

BIOCHEMISTRY

Remember the sugar when making proteins

Eukaryotes have an elaborate trafficking and quality-control system for secreted glycoproteins. The glycosylation pathway begins in the endoplasmic reticulum with the enzyme oligosaccharyl-transferase (OST), which attaches a long chain of sugars to asparagine residues of target proteins. Wild *et al.* report a cryo-electron microscopy structure of yeast OST, which includes eight separate membrane proteins. The central catalytic subunit contains binding sites for substrates and is flanked by accessory subunits that may facilitate delivery of newly translocated proteins for glycosylation. —MAF

Science, this issue p. 545

STRUCTURAL BIOLOGY

Structure of the human spliceosome

Catalyzed by the spliceosome, precursor mRNA splicing proceeds in two steps: branching and exon ligation. Transition from the C (catalytic post-branching spliceosome) to the C* (catalytic pre-exon ligation spliceosome) complex is driven by the adenosine triphosphatase/helicase Prp16. Zhan *et al.* report the cryo-electron microscopy structure of the human C complex, showing that two step I splicing factors stabilize the active site and link it to Prp16. —SYM

Science, this issue p. 537

ECOPHYSIOLOGY

A demanding lifestyle

Polar bears appear to be well adapted to the extreme conditions of their Arctic habitat. Pagano *et al.*, however, show that the energy balance in this harsh environment is narrower than we might expect (see the Perspective by Whiteman). They monitored the behavior and metabolic rates of nine free-ranging polar bears over 2 years. They found that high energy demands required consumption of high-fat prey, such as seals, which are easy to come by

on sea ice but nearly unavailable in ice-free conditions. Thus, as sea ice becomes increasingly short-lived annually, polar bears are likely to experience increasingly stressful conditions and higher mortality rates. —SNV

Science, this issue p. 568;

see also p. 514

COLON CANCER

Biofilms provide refuge for cancerous bacteria

Familial adenomatous polyposis (FAP) causes benign polyps along the colon. If left untreated, FAP leads to a high incidence of colon cancer. To understand how polyps influence tumor formation, Dejea *et al.* examined the colonic mucosa of FAP patients. They discovered biofilms containing the carcinogenic versions of the bacterial species *Escherichia coli* and *Bacteroides fragilis*.

Colon tissue from FAP patients exhibited greater expression of two bacterial genes that produce secreted oncotoxins. Studies in mice showed that specific bacteria could work together to induce colon inflammation and tumor formation. —PNK

Science, this issue p. 592

MOLECULAR BIOLOGY

Self-defense by avoiding self-targeting

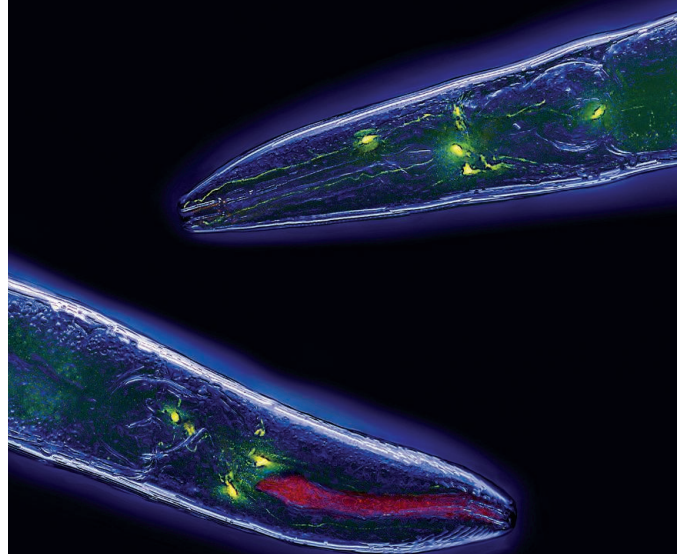
By silencing transposons, Piwi-interacting RNAs (piRNAs) protect the stability of animal genomes in germ lines. However, many piRNAs do not map to transposons, and their functions have remained undefined. Zhang *et al.* described the piRNA targeting logic in *Caenorhabditis elegans* and identified an intrinsic sequence signal in endogenous germline genes that confer resistance to piRNA silencing. Thus, diverse piRNAs silence foreign nucleic acids but spare self genes to defend the *C. elegans* genome. In addition, multiple foreign transgenes can be engineered to escape piRNA targeting, allowing successful expression in the germline. —SYM

