

# ANTENNA



### Editors note



Hi, my name is Rachel Morison and I am the Youth Editor for ANTENNA. I am currently studying Applied Chemistry: Forensic Science at UTS. I have been to three of the Youth ANZAAS conferences as a student and attended the latest two as a staffie. Through Youth ANZAAS I have met many interesting people with a similar passion for science and at the same time, learnt a lot about the study and application of science in our modern world.

### REGIONAL REPORTERS NEEDED

Please share any interesting websites, research or science activities that you come across.

All contributions welcome.

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### Scientists connect global warming to extreme rain

Extreme rainstorms and snowfalls have grown substantially stronger, two studies suggest, with scientists for the first time finding the telltale fingerprints of man-made global warming on downpours that often cause deadly flooding.

Two studies in *Nature* journal link heavy rains to increases in greenhouse gases more than ever before.

One group of researchers looked at the strongest rain and snow events of each year from 1951 to 1999 in the Northern



Hemisphere and found that the more recent storms were 7 percent wetter. That may not sound like much, but it adds up to be a substantial increase, said the report from a team of researchers from Canada and Scotland.

The study did not single out specific storms but examined worst-of-each-year events all over the Northern Hemisphere. While the study ended in 1999, the close of the decade when scientists say climate change kicked into a higher gear, the events examined were similar to more recent disasters: deluges that triggered last year's deadly floods in Pakistan and in Nashville, Tennessee, and this winter's paralyzing blizzards in parts of the United States. (*Editor: and perhaps those terrible floods we have seen in Queensland this summer*).

Both studies should weaken the argument that climate change is a "victimless crime," said Myles Allen of the University of Oxford. He co-authored the second study, which connected flooding and climate change in Britain. "Extreme weather is what actually hurts people."

Not all the extreme rain and snow events the scientists studied, cause flooding. But since 1950, flooding has killed more than 2.3 million people, according to the World Health Organisation's disaster database.

Researchers found that global warming more than doubled the likelihood of that flood occurring. Similar studies are now under way to examine whether last year's deadly Russian heat wave and Pakistan floods - which were part of the same weather event - can be scientifically attributed to global warming.

For years scientists, relying on basic physics and climate knowledge, have said global warming would likely cause extremes in temperatures and rainfall. But this is the first time researchers have been able to point to a

demonstrable cause-and-effect by using the rigorous and scientifically accepted method of looking for the "fingerprints" of human-caused climate change.

The scientists took all the information that shows an increase in extreme rain and snow events from the 1950s through the 1990s and ran dozens of computer models numerous times. They put in the effects of greenhouse gases - which come from the burning of fossil fuels - and then ran numerous models without those factors. Only when the greenhouse gases are factored in do the models show a similar increase to what actually happened. All other natural effects alone don't produce the jump in extreme rainfall. Essentially, the computer runs show climate change is the only way to explain what's happening.

In fact, the computer models underestimated the increase in extreme rain and snow. That is puzzling and could be even more troubling for our future, said Michael Oppenheimer of Princeton University, who was not part of the study.

Similar fingerprinting studies have found human-caused greenhouse gas emissions triggered changes in more than a dozen other ecological ways: temperatures on land, the ocean's surface, heat content in the depths of the oceans, temperature extremes, sea level pressure, humidity at ground level and higher in the air, general rainfall amounts, the extent of Arctic sea ice, snowpack levels and timing of runoff in the western United States, Atlantic Ocean salinity, wildfire damage, and the height of the lower atmosphere.

Most of the 10 outside climate experts who reviewed the papers for The Associated Press called the research sound and strong. However, climate scientist Jerry North of Texas A&M University, while praising the work, said he worried that the studies were making too firm a connection based on weather data that could be poor in some locations. But Francis Zwiers of the University of Victoria, a lead author of the study with Zhang, said the data was from National Weather Service gauges and is reliable.

"Put the two papers together and we start to see an emerging pattern," said Andrew Weaver of the University of Victoria, who wasn't part of either study. "We should continue to expect increased flooding associated with increased extreme precipitation because of increasing atmospheric greenhouse gas. And we have no one to blame but ourselves."

### **Satellite project to predict earthquakes will 'help save lives'**

**By Shaun Walker**

Scientists have launched a project that they hope could one day help save thousands of lives by predicting when and where earthquakes will happen. A group of British and Russian scientists signed an agreement to work together on the project earlier this week in Moscow.

The TwinSat project involves the launch of two satellites - one of which they say is about the size of an old television set and the other smaller than a shoebox - which will orbit the earth a few hundred miles apart.

Data from the satellites will be collated with data from the ground as the scientists try to understand what natural warnings are given prior to earthquakes.

"As stress builds up in the Earth prior to an earthquake, subtle electromagnetic signals are released that can be read from the upper atmosphere," said Professor Alan Smith, Director of the Mullard Space Science Laboratory at University College, London, who was in Moscow this week to launch the project.

"We want to try to work out how these signals differ from all the other things that are present at any given time." The two linked satellites will monitor zones with high seismic and volcanic activity, such as Iceland and the Kamchatka Peninsula in the far east of Russia. The project is being run by a team of British and Russian scientists and was heralded "a new milestone in UK-Russia space collaboration" by Professor Smith.

Professor Vitaly Chmyrev, of the Institute of Physics of the Earth in Moscow, one of the Russian partners, said that the possibilities for progress in earthquake research were extremely exciting. He said that the project will "benefit both Russian and British science in addition to making the Earth a safer place".

