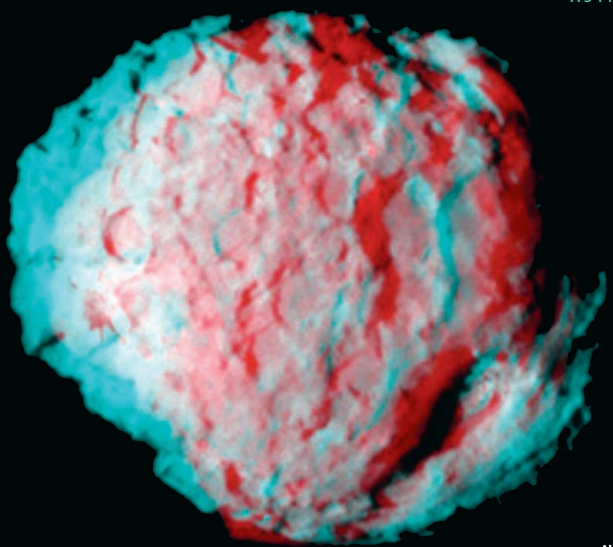
EDITED BY KRISTEN MUELLER AND JAKE YESTON



ASTRONOMY

A Comet Dates Jupiter

In 2004, NASA's Stardust mission flew by comet Wild 2 and retrieved particles from the comet's coma, the tail of dust and gas that forms when a comet approaches the Sun. Two years later, those particles were brought to Earth and analyzed by international teams of scientists. Ogliore *et al.* describe mineralogical and isotope data for a fragment from the Stardust collection. This fragment, named Iris, resembles chondrules, the type of round, once-molten silicate particles typically found in meteorites. Iris probably formed in the inner solar nebula, and thus its presence in the coma of comet Wild 2 is a testament to the transport of particles from the inner, hotter parts of the solar nebula to the outer, colder ones, where comets originate. Iris formed at least 3 million years after the formation of the earliest solids in the solar system. Transport of material across the solar system must have occurred before Jupiter formed, as its growing embryo would have opened a gap in the protoplanetary disk, preventing outward transport past its orbit. Thus, unless transport occurred outside the plane of the protoplanetary disk or Jupiter was interior to Iris when this particle formed, the results imply that Jupiter formed 3 million years after the formation of the earliest solids. — MJC

Astrophys. J **745**, L19 (2012).

SOCIOLOGY

I Liked You From the Start

There is a tendency for people involved in a particular social network to be similar, but separating cause and effect can be difficult. To study the evolution of networks and behavior simultaneously, Lewis *et al*. used Facebook entries written by more than 1500 college students at a U.S. college over a 4-year period. From the time the students were freshmen until their senior year, network and profile information (including "friends" listings and taste in music, books, and movies) was tabulated. Students who liked certain kinds of movies (such as dark satire) or certain kinds of music (such as lite/classic rock) tended, more frequently than chance, to find others with similar tastes at the start. With the exception of a liking for classical/jazz music, preferences did not seem to be contagious. Although the authors acknowledge limitations of their study set, they conclude that ties strengthen among similar people, and our likes and dislikes do not tend to "rub off" on those around us. — BJ

Proc. Natl. Acad. Sci. U.S.A. **109**, 68 (2012).

GENETICS

Wrapped Up Right

All eukaryotic chromosomes have a centromere, which ensures that the genomic DNA is shared equally between daughter cells during cell division. Centromeres are defined by the presence of nucleosomes that contain a special histone H3 variant, CenH3. Accumulating evidence suggests that CenH3-containing nucleosomes have an unusual structure: Rather than consisting of the highly conserved octamer of histone proteins, which wraps up ~147 bp of DNA, they may instead form tetramers, which wrap only half as much DNA.

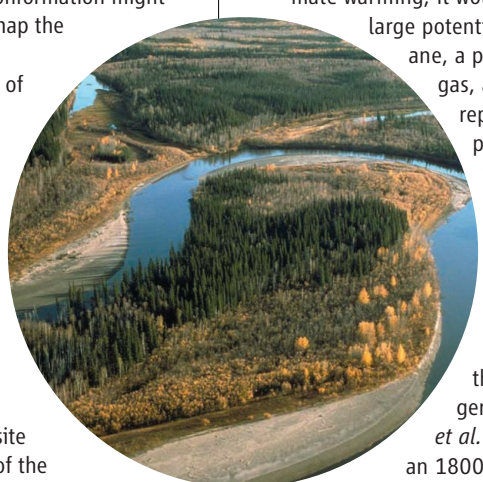
To understand how widespread this unusual centromeric nucleosome conformation might be, Krassovsky *et al.* fine-map the positions of budding yeast centromeres, which consist of a single CenH3 (known as Cse4) nucleosome binding site on each chromosome. Cse4 binds a region of DNA that is 80 bp in length, consistent with a tetramer nucleosome conformation. The highly AT-rich DNA sequence at the centromere and two protein-binding sites that flank the centromere site probably exclude binding of the canonical octamer nucleosome and recruit and stabilize the binding of the Cse4 nucleosome. Cse4 nucleosomes that become misincorporated at noncentromere sites, on the other hand, form octamers and are found in regions of high nucleosome turnover, the latter observation hinting how such excess Cse4, which could impede the function of the centromere, might be purged from the genome. — GR

Proc. Natl. Acad. Sci. U.S.A. **109**, 243 (2012).

