



IMAGES: CURRENT AFFAIRS – SCIENCE & TECHNOLOGY

Supplementary Study Material

- This document contains last one-year's science and tech graphics and associated text from various newspapers such as The HINDU, The Indian Express, Economic Times, Times of India etc. UPSC has been asking questions on topics, which appear in these graphics.
- Though our science and tech notes cover almost all of these topics but we think this document will help you revise quickly as well as the image associated with text will enhance the chances of retention and reproduction in exam.

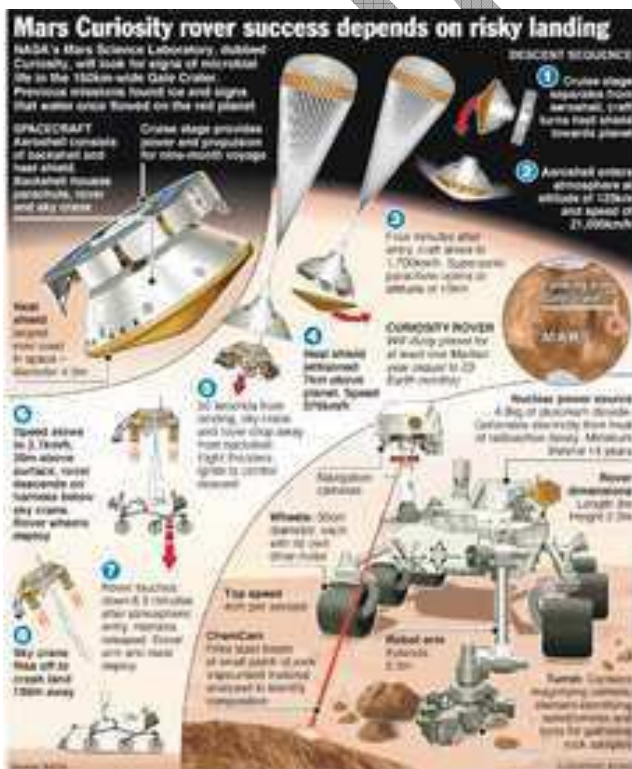
- **Symbols used :**

* marks indicate probable question apart from heading and subheading

† indicates not very important topic

^ indicates recently asked topic

SPACE

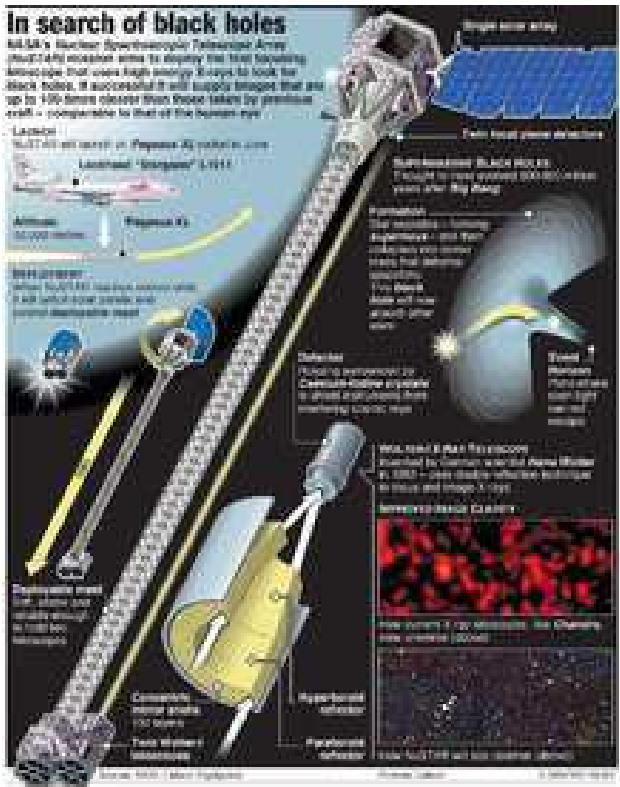


Launch of Mars Science Lab

NASA's most ambitious and expensive Mars mission yet enters a crucial stage Sunday with a touchdown on the red planet so risky it's been described as **"seven minutes of terror"*** -- the time it takes to go from 21,000km/h to a complete stop. By the time Earthlings receive first word of its fate, it will have planted six wheels on the ground, or tumbled itself into a metal graveyard.