Professor Chmyrev noted that in the days leading up to the devastating earthquake in Haiti last year, satellites picked up electromagnetic signals from the area, but they were only analysed afterwards. This project could be a huge step towards understanding how to read these signals. "Just imagine if we could have accurately predicted the Haiti earthquake a few weeks before," said Professor Chmyrev. "Or if we had predicted the Icelandic volcano eruption that paralysed transport routes for weeks. The potential human and economic benefits are enormous."



Peter Sammonds, Professor of Geophysics at UCL and another member of the project team, said that because the satellites were so small, the

technology was relatively cheap. "These satellites are absolutely incredible, you can almost hold them in the palm of your hand," he said. "If the project progresses as we want it to, we'll be able to send up several more of them to increase coverage."

The first satellite launch is planned for 2015, and the team is confident that the project could change the way we understand earthquakes. "It wasn't long ago that if you said there was a chance of predicting earthquakes, people would say you were a charlatan, and not a real scientist," said Professor Chmyrev. "But science moves quickly and I'm absolutely certain that sooner or later we'll be able to make very accurate predictions."

## The portable 'factory in a box' that can create any 3D object out of plastic before your eyes

By David Derbyshire

Imagine breaking the plastic knob on your dishwasher.

As the plates pile up in the sink, you ring the manufacturer to ask for a spare part. Weeks later you are still waiting - and washing up by hand.

But it doesn't have to be like that. Now, you can simply manufacture your very own dishwasher knob. And bath plugs, drink bottles, spectacle frames, shin pads, helmets and even action figures.



It's all thanks to the Thing-O-Matic, a 'factory in a box' that

claims to create any three-dimensional object out of plastic in a matter of minutes.

The machine, which was unveiled at a trade fair in Las Vegas this week, aims to make manufacturing more a kitchen table affair.

And with 3,000 said to have been sold already, it could soon be making an impact in a household near you. The first version of the Thing-O-Matic, which costs £790, is limited to making small plastic objects. But its creators say future models could combine plastic with metals - allowing them to make electronic gadgets at the push of a button.

Bre Pettis, the chief executive of New York-based Makerbot Industries, the company behind the Thing-O-Matic, said: 'We want to democratise manufacturing.'

The machine can make any plastic shape measuring up to six inches by six inches by seven inches. It can't cope with hinges but can produce boxes with lids, tubes or detailed action figures. Users must first create or download a 3D image on their PC using special software. Up to 5,000 designs are available on the firm's website.

The virtual design is then transferred to the Thing-O-Matic by a standard computer cable.

It heats strands of plastic to 200c and squirts them onto a platform inside the machine, building up objects layer by layer.

Any excess plastic is cleaned away using a chemical bath and the finished object is ejected. A bottle opener, spat out at the trade fair in Las Vegas, took about 30 minutes to make.

The machine works with three types of plastic: ABS - the hard, lightweight plastic used to make Lego bricks and recorders; high density polyethylene (HDPE) used to make watering cans, plastic bags and folding chairs, and corn-based biodegradable plastic.

### HOW IT WORKS

- Virtual 3-D object is created with computer software or downloaded from the internet
- Dimensions of the object sent to Thing-O-Matic via USB computer cable
- The object is built up layer by layer from a nozzle spraying jets of hot plastic onto the build tray

■ Chemical jets brush away excess plastic

■ Small household items can be produced in as little as 30 minutes

#### THINGS YOU CAN MAKE

- Model cars
- Bottle opener
- Plastic cutlery
- Golf club head
- Ruler
- Bath plugs
- Drinks bottles
- Chess set
- Lunch box
- Toy soldiers
- Coat-hangers

Mr Pettis said as well as making new things, the Thing-O-Matic was useful for household repairs. Owners simply take a measurement of the broken part, make a computer model and manufacture it. One householder used his Thing-O-Matic to make shower curtain rings when his local shop had run out. It can even be used to make spare parts for itself.

But the first challenge is to build the Thing-O-Matic. It comes as a kit and is said to take about 12 hours to put together. Or as Mr Pettis said hopefully: 'You can make this if you're comfortable making IKEA furniture.'

Read

more: <http://www.dailymail.co.uk/sciencetech/article-1345789/MakerBot-Thing-O-Matic-The-portable-factory-box-create-3D-object-plastic.html#ixzz1EYHYO39T>

## Frog bladder holds a surprise

By Abbie Thomas

Australia's desert frogs are famously able to store up large amounts of water in their bladder to last them through the drought.

But now researchers from Charles Darwin University in the Northern Territory have found that frog bladders can hold another, even more bizarre surprise.

Dr Chris Tracy and colleagues report in the Royal Society journal *Biology Letters* that frogs have a unique way of dealing with foreign objects that become lodged in their bodies - they store and even expel them from the bladder.



After finding that frogs implanted with radio transmitters in the field became mysteriously separated from the devices, the researchers implanted small

beads into the body cavities of tree frogs and cane toads to see what would happen.

Within nine days, all the tree frogs had expelled the beads completely from the body via their bladder, while the beads in the cane toads had migrated to the bladder and stayed there.

"The bladder of frogs appears to be a unique pathway of expulsion of foreign objects from the body," says Tracy.

Animals such as fish and snakes - and even humans - are known to expel objects out of the body through the skin or the intestine.

But, says Tracy, they were surprised to find that a 2 centimetre long transmitter implanted in the body cavity of an 8 centimetre long frogs could migrate to the bladder.

"When we first started finding transmitters in bladders, we thought wow that's really bad surgery we did. But when we started seeing them over and over again, we realised, 'Hey, this really is something different.'"

The researchers wanted to know how the bead came to be in the bladder, so they dissected implanted cane toads over a number of days to see where it went.

