

All I want for 2005 is...

2004 was a year dominated by news of war, disease and dark threats of bioterrorism and nuclear proliferation.

But for the scientific community there were signs of progress and hope. Researchers continued to interrogate nature and produce intriguing results, ranging from the genetic sequence of the rat to the surprise discovery of a

previously unknown and diminutive species of humankind. And scientists exasperated by the reluctance of policy-makers to take research seriously could draw some comfort, at least, from Russia's ratification of the Kyoto Protocol on Climate Change. In the following pages, *Nature* highlights some of the events that excited the world of science over the past 12 months.

And as the calendar pages flip over to a new year, we've also been making some enquiries into what scientists think — and hope — is in store next. Given no constraints, we asked, what would you wish for in 2005? What follows is a sample of the responses our reporters got from researchers and policy-makers across all fields of study, along with summaries of the events that framed these aspirations. From the development of effective therapies against HIV and malaria, to the detection of life elsewhere in the Universe, to the ability to do research without the intrusion of politics or bureaucracy, the community's wish list provides an insightful — and refreshingly optimistic — glimpse into the future.

“Open access to America from abroad.”

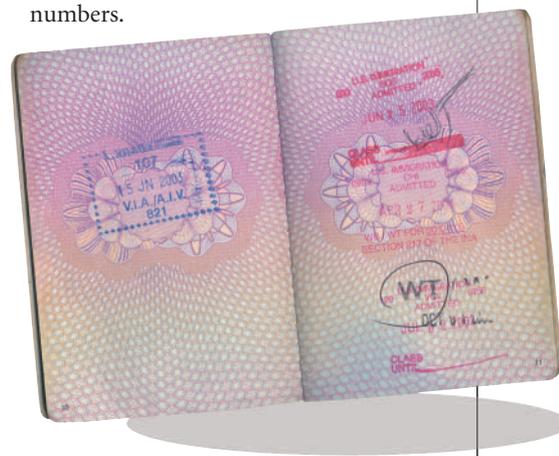
David Baltimore
President, California Institute of Technology

Students, scholars and at least one Nobel prizewinner have had trouble getting into the United States this year, thanks to immigration rules that have grown ever tighter since the terrorist attacks of 11 September 2001. Zhores Alferov, who won the 2000 Nobel Prize in Physics for his work on semiconductors, stormed out of the US consulate in St Petersburg, Russia, this September without his visa after being grilled about the nature of his work.

The situation has improved somewhat since heavy restrictions were introduced shortly after the attacks. Most background checks are now completed within 30 days — half the time it used to take — and are valid for up to a year, making it easier for foreign scientists working in the United States to travel home for holidays and family events. But it remains unclear whether these reforms will be enough to stop foreigners from spurning US academic institutions. This year's omens were not good: for the first time in more than three decades, the number of international students enrolling in the United States fell.

This is a trend that Baltimore finds deeply disturbing. With Europe and Asia becoming increasingly competitive, he says, the United States no longer has a firm lead in research. One of the reasons for this is that it's now so much harder to come to the United States to study, he argues.

Meanwhile, other nations are making the most of the United States' tough new rules. The number of foreign science students enrolled at universities in Australia has shot up by 32% since 2001. Asian students seem to be flocking to Britain too: the University of Cambridge, for example, has seen a surge in students from China. And China, in turn, is welcoming students from neighbouring countries such as Indonesia in record numbers.



“A malaria vaccine that really works and is cheap enough for African kids to afford.”

Gustav Nossal

Immunologist, University of Melbourne, Australia

A trial vaccine, known as RTS,S/AS02A, was shown this year to shield some children from malaria: the first real success in the field. Much more work needs to be done to achieve full protection, and to make the jabs affordable. But more trials are under way.

“I’d wish for two burning plasma experiments in the world, instead of just one.”

Gerald Navratil

Plasma physicist, Columbia University, New York

For plasma physics, 2004 was characterized by the constant dispute over where to build ITER, an international experimental reactor aimed at producing power from the fusion of hydrogen atoms. The community is united in its desire to see the project go ahead. But the six partners — Russia, China, South Korea, Japan, the United States and the European Union — are currently deadlocked over whether the reactor should be located in France or Japan.

The stalemate has led the Europeans to decide that, if necessary, they will go it alone. That could be okay, laughs Navratil, if it means that both the European and Japanese consortiums each build a machine. “Obviously we’d like to have at least one ITER,” he says; but two would be even better. Observers, however, would be extremely surprised if this wish actually came true.

