EDITORS' CHOICE

edited by Gilbert Chin

GEOLOGY

A Fresh Look

Most of the Amazon rain forest, even in western Peru and Brazil, is not far above sea level, and it has been proposed that during the Miocene (about 10 to 20 million years ago), much of this region was part of a shallow inland sea or seaway connected to the Atlantic or Caribbean. This notion is controversial, however, and resolving the geography has implications for the extent and development of rainforest flora and fauna during this and later periods.

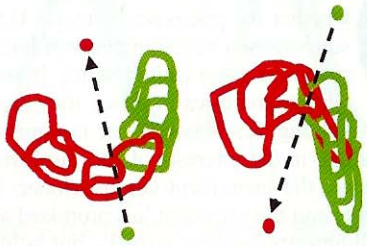
Vonhof *et al.* used carbon, oxygen, and strontium isotope measurements of mollusks in the dominant Pebas Formation to analyze the composition of the waters across western Amazonia during this time. Together, these isotopes reflect and fingerprint the origins and salinity of waters. The results show that most of this formation represents deposition in a shallow freshwater lake and swamp, where most of the water was derived from snowmelt in the Andes and was sufficient to prevent any marine incursion and large enough to have tides. In one period, about 11 million years ago, outcrops to the northeast show evidence of brackish water, implying a limited marine incursion, perhaps from a connection to the Caribbean, that was insufficient to produce a marine seaway. — BH

Geol. Soc. Am. Bull. **115**, 983 (2003).

CELL BIOLOGY

Changing Gears

Cells as unlike as the amoebae *Dictyostelium* and the neutrophil share the ability to propel themselves in response to chemoattractant gradients. This movement is achieved through coordinated polarization of intracellular signals that couple attractant detection with cytoskeletal activity. Previous studies have shown that signals at the leading edge of the neutrophil-like cell line HL-60 are regulated by a positive feedback loop initiated by trimeric G proteins. The production of phosphoinositide lipids and activation of the GTPase Rac leads to actin polymerization and pseudopod protrusion.



Cells that normally make U-turns (left) to follow attractant movement (from green to red spots) can reverse direction after treatment with a ROCK inhibitor (right).

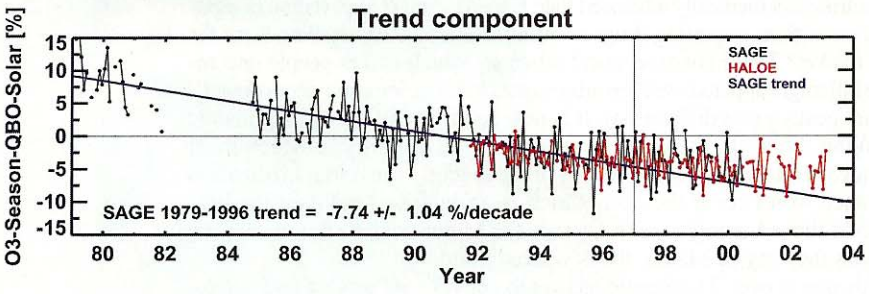
Xu *et al.* relate these front-end biochemical events to those regulating structurally distinct assemblies at the rear of migrating neutrophils, observing that leading-edge signals are countered by attractant desensitization at the sides and rear of HL-60 cells. These processes, which are also initiated by G proteins, activate the GTPase Rho and the Rho-dependent kinase ROCK, resulting in actin-myosin contraction and deadhesion of the trailing edge. Hence, activation of dialectical signaling pathways, even in the absence of a chemoattractant gradient, can establish functionally distinct front and rear domains. — SJS

Cell **114**, 201 (2003).

ATMOSPHERIC SCIENCE

The First Signs of a Recovery

The ozone hole in the stratosphere over the poles is caused by anthropogenic chlorine-containing compounds such as chlorofluorocarbons (CFCs). Since 1987, the production and consumption of these compounds have been controlled under the Montreal Protocol and its amendments. As a consequence, chlorine concentration near Earth's surface has decreased since 1993, and in the upper stratosphere, total chlorine has been decreasing since 1997. But have these reductions had any effect on ozone loss?



Recent Stratospheric Aerosol and Gas Experiment (SAGE, black) and Halogen Occultation Experiment (HALOE, red) observations lie above the pre-1997 ozone trend (blue line).

Newchurch *et al.* have analyzed ground-based and satellite ozone measurements for 1979 to 2003. After taking into account seasonal, solar, and quasi-biennial oscillation effects, they find that before 1997, ozone loss in the upper stratosphere (altitudes from 35 to 45 km) followed a linear downward trend, whereas after 1997, the rate of ozone depletion slowed down significantly. These data are the first indication that the ozone layer is beginning to recover. However, much of the ozone lies below the region studied here, so further analyses will be required to ascertain whether ozone is also recovering in lower atmospheric regions. — JFU

J. Geophys. Res. **108**, 10.1029/2003jd003471 (2003).

APPLIED PHYSICS

Complex Layered Construction

A number of techniques, such as molding, printing, and embossing, are commonly used to fabricate two-dimensional structures cheaply and quickly. In traditional microcontact printing, a patterned stamp of a soft polymer that has been coated with a thin film is used to deposit the film only in the places where the stamp touches the substrate. Zaumseil *et al.* use their related nanotransfer printing technique to build complex three-dimensional structures that would be difficult to fabricate by other means. They coat the substrate with a thin layer of "ink," such as a monolayer of an alkane thiol, which aids in the transfer of the stamped gold film without the need for elevated pressure or temperature. When a stamp with sloping sidewalls is used, even the areas not in contact with the substrate are transferred. This grooved pattern can then be used as a mask for deep etching, or a second