Tracy says tissue grows out from the bladder and wraps around the bead, eventually enveloping it and drawing the bead into the bladder.

"It's pretty remarkable that these amphibians can safely and relatively quickly get rid of potentially dangerous things in the body cavity," he says.

So why would frogs have such a special adaptation?

Tracy speculates that because frogs eat live insects, some of the sharp insect body parts could break off and become lodged in their body.

"The other thing about frogs is their jumping - they aren't very coordinated and they tend to crash land. They have relatively thin skins, so it's easy to imagine a frog landing on something spiny that could poke into their body that way," he says.

"If you have something roaming around inside the body, it's usually a bad thing. It could poke through a vital organ, so it's a good idea to get rid of them."

Tracy says his findings are a cautionary note for other researchers implanting transmitters into animals.

"Finding that your study animal has become separated from your transmitter may not mean it has been eaten by a predator. It might have just expelled the object."

## NASA finds 'alien life' on Earth

By Niall Firth

**NASA has discovered alien life - but it is right here on Earth.**

The announcement, at a press conference at the space agency's US headquarters early today, follows days of frenetic speculation that it was about to reveal the existence of life on another planet.

While the truth - an 'alien' bacterium lurking deep within a Californian lake - is rather closer to home, it markedly raises the odds of ET's existence.

The excitement lies in the bug's ability to eat and thrive on arsenic, one of the most toxic chemicals on the planet. It can even incorporate arsenic into its DNA, making it part of its very being.

All 'known' life requires six fundamental elements - carbon, hydrogen, nitrogen, oxygen, phosphorous and sulphur - which provide the building materials for DNA, proteins and fats.

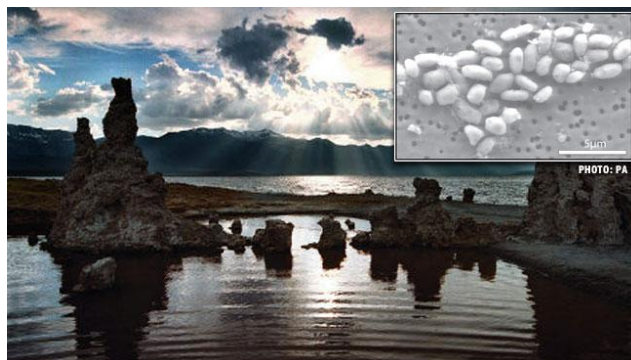
As every other form of known life uses phosphorus rather than arsenic as a key building block of its DNA, the find suggests that a second form of life is with us, right here on Earth.

And if one alien life form exists, space enthusiasts argue, it is highly likely there are others out there.

Dr Felisa Wolfe-Simon, from Arizona State University, who led the US researchers, said: 'Our findings are a reminder that life as we know it could be much more flexible than we generally assume or imagine.'

'If something here on Earth can do something so unexpected, what else can life do that we haven't seen yet? Now is the time to find out.'

Astrobiologist Professor Ariel Anbar, also from Arizona State University, who co-authored the study reported today in the journal *Science*, said: 'Life as we know it requires particular chemical elements and excludes others. But are those the only options? How different could life be?'



Alien environment ... Rock formations at Mono Lake, near California's Yosemite National Park. *Source:* The Daily Telegraph

'One of the guiding principles in the search for life on other planets, and of our astrobiology programme, is that we should "follow the elements".'

'Felisa's study teaches us that we ought to think harder about which elements to follow.'

The bugs, from the GFAJ-1 strain of the Halomonadaceae family were found at the bottom of the salt and arsenic-ridden Mono Lake, near California's Yosemite National Park.

Experiments showed that they can live like normal life-forms, using phosphorous in their molecules. But when necessary the strain can switch to a 'weird' mode of life that relies on arsenic.

The finding bolsters the 'weird life' theory coined by Paul Davies, a British-born professor of cosmology, also at Arizona State University.

He says it is likely that life on Earth has evolved more than once - and the only reason we haven't found the imposters among us is that we don't know what we are looking for.

The professor, who was part of the latest research, cautioned that the discovery that the lake-lurking bacterium can use phosphorus as well as arsenic means it is not a true 'alien' with its own tree of life.

But he added: 'GFAJ-1 may be a pointer to even weirder organisms. The holy grail would be a microbe that contained no phosphorus at all.'

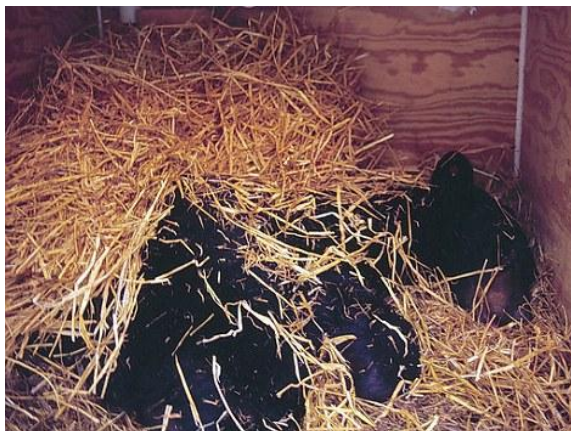
The announcement is the second in as many days that boosts the likelihood of extra-terrestrial life. Other US research released yesterday revealed there are three times more stars - and so many more planets - in the universe than previously thought.

### Secrets of hibernating bears 'could save lives' of stroke and heart attack victims

By David Derbyshire

- *Animals slow down their heart beat by 75 per cent when they sleep for half a year without food or drink*
- *Scientists say the findings could pave the way for long distance space travel using hibernation pods*

The secret of how bears hibernate could save thousands of lives, researchers say.



