

## Breakthrough of the Year

**T**oward the end of each year, *Science's* Editorial and News staffs get together for several meetings devoted to a single purpose: deciding what scientific advances made in this calendar year deserve recognition as Breakthrough of the Year (see also "Signaling Breakthroughs of the Year" in *Science's* STKE in January 2004). The Breakthrough meetings give us a chance to broaden our focus from this week's results to a whole year's output from the global research enterprise. It's always a daunting prospect, and not surprisingly, the meetings stimulate lively disagreements. We get to pick more winners than just the "Breakthrough": There are runners-up, and spirited discussions ensue about which areas, though perhaps premature at the moment, bear watching for the future. Livelier still is the nomination process for "Breakdowns": Each year brings us a few disasters or disappointments that can provoke as much discussion as the big winners.

This year's Cabinet of Wonders was sufficiently well stocked to make the decision difficult, but we've made this the year of astronomy. Nothing's bigger than the Universe; the question is what it's made of. The Breakthrough is confirmation that it's mostly dark energy, with some exotic matter; only a few percent consists of the kind of matter we're familiar with. And we have a better fix on its age. This comes to us from two techniques: a new galaxy map and a satellite-mounted probe that scans the cosmic microwave background, exploring the light that arose in the moments after the Big Bang. Put together, the data conclusively prove the existence of dark energy (a mysterious cosmic force that is pushing the universe apart at an accelerating rate), and they lay the groundwork for finding out what it consists of. In other important astronomical news, new observations tied the titanic blasts of energy called gamma-ray bursts to signals from the hugely energetic collapses of dying stars. Elsewhere in the physical sciences, action on the climate front shifted upward in latitude and altitude, as more studies demonstrated significant melting of ice sheets—an area we had labeled as one to watch a year ago.

The life sciences yielded a harvest of runner-up contenders. At the top was a mix of studies implicating particular genes in mental illness and mood disorders, including impressive evidence that one of these combines with early-adult environmental stress to increase the risk of depression. In cancer biology, limiting tumor blood supply made a comeback with the demonstration that anti-angiogenesis drugs combined with conventional chemotherapy could restrain colon cancer in a clinical trial. Those small RNAs that modify gene action (featured as last year's Breakthrough) stayed in the headlines, with new findings about how they block transcription through chromatin reorganization.

This time around, the Breakdown of the Year was so compellingly tragic that there was little argument about the selection. The *Columbia* shuttle's disintegration on reentry left seven astronauts dead and NASA hunting for causes. A panel chaired by Admiral Harold Gehman concluded that a piece of foam that struck the vehicle during liftoff had caused the accident. Alas, warnings and data that could have modified the mission were ignored by higher-ups, leading to unsparing criticisms of NASA's management by the Gehman panel.

It was also a vintage year for scientific fluffs. We shared in one: Some vials containing the recreational drug Ecstasy got switched with vials containing methamphetamine, and we wound up publishing a paper we wish we hadn't. A National Research Council study recommended that the U.S. Department of Energy stop polygraph testing, whereupon DOE kept right on doing it anyway. Then there was the scientific detective work that couldn't locate evidence or perpetrator: no culprit in the anthrax case; no weapons of mass destruction in Iraq, despite assurances from the highest authority that they were there; no identified natural reservoir for the SARS coronavirus.

So this year may have been the best of times, the worst of times; but next year should be great! Watch for security money to pump up pathogen biology, and expect a flood of comparative genomics and even "ecogenomics." As for space, you won't have to wait that long: This month, the fusillade of Mars missions should arrive there and start hunting for—guess what? Meantime, we at *Science* wish you the best of holidays.

**Donald Kennedy**  
Editor-in-Chief



# Science

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