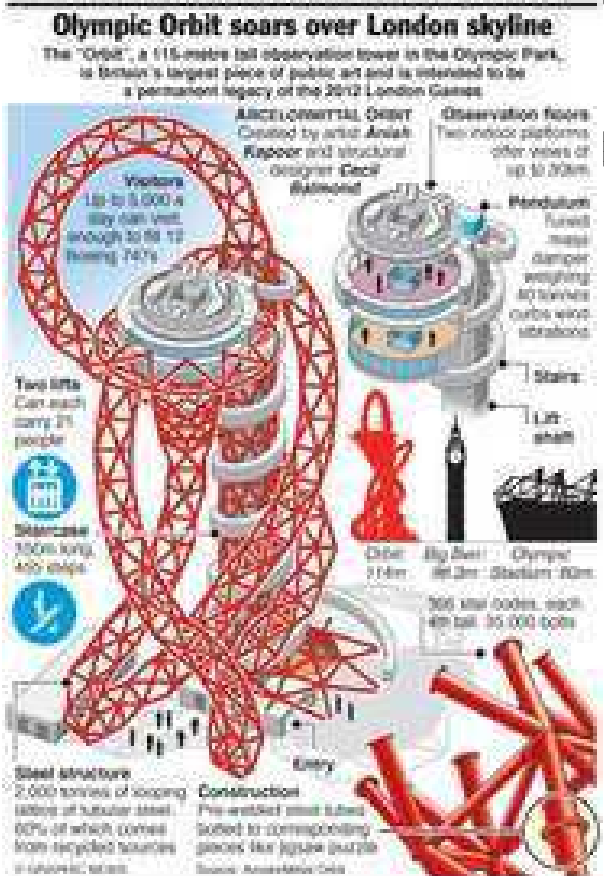
Launch of Mars Science Lab

NASA's Mars Science Laboratory, dubbed **Curiosity***, is being sent on a two-year mission to the red planet, where it will look for signs of past or present microbial life in the 150km-wide Gale Crater.



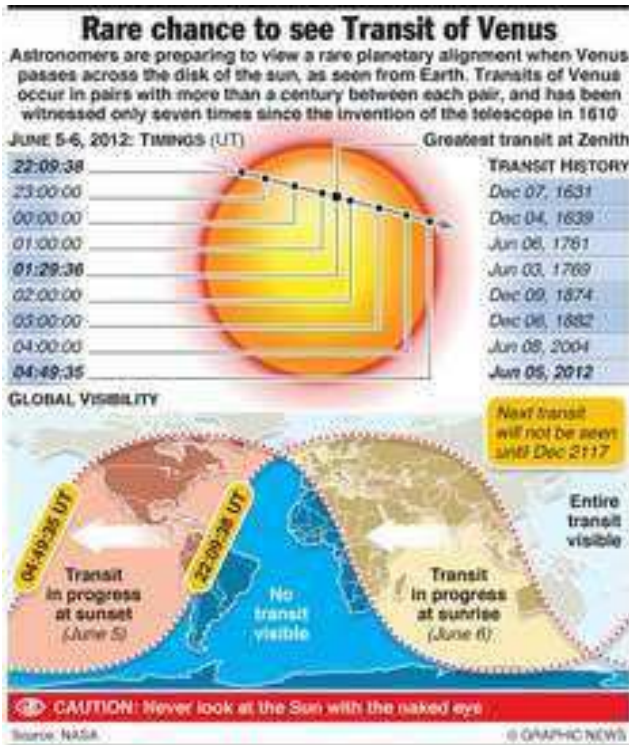
NuSTAR space telescope

NASA's Nuclear Spectroscopic Telescope Array (NuSTAR) mission aims to deploy the first focusing telescope that uses high energy X-rays to look for black holes. If successful it will supply images that are up to 100-times clearer than those taken by previous craft – comparable to that of the human eye.



Orbit tower

The Olympic Games take place in London.



