study period, and the authors suggest that this, as well as the synchronization between rainstorms and chick vulnerable periods, is likely to increase with climate change. Further, such extreme events will affect other species in the region, which have long existed under more predictable weather regimes. — SNV

*PLOS One* 10.1371/journal.pone.0085602 (2014).



GENETICS

## The Cost of Protection

African Americans have a three to five times greater risk of developing end-stage kidney disease and twice the risk of dying from heart disease than do individuals of European descent. In addition to socioeconomic factors, genetic factors probably contribute to these differences. Clinical geneticists have focused on two allelic variants of *APOL1* (the gene encoding apolipoprotein L1) called G1 and G2. These alleles confer protection against African sleeping sickness, which may explain why they are common in populations of African descent but rare or absent in other populations.

Two research groups independently examined the effect of the *APOL1* genotype on disease burden in African Americans. Studying chronic kidney disease, Parsa *et al.* found that patients with two copies of G1 or G2 were twice as likely to progress to end-stage disease as those with no or one copy. Ito *et al.* arrived at a similar conclusion in a study of heart disease: Individuals with two copies of G1 or G2 were twice as likely to experience a major adverse cardiovascular event as those with one or no copy. In certain settings, *APOL1* genotyping may help guide treatment decisions. — PAK  
*N. Engl. J. Med.* 369, 2183 (2013); *Circ. Res.* 10.1161/CIRCRESAHA.114.302347 (2013).

PLANETARY SCIENCE

## Shock-Buffering Asteroid

The stereotype of an asteroid as a rigid monolith has been dispelled numerous times when spacecraft have allowed closer inspection: Many of these minor planets look more like fluffy piles of rubble. The second Chinese lunar probe, Chang'E-2, explored the asteroid Toutatis (4179) in a December 2012 flyby, and Zhu *et al.* report evidence that the body has endured repeated impact shocks that were attenuated by compression of its porous regolith. One 800-m crater seen near the south pole of Toutatis (~4.5 km long) implies an impactor of sufficient energy to have shattered a solid asteroid. However, if this



collection of material is already fractured, it is more resilient to dramatic impact. The impact energy flows through the body as seismic shaking that resettles the surface and erases smaller craters, which are indeed deficient in number as compared to expectations. Further support for seismic resurfacing may lie in boulders observed on the "neck" of Toutatis, where such larger fragments experiencing shaking would eventually rattle to the surface. The authors believe

that these also imply that the bi-lobed body is the result of a low-velocity sticking collision that initially damaged the impact surface and then slowly excavated the boulders. — MMM  
*Geophys. Res. Lett.* 10.1002/2013GL058914 (2013).

MOLECULAR BIOLOGY

## Glassy Cytoplasm

Bacteria lack motor proteins such as myosins, kinesins, and dyneins, and molecular transport and cytoskeletal mixing are thought to rely on diffusion. Using single-molecule tracking, Parry *et al.* found that the mobility of protein filaments, large granules, and plasmids was higher in metabolically active cells. They developed a probe, based on a GFP-labeled self-assembling reovirus protein, in which size could be tuned by protein expression. Metabolically dependent motility of the probe was dependent on size, with particles of about 30 nm and higher showing significantly higher mean square displacements in metabolically active cells. The motion of large particles was characteristic of movement in a glass-forming liquid approaching the glass transition. The distribution of displacements was non-Gaussian, the system non-ergodic, and the cytoplasm displayed dynamic heterogeneity with regions of both high and low particle motility. Metabolic activity fluidized the cytoplasm so that large particles could escape a caged environment. As a result, a higher fraction of

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particles showed large displacements in active cells. These properties of the bacterial cytoplasm need to be taken into account in understanding bacterial physiology, particularly transitions between dormancy and growth. — VV

*Cell* 10.1016/j.cell.2013.11.028 (2014).

