



EDUCATION

Learners As Teachers

Among emerging massive open online courses, the Peer 2 Peer University remains unique. This online learning platform allows members to take the dual role of learners and teachers: All members are able to create courses, which can be accessed by any online user. To understand how this peer-created, peer-led online environment sustains itself, Ahn *et al.* investigated how members, either as learners or teachers, engaged with open online learning available through the platform. Data describing the nature, history, and activity associated with every project within the platform showed that the Peer 2 Peer University draws a pool of over 40,000 users. However, 85% of members never engaged in the community, and only 18% of the courses were considered to be finished and thus implemented live on the platform. Although the Peer 2 Peer University users actively generate ideas to create courses, they struggle to see these courses through to completion, indicating a need to foster engagement with these teacher and learner users over time. Lack of motivation or community involvement may explain why some teachers leave their projects incomplete. Nonetheless, the data show how crowd-sourced education is useful for small groups with niche interests as well as broad audiences. — FB

J. Online Learn. Teach. **9**, 160 (2103).

GEOCHEMISTRY

Magma Writ Small

Solid phases that precipitate from supersaturated solutions often form from the aggregation or self-organization of molecular clusters or nanoparticles. These undersaturated precursors have been documented in a number of materials for crystals growing from aqueous solution; however, at more extreme conditions, such as in magmatic systems composed of hot melts, evidence has been more circumstantial. Through a series of high-temperature quenching experiments from 950° to 1180°C, Helmy *et al.* demonstrate that Pt- and As-rich nanoscale phases form in sulfidic melts despite being present in low concentrations and far from saturation for macroscopic crystalline minerals. If Pt and other noble metals preferentially form continuums of nanoscale associations with As and related elements instead of homogeneously dissolving in the melt phase, their partitioning will largely depend on surface thermodynamics instead of chemical properties determined by simple partition coefficient experiments. — NW

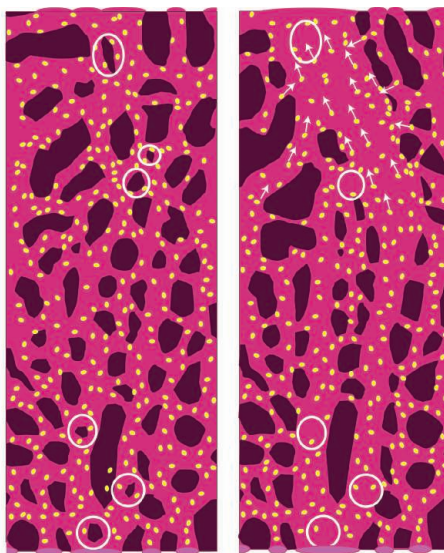
Nat. Commun. **4**, 2405 (2013).

DEVELOPMENTAL BIOLOGY

Growing Vessels

Blood flow in an animal is not only made possible by blood vessel structure, but it also governs the development and remodeling of the vessels themselves. However, little is known about how mechanical forces affect endothelial cells so as to alter vessel diameter. Udan *et al.* have

used time-lapse confocal microscopy to monitor vessel architecture and remodeling in cultured mouse embryos. Larger-diameter vessels contain more endothelial cells, but their proliferation was not affected by blood flow. Furthermore, changes in cell death did not account for vessel diameter variation. Instead, they observed that vessel fusion and directed endothelial cell migration depended on blood flow and that



both contributed to an increase in vessel size. The former occurs near the vitelline artery and vein, where fluid flow is high, whereas the latter involves the migration and recruitment of endothelial cells from capillaries to regions of greater need. This work nicely elucidates the behavioral

biomechanics of cells in vessel remodeling during development. — BAP

Development **140**, 4041 (2013).

EVOLUTION

Sunny Days

The human melanocortin-1 receptor (MC1R) locus in humans is involved in regulating melanin synthesis and hence skin pigmentation; some alleles are associated with lighter skin pigmentation, and several nonfunctional variants are associated with fair skin, red hair, and poor tanning capacity. Furthermore, light skin pigmentation is a risk factor for melanoma. Martínez-Cadenas *et al.* examined the genetic diversity of the MC1R locus in Spain and compared it to those of other populations. MC1R showed high levels of diversity that appear to be due to high CpG content, which are sites of mutation. However, despite the high level of observed mutation, the authors found evidence that most alleles are being removed from the population and are under purifying selection in Spaniards. One exception was the most common variant V60L, which appears to be under positive selection, although it showed spatial heterogeneity. Interestingly, V60L was also the most common variant in a sample of melanoma patients, suggesting that although it may be under positive selection, it has a deleterious and postreproductive consequence as well. — LMZ

Mol. Biol. Evol. **30**, 10.1093/molbev/mst158 (2013).

