# EDITORS' CHOICE

edited by Stella Hurtley



DEVELOPMENT

## Synoviolin and Rheumatoid Arthritis

Rheumatoid arthritis (RA) afflicts nearly 1% of the worldwide adult population. Cytokines released from immune cells cause chronic inflammation and stimulate the proliferation of synovial cells that destroy bone and cartilage of joints. But nearly 25% of RA patients do not respond to anti-cytokine therapy. This may be because synovial cell growth is also controlled by an enzyme called synoviolin. Amano *et al.* detected elevated synoviolin expression in the synovial tissue of RA patients. Mice overexpressing this molecule exhibited spontaneous arthropathy and a progressive synovial cell hyperplasia characteristic of RA patients. Reduced expression of synoviolin in mice correlated with protection from arthritis. This resistance was not due to an impaired cytokine response or reduced inflammatory cell infiltration, but to an increase in synovial cell apoptosis. Knockdown of synoviolin expression in rheumatoid synovial cells by RNA interference suppressed growth responses to cytokines. Synoviolin-null mouse fibroblasts also showed enhanced apoptosis induced by endoplasmic reticulum–related stress, suggesting a possible anti-apoptotic mechanism, and marking synoviolin as a possible drug target to treat RA. Synoviolin is an E3 ubiquitin ligase, but the role of its enzymatic activity in the pathogenesis of RA is not yet known. — LDC

**Arthritic (left) synoviolin-overexpressing and non-arthritic (above) wild-type paws.**

*Genes Dev.* 10.1101/gad.1096603 (2003).

ECOLOGY/EVOLUTION

## Nutrient Recycling

Transport of nutrients from terrestrial to aquatic habitats is mostly a physical process. Transport in the opposite direction has a significant biological component, for instance in the form of guano from seabirds or the carcasses of salmon that have returned from the sea to spawn. Farina *et al.* show that a marine mammal, the Galapagos sea lion (*Zalophus wollebackei*), is an effective vector of nutrients from the sea to the land. Nitrate and ammonia concentrations in soils from low-elevation shoreline sites favored by sea lions were higher than in other sites, in some cases by an order of magnitude. The nitrogen and carbon isotopic ratios in plants from these sites were consistent with a marine bias in the origin of these nutrients. Because seabird and sea lion colonies are completely separate, and breeding colonies of the sea lions are present year-round, the authors could rule out an influence of seabirds on their results. — AMS

*J. Anim. Ecol.* **72**, 873 (2003).


BIOMEDICINE

## Big Hearts

The increase in heart size seen in cardiac hypertrophy is a mechanism by which the heart adapts to increased workload. In the context of pathological stimuli, such as high blood pressure, this response is deleterious and eventually leads to heart failure. By contrast, the exercise-induced cardiac hypertrophy that is often seen in elite athletes can enhance heart function. Whether these two forms of hypertrophy arise through common or distinct signaling pathways is a question of great current interest. In a study of transgenic mice, McMullen *et al.* identify a signaling protein, PI3K (phosphoinositide 3-kinase p110 alpha), that is required for physiological but not pathological hypertrophy, consistent with the idea that distinct signaling cascades are involved. This finding also raises the possibility that pharmacologi-

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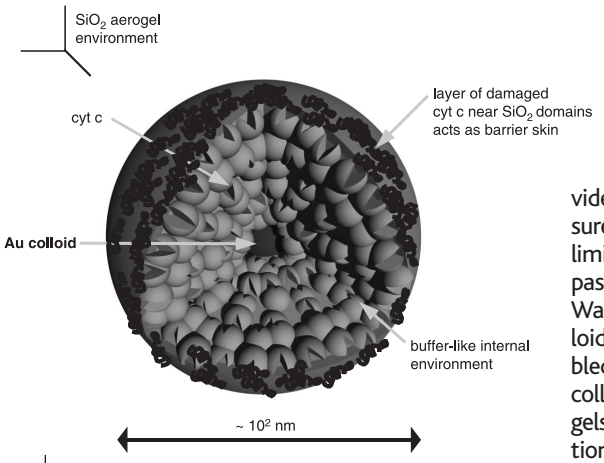
CHEMISTRY

