



Skull embedded in flowstone.

ANTHROPOLOGY

Early People of Palau

Diminutive fossils of *Homo sapiens*, perhaps representing several tens of individuals, have been found in two caves in Palau. The fossils, described by Berger *et al.*, range in age from about 3000 to 1500 years; humans are thought to have arrived on the island from the Philippines (700 km to the west) about 1000 years earlier. The fossils include several complete, small crania still encased in flowstone. Preliminary measurements suggest a brain size near the low end of extant *Homo sapiens* and close to that of *Homo erectus*. Measurements of multiple postcranial bones imply a corresponding body size comparable to those of the smallest known *H. sapiens* and the early hominin Lucy. Although many traits are consistent with *H. sapiens*, some fossils also exhibit more primitive traits, including minimal chins and an enlarged brow ridge. These traits and some aspects of the teeth and the small body size are similar to those seen in the older, enigmatic diminutive fossils found recently on the nearby island of Flores, which in turn have been ascribed to a relict population of an earlier *Homo* species. Although any relation between these fossils is not clear, the sample on Palau is further evidence of the extremes in size and characteristics that may develop in isolated island human populations. — BH

PLoS One 10.1371/journal.pone.0001780 (2008).

CHEMISTRY

Cool Clustering

The decomposition of a precursor within a polymeric medium can yield metal nanoclusters with narrow size distribution and uniform morphology. Gazit *et al.* explored the impact of this approach, performing the synthesis below the glass transition temperature (T_g) of the polymer, thereby precluding large-scale motions of the polymer segments. For iron nanoparticles within a polystyrene (PS) matrix, a large reduction in temperature shifted size and morphology from 70-nm spherical particles to 50-by-3-nm needles, whereas intermediate temperatures produced 8-nm spheres. Formation rates scaled exponentially with temperature above and below T_g . In the case of a poly(methyl methacrylate) (PMMA) matrix, similar size and morphology changes occurred, but the rate of cluster growth below T_g proved insensitive to temperature.

The authors attribute the discrepancy to the relatively strong coordinative bonding between cluster and polymer present in the PMMA matrix but absent from PS. Taken together, the results support tuning of polymer segment mobility as

an additional control variable in the synthesis of metal clusters. — MSL

Macromolecules 41, 10.1021/ma071816o (2008).

PLANT BIOLOGY

Leaf Production Plant

Leaf epidermis, usually a single layer of cells, negotiates the balance between environmental factors and internal physiology. Leaf epidermal cells synthesize a wax that serves as a protective surface barrier and also synthesize

a variety of complex metabolites important in plant defense. Leaves of the Madagascar periwinkle (*Catharanthus roseus*), long known as an herbal medicine, synthesize the alkaloids vinblastine and vincristine, which have valuable anticancer activities. In the search for other useful alkaloids or metabolites,

Murata *et al.* have exploited RNA analysis of the leaf epidermis. *C. roseus* epidermis is rich in a variety of biosynthetic pathways, including those for flavonoids, lipids, and pentacyclic triterpenes. Analysis of RNAs expressed in

leaf epidermis revealed much more complexity of the biochemistry occurring in leaves than did similar analytic approaches using broader tissue samples of the plant. The diversity of biosynthetic pathways represented in the leaf epidermis, combined with the variable destinations of the products, makes this single layer of cells look like the busiest of production and distribution centers. — PJH

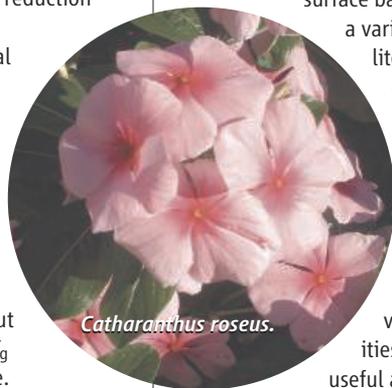
Plant Cell 10.1105/tpc.107.056630 (2008).

NEUROSCIENCE

More to Noradrenaline

Noradrenaline is a well-established neuromodulator in many parts of the brain. Its effects have usually been described in terms of its impact on cells or synapses. Using paired recordings from connected GABAergic interneurons in the hippocampus, Zsiros and Maccaferri investigated a novel type of noradrenergic modulation. Activation of β -adrenergic receptors decreased gap junction-dependent electrical coupling between inhibitory interneurons. A series of pharmacological interventions established that this effect was due to activation of the cAMP/protein kinase A signaling cascade. Electrical coupling is important for the coordination of interneuron activity, which may lead to synchronous firing and oscillatory

Continued on page 1461



Catharanthus roseus.