Science, this issue p. 587

IN OTHER JOURNALS

Edited by **Caroline Ash**
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Confocal micrograph
of *Caenorhabditis*
elegans worms



CELL BIOLOGY

Targeting the demise of male mitochondria

In the nematode worm *Caenorhabditis elegans*, as in humans, offspring inherit mitochondria and mitochondrial DNA only from their mother. Sato *et al.* identified key molecular components of the machinery that recognizes male mitochondria and targets them for degradation. In a screen for kinases that might be required for the process, they identified IKKE-1, a protein kinase with similarity to the mammalian protein kinases TBK1 and IKKε. IKKE-1 interacted with a protein that they named ALLO-1, which had sequence similarity to autophagy receptors and was required for clearance of paternal organelles. The similarity of the role of IKKE-1 in removing male mitochondria to that of mammalian TBK1, which functions in the innate immune response, hints that the two processes might have a similar evolutionary origin. —LBR

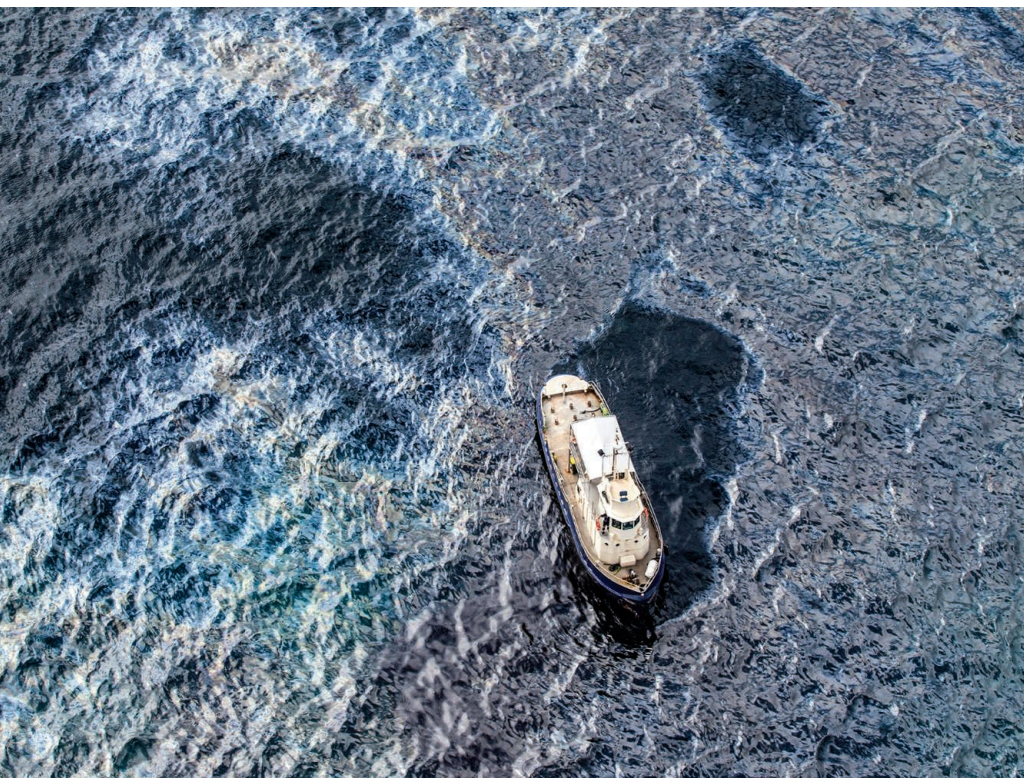
Nat. Cell Biol. 10.1038/s41556-017-0008-9 (2018).

