

cells that were then reinfused.

Six months later, patients had 28% less scar tissue mass than control patients who did not receive the infusion. Viable heart tissue mass also increased following the treatment, suggesting partial restoration of tissue lost during the heart attack. However, patients showed no improvement in several measurements of heart function, such as the volume pumped out of the left ventricle with each heartbeat.

*Lancet* [http://dx.doi.org/10.1016/S0140-6736\(12\)60195-0](http://dx.doi.org/10.1016/S0140-6736(12)60195-0) (2012)

## GENOMICS

## Loss-of-function found in droves

Genome-sequencing work has suggested that even healthy humans carry hundreds of 'loss of function' (LoF) mutations that seriously disrupt protein-coding genes. Daniel MacArthur at the Wellcome Trust Sanger Institute in Hinxton, UK, and his colleagues performed extensive analysis on 185 genomes and determined that a typical individual carries around 100 LoF variants, of which about 20 inactivate both copies of a gene.

Most of the common mutations occurred in non-essential genes and didn't seem to affect health. The team also identified many rare LoF variants found in less than 1% of the population, including 47 serious disease mutations in one copy of a gene. By studying differences between the harmful and neutral variants, the scientists developed an algorithm to prioritize mutations found in medical genome sequencing for further investigation.

*Science* 335, 823–828 (2012)

## ASTROPHYSICS

## Zombie star rising

When a star suddenly brightened in 1961, many assumed it had died in a supernova — but it seems

that the light has not yet gone out. Schuyler Van Dyk at the California Institute of Technology in Pasadena and Thomas Matheson at the National Optical Astronomy Observatory in Tucson, Arizona, examined ground- and space-based observations, and say that it still lives.

The duo reports that the star, designated 'Object 7', can be seen on the Hubble Space Telescope as a luminous blue variable (LBV) star. The authors suggest that the decades-old outburst could represent a 'supernova imposter', a type of explosion for which LBVs are known that doesn't destroy the parent star. Nevertheless, Object 7 may be on course to explode, and astronomers should look out for its stellar death rattle.

*Astrophys. J.* 746, 179 (2012)

## IMMUNOLOGY

## Immune system master switch

The fetal immune system develops from stem cells in the liver, whereas the immune cells that protect adults form in the bone marrow. Moreover, early in life the immune system contains cells that quickly respond to only a limited number of foreign molecules; adult immune cells can recognize almost anything that might harm a host.

A 'master-switch' gene called *Lin28b* accounts for these differences, report Stefan Muljo and his team at the National Institute of Allergy and Infectious Diseases in Bethesda, Maryland. *Lin28b* — which blocks a class of gene-regulating RNA fragments called microRNAs — is active in the stem cells that form a mouse's immune system early in life, yet is absent from adult bone marrow. Marrow cells engineered to express a closely related gene, *Lin28*, and transplanted into adult mice form fetal-like immune cells.

Because the fetal-like immune cells are known to be effective against some pathogens, cancers and other

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## CHEMISTRY

## Simple solution for tricky chemistry



Chemists have invented a reagent to ease the addition of a desirable chemical group to many useful compounds.

Pharmaceutical, medicinal and agricultural chemists add fluorine groups to molecules to improve certain properties — to lower toxicity, for example. However, adding a difluoromethyl group has proved complicated.

The process developed by Phil Baran at the Scripps Research Institute in La Jolla, California, and his colleagues does the job in a simple one-pot reaction. The authors used zinc difluoromethylsulphinate salt, a white powder that is soluble in water and stable in air, making it easy to handle. In water, this produces a reactive difluoromethyl radical that targets specific sites on other molecules.

In particular, Baran's reagent can add a difluoromethyl group to nitrogen-containing aromatic ring systems and onto some organic molecules containing sulphur.

*J. Am. Chem. Soc.* 134, 1494–1497 (2012)

diseases, coaxing transplanted bone marrow cells to take on fetal properties could be used to improve immune responses.

*Science* <http://dx.doi.org/10.1126/science.1216557> (2012)

## ZOOLOGY

## Antifreeze's role in fish spread

Antifreeze proteins in the bodily fluids of Antarctic fishes are a crucial adaptation to life in the freezing waters — but their appearance alone is insufficient to explain the huge diversity of the region's fish species. Thomas Near of Yale University in New Haven, Connecticut, and his colleagues constructed a phylogeny of these notothenioid fishes (a sample pictured) and correlated it to both the appearance of the proteins and changes in global climate.

Contrary to the perception that the appearance of antifreeze proteins was the crucial factor driving evolution, they found that the most species-rich lineages diversified at least 10 million years after the proteins' appearance. This bout of evolution happened



during a second cooling event in the Late Miocene (11.6 million to 5.3 million years ago), when ice activity in the Southern Ocean is thought to have increased. The authors suggest that the appearance of this new polar habitat, combined with the pre-existing antifreeze proteins, spurred the evolution of notothenioids.

*Proc. Natl Acad. Sci. USA* <http://dx.doi.org/10.1073/pnas.1115169109> (2012)

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