#### MOLECULAR BIOLOGY

### Protecting Mitochondria

The power plant of the cell, the mitochondrion, can be a hostile environment in which proteins or the whole organelle can become damaged. To prevent further disruption of the cell, whole damaged mitochondria can be engulfed and degraded by autophagosomes, and the failure of this process may cause neurodegeneration. The *Parkin* and *PINK1* genes—mutations of which are linked to neurodegenerative Parkinson's disease—function in this process. McLelland *et al.* describe a less dramatic protection mechanism in which proteins damaged by overproduction of reactive oxygen species in the mitochondria are carted in membrane vesicles to lysosomes. Like the wholesale remodeling of mitochondria themselves, this vesicle-mediated quality-control mechanism required the *PINK1* and *Parkin* proteins. The authors propose that the protective actions of *Parkin* and *PINK1* may

consider the case of colloidal semiconducting nanoplatelets, which can be considered a two-dimensional analog of anisotropic nanorods. Solutions of a single population of particles coated with oleic acid were dispersed in hexane, and exposure to a few drops of ethanol, acting as an antisolvent, led to the formation of superparticles up to 20  $\mu\text{m}$  in length. These initially showed a sausage-chain structure where sections 10 to 20 units wide were joined together with defect areas much narrower in size, but these defects disappeared on aging. The authors further examined the superparticles by depositing them on a substrate, causing the plane of the platelets to lie perpendicular to the surface. In testing the optical properties, they found that the superparticles emit strongly polarized light in a direction perpendicular to the long axis. — MSL

*Nano Lett.* 10.1021/nl4039746 (2014).

#### EDUCATION

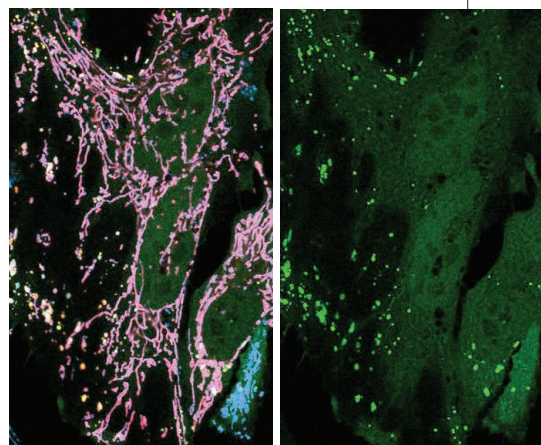
### Time Well Spent?

As science, technology, engineering, and mathematics (STEM) instruction begins to shift to a more active approach, how do we best collect and analyze data on how teachers and students spend their classroom time? Smith

*et al.* have developed the Classroom Observation Protocol for Undergraduate STEM, or COPUS, as a standardized protocol for collecting data on STEM teaching practices. Development spanned 2 years and involved dozens of iterations and testing scenarios designed and executed by science education specialists. COPUS works by documenting classroom behavior at 2-min intervals during a class session through the use of 25 codes in two categories: "what the students are doing" and "what the instructor is doing." The benefit of this system is that observers recording the behaviors are not required to make judg-

ments about teaching quality, and analysis of classroom activities can be summarized for the teacher in the form of a pie chart. Moreover, minimal training is needed in order for COPUS to be used effectively. The protocol should enable faculty members to characterize the general state of teaching and learning in their departments, provide feedback to colleagues interested in assessing how their time with students is being spent, and, perhaps most importantly, identify areas where faculty professional development is needed. — MM

*CBE Life Sci. Educ.* 12, 618 (2013).



play out in two stages: a more rapid one in which damaged proteins can be selectively removed in vesicles, and, in cases where damage is advanced, the recycling of the full organelles by mitophagy. — LBR

*EMBO J.* 10.1002/embj.201385902 (2014).

#### CHEMISTRY

### Needle from a Haystack

A current challenge in nanoscale science is the selective assembly of large quantities of particles into ordered arrays. Abécassis *et al.*