They believe that if the mechanism can be replicated in humans, then the 'golden hour' - the vital window in which those who have suffered a stroke, heart attack or severe trauma need to be treated - could be extended to a 'golden day'.

Scientists have discovered that black bears slow down their metabolic rate by 75 per cent to sleep through half the year without food or water.

At the same time they cut their heartbeat dramatically - sometimes leaving gaps of 20 seconds between beats.

It is the first time researchers have been able to monitor North American black bears throughout their seven-month long winter hibernation and the results have astonished experts.

They say the findings could have implications for medicine - and could allow doctors to one day slow down patients' metabolism while waiting for life-saving treatment.

It could even help pave the way for long distance space travel, using the sort of hibernation pods seen in science-fiction movies such as *Alien* and *2001: A Space Odyssey*.

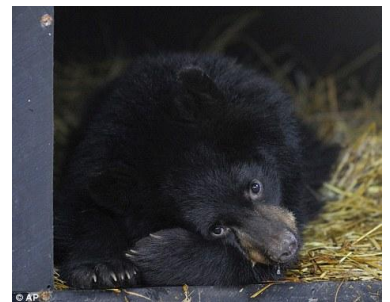
The scientists found that during their long snooze, the bears' heart rates slowed from around 55 beats per minute to an average of just 14.

Dr Olvind Tolen, from the University of Alaska at Fairbanks, said: 'They have an almost normal heartbeat when they take a breath. But between breaths the bears' hearts beat very slowly.'

'Sometimes there is as much as 20 seconds between beats.'

'Each time the bear takes a breath, its heart accelerates for a short time to almost that of a resting bear in summer. When the bear breathes, the heart slows down again.'

The researchers studied five black bears captured by state officials when they wandered too close to towns in Alaska.



In the wild, the bears spend five to seven months hibernating each winter. During that time they do not drink eat, urinate or defecate and yet emerge from their dens in spring in pristine condition.

The bears were placed in homes designed to mimic dens in the woods away from people and watched with infra-red cameras and movement sensors.

The scientists implanted radio transmitters in the animals' bodies to monitor heart rate, body temperature and muscle activity.

Measuring the oxygen levels in their blood showed that the bears slowed down their metabolic rates - the rate they convert food to energy - to just 25 per cent of the normal summer level.

The reduced metabolism allows them to survive on the fat they store up in the summer and autumn.

Their body temperature fluctuated between 30C and 36C in two to seven day cycles - a pattern never seen in any other hibernating animal before.

Once the bears' temperatures dropped to 30C they started to shiver, until the temperature rose to 36C again. Then the bears stopped shivering, until their temperature reached 30C.

In spring, when they woke up, the metabolic rates were still sluggish - just half the normal summer levels. It took another three weeks before their bodies returned to normal.

The researchers say the findings don't just explain how animals hibernate - they could also be useful for people.

Hibernation is common in mammals - and people may still carry genes that help our bodies slow down for long periods.

'If our research could help by showing how to reduce metabolic rates and oxygen demands in human tissues, one could possibly save people,' Dr Tolen said. 'We simply need to learn how to turn things on and off to induce states that take advantage of the different levels of hibernation.'

Dr Brian Barners, a co-author of the study, said: 'When black bears emerge from hibernation in spring, it has been shown that they have not suffered the losses in muscle and bone mass and function that would be expected to occur in humans over such a long time of immobility and disuse.'

'If we could discover the genetic and molecular basis for this protection, and for the mechanisms that underlie the reduction in metabolic demand, there is the possibility that we could derive new therapies and medicines to use on humans to prevent osteoporosis, disuse atrophy of muscle or even to place injured people in a type of suspended or reduced animations until they can be delivered to advanced medical care.'

Hibernation could even be used in deep space travel, the experts said.

Read more:

<http://www.dailymail.co.uk/sciencetech/article-1357880/Black-bears-slow-heart-beat-75-sleep-months-year-food-drink.html#ixzz1EZv2W1iK>

### **Spiral galaxy's newborn stars come to life in stunning Hubble image**

This incredible image of a spiral galaxy reveals a majestic disc of dust lanes dotted with stars.



Taken by Nasa's Hubble Space Telescope, a bright cusp of starlight marks the centre of galaxy NGC 2841.

Read more:

<http://www.dailymail.co.uk/sciencetech/article-1358002/NGC-2841-Spiral-galaxys-newborn-stars-come-life-stunning-Hubble-image.html#ixzz1EYBtPVk2>

### **They've really clicked! Dolphins and scientists talk to each other using shared primitive language**

Dolphins are the world's second brightest creatures after humans and have many brain features associated with high intelligence.



So clever are the aquatic mammals that scientists have frequently communicated with those in captivity by rewarding their responses with fish.

But behavioural biologists have now carried out two-way communication with dolphins in the wild in the first study of its kind.

Dr Denise Herzing and colleagues at the Wild Dolphin Project in Jupiter, Florida, established a shared, primitive form of language using sounds, symbols and props.

'Many studies communicate with dolphins, especially in captivity, using fish as a reward,' Dr Herzing told Wired.com. 'But it's rare to ask dolphins to communicate with us.'

The experiment revolved around both dolphins and humans asking each other for props such as balls and scarves.

A large underwater keyboard formed the focus of the study; each key was painted with a different symbol and emitted a precisely pitched whistle.

When a dolphin pressed a certain key with her nose, researchers would throw the corresponding prop into the water. Should the dolphin instead decide to whistle the pitch that a certain key would emit, then that prop would be thrown in.

