Top 10 Sci-Tech Stories Of The Decade

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Discoveries, devices, and developments that have changed the way we view our world over the past ten years.

1. DNA, Genomes, and Stem Cells

The hope and excitement surrounding "genomic" research, which is aimed at decoding DNA, has been almost boundless this decade. Even before the drafts of the human genome appeared in 2001, the amount of work that went into decoding it was being compared to landing a man on the moon. The promise of all those carefully counted billions of letters of DNA was that among them would be found fundamental biological secrets, helping scientists discover genetic markers of human disease,

and perhaps revealing new drug targets for those diseases.

Humans were not the only creatures to have their DNA decoded in the last few years. Also solved this decade were the genomes of dogs, cows, chickens, horses, cats, mice, moths, chimps, mosquitoes, bumble bees, puffer fish and pigs. Joining them in the scientific databases were the sequences of the mustard plant, rice, corn, grape, and more species of virus, yeast, mold, algae and fungus than most people would care to count.

Many of the biggest headlines coming from the field of biology were captured by stem cells. These cells hold tremendous promise to treat diseases like Parkinson's and cancer because they have the potential to become any type of cell in the body. While debates in the last decade have often focused on the ethical uses of stem cell research, researchers have made tremendous strides in the field, finding ways to program and reprogram cells in the test tube, for instance.

2. Large Hadron Collider

The most powerful particle accelerator ever designed was constructed over the last decade and is now online. Located far underground in Geneva, the Large Hadron Collider features a 16-mile circular tunnel, through which two separate beams of protons shoot around at close to the speed of light. At several spots around the tunnel the two beams are made to collide, providing the high-energy impact needed to produce new kinds of particles. Physicists hope that these particles will help to push forward our basic understanding of matter -- especially the Higgs boson, which is the most important of these and is supposed to confer mass on many of the known particles.

At the very end of 2009, scientists and engineers succeeded in getting protons to collide for the first time in the LHC tunnel. In the process

they set a new record for the highest energy ever achieved for a smashup between two particles, almost 2.4 trillion electron volts. In the coming year, LHC scientists hope to reach even higher energies and to produce much more intense beams.

3. Climate Change

Climate change has been discussed in the scientific community for decades. A 2001 National Academies panel recognized a "paradigm shift" in the scientific community, acknowledging the possibility of decade-scale climate change. The science has also shown that ocean basins are warming -- endangering the world's coral -- and that levels of carbon dioxide have passed 380 parts per million for the first time in hundreds of thousands of years.

In 2006, NASA scientist James Hansen told the New York Times that his superiors were trying to silence his attempts to speak publicly about man-made climate change, a concept that Al Gore would call an "inconvenient truth" in his documentary, also released in 2006. In 2009, the Environmental Protection Agency moved towards regulating greenhouse gases under the Clean Air Act, acknowledging that gases like carbon dioxide pose a threat to public health and the environment. As the decade closed, the international meeting of climate scientists and policy makers held in Copenhagen in December 2009 proved to be inconclusive, disappointing many of the participants.

4. The Proliferation of Personal Technology

Twenty years ago, few people had ever sent an e-mail or owned so much as a mobile phone, let alone a hand-held device that could access the Internet, send e-mail and show movies in high-definition. What personal computers and faxes were to the 80s and 90s, smart phones, laptops and

social networking were to the past decade.

How did people ignore each other on mass transit in 1999? There were no iPods (launched in October, 2001). People lacked the capability to poke, tweet, or any of a host of other new verbs that were incomprehensible just 10 years earlier. Facebook meant a book with pictures in it. Second Life meant reincarnation. Even after the dot-com bubble burst at the beginning of the decade, portable devices and their exciting, convenient technologies exploded, helping to change the previous decade into an ever more connected world.

5. Exploring Other Planets

When the ancients looked out into the night sky, they saw thousands of fixed points of lights, which we now know as stars, and a few others that moved quickly from night to night. When Galileo turned his new telescope on these wanderers (the origin of the name "planet"), he revolutionized our understanding of the cosmos. This revolution continues.

In the last 10 years, a series of versatile spacecraft have fanned out across the solar system to visit or photograph the planets. These craft include Galileo's mission to Jupiter, Cassini's mission to Saturn, Messenger travelling to Mercury, and a handful of craft dispatched to Mars. Major findings have included water on Mars and our moon, a large thin new ring around Saturn, Titan's hydrocarbon lakes visited by the craft Huygens Titan, and sections of Mercury's surface that were previously unmapped.

Older spacecraft launched in the 70s, such as the Voyagers and Pioneers, continue to do important duty. Beyond the orbit of Pluto, these senior citizens of the space age are gathering important information about the boundary area where the sun's influence leaves off and the interstellar

medium begins.

By measuring the subtle wobbles in nearby stars, astronomers have also been able to indirectly detect exoplanets -- planets that orbit other stars -- and to measure their mass and their distance from the star, hopefully identifying additional Earth-like planets. Recent exoplanets sightings have included the first visual images of distant worlds and have revealed "super earths" about 5-to-7 times more massive than our own planet.