“I wish for a cataclysmic rearrangement of the tectonic plates — or alternatively some creative legislative gerrymandering — so that the San Andreas Fault line ends up just west of Boston, Massachusetts.”

George Daley

Stem-cell scientist, Harvard University

It seems as though nothing short of serious seismic upheaval will be enough to get researchers on the US east coast the money they want to study human embryonic stem cells.

Federal funds for such work remain limited to a few dozen cell lines. But on the day of George W. Bush’s re-election,



a referendum in California backed an initiative to plough \$3 billion of state funds into the field, turning a lot of researchers farther east green with stem-cell envy.

Those outside California aren’t completely bereft. In April, Harvard University announced the creation of a stem-cell institute in and around Boston involving 100 researchers and funded with millions of dollars of private money. Three months later, the governor of New Jersey signed legislation to spend \$9.5 million on stem-cell research.

The stage is now set for regulatory battles between the conservative federal government and those states using public money to pursue embryonic stem-cell research. A bill to ban ‘therapeutic cloning’ — which would use genetic material from a cloned embryo of the patient to make new cells for a potential transplant, for example — that has languished since 2001 may pass next year, thanks to the newly enlarged Republican majority in the Senate. Even if this bill doesn’t pass, limitations on stem-cell research could also be tacked on to unrelated legislation and end up as law if supporters of the research fail to muster the political muscle to stop them.

“I wish to see tranquility, security and freedom of thought granted for scientists and researchers in parts of the world suffering political turmoil.”

Radwan Barakat
Plant scientist, Hebron University,
Palestinian Authority

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Highlights

Bring in the clones

Scientists in South Korea successfully cloned 30 human embryos and extracted stem cells from them. Others have claimed to do the same before: a US company announced in 2001 that it had produced a short-lived cloned embryo, for example. But evidence for such reports has been scarce until now. It took 242 eggs from 16 women to make these few clones. If the process can be streamlined, some hope it could one day be used to provide replacement cells tailor-made for any patient.

The hobbit

The skeleton of a tiny hominid was unearthed in Indonesia, providing evidence for a previously unknown branch of human evolution that lived just 18,000 years ago — a startlingly contemporary date. The one-metre-high species, called *Homo floresiensis* after the island it was found on, and nicknamed ‘hobbit’ by its finders, has made researchers wonder what other creatures might be out there waiting to be found.

Tracking electrons...

A magnetic microscope was tuned to detect the tiny signal of a single electron’s spin. The device — a minuscule cantilever with a magnetic tip — wobbles in the presence of the magnetic field created as a single electron spins. This wobble is in turn tracked by a laser. Although the principle is simple, it took the research team 12 years to attain the sensitivity needed to detect a single electron. The researchers say that the same technique should be able to detect an electron’s spin orientation, aiding attempts to produce quantum computers.

...and taking their picture

A snapshot was taken of an electron orbital, by blasting a nitrogen molecule with laser pulses. The light emitted after these kicks from the laser reveals an image of the space where the molecule’s electrons reside. The shapes and sizes of electron orbitals have been determined in the past through experiment and theoretical calculation, but this is the first time their picture has been taken. The same technique should some day let researchers watch electrons as they take part in chemical reactions.

Rat tales

The Brown Norway rat became the third mammal to have its genome sequenced, joining mice and humans. The rat is a model of choice for many studies in physiology and pharmacology, and is used to investigate everything from cardiovascular disease to space motion sickness. Researchers pored over the animal’s 25,000 genes to enlighten this work. Next year should see several more mammals join the club of sequenced creatures, including the chimpanzee and the dog.

A definitive cure in gene therapy for some sort of routine disorder that's applicable to a large number of other diseases.

Mark Kay
Gene-therapy researcher, Stanford University

This year, the gene-therapy field began regrouping after a difficult period — and received a shot in the arm from a young technology called RNA interference.

In France, authorities allowed Alain Fischer of the Necker Hospital in Paris to restart a gene-therapy trial that had been on hold for almost two years. The trial uses gene therapy to cure children who have the fatal condition X-linked severe combined immunodeficiency disease (SCID), which leaves sufferers unable to fight off infections. But it and other SCID gene-therapy trials around the world have been on hold since last January because Fischer's treatment caused cancer in two out of eleven children.

Now, regulatory authorities in France and elsewhere have decided that the SCID trials can resume, because the alternative — bone-marrow transplants — isn't always successful. In the United States, the Food and Drug Administration (FDA) has likewise decided to allow at least one trial to go ahead.