Over the course of three years, the scientists played with the dolphins for 40 half-hour sessions.

They found that while young males were less interested in interacting with humans, young females enjoyed the game.

Dr Herzing said: 'This is when the females have a lot of play time, before they are busy being mothers.'

The sessions were at the most successful when the biologists had swum slowly with the dolphins beforehand, particularly if they had made eye contact and mimicked each other's movements.

Highlighting their social tendencies, the spotted dolphins Dr Herzing's team was playing with even recruited another species, bottlenose dolphins, to play the game.

The study was published in the Acta Astronautica journal.

## Mammoth 'could be reborn in four years'

The woolly mammoth, extinct for thousands of years, could be brought back to life in as little as

How to clone a mammoth



four years thanks to a breakthrough in cloning technology.

Previous efforts in the 1990s to recover nuclei in cells from the skin and muscle tissue from mammoths found in the Siberian permafrost failed because they had been too badly damaged by the extreme cold.

But a technique pioneered in 2008 by Dr Teruhiko Wakayama, of the Riken Centre for Developmental Biology, was successful in cloning a mouse from the cells of another mouse that had been frozen for 16 years.

Now that hurdle has been overcome, Akira Iritani, a professor at Kyoto University, is trying to resurrect the species that died out 5,000 years ago.

"Now the technical problems have been overcome, all we need is a good sample of soft tissue from a frozen mammoth," he told The Daily Telegraph.

He intends to use Dr Wakayama's technique to identify the nuclei of viable mammoth cells before extracting the healthy ones.

The nuclei will then be inserted into the egg cells of an African elephant, which will act as the surrogate mother for the mammoth.

Professor Iritani said he estimates that another two years will be needed before the elephant can be impregnated, followed by the approximately 600-day gestation period.

He has announced plans to travel to Siberia in the summer to search for mammoths in the permafrost and to recover a sample of skin or tissue that can be as small as 3cm square.

If he is unsuccessful, the professor said, he will ask Russian scientists to provide a sample from one of their finds.

"The success rate in the cloning of cattle was poor until recently but now stands at about 30 per cent," he said. "I think we have a reasonable chance of success and a healthy mammoth could be born in four or five years."

## Planet Earth 'unrecognisable' by 2050

A growing, more affluent population competing for ever scarcer resources could make for an "unrecognisable" world by 2050, warned researchers at a major US science conference.

The United Nations has predicted the global population will reach seven billion this year, and climb to nine billion by 2050, "with almost all of the growth occurring in poor countries, particularly Africa and South Asia," said John Bongaarts of the non-profit Population Council.

To feed all those mouths, "we will need to produce as much food in the next 40 years as we have in the last 8,000," said Jason Clay of the World Wildlife Fund at the annual meeting of the American Association for the Advancement of Science (AAAS).

"By 2050 we will not have a planet left that is recognisable" if current trends continue, Clay said.

The swelling population will exacerbate problems, such as resource depletion, said John Casterline, director of the Initiative in Population Research at Ohio State University.

But incomes are also expected to rise over the next 40 years - tripling globally and quintupling in developing nations - and add more strain to global food supplies.

People tend to move up the food chain as their incomes rise, consuming more meat than they might have when they made less money, the experts said.

It takes around seven pounds (3.4 kilograms) of grain to produce a pound of meat, and around three to four pounds of grain to produce a pound of cheese or eggs, experts told AFP.

"More people, more money, more consumption, but the same planet," Clay told AFP, urging scientists and governments to start making changes now to how food is produced.

Population experts, meanwhile, called for more funding for family planning programmes to help control the growth in the number of humans, especially in developing nations.

"For 20 years, there's been very little investment in family planning, but there's a return of interest now, partly because of the environmental factors like global warming and food prices," said Bongaarts.

"We want to minimise population growth, and the only viable way to do that is through more effective family planning," said Casterline.



## 10 Ways Robots Could Replace Humans

By Robert Lamb

### 10. The Metal Musicians

Oh, you only listen to human musicians, is that right? Enjoy it while it lasts, because the era of the



robotic rocker will come sooner than you think. Computers first generated compositions in the mid-1950s, and influential artists such as Brian Eno and Autechre have employed algorithmic compositions on their albums.

The use of formal instructions and processes to create music dates back to ancient Greece, and today you'll find functioning robot musicians aplenty in the world's leading technical universities. We're not talking player pianos either, but bots like 2010's Shimon, a marimba-playing robot at the Georgia Tech Centre for Music Technology. Designed to play like a machine and improvise like a robot, Shimon can adapt and learn while jamming with its organic bandmates. Designer Gil Weinberg also unveiled a robotic drummer named Haile in 2006.

These are just two examples of the world's growing population of robotic and computerized musicians, which include Toyota's trumpet-playing robots and Georgia Tech's Crazy J, a robotic guitarist.

### 9. Surgeons of Steel



[AP Photo/](#) Keystone, Salvatore Di Nolfi  
Surgeons use the robot da Vinci to aid a hernia operation.

It's one thing to trust a robot with a trumpet solo, but what about prostate surgery? If you find the thought of a mechanical physician cutting into your nether regions creepy, then you'll be interested to know that 73,000 American men underwent robot-assisted prostate surgery in 2009 [source:Kolata].

Robot-assisted procedures entail a human surgeon manipulating tiny robotic arms through an incision to remove diseased tissue. This method takes less time and results in less blood loss than traditional surgical techniques. While the human surgeon typically works from the same room as the machine, the technology spearheads the emerging reality of **telesurgery**. In this reality, future surgeons may operate on a patient halfway around the world without leaving their offices.

