EDITORS'CHOICE

EDITED BY GILBERT CHIN AND MARIA CRUZ

TOXICOLOGY

Teething Signs

Bisphenol A (BPA) is used in the production of polycarbonate plastics, which are widely used in the food packaging industry. Because of this, some developed-world populations have become extensively contaminated with BPA, which is a known endocrine-disrupting chemical. This class of chemicals has been linked to a set of adverse health effects, including infertility, obesity, and cancer. Jedeon *et al.* show that exposing rats to BPA in utero and during early life can affect the deposition of enamel on their teeth (amelogenesis), resulting in hypomineralization. This condition shares a number of features with the recently described human condition known as molar incisor hypomineralization, which manifests as patchy white opacities on the teeth of children at 6 to 8 years of age. Like molar incisor hypomineralization, the dental effect in rats is limited to a developmental window. BPA may act by interfering with the expression of an ameloblast protease that removes enamel-forming proteins from the enamel matrix; if these proteins were to persist, they would inhibit proper enamel deposition. If the defect in tooth development seen in rats is a good model for molar incisor hypomineralization, then this condition might provide a visible marker for infant exposure to BPA. — GR

Am. J. Pathol. **183**, 109 (2013).

GENETICS

Of Hinnys and Mules

Imprinting—the silencing of genes due to the methylation of specific DNA sequences coming from one parent—is known to play a crucial role in the development of the placenta in mammals. The offspring of matings between horses and donkeys are generally viable, but sterile. However, because of genetic differences between the species, estimated via RNA sequencing, Wang *et al.* were able to assess transcription differences and to identify equid-specific imprinted genes in the chorionic girdle that do not appear to be due to their hybrid status. Of 40 known imprinted genes in humans and/or mice, only 15 were imprinted in the equine offspring. They also identified 93 imprinted genes, including 78 not previously described, that showed distribution across the genome and not in clusters, as had previously been observed for imprinted genes. Furthermore, imprinted genes appear to show specific differences between equids versus humans and mice, suggesting that equine hybrids may provide information on the evolutionary origins and maintenance of genomic imprinting. — LMZ

Proc. Natl. Acad. Sci. U.S.A. **110**, 10.1073/pnas.1308998110 (2013).

NEUROSCIENCE

A Less Selective Inhibitor

The most widely used antidepressant drugs are selective serotonin reuptake inhibitors. They block the high-affinity serotonin transporter and thereby prevent the retrieval of serotonin from the extracellular fluid into nerve terminals. Unfortunately, many individuals suffering from depression experience minimal or no improvement when taking these drugs; new medications would help patients who respond poorly to selective serotonin reuptake inhibitors. The organic cation transporters and the plasma membrane monoamine transporter have low affinity for serotonin but a high transport capacity. Decynium-22 is an inhibitor of this group of transporters and has been shown to block serotonin uptake into brain synaptosomes. Horton *et al.* report that the antidepressant-like effect of a selective serotonin reuptake inhibitor can be strengthened significantly by coadministration of decynium-22. This group of decynium-22–sensitive transporters may thus be a promising target for the development of new antidepressant drugs. These drugs might act either in combination with existing antidepressants or perhaps all on their own by blocking one or more of the organic cation transporters or the plasma membrane monoamine transporter. — PRS

J. Neurosci. **33**, 10534 (2013).

CELL BIOLOGY

Centrosome Surfeit

Centrosome amplification is a hallmark of human tumors and is associated with aneuploidy and tumorigenesis. In fruit flies, even when extra centrosomes do not induce high levels of aneuploidy, spindle position defects cause an expansion of the neural stem cell (NSC) population and subsequent tumor formation. To investigate the consequences of centrosome amplification on mammalian NSCs during embryonic development, Marthiens *et al.* developed a mouse model in which centrosome numbers were increased in the developing central nervous system. Surprisingly, centrosome amplification caused microcephaly—a brain of reduced size but with otherwise normal architecture. This microcephaly resulted from defects in NSC division, which generated aneuploid cells that went on to die by apoptosis. These results may explain the etiology of certain types of microcephaly, which in humans have been associated with a number of centrosomal genes, and suggest that in the mammalian developing brain, centrosome amplification can cause depletion of the NSC pool. — SMH

Nat. Cell Biol. **15**, 10.1038/ncb2746 (2013).