## Packaging Proteins into Aerogels




**Proposed model of the protein superstructure within the aerogel.**

Encapsulation of proteins is desirable for their use in applications such as sensors. Many proteins have been encapsulated in sol gels, but the ultraporous nature of aerogels would provide faster response times. However, the high pressures and temperatures of aerogel processing have limited aerogel encapsulation to enzymes such as lipases that readily withstand extreme conditions. Wallace *et al.* show how the introduction of colloidal gold allows cytochrome c (cyt c) to be assembled into an aerogel and retain activity. Without colloidal gold, supercritical processing of cyt c–silica gels destroys even the metal-porphyrin coordination. Incubation of cyt c with colloidal gold appears to nucleate a multilayer protein shell. Transmission electron microscopy suggests that the outer layer of protein is damaged in the aerogel but that the majority of the cyt c molecules are preserved intact; absorption of gas-phase NO leads to characteristic changes in the intensity of the Soret band at 410 nm. The superstructure formed protects the undamaged proteins even against strong denaturants such as guanidinium hydrochloride. — PDS

*Nano Lett.* 10.1021/nl03646b (2003).

cal manipulation of PI3K signaling could be used to promote physiological hypertrophy and enhance heart function in patients with heart failure. — PAK

*Proc. Natl. Acad. Sci. U.S.A.* 10.1073/pnas.1934654100 (2003).

ATMOSPHERIC SCIENCE

## Vegetation Effects on Atmospheric Pollution

How changes in the composition of Earth's atmosphere may affect climate has received much attention, but how climate change may influence the composition of the atmosphere is not so clear. In particular, it is important to know how global climate change may affect pollutants such as surface ozone. This is a complicated task, however, because pollutant concentrations depend on a complex web of chemical reactions and species. For example, surface ozone concentrations are sensitive to the abundance of isoprene, which is produced by vegetation and thereby is a function of climate.

Sanderson *et al*. use a global atmospheric general circulation model coupled to dynamic vegetation and chemistry models to predict how climate change will affect vegetation, isoprene, and ozone over the 21st century. Although changing patterns of vegetation will reduce the emission of isoprene, background ozone levels are expected to rise by 10 to 20 parts per billion by volume (ppbv) and to cause parts of China, Korea, and the eastern USA to exceed the health safety limit of 60 ppbv. — HJS

*Geophys. Res. Lett.* **30**, 1936 (2003).

REPRODUCTIVE BIOLOGY

## From Stem Cells to Sperm

Embryonic stem (ES) cells can generate all lineages of the embryo in vivo. However it has not been clear whether germ cells can be derived from ES cells in vitro. Recently Hübner *et al*. were able to produce oocytes from mouse embryonic stem cells (Reports, 23 May, p.1251). Now Toyooka *et al*. have demonstrated that ES cells can also generate male germline cells in vitro. Cells were dissociated from embryoid bodies, grown with bone morphogenic protein 4–expressing cells, and then co-cultured with male gonadal cells before transplantation into a host testis capsule. The ES-derived cells differentiated into cells that expressed a characteristic marker of meiotic spermatogenic cells. When transplanted into reconstituted testicular tubules, the cells could develop into sperm. The cells produced probably represent primordial germ cells, which migrate into the fetal gonad where they will undergo meiosis and produce sperm. It will now be of interest to see if viable progeny can be produced using these cells. — BAP

*Proc. Natl. Acad. Sci. U.S.A.* **100**, 11457 (2003).

ASTROPHYSICS

## Swallowing Planets


V838 Monocerotis.

In January 2002, a star, V838 Monocerotis, suddenly brightened by about 6 magnitudes, followed by a slow decline. The star then repeated this outburst in February and again in March, leaving astronomers puzzled about what would cause such an unusual sequence of events. Retter and Marom suggest that V838 Mon swallowed three Jupiter-mass planets that were all orbiting within 0.5 astronomical units of the star; a very tight planetary system. V838 Mon probably started life as a main sequence star with a mass similar to that of the Sun, then the outer stellar shell started to expand as the star transitioned to a red giant. The expanding shell probably caught the closest orbiting planet in its grasp and pulled the planet into its interior. The gravitational energy generated by this planet-munching was used to throw off some ejecta, while the rapid release of a new source of hydrogen from the planet into the hydrogen-burning stellar shell produced the increase in luminosity. Once the process was started, the second and third planets were easy meals for the hungry star. — LR

*Mon. Not. R. Astron Soc.*, in press, preprint astro-ph0309341.

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