But will gene therapy prove successful? Enter RNA interference, a technique that takes advantage of natural human defence mechanisms and that many researchers think could deliver the



first full cure in molecular medicine. Biotechnology companies seem to agree; this year, two of them — Sirna Therapeutics in Boulder, Colorado, and Acuity Pharmaceuticals in Philadelphia, Pennsylvania — filed applications with the FDA to begin clinical trials using RNA interference to treat macular degeneration, a progressive eye disease.

They are likely to be joined next year by Alnylam Pharmaceuticals of Cambridge, Massachusetts. Researchers at this firm have already demonstrated that RNA interference can be used to cut cholesterol in mice. A cholesterol-lowering treatment would be blockbuster for RNA interference, but that is still years away.

In the immediate future, look for more clinical trials in 2005 — including some using RNA interference to combat hepatitis C or HIV.

But although some scientists were grumbling about the limits of today's transportation, others were working on a project that they think could revolutionize tomorrow's. Proving that space is accessible to your average billionaire as well as to space agencies, aerospace designer Burt Rutan and Microsoft co-founder Paul Allen launched the first private rocket to the outskirts of suborbital space and scooped the US\$10-million X prize in the process.

Rocket enthusiasts celebrated the achievement as the dawn of a new era of space tourism. But sceptics said that private space travel is unlikely to take off until engineers conquer the much harder feat of getting tourists into orbit. Virgin Galactic expects to begin commercial flights as early as 2007, with seats going for about \$200,000 a pop. That probably falls outside the reach of most researchers — but some, at least, hope that the technology will one day find a use in faster-than-Concorde intercontinental travel.

“A cure for jet lag — or super-fast flight. And fool-proof, fast, invisible airport screening technology. Actually, I'd settle for super-comfortable flight.”

George Daley
Stem-cell scientist, Harvard University

If there's one thing scientists agree on, it's that they spend too much time crunched up in economy class and not enough in the lab — and travel only seemed to take longer in 2004.

The United States, for one, lengthened queues when it phased in the largest biometric scheme yet deployed at national borders, demanding that foreign visitors give electronic fingerprints for checking against a database of undesirables. Next year, many countries are expected to introduce passports that encode biometric information about their owners on microchips. This will either shorten or lengthen queues, depending on your faith in technology.

“My wish? ET: call me.”

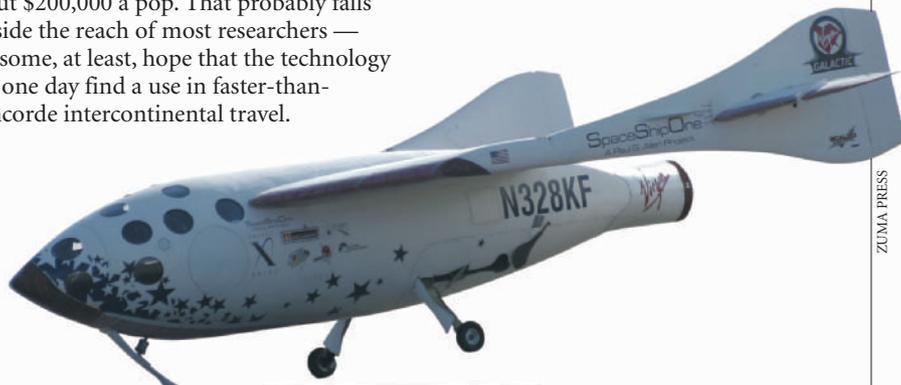
Louis Friedman
Executive director, Planetary Society

For Friedman, who heads a large space-advocacy group, there is no question about the major goal of space exploration: it is to find life. To this end the Planetary Society strongly supports SETI — the search for extraterrestrial intelligence that scans the skies for signs of communication.

In contrast, NASA now seems relatively unsure of its goals. Should it finish building the International Space Station? Stick with robots for most voyages, or push for piloted missions?

The Bush administration tried to create some focus this year by declaring that NASA would put astronauts back on the Moon by 2020, and then head for Mars. Initial funding for the president's 'Vision for Space Exploration' was passed by Congress in November despite reservations from many lawmakers and scientists. It may provide a focus for the space programme, but it doesn't seem to be a wildly popular one.