Transit of Venus

Astronomers are preparing to view a rare planetary alignment when Venus passes across the disk of the sun, as seen from Earth. Transits of Venus occur in pairs with more than a century between each pair, and has been witnessed only seven times since the invention of the telescope in 1610.



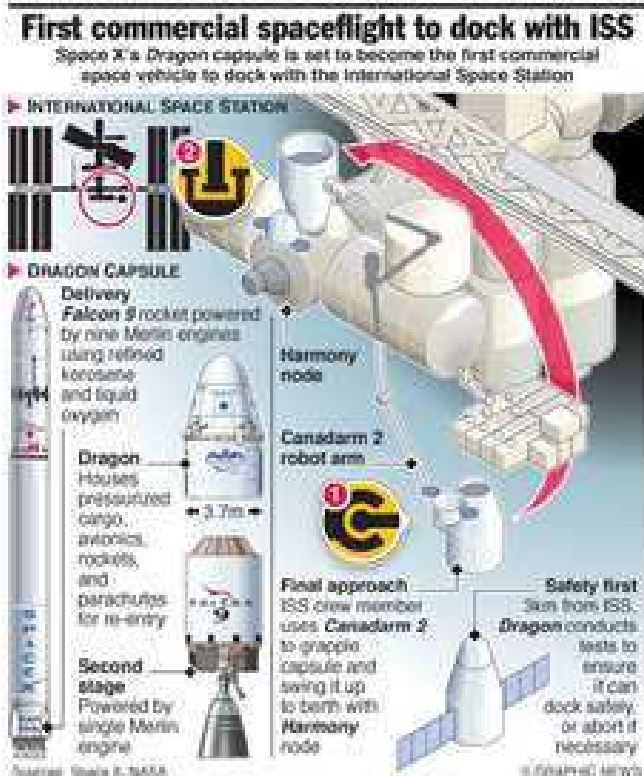
Sun-powered intercontinental flight

Prototype aircraft **Solar Impulse** has taken to the skies in its first intercontinental flight, travelling from Switzerland to Morocco, powered solely by the sun. If successful, a round-the-world flight is planned for 2014.



World's biggest radio telescope

The Square Kilometre Array - one of the great scientific projects of the 21st Century - will be built and based in both Australia and South Africa, the international consortium overseeing the project has announced. SKA will be 50 times more sensitive and 10,000 times faster than any other telescope on the planet.

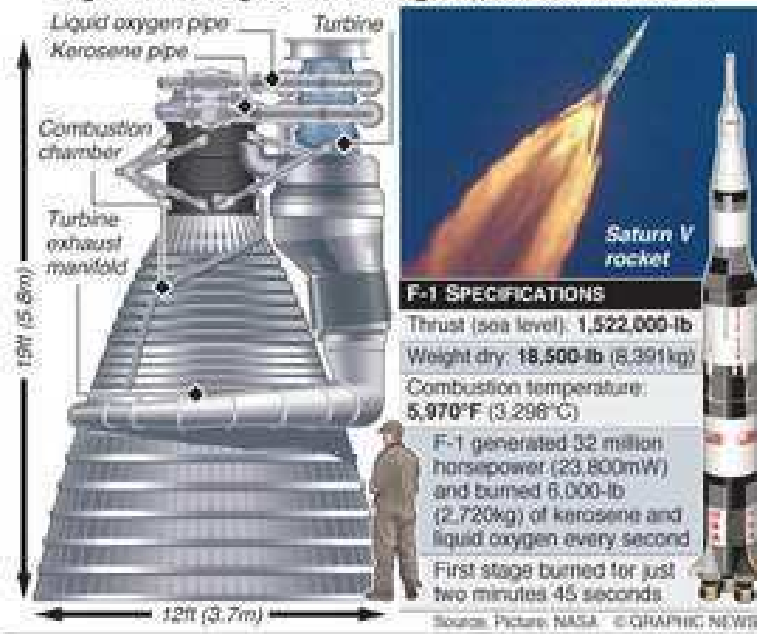


First commercial launch to ISS

SpaceX is set to launch an unmanned version of the **Dragon capsule** to the International Space Station. The Dragon mission would be the first time a privately owned and operated vessel visits the space station.

