

## GENE EXPRESSION

### Doubling DNA but not expression

As the genome replicates, and before the cell divides, the copy number of the replicated portions of the genome doubles. In bacteria and archaea, gene expression tracks with gene dosage, both of which increase after DNA replication. Voichek *et al.*, however, show that an increase in DNA dosage after replication does not increase gene expression in budding yeast. This expression buffering is mediated by the acetylation of newly synthesized histone H3 deposited on the replicated DNA. This acetylation helps suppress transcription from the excess DNA. — GR

*Science*, this issue p. 1087

## CELL BIOLOGY

### Separating dividing cells into two

By activating genes involved in cell growth and proliferation, the transcriptional coactivator YAP can act as a tumor promoter. Bui *et al.* uncovered a nontranscriptional role for YAP in separating dividing cells, a process called cytokinesis. In mitotic cells, YAP was localized to subcellular structures that mediate cytokinesis, which ensured the proper localization of other proteins necessary for cytokinesis. Cells deficient in YAP were more likely to have an abnormal number of chromosomes, a condition that can give rise to tumors. — WW

*Sci. Signal.* **9**, ra23 (2016).

## CATALYSIS

### Small olefins from syngas

The conversion of coal or natural gas to liquid fuels or chemicals often proceeds through the production of CO and H<sub>2</sub>. This mixture, known as syngas, is then converted to hydrocarbons with Fischer-Tropsch catalysts. For the light olefins (ethylene to butylenes) needed for chemical and polymer synthesis, conventional catalysts are mechanically

limited to <60% conversion and deactivate through carbon buildup. Jiao *et al.* developed a bifunctional catalyst that achieves higher conversions and avoids deactivation (see the Perspective by de Jong). A zinc-chromium oxide creates ketene intermediates that are then coupled over a zeolite. — PDS

*Science*, this issue p. 1065,

see also p. 1030

## HUMAN ALTRUISM

### Brain activity shows underlying motives

In humans, two completely different motives may nevertheless lead to exactly the same behavior. Because we can't directly observe motives, modern economists often completely disregard them. However, Hein *et al.*, using fMRI, show that different human motives can yield observable responses in the brain (see the Perspective by Gluth and Fontanesi). In empathy-based and reciprocity-based altruistic behavior, the direction and the strength of functional connectivity between specific brain regions were different for each motive. Moreover, the connectivity patterns were independent of the behavioral implications of the motives. — PRS

*Science*, this issue p. 1074;

see also p. 1028

## FLEXIBLE ELECTRONICS

### Make it stretch, make it glow

The skins of some cephalopods, such as the octopus, are highly flexible and contain color-changing cells. These cells are loaded with pigments that enable rapid and detailed camouflaging abilities. Larson *et al.* developed a stretchable electroluminescent actuator. The material could be highly stretched, could emit light, and could also sense internal and external pressure. A soft robot demonstrated these combined capabilities by stretching and emitting light as it moved. — MSL

*Science*, this issue p. 1071

## IN OTHER JOURNALS

Edited by Sacha Vignieri and Jesse Smith



A common type of earthworm, *Lumbricus terrestris*

## PLASTIC POLLUTION

### Earthworms on a microplastics diet

Microplastics commonly found in marine environments can cause harm to marine organisms when ingested. Terrestrial environments are also widely polluted with plastics, but little is known about their effect on terrestrial species. Huerta Lwanga *et al.* have investigated the effect of polyethylene microplastics in plant litter on earthworms. To provide a realistic exposure scenario, the authors added the microplastics to plant litter deposited on the soil surface. They show that environmentally relevant microplastic concentrations led to reduced earthworm growth and elevated mortality as compared to a control. Furthermore, earthworms may transport microplastics into soils, from which they may leach into surface waters. — JFU

*Environ. Sci. Technol.* **10**.1021/acs.est.5b05478 (2016).

## MICROBIOTA

### For health, microbial location matters

The composition of our gut microbes probably affects our health. For instance, certain microbes may predispose individuals to some types of cancer, alter their metabolism, or even contribute to the aging process.