IMMUNOLOGY

High caloric intake induces inflammation

The consumption of high-calorie diets has become prevalent in industrialized nations and is associated with increased body mass, inflammation, and resulting pathologies. What are the underlying mechanisms

connecting diets of high-energy, processed food to inflammation? Christ *et al.* show that mice fed on a high-calorie Western diet developed systemic inflammation and functionally reprogrammed granulocyte monocyte precursor cells. After a standard chow diet was restored to the animals, inflammation persisted, indicating that



OCEAN PHYSICS

Shear by the centimeter

Predicting the transport of oil and floating debris in the ocean is very difficult because it is challenging to measure differences in water motion very close to the surface. Laxague *et al.* present measurements of the ocean's current vector profile made in the Gulf of Mexico, showing that the velocity of the uppermost centimeter of the water column was four times that at a depth of 10 m and displaced by nearly 90°. Therefore, incorporating these kinds of dynamics into forecasting efforts is essential for better understanding the movement and fates of plastic particles and spilled oil in the oceans. —HJS

Geophys. Res. Lett. 10.1002/2017GL075891 (2017).

Oil from the 2011 MV *Rena* spill surrounds a service vessel.

components in the Western diet induced innate immune memory. This study identifies possible targets for preventing diet-induced inflammation. —GKA

Cell **172**, 162 (2018).

COMPARATIVE GENOMICS

Using phylogeny to test evolution

Sequencing of whole genomes and obtaining information about gene transcription offer the promise to compare changes and variation in gene expression and function across species. However, Dunn *et al.* show that analyses of gene expression data that use pairwise comparisons across multiple species may not be able to distinguish between differing models of evolution. By examining published studies of how gene expression may change across species, they show that it is necessary to consider the mode of evolution—i.e., duplication generating paralogs or orthologous evolution through speciation—as well as the time since the species diverged. Thus, phylogenetic information is needed to discern

commonalities and differences across species and among genes that share an ancestor but may have undergone different evolutionary trajectories. —LMZ

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1707515115 (2018).

STAR FORMATION

Many stars don't form in clusters

Most stars are thought to form in dense, gravitationally bound molecular clouds, which should produce a bound cluster of stars. As unused gas is expelled from the system by stellar feedback, the cluster becomes gravitationally unbound to form an association, which gradually drifts apart. Associations of young stars (no more than a few million years old) should therefore be slowly expanding. Ward and Kruijssen use astrometric data to test this idea by looking for evidence of expansion in several nearby young associations. They do not find any; the associations show no sign of ever having been gravitationally bound. The authors suggest that this indicates that star formation

is dominated by turbulent fragmentation, not monolithic collapse. —KTS

Mon. Not. R. Astron. Soc. 10.1093/mnras/sty117 (2018).

ANTIBIOTICS

Recycling antibiotic sensitivity

Cystic fibrosis (CF) is accompanied by chronic lung infections, requiring lifelong consumption of many antibiotics to maintain airway function. Antibiotic resistance and clinical deterioration are apparently inevitable. In a multifactorial study, Imamovic *et al.* discovered that mutations in *Pseudomonas aeruginosa* that endow resistance to some classes of antibiotic concomitantly result in sensitivity to others. For example, in any strain of *P. aeruginosa*, resistance to the fluoroquinolone ciprofloxacin was consistently associated with sensitivity to aminoglycoside antibiotics, such as amikacin. In this case, resistance was mediated by mutations in the transcriptional regulator nfxB of the MexC transporter. Using biomarkers such as nfxB, it

appears to be possible to design antibiotic regimens for individual CF sufferers that flip resistant bacteria between predictable drug-sensitive states. —CA

Cell 10.1016/j.cell.2017.12.012 (2018).

MICROBIOLOGY

Cutting up in the deep

Life in the deep ocean is cut off from sunlight as an energy source. Fixed carbon from the surface—namely, dead microbes and larger organisms—therefore serves as a source of energy at depths below the reach of sunlight. Bergauer *et al.* analyzed genomic and proteomic data from microorganisms collected at depths down to 4 to 5 km. Microbial transport proteins varied only slightly in abundance with depth, reflecting changes in the abundance of organisms and in lifestyle. Organic acid transporters were found throughout the water column and were more abundant in the deep ocean, suggesting that uptake of dilute dissolved organic matter is crucial for microbial metabolism at these depths. —MAF

Proc. Natl. Acad. Sci. U.S.A. 10.1073/pnas.1708779115 (2018).

Science

Using phylogeny to test evolution

Laura M. Zahn

Science **359** (6375), 531-532.
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