Apollo 11 engines to be recovered

Amazon founder Jeff Bezos has located the five F-1 rocket engines that blasted the Apollo 11 moon mission into space. The world's most powerful single-chamber engines are submerged 4,300m below the Atlantic

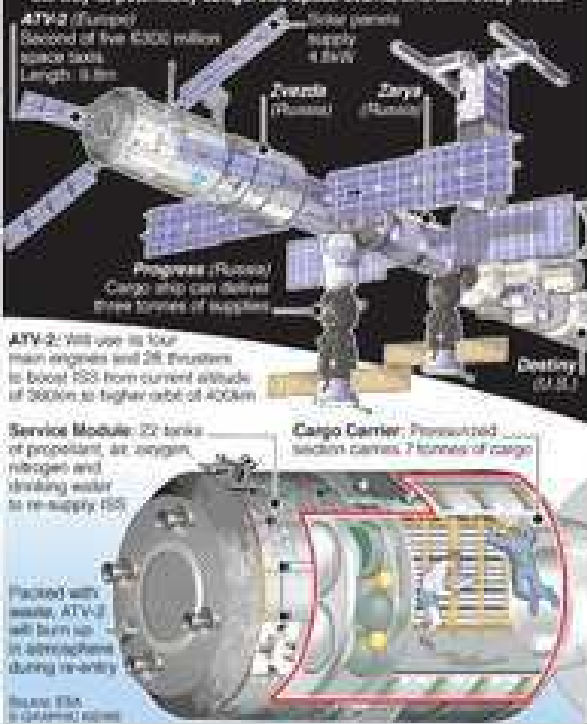


Apollo 11 engines found

Billionaire Jeff Bezos plans to retrieve one of the five Apollo 11 moon mission engines that plunged into the Atlantic more than 40 years ago. The F-1s, the most powerful single-chamber engines ever built, lie 4,267m deep. The first-stage engines that rocketed the crew toward the moon on July 16, 1969, burned for just 165 seconds before plunging into the ocean as planned. Four days later, Neil Armstrong took man's first steps on the moon.

Kepler's mission to the ISS

Europe's second Automated Transfer Vehicle, named after German astronomer Johannes Kepler, has four objectives: to deliver more fuel, boost the orbit of the International Space station, move the ISS out of the way of potentially dangerous space debris, and take away waste



Kepler mission to ISS

Europe's Automated Transfer Vehicle blasted off from Kourou in French Guiana. Heading to the International Space Station with supplies of food, water, air, and fuel, the ATV is the biggest supply ship now the U.S. shuttles have been retired. Named after German astronomer Johannes Kepler, the ATV can also move the ISS out of the way of potentially dangerous space debris, and take away waste.

DEFENSE



Agni-V missile test

India is planning to test launch a new nuclear missile that for the first time would give it the capability of hitting the major Chinese cities of Beijing and Shanghai. The Agni-V missile has a range of 5,000 kilometres (3,100 miles). The new Agni, meaning fire in Hindi, is expected to enter service by 2014-15.

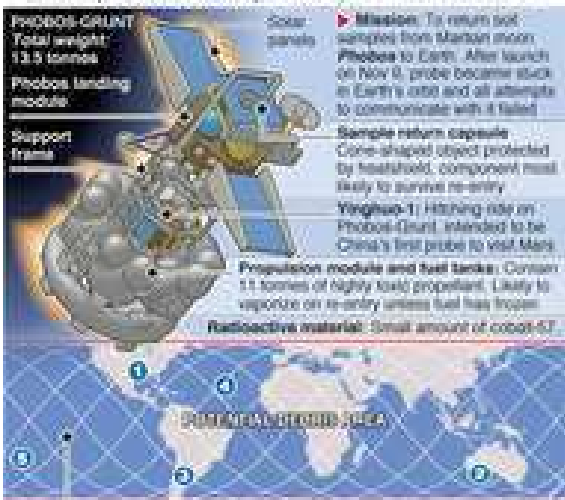


K-Max helicopter

An unmanned helicopter designed to lift supplies and equipment to U.S. troops is being deployed in Afghanistan. The Kaman K-MAX can be flown into under-fire areas without risk to aircrew, reducing the need for truck convoys that are often targeted by insurgents.