Some US scientists worry that if the tide shifts back to an expensive astronaut programme, it will detract from pure research without much obvious benefit. Missions already launched won't feel the squeeze — including Messenger, which is due to arrive at Mercury in 2011, and the Cassini craft, which should release a probe down to one of Saturn's moons, Titan, in January. But plans for spacecraft to study black holes and dark matter have been put on hold, conceivably delaying our discovery of wormholes and pockets of alien life in far reaches of the Universe. Unless, of course, ET calls us first.



Highlights

Mum's the word

Mouse eggs were persuaded to grow into apparently healthy mice without being fertilized by sperm, making for the first birth of a mammal without contribution from a father. The success doesn't make men irrelevant — the genetic manipulations used by the team are for now, at least, technically and ethically infeasible in humans: the experiments produced far more dead and defective baby mice than normal ones.

As old as ice

Results have started to pour in from a core of Antarctic ice that dates as far back as 740,000 years, giving researchers a hint of temperatures and greenhouse-gas levels during the past eight ice ages. It took eight years, two attempts, and more than a bit of luck to extract the core. Initial tests suggest that our present interglacial period, like a similar one about 400,000 years ago, might last an exceptionally long time — another 16,000 years or so, without taking account of global warming.

In the hot seat

Climate researchers estimated that anthropogenic climate change has at least doubled the chances of a heatwave like the one that hit Europe in the summer of 2003. Although scientists have long thought that a warmer world will have more extreme weather, this result provided the most solid link so far between global warming and a single weather event. Such work could open the door for groups to win lawsuits against big emitters of greenhouse gases for damages caused by bad weather.

Table-top accelerators

High-quality electron beams for use in accelerators were produced by laser focusing. This eliminates the need for the massive magnets that have traditionally been used to focus such beams, and whittles down the instrumentation needed to make a particle accelerator from the size of a football stadium to the size of a lab. The ever-shrinking size of these devices will make them increasingly accessible to universities and individual research teams.

Home-made cure

A compound was mixed in the lab that could make for cheaper antimalarial drugs. Doctors currently recommend that high doses of artemisinin-based treatments be used in countries that have problems with resistance to drugs such as chloroquine. But artemisinin, which comes from a Chinese plant, is very expensive. A public-private partnership created a cheaper synthetic version, which is now in clinical trials in Britain.

“For legal enforcement of the Hippocratic oath ‘first, do no harm’ to ensure that all physicians and researchers are held accountable if they violate ethical standards.”

Vera Sharav
President, Alliance for Human Research Protection, New York.

Every year has its share of people who lie, steal, cheat or fall prey to subtler ethical slip-ups in the lab.

Although 2004 wasn't the worst of recent years, an array of scientists were nevertheless accused of plagiarism, fraud and other misbehaviour. Even the editors of journals confessed to the occasional ethical slip-up in their publishing practices — such as asking authors to add specific references to their papers to boost the journal's impact factor. As a result, one association of medical journals, at least, has drawn up a code of good practice for themselves to keep things in line, which came into force this month.

The pharmaceutical industry came under attack when GlaxoSmithKline (GSK) was accused of suppressing results of clinical trials that suggested some antidepressants could increase the risk of suicidal behaviours in children. Rules were changed in the United States to ensure that these drugs were labelled with a warning, and that more data would generally be made available for public scrutiny. Twelve leading international medical journals decided that companies would have to register details of clinical trials in a public database if they want to have their results published. This, they hope, will redress the fact that only trials with positive results tend to be published or aired in public. GSK also promised to put summaries of its clinical-trial data for marketed drugs online for free — and has begun to do so.

The physical sciences suffered some unusual problems as well: staff were fired from Los Alamos National Laboratory in New Mexico after some classified computer-storage devices disappeared, forcing the lab to shut down for weeks for a security review.

And one of this year's science highlights — the successful cloning of human embryos in South Korea — was clouded by suspicions that one of the lab's researchers was the source of some of the eggs; usually considered to be ethically unacceptable. Lab chief Woo Suk Hwang at Seoul National Laboratory put his work on hold after the accusations hit. A national bioethics law that comes into effect in January 2005 may help to sort out future issues.

“I'd wish to find out if there is life on Mars; perhaps martians can be detected by a whiff of their farts.”

Roger Buick
Geologist, University of Washington, Seattle

If you're looking for extraterrestrial life, then Mars is a great place to start. Tantalizing discoveries this year meant that the possibility of finding microbial life — ancient or contemporary — on the red planet once again came to the fore.