CLIMATE SCIENCE

Here's Looking at You

Permafrost contains huge amounts of organic carbon. If it were to thaw in response to climate warming, it would constitute a very large potential source of methane, a powerful greenhouse gas, and therefore could represent a potent positive feedback to warming. The spatial extent and dynamic state of permafrost are difficult to determine, however, making it difficult to assess the prospective danger to climate. Minsley *et al.* present results from an 1800-km-long aerial electromagnetic survey of the Yukon Flats region of northeastern Alaska, which shows the configuration of permafrost to depths of 100 m in sediments deposited over the past 4 million years. In addition to providing a baseline for future studies, their data reveal important details about potential



CREDITS (TOP TO BOTTOM): NASA; U.S. FISH AND WILDLIFE SERVICE

Published by AAAS

connections between surface and groundwaters and the evolution of the permafrost over the past 1000 years. — HJS

Geophys. Res. Lett. **39**, 10.1029/2011GL050079 (2012).

CELL BIOLOGY

Push Me Pull You

A contractile ring composed of actin and myosin promotes cytokinesis—the final stage of cell division when daughter cells are physically separated from one another. The small GTPase RhoA regulates the contraction of this actomyosin ring. A Rho-family GTPase-activating protein (GAP), CYK-4 helps RhoA localize to the cleavage furrow, in part by binding to the guanine nucleotide exchange factor (GEF) for RhoA, ECT2. The cytokinetic role of the GAP domain of CYK-4, however, is unclear. Previously, Rac1 inactivation was proposed to be the primary function of the GAP domain. Now, working in *C. elegans* embryos, Loria *et al.* suggest that the CYK-4 GAP domain also contributes to activating RhoA during cytokinesis. Some defects in furrow ingression could be relieved by relaxation of the Rac1-dependent cortical actin network, bypassing to a certain extent the need for activated RhoA and a functional GAP domain in CYK-4. Cleavage furrow ingression thus reflects the balance of forces between the contractile ring and the cell cortex outside of the furrow region, allowing the cell to complete cytokinesis even when some of the cytokinetic machinery has been compromised. — SMH

Curr. Biol. **22**, 10.1016/j.cub.2011.12.019 (2012).

CHEMISTRY

Sacrifices at the Surface

There has been a thriving research discussion over the past decade about the tendency of certain dissolved ions to accumulate at the air/water interface of aerosols, and the associated implications for atmospheric chemistry. The driving framework of this sort of partitioning also has some bearing on how various salts affect aqueous protein solubility and conformational equilibria. A chemically intuitive explanation for the effect might suggest that surface migration is enthalpically unfavorable (as the ions remain only partially solvated) but is ultimately driven by the entropic enhancement associated with liberating the bulk water molecules that previously surrounded the ion completely. Otten *et al.* now present experimental studies of thiocyanate partitioning by temperature-dependent second harmonic generation spectroscopy (a surface-sensitive technique), together with theoretical simulations, that reverse the reasoning in this framework. The data point to an enthalpic gain and accompanying entropic sacrifice as the ions move from bulk to surface. The enthalpic gain is essentially attributed to full hydrogen bonding at water molecules driven away from the surface (where they previously were half exposed to uncoordinating air). The entropic loss, somewhat harder to account for, is attributed to suppression of collective capillary wave motions by the ions, engendering a more ordered surface. — JSY

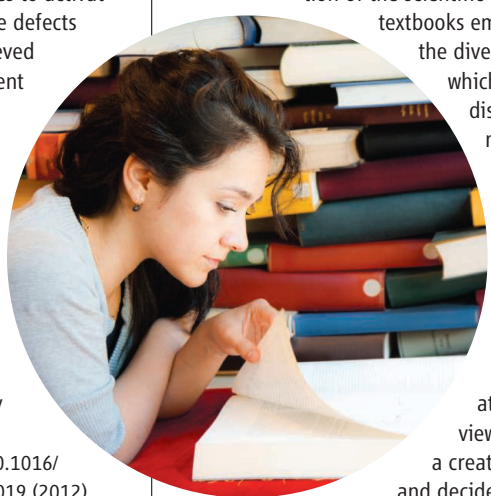
Proc. Natl. Acad. Sci. U.S.A. **109**, 701 (2012).

EDUCATION

Science Illustrated

U.S. college freshmen aspiring to a career in science often lose their enthusiasm. One cause may be introductory courses lacking an integration of the scientific process. If textbooks emphasized the diverse paths by which scientific discoveries are made, instead of simply stating outcomes derived from these discoveries, undergraduates Might view science as a creative endeavor and decide to stick with it. Duncan *et al*. examined figures in six introductory biology textbooks published in 2008 and tallied the number of figures presenting descriptive information (such as illustrations of ribosomal subunits) versus the number that illustrated a multistep process. On average, multistep scientific investigations were presented in fewer than 5% of the hundreds of figures in each book. The authors argue that this may contribute to a lack of appreciation of the nature of science by students. Shifting the balance of illustrations in scientific textbooks toward those presenting the design and interpretation of models, experiments, and field studies, and inclusion of the unexpected twists and turns involved in scientific discovery, could help undergraduates maintain their interest in scientific careers. — MM

J. Microbiol. Biol. Educ. **12**, 143 (2011).



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