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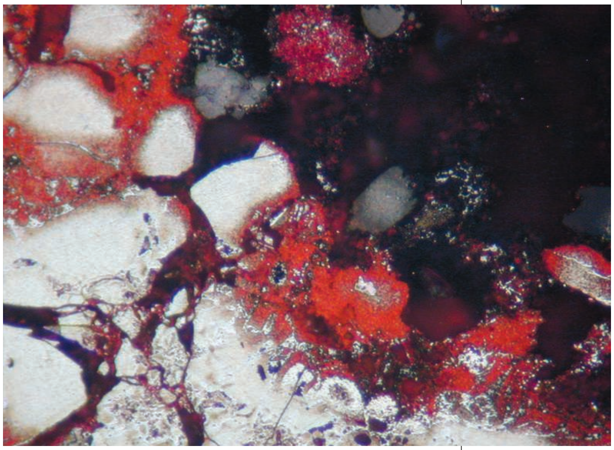
GEOCHEMISTRY

Siderite in Time

Banded iron formations are some of the oldest existing rocks that provide direct evidence of ancient sedimentary processes before Earth's atmosphere oxidized. The alternating layers of iron-rich minerals probably reflect changes in Precambrian seawater chemistry, but the numerous abiotic and potentially biotic reactions that resulted in their formation remain difficult to decipher. Based on high-pressure and high-temperature experiments, Köhler



et al. show that the iron-carbonate mineral siderite ($FeCO_3$) forms as a consequence of the concomitant burial of iron oxyhydroxide minerals and organic matter. Because the reactions depend on the amount of sedimentary organic matter, which was probably microbial in origin, these spheroidal siderite grains may serve as an indicator of ancient microbial metabolisms. In a series of related laboratory experiments, Kim *et al.* show that siderite in the Precambrian water column could photo-oxidize to form molecular hydrogen and iron oxide minerals that served as building blocks of banded iron formations. If global in scale, this abiotic process could have contributed to the early oxidation of Earth's atmosphere and provided an energy source for anaerobic microorganisms. — NW

Nat. Comm. **4**, 1741 (2013); *Proc. Natl. Acad. Sci. U.S.A.* **110**, 10.1073/pnas.1308958110 (2013).

ATMOSPHERIC SCIENCE

Green Gains

Satellite-based observations have shown that many regions of the terrestrial biosphere are getting greener; i.e., their above-ground vegetative mass is increasing. A number of factors, including changes in light, water, nutrients, and land use, could be causing that trend, although the most obvious cause would seem to be the rising concentration of CO_2 in the atmosphere. Donohue *et al.* used gas exchange theory, which links vegetation mass to the concentration of atmospheric CO_2 through its effect on the water use efficiency of plants, to predict that the increase of atmospheric CO_2 between 1982 and 2010 should have produced an increase in the amount of green foliage between 5 and 10%. The authors then confirmed, based on satellite measurements, that the amount of vegetation increased by about 11% in warm, arid environments, where other factors affecting greenness should be unimportant. Although these findings cannot be used to explain changes in greenness in other regions, where different drivers may control vegetation, the principle still applies, and so the challenge is to develop a more general understanding of how increasing CO_2 is affecting vegetation in other environments, where the other forcing factors are more important. — HJS

Geophys. Res. Lett. 10.1002/grl.50563 (2013).

MATERIALS SCIENCE

Magnetic Titanium

The interface of $SrTiO_3$ and $LaAlO_3$ has puzzled physicists for some time now—it is not only highly conductive (and under certain circumstances even superconducting), it also exhibits magnetism even though neither of the two oxides is magnetic. Various explanations have been proposed for this unexpected magnetism, ranging from the presence of magnetic impurities or defects to an intrinsic property of the interface. Lee *et al.* used chemical-element–specific spectroscopic techniques to pinpoint the "host" of the magnetism. The analysis of the spectra indicated that the magnetic moments responsible for the magnetism were lying in the plane of the interface and were carried by Ti atoms, whereas comparison with calculations revealed similarities with spectra expected for the Ti^{3+} valence state of Ti. Furthermore, varying the thickness of the $LaAlO_3$ overlayer indicated that the Ti magnetic moments were located at the interface. Taken together, these results lend support to the intrinsic origin of the magnetism at the interface, although the role of, for example, oxygen defects cannot be entirely excluded. — JS

Nat. Mater. 10.1038/nmat3674 (2013).

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