Doomed Russian spacecraft to hit Earth

Russia's failed Phobos-Grunt Mars probe is expected to re-enter Earth's atmosphere and burn up on January 15. Scientists predict that about 20 to 30 fragments with a total weight of less than 200kg might survive the fiery descent, but exactly where they will fall is still unknown.



Typical ground track of Phobos-Grunt: As Earth rotates, all areas between latitudes 51.4 degrees north and 51.4 degrees south pass under spacecraft orbit

LARGEST UNCONTROLLED RE-ENTRIES FROM SPACE

Rank	Spacecraft	Year	Weight	Crash site
1	Columbia space shuttle	2003	100 tonnes	Texas, U.S.
2	Soyuz	1979	80 tonnes	Australia
3	Salyut 7-Kosmos 1886	1987	44 tonnes	Argentina
4	Pegasus 2	1979	11 tonnes	Atlantic Ocean
5	UARS	2017	5 tonnes	Pacific Ocean

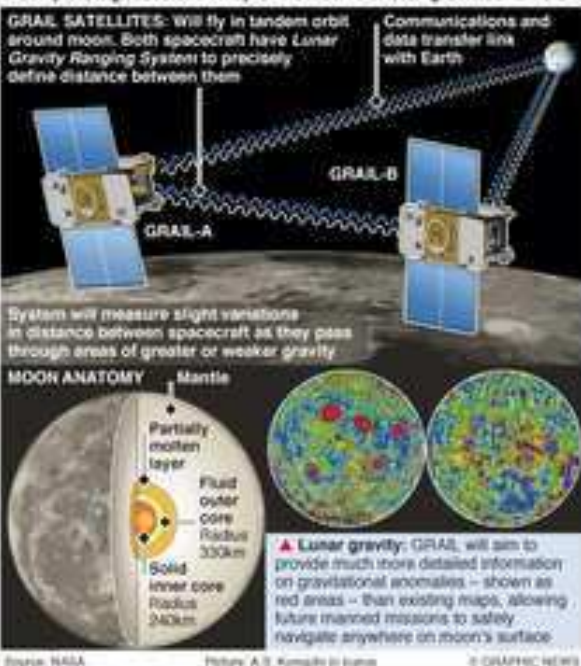
Source: Space.com, with updates. © GRAPHIC NEWS

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NASA Grail probes begin lunar orbit

NASA's twin unmanned Gravity Recovery and Interior Laboratory (GRAIL) probes have begun a 90-day mission gathering data to create the first complete high-resolution map of the Moon's uneven gravitational field.



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"Three-parent" fertility treatments

Three-parent in vitro fertilisation (IVF) can prevent some incurable diseases including fetal heart problems, liver failure and brain disorders, inherited from the mother through faulty mitochondrial DNA (mtDNA).

Human cell: Nucleus: Chromosomes contain DNA inherited from both parents. Mitochondrial DNA: Ring-shaped mtDNA, found outside nucleus but still within cell, is inherited only from mother.

Treatment can either swap DNA between two fertilized female eggs or swap DNA between mother's egg and donor egg before fertilisation.

- 1 Pro-nuclear transfer:** IVF is performed using intended parents' sperm and egg which contains faulty mtDNA.
- 2 Fertilized egg** contains genetic material of sperm and egg - each enclosed in a membrane. These are male and female pronuclei.
- 3 Zygote:** While embryo is still an undivided cell, pronuclei are removed and replaced by healthy mtDNA. Zygote is discarded.
- 4 Embryo:** Egg with healthy mitochondria is fertilised in vitro using father's sperm. Pronuclei are removed and discarded. Zygote is retained.
- 5 Parents' pronuclei** are injected into egg of donor.

Reconstructed embryos - containing genes from mother, father and female donor - can develop unaffected by inherited mitochondrial disorders.

