

Scientific achievements of 2016

GRAVITATIONAL WAVES DETECTED

Collision and merger of two black holes, about 29 and 36 times the mass of the Sun, results in first direct observation of gravitational waves – ripples in space and time predicted by Albert Einstein's 1915 general theory of relativity.

Based on observed signals, scientists at Caltech and MIT conclude that during final fraction of a second, the black holes collide into each other at nearly one-half the speed of light, converting part of combined black holes' mass to energy, according to Einstein's formula $E = mc^2$



SUPERMAN MEMORY CRYSTAL



Scientists at England's University of Southampton create "5D" data storage that can survive for some 14 billion years – about as long as the universe has existed. Data is written on small glass disk by ultrafast laser using short, intense light pulses. File is written in three layers of nanostructured dots that are 5 micrometers apart (0.005mm). Data is read in five dimensions: position of dots in three dimensions plus their size and orientation

NEW PERIODIC TABLE FOR 2017

The discovery of four new synthetic elements by teams of Japanese, Russian and American researchers complete seventh row of chemistry's periodic table.

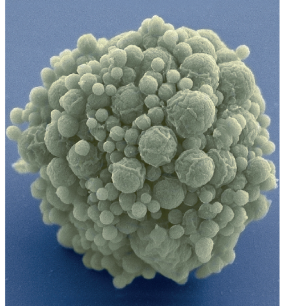
The official names for elements 113, 115, 117 and 118 are **nihonium (Nh)**, **moscovium (Mc)**, **tennessine (Ts)** and **oganesson (Og)** respectively. While first 94 elements exist naturally, super-heavy elements with atomic numbers from 95 to 118 have only been synthesized in laboratories or nuclear reactors

48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3
80 Hg mercury 200.6	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 208.98	84 Po polonium 209	85 At astatine 210	86 Rn radon 222
112 Cn copernicium 277	113 Nh nihonium 286	114 Fl flerovium 289	115 Mc moscovium 289	116 Lv livermorium 293	117 Ts tennessine 294	118 Og oganesson 294

GENETICISTS DESIGN, CREATE NEW SPECIES

Researchers at J. Craig Venter Institute (JCVI) synthesize **self-replicating minimal synthetic cell**, containing only the genes necessary for life. **JCVI-syn3.0** contains 531,560 base pairs – building blocks of DNA – and just 473 genes, all essential for life.

It is smallest genome of any organism that can be grown in laboratory media



SCIENTISTS SPEND YEAR ON SIMULATED MARS

On August 28, a multinational crew of six scientists, simulating human colony on Mars, finally "re-enter" Earth after exactly one year of extreme isolation on desolate slopes of Hawaiian volcano.

Since entering solar-powered habitat, crew have only been allowed outside while dressed in full spacesuits



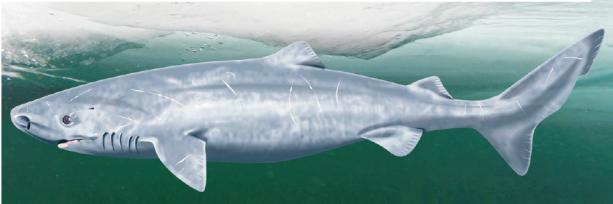
RECORD PRIME NUMBER DISCOVERED

2 74,207,281-1 University of Central Missouri mathematician **Curtis Cooper** discovers new record-breaking prime number.

Known as a **Mersenne prime**, **M74207281** is calculated by multiplying together 74,207,281 twos then subtracting one. It has 22,338,618 digits and is almost 5 million digits larger than the previous record prime number*

*prime numbers can only be divided by themselves and one

SHARK HOLDS LONGEVITY RECORD



Greenland shark, **Somniosus microcephalus**, is found to be the longest-lived vertebrate on Earth, capable of living nearly 400 years

HUBBLE TEAM BREAK COSMIC RECORDS

Using 3D imaging techniques on 20 years of photographs by Hubble Space Telescope, astronomers find that observable universe contains at least 2 trillion galaxies – 10 times more than previously thought.



Hubble detects **GN-z11** – most remote galaxy ever seen. At distance of 13.4 billion light years from Earth it appears as it was just 400 million years after Big Bang

DNA CONFIRMS CAUSE OF 1665-66 PLAGUE

DNA testing of skeletal remains confirms for first time that **Yersinia pestis** was bacteria responsible for **Great Plague of London** that killed nearly a quarter of city's population. Teeth of 20 individuals from Bedlam burial ground in east London were analysed at Max Planck Institute in Germany