But will robot surgeons ever carry out these procedures without the aid of a human behind the curtain? Roboticists hope to create machines capable of learning the art of surgery from the humans they assist -- enough to eventually operate autonomously.

### 8. Artificial Artists



[Vangobot/PopArtMachine.com](#)

Behold, an original painting by Vangobot.

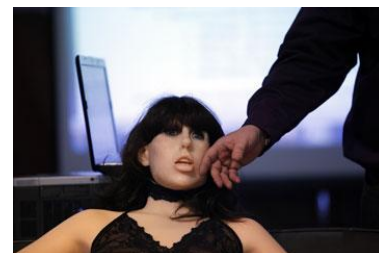
If you want to see the work of a robotic painter, look no further than the paint job on a new automobile. Chances are that shiny coat came courtesy of an industrial robot on an assembly line. But can a robot painter create true works of art?

Any fax machine can scan an image and produce a facsimile. For example, Aikon 2, a robot built by Goldsmiths, a college within the University of London, can scan a human face and sketch the image on a sheet of paper. But is this art or merely a more complex form of artless image reproduction?

It takes a robot like Doug Marx and Luke Kelly's Vangobot (as in Vincent van Gogh, get it?) to further complicate the question. This particular bot boasts 18 brushes, a paint mixer and 3-D spatial awareness. Furthermore, it can combine artistic influences to create fresh takes on a given subject.

Will future generations accept robot-generated art or will they prefer the work of human painters and sculptors?

### 7. My Robot Lover



[AP Photo/](#)Paul Sakuma

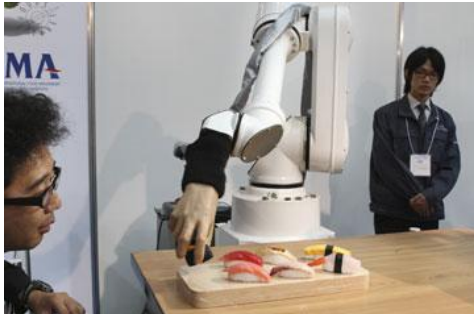
Will the future be this creepy, Roxxy?

Long the obsession of sci-fi nerds around the world, the age of the sexbot has finally dawned. What started as an effort to create a robot home care nurse diverged into

"Cherry 2000" territory when developer Douglas Hines decided there was simply more money in the adult entertainment industry.

Hines' company, True Companion LLC, unveiled a prototype named Roxxy at Las Vegas' 2010 Adult Entertainment Expo. Despite its resemblance to an inanimate sex doll, the product allegedly boasts enough artificial intelligence and pre recorded phrases to engage in pillow talk.

#### 6. Anthony Bourdainbot



[AP Photo/ Koji Sasahara](#)  
**Baba Tekkosho Company's Chef Robot demonstrates its dexterity.**

Robots are learning to create art and music. They're gaining the ability to satisfy our physical and emotional cravings. But surely the culinary arts are off-limits, right? Think again, the age of the mechanical chef is already here.

Each year, FOOMA Japan's International Food Machinery and Technology Exhibition unveils a new legion of machines, ranging from the Toyo Riki Co.'s Okonomiyaki Robot (which makes Japanese pancakes) to Baba Tekkosho Company's Chef Robot, which handles sashimi with delicate, humanoid hands.

In 2010, Chinese fast-food chain Ruyi recently phased out some of its human chefs with automatic rice fryers and noodle boilers at two outlets, with plans for more.

Meanwhile, students at China's Yangzhou University created a fully automated robot capable of cooking up 600 classic Chinese dishes [source: Ngo]. Just imagine a vending machine with a mechanized kitchen inside it, and you're on the right track.

NEC System Technologies' sommelier robot can identify wines with an infrared scanner, it can also "taste" leftovers and tell you what they are.

#### 5. Toy Soldier



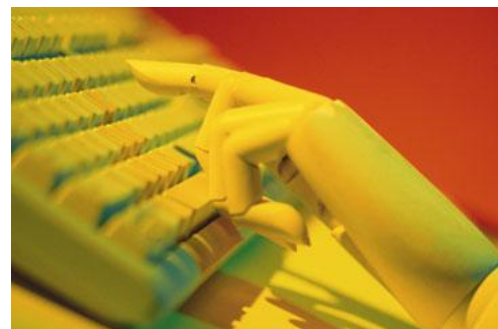
[Ethan Miller/Getty Images](#)  
**Mechanics prepare an MQ-9 Reaper for flight.**

But what about jobs such as policing our streets and fighting our wars? Humans have yet to hand responsibilities for such deadly professions over to robots - -at least not entirely -- but what might the future bring?

Automated weapons have long played a role in human warfare, with unmanned land and air weapons popping up even in World War II. Today, more than 40 countries are currently engaged in the proliferation of **unmanned aerial vehicles (UAVs)**, and the United States deploys its Predator and Reaper drones nonstop over Iraq and Afghanistan [source: Sharkey]. Furthermore, the United States military plans to replace one-third of its ground vehicles with robots by 2015 [source: Markoff].

So far, humans have remained a vital part of these robotic weapons systems. They pull the trigger. They decide when a target is valid. The choice of whether to use lethal force has always fallen to a human operator. But as artificial intelligence increases and ethical governing software improves, human oversight in these matters may greatly decrease.

#### 4. Rise of the Artificially Intelligent Novelist



[Comstock/Comstock Images/Getty Images](#)  
**Will a robot write the great American novel?**

The words you're reading this very moment were written by a human being. Granted, said human being used a computer to write them, but you can still trace it all back to an organic mind. You can say the same for all of history's greatest works of literature. The future, however, may belong to the machines.