Source: The National Council on Bioethics © GRAPHIC NEWS

Catching the Olympic drug cheats

One in two athletes and all medal winners will give urine samples to be tested for 240 prohibited substances. More than 5,000 urine and 1,000 blood samples will be analysed over the 16 days of the London Olympics.

Urine samples provided in tamper-proof bottles

Sample A: Part of sample screened for prohibited substances. Remainder of sample stored.

Sample B: Stored for later use to confirm Sample A findings.

Each anonymous sample identified by unique number and bar code.

Analysis: Gas chromatography and mass spectrometry identify each component in sample.

Results: Each "spike" in graph represents particular chemical present in sample. Some indicate steroids produced naturally; others reveal presence of banned substances.

Autologous blood transfusion: Athlete's blood is stored and later injected to boost red blood cell count and ability to carry oxygen to muscles.

Growth Hormone: Stimulates growth of muscle, cartilage and bone. Test identifies proteins that significantly decrease or increase in blood after exposure to synthetic hormone.

Test detects changes in blood cell ribonucleic acid (RNA) when blood is stored outside body.

Marijuana: Anabolic steroid increases muscle bulk. Test measures ratio of carbon-12 and carbon-13 isotopes. Synthetic steroid has low carbon-13 ratio. Nucleus of C-12 atom has six protons and six neutrons. C-13 has one extra neutron.

Source: © GRAPHIC NEWS King & Liffman London © GRAPHIC NEWS

Drug Testing

One in two athletes and all medal winners will give urine samples to be tested for 240 prohibited substances. More than 5,000 urine and 1,000 blood samples will be analysed over the 16 days of the London Olympics. The 24-hour Olympic testing laboratory is being run by GlaxoSmithKline and the Drug Control Centre at King's College, London.

Huge iceberg breaks off Greenland glacier

An iceberg twice the size of Manhattan has broken away from Greenland's Petermann Glacier, posing a fresh danger to North Atlantic shipping lanes and oil rigs off Canada's east coast. It is the second massive iceberg to calve from the glacier in less than two years.

PETERMANN GLACIER Jul 17

ARCTIC OCEAN

Nares Strait: Navigable by ice-breakers Aug-Sep

GREENLAND

Baffin Bay

CANADA

Baffin Island

Newfoundland and Labrador

Hibernia, Terra Nova and White Rose oil rigs, near site of Titanic sinking in 1912.

Iceberg Area approx. 120km²

Oceanographers say 2010 break accelerated glacier's movement toward sea by 10% to 20%. Current break - further upstream - could have even greater effect.

Picture Source: NASA © GRAPHIC NEWS

Three-parent fertility treatment

"Three-parent" fertility treatments designed to prevent some incurable inherited diseases, inherited from the mother through faulty mitochondrial DNA, are ethical and should go ahead Britain's Nuffield Council on Bioethics said on Tuesday.

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Study estimates Fukushima health effects

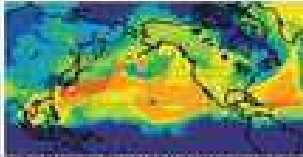
U.S. researchers have released a study indicating that the global health effects of radioactive fallout from Japan's Fukushima nuclear accident may be deadlier than predicted. Previous reports claimed that the release of radiation would likely cause no severe health effects.

KEY REPORT FINDINGS

- **Cancer-related deaths:** Range from 10 (lowest) to 1,300 (highest), with 130 being most likely number.
- **Cancer-related cases:** Between 34 and 2,500 -- 180 most likely.
- **Global distribution:** Most people affected would be in Japan. Extremely small effects seen in mainland Asia and North America.
- **Containment:** Casualties would have been higher if more radioactivity had fallen on land -- about 80% was deposited in Pacific Ocean.
- **Other casualties:** Data predicts total number of casualties -- between 2 and 12 -- among Fukushima plant workers. About 600 elderly or ill people were reported to have died during evacuation of area around plant in 2011.



Satellite image of damage at Fukushima nuclear plant following earthquake and tsunami of March 11, 2011.



Study used 3D atmospheric model to predict radiation spread, and health-effects model to estimate human exposure to radioactivity.

