RONALD GRANT ARCHIVE

SHOWBIZ NEWS

Hard-hitting research
Martial-arts legend Jackie Chan has opened a science-education centre to showcase medical research at the Australian National University, located in Canberra, where his family moved in 1962 and he was first nicknamed Jackie. Let's hope the centre gives public science a healthy kick.

WORDWATCH

Nom de simplicité?
"From today, we're known simply as IUCN," trumpets a press release from the organization once confusingly known as IUCN: The World Conservation Union. Handily pasted underneath is a French translation describing how the organization will henceforth be known simply as UICN ...

NUMBER CRUNCH

5 micrometres is the diameter of the world's smallest diamond ring, created by Australian physicists.

300 nanometres is the thickness of the ring, an elegant plain band of pure synthetic diamond, rather than the traditional stone set in gold.

0 is the number of brides-to-be who will benefit — the nanoscale ring is strictly for studying single photons. But what Sidelines wants to know is: would it still cost a month's salary?

ZOO NEWS

Wild gesture
Kenya's Wildlife Service is giving free entry to under-18s visiting its world-famous national parks until 30 April as a way of "thanking Kenyans for keeping wildlife safe" during the country's recent post-election riots.

Sources: IUCN, Am. Inst. Phys., Environment News Service, Sydney Morning Herald

SIDELINES

Fly's eye detector spies cosmic-ray cut-off

An experiment to detect subatomic particles arriving from deep space has triumphantly announced … their absence.

The finding, a swansong from the now defunct High Resolution Fly's Eye (HiRes) cosmic-ray observatory in Utah, is far from a disappointment. It is the long-awaited confirmation of a decades-old prediction that there is a critical threshold of energy beyond which these cosmic rays dwindle in number (R. U. Abbasi *et al. Phys. Rev. Lett.* **100,** 101101; 2008). And it adds weight to initial measurements from the Pierre Auger Cosmic Ray Observatory in Argentina.

This energy 'cut-off' was predicted in 1966 by Kenneth Greisen of Cornell University in Ithaca, New York, and in the same year by Soviet physicists Georgiy Zatsepin and Vadim Kuzmin of the Lebedev Institute of Physics in Moscow. They predicted that there would be very few cosmic rays with energies greater than about 6×10^{19} electron-volts (eV) because of energy losses through interactions with the ubiquitous photons of the cosmic microwave background, the radiation that fills the Universe.

"There could be some really exciting particle physics involved here."

But scientists studying high-energy cosmic rays have failed to observe the so-called GZK cut-off. Indeed, ultra-high-energy cosmic rays with energies of up to 3×10^{20} eV have been detected by Earth-based instruments. Such cosmic rays are mainly protons, thought to be generated by awesomely energetic astrophysical phenomena such as supernovae or supermassive black holes.

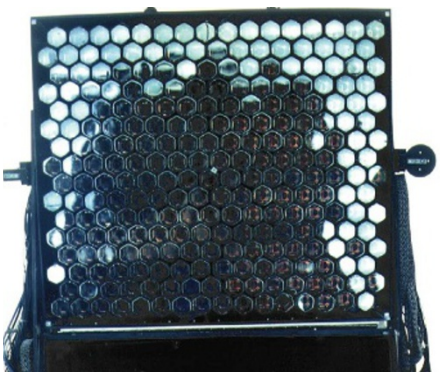
Most perplexingly, researchers working at a Japanese cosmic-ray observatory called the Akeno Giant Air Shower Array (AGASA) near Tokyo have previously reported a cosmic-ray energy spectrum that shows no obvious sign of a cut-off. "This excited many theorists," says Douglas Bergman of Rutgers University in Piscataway, New Jersey. There was speculation about whether the Japanese results revealed new physics beyond Einstein's theory of special relativity, such as the existence of a 'shortest possible length' analogous to the fastest possible speed (the speed of light) imposed by relativity.

The new HiRes results, reported by Bergman and colleagues, discount such speculation — for now, at least. The team describes a cosmic-ray spectrum that drops sharply at around the predicted GZK cut-off energy. "They've pretty clearly seen the effect," says astrophysicist Alan Watson of the University of Leeds, UK.

One of the main difficulties in spotting the cut-off has been a poverty of statistics. Most cosmic rays have energies lower than the GZK limit, and so it is tricky to detect enough particles at high energies for a drop in the energy spectrum to become clear. Bergman's study drew on almost a decade of data from the HiRes experiment, which ran at the US Army Dugway Proving Ground in Utah from the late1990s until early 2006, when it was shut down.

HiRes's two telescopes searched the sky for the characteristic flashes of ultraviolet light produced when a cosmic ray collides with a molecule in Earth's atmosphere and creates a shower of secondary particles. The two 'eyes' — hemispheres covered in photomultiplier tubes that look like a fly's compound eyes — capture just about all the light in the shower, giving a good measure of the original particle's energy. "To see the GZK cut-off, it is vitally important to have good energy resolution," Bergman says.

So why hasn't AGASA seen it? "The AGASA people are really good experimentalists, and you can't doubt their measurements," Watson says. But AGASA doesn't measure the cosmic-ray energies directly, so Watson thinks there could be something wrong in the theoretical model used to calculate them — something that might, after all, point to unknown new physics at these high energies. "There could be some really exciting particle physics involved here," he says.



The many photomultiplier tubes of the HiRes detector captured tell-tale signs of cosmic rays.