CREDITS: (BOTTOM) NEWCHURCH *ET AL.*, *J. GEOPHYS. RES.* **108**, 10.1029/2003JD003471 (2003); (TOP) XU *ET AL.*, *CELL* **114**, 201 (2003)

grooved layer can be deposited perpendicularly to the first. Complex patterns that have both nanometer- and micrometer-scale features built into the master stamp are easily transferred, and the quality of the patterned gold films is dramatically improved by coating the polymeric stamp with a thin layer of titanium or by treating it with an oxygen plasma. — MSL

Nano Lett. 10.1021/nl0344007 (2003).

DEVELOPMENT

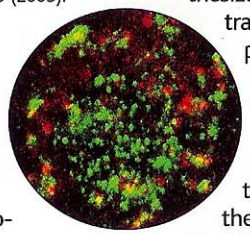
Separate and Unequal

When a cell divides, it often does not produce two equivalent daughter cells. For instance, in the *Drosophila* sensory bristle lineage, division of the sensory organ precursor cell (pI) generates two cells with different cell fates. Le Borgne and Schweisguth report that the daughter cells differ in Notch signaling: Notch is activated in the anterior daughter cell (pIIa) but is inhibited in the posterior daughter cell (pIIb). This difference in Notch activation is mediated by the unequal distribution of Neuralized, a factor that is required for the endocytosis of the Notch ligand Delta in sensory cells. Neuralized function is conserved from flies to frogs; therefore, the involvement of Neuralized during asymmetric cell division may also be found in other animals, including vertebrates. — BAP

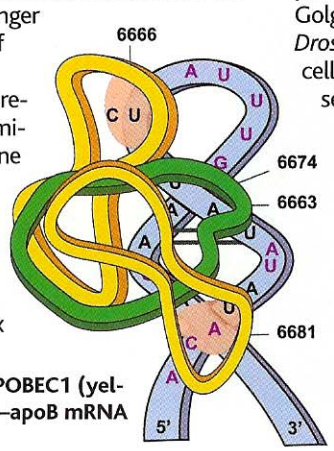
Dev. Cell **5**, 139 (2003).

BIOCHEMISTRY

Safe Passage



A variety of RNA processing events can occur after RNA is made from DNA (transcription) and before it is used to make protein (translation). Two such processes are RNA editing and nonsense-mediated decay (NMD). Editing enzymes (for the role of editing in innate immunity, see KewalRamani and Coffin, Perspectives, this issue, p. 923) can convert adenosine to inosine in the messenger RNAs (mRNAs) of ion channels and neurotransmitter receptors or, in a similar fashion, cytosine to uridine. The latter reaction is carried out in the nuclear compartment by a protein complex that includes apolipoprotein B mRNA editing catalytic polypeptide 1 (APOBEC1) as well as APOBEC1 complementation factor (ACF). Changing C6666 to a U introduces a termination codon and results in the synthesis of the shortened apoB 48 isoform rather than the apoB 100 protein. Chester *et al.* show that the APOBEC1-ACF editing complex accompanies the already-edited mRNA into the cytoplasm and protects it from degradation via NMD, which normally acts as a surveillance system to prevent the translation of mRNAs that contain premature termination codons, a source of deleterious mutant proteins. — GJC

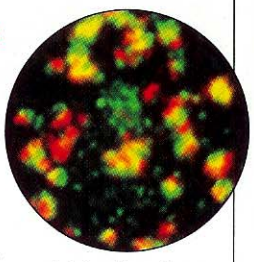


A model of the APOBEC1 (yellow)–ACF (green)–apoB mRNA (blue) complex.

EMBO J. **22**, 3971 (2003).

CELL BIOLOGY

Easy Transitions



Golgi (red) and tER (green) cluster and overlap in the presence (left) but not in the absence (right) of dp115.

Inside eukaryotic cells, a panoply of membrane-bound organelles exchange material in a process termed membrane traffic. Two organelles, the endoplasmic reticulum (ER) and the Golgi complex, are key stages in the secretory pathway whereby newly synthesized proteins traverse the ER membrane and are packaged into transport vesicles within the transitional ER (tER) for onward transport to the cell surface via the Golgi. The Golgi complex is composed of a set of tightly apposed cisternae, and there has been a lot of debate about how the architecture of the Golgi is established and maintained in the face of ongoing intracellular membrane traffic.

Using RNA interference, Kondylis and Rabouille looked at the contribution of the protein dp115 in the organization of the Golgi complex and the tER in cultured *Drosophila* S2 cells. In dp115-depleted cells the Golgi stacks were unable to assemble and appeared instead as clusters of vesicles and tubules; the tER regions also lost their normal focused organization and appeared to be dispersed throughout the cytoplasm. Even so, the secretion of membrane and secretory proteins remained efficient. Thus, dp115 is important in the generation and maintenance of Golgi and tER architecture, but this architecture is not intrinsically required for the secretory pathway to function. — SMH

J.Cell Biol. **162**, 185 (2003).

CREDITS: (TOP) KONDYLIS AND RABOUILLE, *J. CELL BIOL.* **162**, 185 (2003); (BOTTOM) CHESTER *ET AL.*, *EMBO J.* **22**, 3971 (2003)