ESTIMATES BY REGION*	Number of deaths			Number of cases		
	Low	Medium	High	Low	Medium	High
Asia (incl. Japan)	13	99	935	22	139	1,362
North America	0.24	1.4	8.8	0.39	2.1	32
Europe	0.17	0.99	4.8	0.29	1.4	13
Africa	0.08	0.55	3.8	0.14	0.9	12
Japan	13	94	908	30	181	1,450
Worldwide total**	15	190	1,300	34	180	2,000

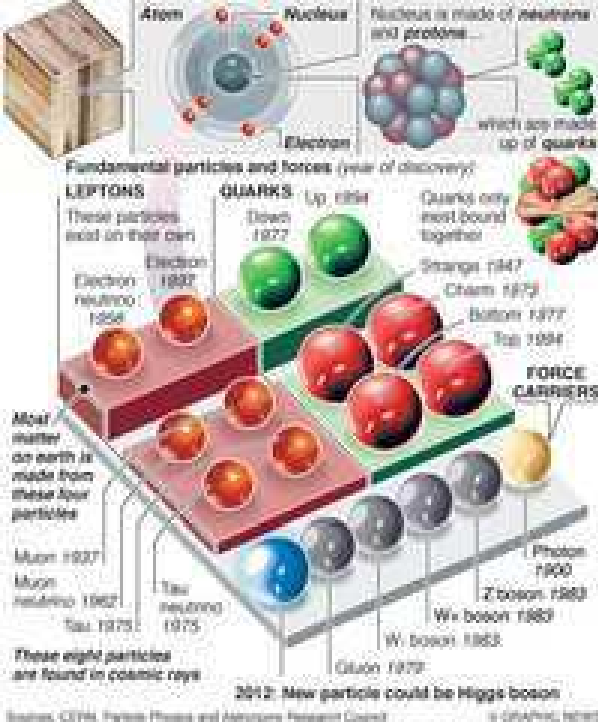
* Figures are for population and income increases to 2050. ** Worldwide total also includes fugitive emissions and other factors based on various release rates and deposition ratios around plant. Source: Scientific American. © 2012 Scientific American.

Fukushima health effects

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New particle could be missing force carrier

Physicists believe that matter -- created by the Big Bang some 14 billion years ago -- is made up of 12 subatomic particles and six force carriers. One, the Higgs boson, gives matter mass and holds the universe together.



New particle could be Higgs boson

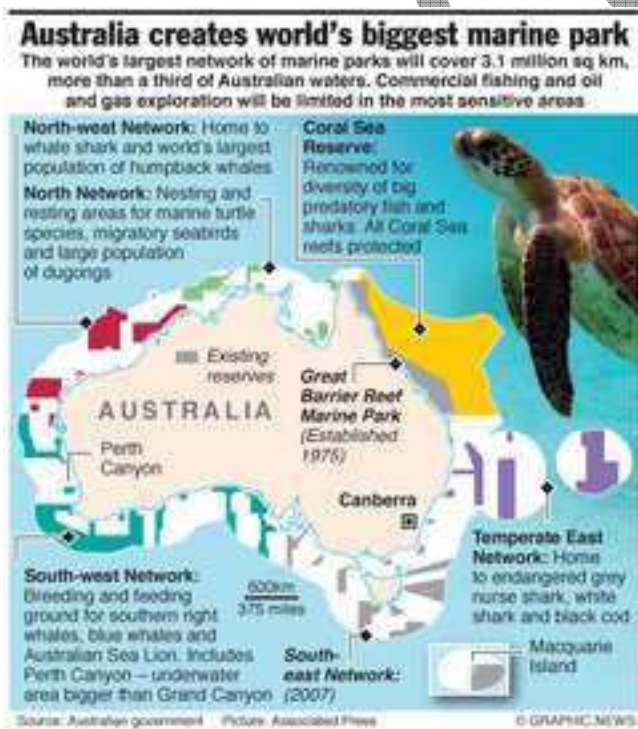
The European Organisation for Nuclear Research (CERN) has announced the discovery of a new particle that could be the elusive Higgs boson. The Higgs -- a force carrier thought to give matter its mass -- is the only particle in the Standard Model theory of matter that scientists had not detected.



