NASA

R2 has a ticket for the space shuttle

Humanoid robot set for space

NASA is preparing to send its first humanoid robot into space. Robonaut first twitched to life in September 1999 and, after a decade of tests, the 140-kilogram R2 model will finally be launched to the International Space Station on the space shuttle Discovery's last mission in September.

With continual maintenance work needed on the ISS, the idea is to give the crew an assistant that never tires of undertaking mundane mechanical tasks – initially inside the craft but later outside it too.

R2 comprises a humanoid head and torso with highly dexterous arms and hands. It was developed by NASA in conjunction with roboticists at General Motors. After being bolted to a piece of ISS infrastructure, R2 can use the same tools, such as screwdrivers and wrenches, as the astronauts.

One reason for the mission, NASA says, is to see how Robonaut copes with the cosmic radiation and electromagnetic interference inside the space station.

The main challenge, though, will be to ensure the robot is safe to work with, as tools can fly off easily in microgravity, says Chris Melhuish of the Bristol Robotics Laboratory in the UK. "Robots have to be both physically and behaviourally safe," he says.

"The main challenge will be to ensure the robot is safe to work with, as tools can fly off in microgravity"

"That means torque control of limbs and tools, but also an ability to recognise human gestures to safely achieve shared goals. These are serious hurdles NASA will need to overcome."

Carbon flakes brush up for solar

GIVING graphene – atom-thick sheets of carbon – a good brush could be the key to boosting the efficiency of cheap solar cells.

A graphene-based dye that yields photoelectrons could be used in dye-sensitised solar cells – a cheaper alternative to silicon-based cells. But the idea turned out to have a sticky problem.

A team of chemists led by Liang-shi Li at Indiana University in Bloomington were able to make graphene flakes of a suitable size for photoelectric dyes – about 2 nanometres across. But usually flakes of this size would coalesce to form insoluble graphite. Li's team found that bonding "brushes" in the form of phenyl groups onto the graphene surface ensured the flakes remained free, and showed that solar cells made using the dye would work (*Nano Letters*, DOI: 10.1021/nl101060h).

88

per cent of Fortune 500 companies have had their computer networks infected by Zeus malware, RSA Security says

Unbreakable code secures network

THE first high-speed network link that is so secure it is theoretically unbreakable has been created, thanks to quantum physics.

A team at Toshiba Research Europe in Cambridge, UK, has sent encrypted data at over 1 megabit per second along 50 kilometres of optical fibre. That's fast enough to stream video.

Secure links like Toshiba's involve one user sending a secret "key" to the other, encoded into the quantum properties of a string of single photons. Quantum mechanics ensures that any attempt to intercept this quantum key will change it, revealing the attack.

Until now, the fastest way to send the encoded photons was through the air, but the best spanned not much more than 700 metres. For quantum encryption to be practical, the photons need to travel further and use existing infrastructure, such as the optical fibre that already forms the internet's backbone.

Unfortunately, optical fibre can only transmit light over long distances when it is of a certain wavelength. Individual photons of that wavelength are difficult to detect, but Toshiba has now developed a detector that can pick them up (*Applied Physics Letters*, DOI: 10.1063/1.3385293).

"We will have a wide range of laser weapons"

Douglas Graham of US security company Lockheed Martin is adamant that laser-based weapons will be operational in five to 10 years, despite the Airborne Laser project he was working on being scaled back (*San Francisco Chronicle*, 16 April)