Medicine

Virus offers life support to cancer

Proc. Natl Acad. Sci. USA
doi:10.1073/pnas.2336099100 (2003)

Many human cancers are causally associated with viruses. For instance, Epstein–Barr virus (EBV) is frequently found in Burkitt's lymphoma — an aggressive type of cancer that affects the immune system's B cells. Now Gregory Kennedy and colleagues find that the viral protein EBNA-1 helps these tumour cells to survive.

One common event that causes Burkitt's lymphoma is a chromosomal translocation that activates c-*myc*, a gene that promotes cell division. Still, most such tumours have additional alterations that affect proliferation and inhibit cell death. In areas where the cancer is endemic, such as Africa, virtually all cases are associated with EBV. But although the virus induces proliferation of infected cells, it's not clear how it supports the tumour.

The only EBV protein consistently expressed in Burkitt's lymphoma cells is a DNA replicator called Epstein–Barr nuclear antigen-1 (EBNA-1). Previously, Kennedy and colleagues constructed an EBNA-1 gene that encodes a non-functional protein, which inhibits its viral counterpart if expressed in the same cell. With this tool to hand, Kennedy *et al.* now show that, without functional EBNA-1, the tumour cells trigger their intrinsic suicide programme and die. Hope springs eternal — although much more research is needed, the finding suggests that EBNA-1 inhibitors might be useful in treating EBV-associated malignancies. **Marie-Thérèse Heemels**

Evolutionary biology

Spot the difference

Am. Nat. **162,** 377–389 (2003)

One explanation for the evolution of conspicuous warning signals — for example, as displayed by certain caterpillars (see picture) — is that predators learn to avoid distinctive, 'defended' animals more quickly. Thomas N. Sherratt and Christopher D. Beatty have tested an alternative view, which does not invoke any particular psychological biases in predators. Their experiments involved student hunters and virtual prey; their results support the idea that bright warning colours evolved simply to let the poisonous stand out from the palatable.

Sherratt and Beatty asked students to forage for computer-generated animals, scoring points when attacking an undefended victim, and losing points if they hit a noxious one. The prey varied in their conspicuousness, and passed on their traits

DR JOHN BRACKENBURY/SPL

Pretty poisonous: spurge hawkmoth caterpillars (*Hyles euphorbiae*).

to the next generation — if they survived. Defended prey rapidly evolved to become more obvious; even in trials where all prey retained a cryptic appearance, the markings of well-defended and vulnerable animals diverged. Becoming easily detectable might be a good way for inedible animals to distinguish themselves from the rest, the researchers suggest, because an obvious yet edible animal is unlikely to survive for long. **John Whitfield**

Organic electronics

Carbon makes contact

Appl. Phys. Lett. **83,** 3945–3947 (2003)

A carbon composite material could help to make electronics all-organic, say Erik J. Brandon and co-workers, by providing the contacts for polymer-based devices. These contacts have previously tended to be made from metals such as gold or platinum, undermining several of the potential advantages of organic devices: ease of processing, low cost and low weight.

The contacts used to 'wire up' the terminals of microelectronic devices must not only be good conductors, but they should also have a work function (the energy needed to remove an electron) matched to the conduction band of the semiconductor from which the device is made. And they have to be chemically stable, sometimes at high voltages. Metals such as gold meet these stringent requirements, but depositing them typically requires high-vacuum conditions.

Brandon and colleagues show that a commercial paste composed of carbon particles dispersed in a heat-curable polyester binder can be used to make contacts about 0.5 mm wide. The contacts have good conductivity, adhesion and flexibility when printed onto silicon dioxide through a stencil, and don't decompose at voltages of up to 100 V. Brandon *et al.* think it should be possible to make much smaller contacts, perhaps using ink-jet printing. **Philip Ball**

Atmospheric chemistry

Iron injection

Geophys. Res. Lett. doi:10.1029/2003GL018035 (2003)

Sulphur dioxide, a gas emitted by industrial processes and implicated in acid rain, may be a cloud with a silver lining, according to N. Meskhidze and colleagues. They propose that SO_2 converts iron in mineral dust into a form that can be assimilated as a nutrient by phytoplankton, encouraging primary production in the oceans. As this process 'fixes' atmospheric carbon dioxide in biological tissues, it alleviates global warming.

The limited availability of iron restricts primary production in some regions of the oceans: atmospheric dust is considered to be the main source. But iron in the dust from arid lands is mostly in the form of Fe(III), which is poorly soluble in sea water and thus has low bioavailability. It can be made soluble by acid, and Meskhidze and colleagues think that a prime source of such acid is the SO_2 that dust plumes encounter over urban areas. They confirm that mineral dust transported from the Gobi desert to the Yellow Sea shows a fingerprint of pollutant gases from China.

This doesn't necessarily mean, however, that SO_2 is good on balance for the global climate: the molecules also become oxidized to form sulphate aerosol particles, which have complex effects on the Earth's radiation budget and cloud cover. **Philip Ball**

Astronomy

Asteroids warm to analysis

Icarus **166,** 116–130 (2003)

Asteroids are far away and usually just points of light in telescopes. So estimating their size has been a headache for astronomers, especially those who calculate the risk of collision with our planet posed by so-called near-Earth asteroids (NEAs).

Asteroid size is inferred from their albedo, a measure of surface reflectivity which depends on their composition. But the compositions and albedos of NEAs are poorly known, and estimates of NEA masses may be wrong by up to a factor of eight.

Using the Keck I telescope on Mauna Kea in Hawaii, Marco Delbó and colleagues measured the infrared thermal emission from 20 NEAs. From this they deduced the amount of light the NEAs absorb. By subtracting the absorbed light from the known incident sunlight, they inferred values for albedo. The findings increase the number of NEAs for which albedos have been calculated by 35%.

From these results, J. Stuart and one of the paper's co-authors, R. Binzel, produce another estimate: that the Earth should be hit by an asteroid of one kilometre or larger every 600,000 years, a frequency that is some 20–30% lower than previous estimates. **Tom Clarke**