EDITORS' CHOICE

edited by Stella Hurtley

IMMUNOLOGY

Deactivation by Degrees

The cell-surface tyrosine phosphatase, CD45, provides critical regulation of lymphocyte activation. By dephosphorylating inhibitory tyrosine residues on protein tyrosine kinases (PTKs), CD45 facilitates signaling through the T cell receptor. This phosphatase activity is constitutive in the CD45 monomer but is down-regulated through dimerization.

CD45 is expressed as distinct isoforms, generated through alternative exon splicing of the extracellular portion of the molecule. Xu and Weiss now show that these isoforms are the key to how dimer formation is regulated. The smallest isoform (CD45RO) dimerizes more readily than its longer counterparts, correlating with reduced levels of T cell activation and reduced levels of posttranslational modification by O-linked glycosylation and sialylation. Thus, longer isoforms, which are more prevalent on resting T cells, appear to be preferentially maintained as active monomers because increased sugars would impede dimer formation. Production of smaller isoforms after T cell activation would thus promote dimerization, reducing CD45 phosphatase activity and dampening down T cell responses. — SJS

Nature Immunol. **3**, 764 (2002).

GEOLOGY

Pangea Weather Report

The final assembly of the supercontinent Pangea, toward the end of the Paleozoic Era, built up an enormous, high-standing land mass that straddled Earth's equator. Those were excellent conditions for the development of a monsoon in the supercontinent's equatorial regions, and paleoclimate models have suggested that a transition from zonal to monsoonal circulation patterns had probably taken place by the early Permian Period, approximately 280 million years ago.

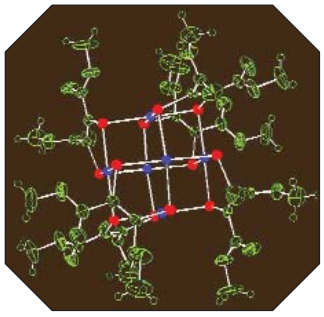
Now Soreghan *et al*. present some persuasive geological evidence for such a transition. They employed an ingenious tracer: the isotopic ages of detrital zircons in Upper Paleozoic loessites (rocks formed from deposits of windblown silt) in the southwestern United States, which marks the late Paleozoic location of western equatorial Pangea. Tying the isotopic ages to regional source rocks exposed during the late Paleozoic, they inferred predominant northeasterly winds during the middle Pennsylvanian Period (290 to 300 million years ago), but a combination of westerly and easterly wind patterns during the early Permian, a pattern consistent with a shift from zonal circulation to a seasonal monsoon. — SW

Geology **30**, 695 (2002).

CHEMISTRY

Charging Ahead

Dithiolenes, which contain the –S–C=C–S– group, can form complexes with transition metals that display unusual magnetic or redox properties and can provide insights into the reactivity of metal-sulfur clusters in enzymes. Normally, if the complex has only dithiolene ligands, all of the potential sites for ligand binding are occupied: The compound is coordinately saturated.



A view of the cube shape showing Pd (blue) and S (red) atoms.

Beswick *et al*. now report on the synthesis and characterization of an air-stable palladium-dithiolene complex in which six $Pd\text{-}S_2C_2(COOCH_3)_2$ units adopt a slightly distorted cube-octahedron structure. The Pd atoms occupy the center of the cube's faces and the S atoms occupy the midpoints of the edges, leaving the center of the cube and the opposite site on each Pd atom unoccupied. Cyclic voltammetry studies show that the neutral complex can be reduced reversibly to form the 4^- anion. This stable unsaturated cluster should provide a useful starting point for the synthesis of related compounds. — PDS

J. Am. Chem. Soc. 10.1021/ja026079k (2002).

ECOLOGY/EVOLUTION

Radiation Revised

Darwin's finches.

With their diverse bill shapes and ecological habits, Darwin's finches—13 species from the Galápagos Islands and 1 from Cocos Island—serve as a classic example of adaptive radiation. Understanding the evolution of the group and its morphologies has been handicapped by a lack of agreement about these finches' closest living relatives. Burns *et al*. analyzed cytochrome b mitochondrial DNA sequences from the finches, sister taxa, and potential outgroups within the finch-tanager tribe. Darwin's finches form a clade within a larger, well-supported monophyletic group of species that build domed nests. Most of these close relatives are endemic to Caribbean islands and not found in South America. The relatives have a diversity of bill morphologies and feeding behaviors similar to those of Darwin's finches, and this diversity also evolved rapidly. The parallel courses may reflect strong selection as birds colonized islands with vacant niches, a developmental-genetic architecture inherited from the common ancestor, or both. In any case, it appears that the key change in the clade's history occurred before its arrival in the Galápagos. — ShJS

Evolution **56**, 1240 (2002).

ASTROPHYSICS

Planets in the Mist

T Tauri stars are considered active adolescents in stellar terms (less than 10 million years old). When they grow up, they will become solar-type stars. Classical T Tauri stars are less than 1 million years old and possess a circumstellar disk from which gaseous giant planets may form. It has been thought that it would take more than 1 million years to

CONTINUED ON PAGE 1097

CREDITS: (TOP) BESWICK *ET AL*., *J. AM. CHEM. SOC.* 10.1021/JA026079K (2002); (BOTTOM, COUNTERCLOCKWISE) (FIRST TWO IMAGES) DOUG WECHSLER/VIREO; SAM FRIED/VIREO; T.J. ULRICH/VIREO