one of the 'letters' of the genetic code, which changes the letter and leads to errors in DNA replication or protein synthesis. To inventory such changes, Alexander Wait Zaranek and Erez Levanon, both at Harvard Medical School in Boston, Massachusetts, and their colleagues compared more than 600 million sequences spanning 10 organisms with the corresponding reference genomes.

The authors identified thousands of human DNA sequences and an expanded number of human and mouse RNA sequences that have probably been edited. They also uncovered a common sequencing error that seems to have infiltrated important databases such as that of the HapMap, a resource documenting human genetic variation. **H.L.**

VIROLOGY

Back-up resistance

Science **328,** 1272–1275 (2010)

A particular mutation in the H1N1 influenza virus makes it resistant to the antiviral drug Tamiflu — but it also weakens the virus, so researchers didn't think that the mutation, called H274Y, could lead to widespread drug resistance. During the 2007–08 flu season, however, resistance to Tamiflu spread rapidly.

David Baltimore and his colleagues at the California Institute of Technology in Pasadena suspected that additional viral mutations were neutralizing the weakening effects of H274Y, allowing drug resistance to flourish. The team analysed H1N1 strains gathered from 2006 onwards, and identified two such mutations.

Viruses constructed to carry these 'permissive' mutations along with H274Y grew as well as normal viruses in cells, and weren't inhibited by Tamiflu. This suggests that they enabled the sharp rise in drug resistance. **A.K.**

BIOPHYSICS

Molecular carnival ride

Biophys. J. doi:10.1016/j.bpj.2010.03.012 (2010)

A spinning microscope that uses centrifugal force to probe individual molecules may offer an alternative to more expensive tools used in single-molecule studies.

The 'centrifuge force microscope', developed by Ken Halvorsen and Wesley Wong at Harvard University in Cambridge, Massachusetts, consists of a camera and objective fixed to an arm that rotates around one end. At the far end is a coverslip positioned perpendicularly to the applied centrifugal force. The molecule of interest tethers a bead to the coverslip. When the arm spins, the centrifugal force moves the bead away from the coverslip, stretching or even breaking the molecule, and the instrument measures these changes.

The authors say that the device can perform thousands of single-molecule experiments at once and could cost thousands of dollars less than conventional instruments. **C.L.**

BIOMATERIALS

Surgical solution

Proc. Natl Acad. Sci. USA doi:10.1073/pnas.0811529107 (2010)

Researchers have designed an injectable polymer that can fill 'dead space' left inside the body after surgical tissue removal. Left empty, such spaces can fill with fluid and form internal blisters called seromas, which can lead to infections and other complications.

David Putnam at Cornell University in Ithaca, New York, and his colleagues combined polyethylene glycol with a dihydroxyacetone polycarbonate to produce their MPEG-pDHA hydrogel.

Used in a rat model of breast mastectomy, a specific amount of the material seemed to reduce the volume of postoperative seromas. It also degraded into inert products and was well tolerated by the body. **D.P.C.**

ANIMAL COGNITION

Colder is cleverer

Proc. R. Soc. B doi:10.1098/rspb.2010.0630 (2010)

Black-capped chickadees living in a harsh environment are better learners than their counterparts in more comfortable climates, a difference that may be inherited.

G. BARTLEY/PHOTOLIBRARY

Timothy Roth and his co-workers at the University of Nevada in Reno took 10-day-old black-capped chickadees (*Poecile atricapillus*; pictured) from wild populations in Anchorage, Alaska, and the milder climes of Manhattan in Kansas. They kept the chicks in similar indoor environments until they were about 5 months old, at which point they began the learning tests.

The authors found that the Alaskan chicks were significantly better at a problem-solving task than those from the southern population. The results suggest that the difference is inherited, although the study could not rule out the effects of early-life experience. **N.G.**

JOURNAL CLUB

Zhe-Xi Luo
Carnegie Museum of Natural History, Pittsburgh, Pennsylvania

A palaeontologist ponders how genes and fossils can illuminate mammalian evolution.

Mammals are defined by what they eat with: dental features are characteristic of different species and the evolution of teeth is well recorded by abundant dental fossils. If mammalian diversity and evolution were a language, then a cornucopia of tooth features, including cusps, crests, basins and grooves, would form a large part of its alphabet.

Fossil muroids of the rodent group show specific evolutionary patterns of dental cusps and crests. The laboratory mouse, *Mus musculus*, is a muroid species, and the morphological development of its dental crests and cusps is influenced by a host of genes, including *Fgf3*.

Dental evolution in mice has now been replayed, in reverse, in a clever experiment by Ophir Klein at the University of California, San Francisco, Laurent Viriot at the University of Lyon in France and their colleagues (C. Charles *et al. Proc. Natl Acad. Sci. USA* **106,** 22364–22368; 2009). They compared tooth characteristics in mice with two copies of the *Fgf3* gene, just one copy, or none.

The authors found that with decreased *Fgf3* dosage, tooth morphogenesis shifted from modern-day patterns of crests and cusps to more primitive forms seen in fossil muroids from 14 million years ago. Humans with defects in *FGF3* also have a cusp–crest pattern similar to that of fossil anthropoid relatives. Increased *Fgf3* dosage seems to correlate with the evolution of derived dental features in both muroid and anthropoid mammals.

Gene patterning of morphogenesis can provide insight into evolution if the corresponding morphological traits are reflected in the fossil record. Fossils can also suggest when in evolution a developmental process occurred. And, when compared with fossils, the dental cusps and crests of mice with the mutant *Fgf3* gene show how development and evolution can shed light on one another.

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