Goal line technology decision

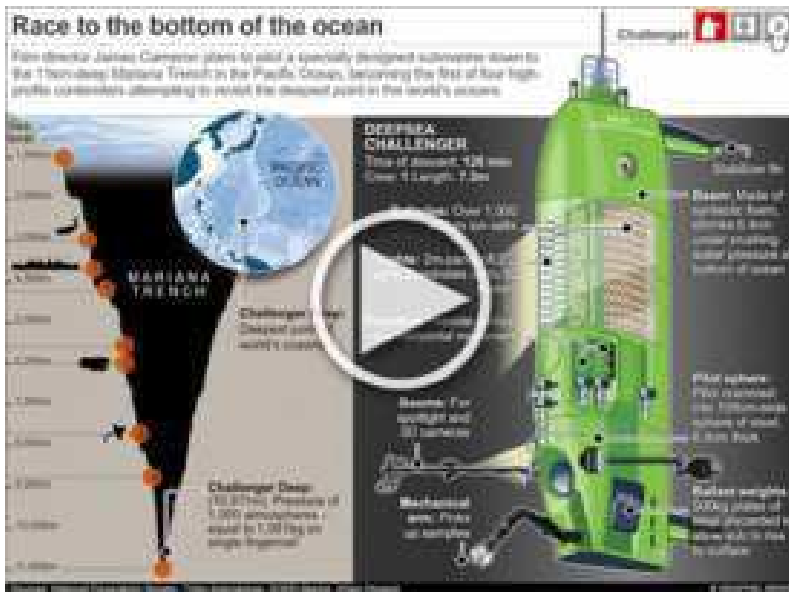
After much debate, FIFA appears set to introduce goal-line technology, choosing between two rival systems that meet its standards on accuracy, speed of decision-making – the one-second rule – and 100% reliability.

Ecology



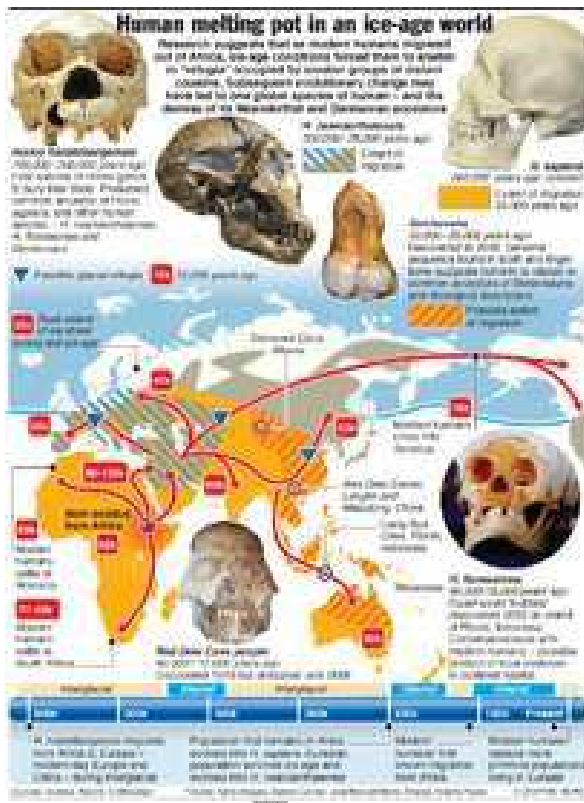
World's largest marine park

Australia has announced that it will create the largest network of marine parks in the world, covering 3.1 million sq km, more than a third of the nation's waters. Commercial fishing and oil and gas exploration will be limited in the most sensitive areas.



Race to ocean deep

In the next few weeks, film director James Cameron plans to pilot a specially designed submarine down to the 11km-deep Mariana Trench in the Pacific Ocean, becoming the first of four high-profile contenders attempting to revisit the deepest point in the world's oceans.



Ice age human melting pot

Research suggests that as modern humans migrated out of Africa, ice-age conditions forced them to shelter in "refugia" occupied by smaller groups of distant cousins. Subsequent evolutionary change may have led to one global species of human – and the demise of its Neanderthal and Denisovan ancestors.



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