Continued from page 1459

lations of larger neuronal networks. Noradrenergic modulation of electrical coupling between connected inhibitory interneurons can thus have important effects on information transmission in the whole GABAergic inhibitory hippocampal network and hence on signal propagation throughout the hippocampus and the many other brain regions connected to it. — PRS

J. Neurosci. **28**, 1804 (2008).

ECOLOGY

Shared Prosperity

The relationships between biodiversity and ecosystem function (such as productivity and nutrient dynamics) have mostly been investigated with tractable ecological communities such as herbaceous vegetation. Now Potvin and Gotelli have extended such studies to simple tree communities, with an experiment on the effects of tree species



Forest plantation at 5 years.

diversity on yield, measured by growth in tree basal area. In a forest plantation in Panama, plots in which several species of tree seedlings were planted yielded 30 to 58% more growth than monocultures after 5 years. The increased yield resulted from increased growth in the mixed-species plots rather than

from mortality in the monocultures. The authors speculate that competition for light is greater in monocultures, implying that more effective partitioning of resources permits more biomass accumulation in the mixed-species plots. — AMS

Ecol. Lett. **11**, 217 (2008).

CHEMISTRY

Crystals of an Iron Nitride

Both industrial and enzymatic nitrogen reduction catalysts rely on iron centers. However, high valent molecular iron nitride complexes ($\text{Fe}\equiv\text{N}$) have stubbornly eluded crystallographic characterization, in contrast to analogous terminal oxo structures ($\text{Fe}=\text{O}$). Vogel *et al.* now find that a tridentate ligand comprising three coordinating N-heterocyclic carbene moieties offers the solution. Reaction of the ligand (bearing either xyllyl or mesityl groups for steric protection) with ferrous chloride followed by reduction with sodium amalgam and treatment with trimethylsilylazide yields a cationic Fe-N_3 complex that loses dinitrogen under xenon lamp photolysis to afford the terminal iron nitride. Air-stable purple crystals of the compound were characterized by x-ray diffraction, revealing a short FeN bond length of 1.53 Å. Mössbauer spectroscopy further suggested an iron center more electron-rich than a previously prepared phosphorus-coordinated iron nitride characterized in solution; the authors attribute the difference to π -donation from the carbene ligands. — JSY

Angew. Chem. Int. Ed. **47**, 10.1002/anie.200800600 (2008).

Science Signaling



<< Pulling on the TCR

The exact mechanism by which peptide-loaded major histocompatibility complex (pMHC) activates the T cell receptor (TCR) has been controversial. Effective TCR activation requires presentation by antigen-presenting cells—soluble pMHC cannot activate T cells. In the presence of endogenous pMHC, however, very low concentrations of agonist pMHC are required to activate TCR signaling, as are costimulatory interactions. Ma *et al.* anchored pMHCs to lipid bilayers or plastic surfaces and found that in the absence of nonagonist pMHC, a minimum of 1 to 10 monomeric agonist pMHCs (MCC-loaded pMHC) per T cell was sufficient to stimulate TCR signaling in T cells interacting with the artificial substrates. Furthermore, the T cell response (calcium signal) was not enhanced by the addition of nonagonist pMHC with the agonist pMHC or under conditions where the nonagonist pMHC and agonist pMHC were close enough to function as a dimer. When murine B cell lymphoma cells were loaded with various endogenous peptides and the MCC peptide, the production of interleukin-2 by the T cells was the same whether a costimulatory endogenous pMHC was present or not. In further experiments, adhesion was shown to be necessary for TCR triggering, as was the actin cytoskeleton. The authors propose a model whereby the agonist pMHC-TCR interaction leads to receptor deformation and activation when the cytoskeleton provides a pulling force on the complex. Endogenous pMHC-TCR interactions would be insufficiently strong to provide the necessary activation signal, and the complex would dissociate when “pulled on” by the cytoskeleton. — NRG

PLoS Biol. **6**, e43 (2008).