Continued on page 165

Continued from page 163

BIOCHEMISTRY

Homologous Recombination

In the 1970s, we learned that eukaryotic DNA contains introns—segments that are removed from RNA transcripts by splicing to yield messenger RNA. Since then, introns have been shown to play roles in regulating gene expression. In the 1990s came another surprise, that some proteins contain intervening sequences—inteins, which posttranslationally excise themselves and religate the remnants. Protein splicing usually occurs intramolecularly (cis), with the product comprising two elements (exteins) that were separated by the intein. However, in cyanobacteria, protein splicing also occurs between (trans) two monomer precursors, each containing parts of an intein and an extein. Association of the two monomers completes the intein, and the splicing reaction joins the two exteins. Aranko *et al.* found that splicing can occur between a cis-splicing precursor and a trans-splicing precursor, yielding up to four distinct ligation products. Expressing cis-splicing inteins with an artificially created C-terminal split intein fragment resulted in alternative splicing for all inteins tested, though the ratio of cis to alternative splicing varied. NMR spectroscopy and crystallography confirmed that the alternative splicing occurred through intermolecular domain swapping of inteins. — VV

Nat. Chem. Biol. **9**, 616 (2013).

CHEMISTRY

Multitunable Hydrogels

Hydrogels, consisting of water-swollen cross-linked polymer chains, have proved a versatile platform for creating an artificial environment for cells. Through dynamic crosslinking, it is possible to spatially change the physical and chemical properties within the gel or to allow for drug delivery or degradation of the gel. One challenge is to find routes that allow for either modification of the mechanical properties of the gel or of its local chemistry, without affecting the other. Gramlich *et al.* show that this is possible for a system based on hyaluronic acid, which is a component of native extracellular matrix that has been functionalized using norbornene groups. Gelation occurs through the reaction of the norbornene groups with a di-thiol, but only a few connections were needed to form the gel. Thus, remain-

ing pendant norbornene groups were available for secondary reactions, either to tune the gel's mechanical properties by using additional di-thiol linkages or by using mono-thiol groups to change the local chemistry by linking in additional molecules such as peptides. For example, the compressive modulus ranged from 1 to 70 kPa, depending on the extent of crosslinking for the same overall norbornene content. Using reactions controlled by ultraviolet light made it possible to pattern the gels with either spatial or temporal control of the patterns. — MSL

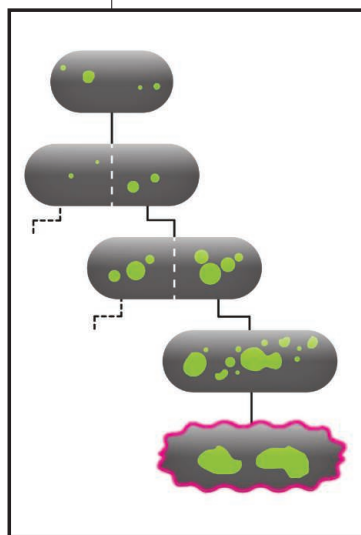
Biomaterials, 10.1016/j.biomaterials.2013.08.089 (2013).

CELL BIOLOGY

Sequestration Stress

All organisms age—at least that's what we thought until now. Although we are familiar with the signs of aging in multicellular organisms

such as ourselves, unicellular organisms also get old though replicative aging, measured as an increase in cell division times and an increased probability of cell death. For example, the budding yeast *Saccharomyces cerevisiae* divides asymmetrically. The larger mother cell ages and normally dies after about 20 divisions. Coelho *et al.* study the fission



yeast *Schizosaccharomyces pombe*, which has rod-shaped cells that divide symmetrically, and show that under nonstressed conditions, neither of the daughter cells or their progeny age—all cells continue to divide at a roughly constant rate. Making the cell divisions asymmetric, producing larger and smaller daughter cells, also did not result in aging. Cells did occasionally die, but death was not preceded by signs of aging and instead was due to catastrophic failure of a cellular process. Under stressful conditions that cause the aggregation of misfolded proteins, fission yeast cells do age. The daughter cell and her progeny, which sequester the single large protein aggregate from the stressed mother cell, will age, whereas the unencumbered daughters will remain ageless. — GR

Curr. Biol. **23**, 10.1016/j.cub.2013.07.084 (2013).