What, you don't think a robot can write a novel? Let's be honest, computers are already handling most of the spelling for us. Human language is nothing but coded data, a semiotic web of meanings and symbols that, in proper alignment, creates sentences, paragraphs and everything from crude jokes to philosophical arguments.

Artificial intelligence can't yet navigate this labyrinth of meaning well enough to rival the works of Shakespeare, but we have already created text-manipulating and text-generating programs capable of piecing together dialogue, poetry and stories in a manner that is at least capable of amusing audiences.

Some of the first computers engaged in creative writing. Back in 1952, British computer scientist Christopher Strachey programmed the Mark One "Baby" computer to generate love poetry from a database of romantic language.

### 3. Ambassadors of Earth



[NASA](#)/JSC Robert Markowitz/dapd

NASA's Robonaut stared down a human astronaut.

Robots have already seen more of our solar system than their human creators ever have. Rovers and Landers have touched down on Mars, Venus, Jupiter's moon Titan and even the surface of asteroids and comets. Voyager 1, launched in 1977, is currently the farthest man-made object from Earth as it continues to leave our solar system at a rate of 3.6 astronomical units (the distance between Earth and the sun) per year [source: NASA].

Radio and transmission signals continue to leak out into space and the Voyager and Pioneer probes all carried human images and records, but there's no denying that robots serve as Earth's galactic messengers. Living humans, after all, are fragile and difficult to keep alive in space. Meanwhile robots are capable of enduring extreme conditions and mission times that span multiple generations. Barring incredible advances in human spaceflight technology, the machines will continue to dominate the field of space exploration.

### 2. Bot for Teacher



[AP Photo](#)/Koji Sasahara

Kudan Elementary School children raise hands as they respond to a question by robot teacher Saya during a special 2009 class in Tokyo, Japan.

If you've ever taken an online course or just a computerized quiz, then congratulations, you've studied under a robotic teacher of sorts. But could machines one day march into our schools and handle classrooms of potentially unruly children?

Tokyo University of Science professor Hiroshi Kobayashi thinks so. In 2009, Kobayashi even promoted (and upgraded) his 2004 receptionist robot to teach in front of a classroom of live school children. Named Saya, the bot was capable of little

more than handling roll call and hushing the students, but Japan isn't the only country interested in robotic teachers.

In 2010, the University of California, San Diego, experimented with a robotic teacher named RUBI, who at one point taught English-speaking preschoolers a few words in Finnish, and the University of Southern California continue to study how machines such as its robot "Bandit" can interact with autistic children.

It may be difficult to imagine such machines leading a class, much less inspiring students like a gifted flesh-and-blood teacher, but as robotocists continue to develop truly socially intelligent machines, the possibilities expand dramatically.

### 1. The Positronic God



Colin Anderson /Photographer's Choice/[Getty Images](#)  
Welcome to the technological singularity.

If we can love robots both physically and emotionally, if we eventually entrust them with our medical care, teaching and warfare, then can we really place limits on what roles they can usurp from humans? Could they lead us? Could they protect us? Might they even provide us with spiritual or philosophical guidance?

The concept of a robo-Yahweh or a mecha-Buddha may seem a bit silly at first, but only till you fully consider the possibilities of the **technological singularity**. In a 1993 article, former mathematics professor Vernor Vinge coined the term, arguing that technology would continue to improve at an exponential rate and create a computerized superhuman intelligence before 2030.

In creating a superhuman intelligence, would we also develop an intellect capable of both secular and spiritual leadership? Might we actually produce the entity that human minds have turned to since ancient times?

<http://curiosity.discovery.com/topic/future-robots/10-ways-robots-could-replace-humans10.htm>

### Interesting Youtube video

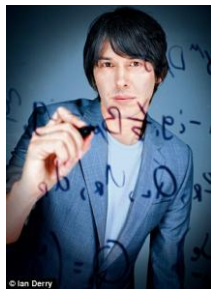
Corning Incorporated is the world leader in specialty glass and ceramic. This video takes a look at Corning's vision for the future with specialty glass at the heart of it.



[http://www.youtube.com/watch?v=6Cf7IL\\_eZ38&feature=youtube\\_gdata\\_player](http://www.youtube.com/watch?v=6Cf7IL_eZ38&feature=youtube_gdata_player)

## He looks more like a pop star than a particle physicist

(but then he did have a No1 hit single). Britain's top TV scientist goes from touring alongside Take That to working on the Large Hadron Collider?



'I want people to have an emotional response to science' said Brian Cox the UK's favourite scientist

Professor Brian Cox is known as the 'rock-star scientist' and described by People magazine as the World's Sexiest

Quantum Physicist.

Cox prefers to call himself a particle physicist, which is all about 'trying to understand what everything is made of and how everything sticks together'.

Cox had played keyboards with D:Ream, whose No 1 single was 'Things Can Only Get Better' in 1994, and it was a hit again three years later, after being taken up as the anthem of New Labour. On the one hand he's a handsome performer. On the other he's a serious scientist who was studying for a first-class degree in physics even while he was with D:Ream.

'I was into science as far back as I can remember. When I got into music, it was because of the electronics, the synthesisers.'

Cox gave up playing with D:Ream in the late Nineties to become a research scientist at Manchester University, and was sent on secondment to CERN

'I am a geek- someone who is immersed in science and engineering and all the real things about the universe and who values exploration and discovery.'

Then came CERN's attempt to recreate conditions as they were at the creation of the universe, by firing particles at great speed around a vast underground loop and smashing them together.