In flies, an altered microbial composition in the gastrointestinal (GI) tract can reduce life span. Li *et al.* investigated this further and found that the GI tract of younger flies compartmentalizes its resident microbes. As flies age, however, inflammatory signaling causes changes in the cells lining the GI tract, reducing its ability to maintain

Cownose rays may have been mistakenly implicated in bivalve decline



## TROPHIC CASCADES

### Innocent until proven guilty

**T**he existence of trophic cascades is well documented; however, characterizing such linkages is more challenging than it might appear. Grubbs *et al.* reanalyzed data used to support the existence of a predator-mediated cascade from sharks, to cownose rays, to bivalves in the Atlantic and argue that the original connections need to be reexamined. Specifically, they found little evidence that the ray could biologically fit the role of damaging

mesopredator in this system. Since the original study was conducted, the cownose ray has been the focus of unregulated fishing pressure justified, in part, as a way to protect the commercial bivalve industry. Such unregulated pressure could have detrimental effects on the very slowly reproducing rays, and draws attention away from other human contributions to bivalve decline. — SNV

*Sci. Rep.* 10.1038/srep20970 (2016).

such compartmentalization. Blocking this process extends the life span of flies, suggesting that as for many things in life, location is key. — KLM

*Cell Host Microbe* **19**, 240 (2016).

## PALEOANTHROPOLOGY

### Modeling Neandertal extinction

The extinction of Neandertals in Europe is commonly thought to have been the result of competition with modern humans. Gilpin *et al.* test this possibility mathematically, with a model that explores the interaction between the level of cultural development and population size. The model confirms that differences in cultural level can lead to competitive exclusion of a larger population by a smaller one. An advantage in learning ability, for example, would ensure that modern humans replaced Neandertals, even though the initial discrepancy in population size was large. Although the reality of the Neandertal demise is likely to have been more complex (for example,

there may have been cultural exchange between Neandertals and modern humans as well as competition), these models affirm the likelihood that cultural sophistication held sway. — AMS

*Proc. Natl Acad. Sci. U.S.A.* 10.1073/pnas.1524861113 (2016).

## ONCOGENE SIGNALING

### KRAS gets the silencing treatment

Mutations in the KRAS proto-oncogene drive the growth of some of the most lethal human tumors, including pancreatic and lung cancers. Efforts to pharmacologically inhibit KRAS itself, or components of its well-studied signaling pathway, have been largely unsuccessful. Shankar *et al.* considered the possibility that KRAS may have additional uncharacterized roles that contribute to tumor development and that may be more susceptible to drug treatment. They explored this idea by using a sensitive method to identify new KRAS-binding proteins. One surprising hit was Argonaute 2 (AGO2), a protein required for

RNA-mediated gene silencing. KRAS and AGO2 colocalize in the endoplasmic reticulum and their interaction alters the activity of each protein. Notably, AGO2 appears to enhance the transforming ability of KRAS in cultured cells. — PAK

*Cell Rep.* **14**, 1 (2016).

## GEOPHYSICS

### Forecasting cascading fault rupture

Earthquake rupture forecasts provide vital estimates of the likelihood of future earthquakes in a region. However, Nissen *et al.* show that rupture forecasts can be muddled by not considering cascading multiple-fault ruptures. A combined geodetic and seismological reanalysis of a 1997 earthquake in Pakistan revealed dynamic triggering of a second fault 50 km away shortly after the first rupture. Current forecasts assume that triggering is limited to faults within 5 km. This observation suggests that longer-range, multiple-fault ruptures should be incorporated into forecasts, and it highlights the

dangers resulting from this type of earthquake doublet. — BG

*Nat. Geosci.* 10.1038/ngeo2653 (2016).

## SOLAR CELL MATERIALS

### Dropping lead from perovskites

Although lead-based inorganic-organic perovskite solar cells can have efficiencies of up to ~20%, degradation of these materials during use can create water-soluble byproducts that could potentially release toxic lead ions into the environment. Slavney *et al.* report on an inorganic bismuth-based “double perovskite” (one in which the B and B' sites alternate in the lattice) that has an indirect band gap of 1.95 electron volts, which is suitable for use as a tandem layer over a silicon solar cell. The material, Cs<sub>2</sub>AgBiBr<sub>6</sub>, is highly stable against heat and moisture and shows a photoluminescent lifetime of 600 ns, which suggests that carrier lifetimes may be long enough to achieve high efficiency. — PDS

*J. Am. Chem. Soc.* 10.1021/jacs.5b13294 (2016).

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## Earthworms on a microplastics diet

Julia Fahrenkamp-Uppenbrink (March 3, 2016)

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Editor's Summary

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