6. Precision Cosmology

Scientific discoveries have prompted much rethinking over the centuries about the place of human beings in the cosmos. These discoveries include the realization that the Earth is not at the center of the universe; that there might not even be a center; that our planetary system is not the only such system; that the Milky Way is not the only galaxy; and that there might even be parallel universes beyond our own.

Cosmology studies the heavens on the largest scale possible -- the universe as a whole. For many years it was a very imprecise science that lacked the highly sensitive instruments used in terrestrial labs, but this is starting to change. The past decade featured a variety of satellites and specialized detectors -- including the Wilkinson Microwave Anisotropy Probe -- that have helped to clarify our understanding of the universe. Because of measurements made this decade, we now know that the universe is 13.7 billion years old, that the first atoms formed 380,000 years after the Big Bang, that the first stars formed around 400 million years after the Big Bang, and that most likely about 73 percent of the energy in the universe consists of mysterious dark energy. Astrophysicists believe that dark matter, a form of nonluminous material, is another important ingredient in the dynamics of galaxies. Recently, some direct evidence for dark matter from particle interactions in sensitive detectors located far underground may have

been uncovered, but researchers need more data before they can be certain.

7. New Materials

The awarding of the 2009 Nobel Prize for physics to scientists making discoveries leading to digital cameras and optical-fiber communications underscores the idea that fundamental research is vital to the development of important technology -- even when the practical application of that research lags behind by decades. This is especially true of scientists studying the properties of condensed matter.

Two new forms of carbon were uncovered and explored over the last several years: thin carbon tubes, or nanotubes, and graphene, a single-atom-thick sheet of carbon atoms. These two forms of carbon have useful properties that include great strength, electrical conductivity for integrated circuits, and interesting thermal and optical features.

Metamaterials is another important substance that was recently-discovered. Constructed from tiny arrays of rods and rings, they have bizarre optical properties that may one day be adapted for a variety of practical applications such as cell phone filters, thin lenses, and cloaking applications.

8. Vaccines and Emerging Infections

From the Spanish flu of 1918, to HIV/AIDS in the 1980s, history is often inexorably linked to the diseases that plague mankind. The previous decade was no different, and some of the biggest stories in science sprung from infectious sources. Malicious anthrax-laced letters arrived in 2001, the deadly SARS epidemic appeared in 2003, and the 2009 swine flu that created long lines for people waiting to receive

vaccination against the H1N1 virus -- the first bona fide influenza pandemic in 40 years.

A number of vaccines made the news in the last 10 years. In 2006 and 2007, human papillomavirus vaccines were approved by the Food and Drug Administration to prevent cervical cancer. And after many years of laboratory and field research, the first successful clinical trial for an AIDS vaccine was reported in late 2009. Not every vaccine story was positive. The international effort to eradicate polio ran into difficulty when rumors of vaccine toxicity spread in a few of the countries where the disease remains endemic. Fears over the measles-mumps-rubella vaccine spread in the U.S. and Britain after an article in a medical journal linked it to autism -- a link that numerous studies and an exhaustive review by the Institute of Medicine and other organizations later discredited.

9. China's Emergence

China is finishing up the first decade of the 21st century showing signs that it could be the next scientific superpower. By 2008, it was producing more Ph.D. candidates than any other country in the world. In 2006, Margaret Chan became the first Chinese citizen to head a U.N. agency when she was elected director-general of the World Health Organization. After the first successful spacewalk by a taikonaut in 2008, China now hopes to build a base on the moon.

Not all the science and technology stories about China over the past decade have been positive. The tainted pet food and toxic toys made major headlines as did the fact that China now produces more carbon dioxide than any other nation -- though still far less than the U.S. per capita. Projects like the Three Gorges Dam have drawn criticism for their effect on the local environment, and the emergence of SARS in 2003 brought international scrutiny of China's public health response.

10. The Expanding Understanding of Human Ancestry

Many people trace their own genealogy as a hobby to better understand their roots. At some point the trail of records ends. The question of what came before remains. Understanding where we humans came from as a species is a more complicated puzzle, requiring all the tools of science and the reasoning evolution helped us develop.

The October 2009 release of numerous scientific papers interpreting a 4.4 million year old fossil, Ardipithecus ramidus, culminated an eventful 10 years of hominid research. Scientists spent 17 years painstakingly gathering, reconstructing, and interpreting A. ramidus fossils found in Ethiopia before formally announcing their findings to the public, including the oldest known skeleton of a human ancestor.

In 2003, another team of researchers found Homo florensis, informally referred to as hobbits, in a cave on Flores Island in Indonesia. They are understood to be a separate lineage from modern humans, one that broke off from our species and endured until about 12,000 years ago. Their demise is more recent than even the Neanderthals.

Numerous findings and fresh interpretations forced anthropologists to reexamine their understanding of the relationship of Neanderthals to modern humans. The previous decade recovered and sequenced Neanderthal DNA, promising a host of research opportunities. Included in that bounty was an important gene connected to our own language skills, called FOXP2, adding another clue to a complicated debate over the level of language skills Neanderthals possessed. Throughout the decade, anthropologists and others continued to track the footprints our species' ancestors, even as legal and philosophical battles raged between those who would teach evolution and those who would teach alternative

ideas for the origins of both Homo sapiens and life on earth.