RESEARCH HIGHLIGHTS

Selections from the scientific literature

BIOPHYSICS

Claustrophobic DNA in tug of war

When a long thin polymer such as DNA is forced into a confined space — say a small membrane channel — it loses some of its freedom, and hence its entropy. Regaining that entropy is a powerful driving force for escape.

Chia-Fu Chou at the Academia Sinica in Taipei and his colleagues used an electric pulse to force a single DNA molecule to extend from one microchannel to another through a restrictive gap just nanometres high. When the electric field was turned off, a tug-of-war lasting from seconds to minutes occurred as both ends of the DNA tried to pull out of the nanometre-sized space. Eventually, one side won and the DNA retracted.

The forces acting on the DNA depended only on the height of the confined passage between channels, and not on its length or the length of DNA passing through it. This understanding could aid applications from molecular filters to nanopore transporters, the authors say.

Nano Lett. **http://dx.doi.org/10.1021/nl2045292 (2012)**

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EVOLUTION

Lilliputian lizards come to light

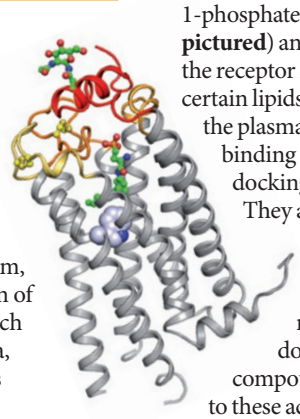
The forests of northern Madagascar harbour a dwarf chameleon that is the smallest lizard in the world in terms of total length. Adult males of the diminutive *Brookesia micra* reach a length of less than 24 millimetres.

B. micra and three other tiny lizard species were discovered in the region's rainforests and dry forests. Miguel Vences at the Technical University of Braunschweig in Germany and his group analysed tail length and head width, male genital morphology and gene sequences to place each species within the chameleon taxonomy. All occupy a small, discrete geographical range, and probably evolved some 10 million to 20 million years ago, the authors suggest.

PLoS ONE 7, **e31314 (2012)**

CELL SIGNALLING

Sideways activation



SCIENCE/AAAS

Elucidation of a cell receptor's crystal structure has revealed a unique lateral docking mechanism, report Hugh Rosen of the Scripps Research Institute in La Jolla, California, and his colleagues.

G-protein-coupled receptors (GPCRs) are signalling molecules that span the plasma membranes of cells and are generally activated by external molecules that pass through a channel-like opening into a binding site. However, the researchers determined the crystal structure of the sphingosine 1-phosphate receptor 1 ($S1P_1$, **pictured**) and showed that the receptor is triggered by certain lipids passing through the plasma membrane and binding through the lateral docking mechanism.

They also found that $S1P_1$ has atypical binding sites in less conserved regions of the docking site and that compounds that adhere to these activate $S1P_1$ more specifically than do lipids.

Science 335, **851–855 (2012)**

BIOLOGY

Immunity's circadian link

Daily patterns in the body's biochemical and physiological processes called circadian rhythms may influence immune-system function. Erol Fikrig and his colleagues at Yale University in New Haven, Connecticut, have found that the expression of an immune protein called TLR9 rises and falls with the circadian cycle.

They induced sepsis in mice to examine whether pathogen recognition — a key part of the immune response — varies with circadian cycles. Higher TLR9 expression at the time of sepsis induction was linked to a worse outcome for mice. This suggests that daily fluctuations in biological processes may influence vulnerability to infections, as well as the efficacy of immune therapies such as TLR9 agonists, which are currently in development.

Immunity **http://dx.doi.org/10.1016/j.immuni.2011.12.017 (2012)**

STEM-CELL BIOLOGY

Restore my beating heart

Infusions of a patient's own cardiac stem cells may reduce scar tissue and promote heart-muscle growth after a heart attack, according to a small safety study. Eduardo Marbán of the Cedars-Sinai Heart Institute in Los Angeles, California, and his colleagues harvested heart cells from 17 heart-attack patients. The cells were used to grow cardiac stem