Cox was nominated as a spokesman. The BBC swooped. His first series, Wonders Of The Solar System, attracted six million viewers. The reason for that was Cox himself.

'In the first programme of the new series we talk about something called the second law of thermodynamics, which is notoriously difficult to explain. 'The second law of thermodynamics means that if you want to process information, if your brain wants to work, then you need an energy source. We put energy in by eating things. When you're alive, everything works. When you die, it's like pulling a plug out of the wall. The law says that everything tends to disorder.'

'I want people to have an emotional response to science. Thinking about the stars throws you outside of your own world and into the universe, and it is inspirational. Think about how rare life is. 'The universe has been going for 11 billion years and will carry on until that moment in the future when it might end, which we predict might be around a year that can be written as ten



followed by 100 noughts. In all of that time, the period when conditions have been right for life to exist will have been ludicrously small, a tiny sliver.

'Now think about the size of the universe, which may be infinite. So far, we can only say that there is life on this one tiny Earth. So in all that time and space life is very rare indeed, and rarity makes things valuable. That can make you feel extremely small but it should also make you feel special because we live in a moment and place that is so rare and precious.'

So is there only life on Earth?

'There are missions going to look for life on Mars and Jupiter's moon, Europa. They will find microbes on Mars in the next ten to 15 years. The big question is whether it is the same as life on Earth. If it turns out that it evolved separately, and is very different, then I think that will probably be the biggest discovery in human history.'

'Are there little green men up there? Enrico Fermi, the great physicist, said that because there are so many planetary systems and

there has been so much time, then even if just one other civilisation has arisen, say a million years before us, the evidence should be there to see. The galaxy should be crawling with civilisations. But we've looked and there's no evidence. I honestly don't understand it.'

The large Hadron Collider is an attempt to recreate conditions as they were at the creation of the universe, by firing particles at great speed around a vast underground loop and smashing them together



'Wonders Of The Universe' is on BBC2

<http://www.dailymail.co.uk/home/moslive/article-1360281/Brian-Cox-Life-Mars-2nd-law-thermodynamics-date-world-end.html#ixzz1F8C1UMNy>

## Cox: the greatest scientific theories

### 1 EINSTEIN'S THEORY OF GENERAL RELATIVITY

'The theory defines gravity as a property directly related to space and time. This is our best theory for why gravity exists, and it's the best theory to explain the origins of the universe - it suggests the existence of the Big Bang.'

### 2 THE SECOND LAW OF THERMODYNAMICS

This states that over time differences in temperature, pressure or chemical potential in a physical system will reach equilibrium, ie, if you have heat and cold in the same environment, both will eventually move towards the same temperature.'

### 3 QUANTUM FIELD THEORY

This is the "law of everything else". It underpins particle physics, and describes the theory that all forces between particles are carried out by other particles - that all forces basically are particles. It governs the way all matter interacts - from light entering your eye and electrons orbiting an atom, to the structure of DNA.'

### 4 THE LAW OF CONSERVATION OF ENERGY

'Also known as the first law of thermodynamics, this states that energy can never be destroyed or created. I like to think of it as the reason why ghosts don't exist - this prevents "spirits" leaving the body and floating round without any source of energy.'

### 5 THE LAW OF CONSERVATION OF ANGULAR MOMENTUM

This governs the movement of any rotating object and states that angular momentum, like all momentum, cannot change without external influence. It explains why the Earth doesn't crash into the Sun and why the Earth spins on its axis.'

## Periodic Table

(Sing to the tune of *Twinkle, Twinkle Little Star*)

Hydrogen and helium, numbers one and two,  
Lithium, beryllium, they sound nice and new;  
Then it gets more boring: boron, if you must;  
Number six is carbon, then nitrogen, I trust;  
Then, at last! some oxygen! Then smelly fluorine gas;  
Then neon with its twenty-point-one-eight atomic mass;  
Sodium, magnesium, metals with a sheen;  
Then poor old aluminium, unlucky old thirteen;  
Silicon and phosphorus are fourteen and fifteen,  
Sulphur's rather smelly but chlorine will keep you clean;  
Argon's number eighteen, another gas I fear;  
Potassium and calcium are in your diet, dear.  
That makes twenty elements; I think that's quite enough;  
The periodic table is way too long and tough.  
There are some other metals of minor interest:

Manganese and iron are probably the best,  
They're numbers twenty-five, and twenty-six I think,  
And unlike many gases, those metals do not stink.  
Cobalt, nickel, copper: twenty-seven, -eight and -nine,  
And finally, number thirty: zinc! your favourite and mine.  
But gold and silver, surely, are metals made in heaven...  
Gold scores well at seventy-nine, and silver: forty-seven.  
The rest are unpronounceable and probably a bore:  
I've had enough of science; it's really quite a chore.  
I think I'll do well in the test, I hope to get PB...  
But wait, I just remembered! Pb means lead! Dear me!  
The Pb comes from plumbum: that's lead's real name in Latin,  
It's heavy and it's dense but it feels as smooth as satin.  
Lead's number eighty-two in that old periodic table:  
Now I'm afraid I've done as much as I am really able.



## Young Scientists of Australia

**If you have an  
interest in science or  
want to meet new  
people in a fun &  
social environment  
then you should  
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Young Scientists of  
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**YSA is a not-for-profit  
organisation established to  
"promote science to the youth of  
Australia."**

**There are five YSA chapters  
across Australia that  
participates in many  
exciting social and science  
events throughout the year.**

**YSA provides many  
opportunities to meet new  
people who share a similar  
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