

Q

What were the major scientific developments in 2003?

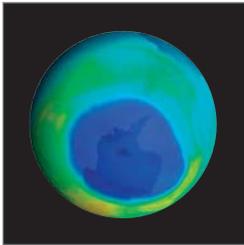
1



LIGHT SHED ON DARK UNIVERSE

In February, the Wilkinson Microwave Anisotropy Probe produced an image of the infant cosmos that, combined with a new galaxy map, has changed our view of the universe forever. *Science* called it the Breakthrough of the Year when reporting how the most detailed picture ever of the cosmic microwave background, the oldest light in the universe, has helped dispel decades of confusion about the nature of the universe. It confirms that the universe is made up largely of mysterious dark energy and dark matter, and also gives it a firm age and a precise speed of expansion.

2



THE COLD FACTS ABOUT GLOBAL WARMING

Climate researchers have a century's worth of temperature measurements to show that the globe has been warming. New work shows that the Earth's environment has taken notice of the change. A stream of studies about global warming's impact on Earth and its inhabitants, published in *Science* and elsewhere, accumulated in 2003. There were important new findings about rates of melting ice, changes in plant and animal distributions and breeding cycles, and the coupling between ocean circulation and the atmosphere.

3



SARS: A PANDEMIC PREVENTED

When the world first heard about severe acute respiratory syndrome (SARS) in March, the disease seemed unstoppable. Experts warned that it could ignite a pandemic. But by July, it had subsided – at least for a while. Epidemiological studies and identification by sequencing, published in *Science*, were important in gaining control. The outbreak is a chilling reminder that new infectious diseases are always lurking. The episode showcased public health and science at their best (and occasionally their worst) in response to a new challenge.

4



THAILAND UNVEILS EXPERIMENTAL AIDS VACCINE FIRST

The first AIDS vaccine efficacy trial ever held in a developing country was completed in 2003. Regardless of the ultimate results, the trial is a significant achievement. The volunteer subjects were 2,545 injecting-drug users. At the study's close in June, project staff had administered more than 17,000 doses, drawn more than 40,000 blood samples, and processed half a million forms charting the results.

5



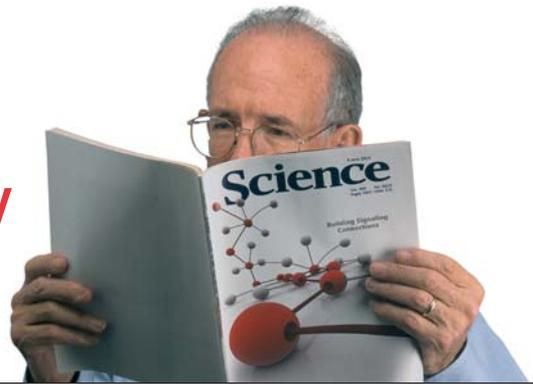
STEM CELL DISCOVERY SHAKES ETHICAL FOUNDATIONS

At least one observer called the surprise discovery an “ethical earthquake” – mouse embryonic stem cells can develop into both sperm and egg cells in culture dishes. The work raised both scientific and ethical questions. In the short term, the discoveries should help reveal how germ cells develop. If the feat can be reproduced in human cells, it could provide a renewable source of human eggs or sperm for research. But it also opens a Pandora's box of ethical questions: could a child be born whose genetic parent is a cell line?

A

Here are the top 10 by Don Kennedy.

Editor-in-Chief of the Journal *Science*.



6



DIETARY CHANGE CAN AFFECT LIFESPAN – AT ANY AGE

Research published in *Science* in 2003 shows that when organisms as diverse as yeast and rodents are subjected to a restricted diet, they live longer. The good news is that switching to a restricted diet at any age can yield the benefit of increased longevity – at least in flies. These findings are important for dietary-restriction research, and also from the broader perspective of what determines longevity. Mortality, even at advanced ages, is strongly affected by current conditions and behaviors.

7



MIXED MESSAGE COULD PROVE COSTLY FOR GM CROPS

The results of the largest-ever field trials of genetically modified crops, a three-year experiment in the United Kingdom, were unveiled in October 2003. The results did not boost prospects for the technology, and have made the future of GM crops in Europe more uncertain than ever. Cultivation of modified beets and oilseed rape had clearly negative effects on wildlife and native plants. Only GM maize proved more environmentally friendly than its non-GM counterpart.

8



ECONOMIC DECISION-MAKING – A GAME OF NERVES

New neuroeconomics research published in 2003 used functional magnetic resonance imaging of subjects playing the Ultimatum Game, a decision-making exercise, to investigate neural substrates of cognitive and emotional processes involved in economic decision-making. Players were scanned as they responded to fair and unfair proposals. Unfair offers elicited activity in brain areas related to both emotion and cognition. Significantly heightened activity in the emotion area suggests an important role for emotions in decision-making.

9



MENTAL ILLNESS MYSTERIES UNRAVELED

Schizophrenia, depression and bipolar disorder often run in families, but only recently have researchers identified particular genes that reliably increase risk. Now they're unraveling how these genes can influence the brain's information processing. Work in New Zealand demonstrated that a gene and a stressful experience in early adult life can interact to edge someone into a clinically depressed state. It was also shown that antidepressant drugs restore the ability of the hippocampus to generate new nerve cells.

10



STATE OF THE PLANET REVIEWED

In a special series of issues on the State of the Planet, *Science* authors provided a sobering report on the status of Earth's major natural and human resources. Topics included population, water and air quality, soils, biological diversity, energy availability, and projections of how these resources might be stressed during this century. This assessment set the stage for another special issue, marking the 35th anniversary of the classic "Tragedy of the Commons" paper by the late Garrett Harden.