Earth-based telescopes and Mars Express — a European mission sent to orbit the planet — detected the presence of methane in the martian atmosphere. As methane is a short-lived gas, researchers say that this must have been produced within the past 300 years or so. With no known active volcanoes on the planet to generate the gas, this has left researchers “twitching and excited” about the possibility of contemporary microbes as the source, says Buick.

Is there a way to find out if the methane comes from life? Buick suggests that we now look for traces of hydrogen sulphide — another gas commonly produced by biological activity. If sufficient volumes of hydrogen sulphide are coupled with the leaking methane, it would suggest that subsurface life is producing the gases, he says. Mars Express did see hints of hydrogen sulphide, but these measurements have not been confirmed.

NASA's martian rover, Opportunity, also found clues to add to the growing body of evidence that Mars once held liquid water: marks in rock that looked as though they had made by ripples; sulphate and other deposits that seemed to have been left when a briny pool evaporated; and tiny spherical rocks that probably formed as minerals precipitated out of water bubbles. Sadly Europe's equivalent lander, Beagle 2 — the only one explicitly designed to look for signs of life — didn't survive the trip to the planet's surface.

“For the French government to take on board scientists' proposals for the future of research, so that France once again becomes an attractive destination for young scientists.”

Alain Trautmann, cell biologist and leader of Save Research, an unprecedented scientific revolt against French government policies and science funding

news feature

I'd like to be able to get on with my experiments, which help people with dyslexia and Parkinson's disease, without being harassed by extremists.

John Stein
Neuroscientist, University of Oxford, UK.

When Stein this summer decided to join the handful of UK researchers who speak publicly about the benefits of animal research, he knew he would soon be the target of animal-rights activists. "I got a continuous stream of abusive e-mails," he sighs. One read: "What is the difference between a Nazi and a vivisector? Answer: nothing."

Stein and his colleague Tipu Aziz decided to speak up after activists scored two notable victories. In January, protests helped to force the University of Cambridge to abandon plans for a primate research centre. Six months later, the building contractor working on a new animal house at Oxford pulled out.

Both Stein and Aziz knew that taking a stand could be dangerous. In the past, at least, activists have gone beyond threats: supporters of animal research have been attacked with baseball bats and had letter bombs posted to their homes.

But the close of 2004 finds the pair

"For the United States to trump Europe and the rest of the world by announcing a successor to the Manhattan and Apollo projects: a bold initiative to decarbonize the energy system within five decades."

Stefan Rahmstorf
Climate modeller, Potsdam Institute for Climate Impact Research, Germany

If anyone has just cause to raise champagne glasses this New Year, it's the climate community. Researchers made significant progress in understanding the nature of past, present and future climate change (see Highlights, page 945). And after years of haggling, this autumn saw the Russian president, Vladimir Putin, ratify the Kyoto Protocol on Climate Change, finally establishing it as a legally binding international agreement. The Russian decision signalled much-needed political support for the push to reduce greenhouse-gas emissions — support

"More uninterrupted thinking time."
Chris Rapley, director, British Antarctic Survey

cautiously optimistic. Activists have now been portrayed as terrorists by some sections of the media, and their often militant approach has been exposed by undercover journalists. And in November, Oxford won a court injunction barring protestors from the immediate vicinity of the proposed site for its animal house. Stein and Aziz say that the threats they receive have now almost petered out.

They are also confident that the public is behind them — thanks in part to a strange experience Stein had at a Royal Institution event on nutrition and neuroscience this September. Stein and his brother Rick, a famous chef in Britain, co-hosted the event. They found themselves harassed by activists dressed in animal suits shouting that John was a "monkey torturer". But when police arrived, says John, they ended up having to protect the protestors from members of the public, rather than the Stein brothers from the protestors. Enraged, the public had turned on the picketers.

The recipe for a good 2005, say Stein and Aziz, would include more support from their university and fellow researchers in their efforts to explain why animal research is needed. Equally importantly, it would also involve the resumption of building work on Oxford's animal facility, which has been on hold since July. The university insists a new contractor will be found. But as *Nature* went to press, no builder had been named.

that seemed very far away this time last year. But, Rahmstorf and others note, the world will need more than Kyoto — preferably an effort with the United States fully involved — to get carbon dioxide emissions in check.

One scheme spurred on by the Kyoto Protocol looks set to make an impact in 2005: the idea of trading permits to emit carbon dioxide. About twice as many 'CO₂ equivalents' swapped hands in 2004 as in 2003. By January 2005, Europe's Emissions Trading Scheme will be in place, making carbon a government-regulated asset. Observers hope that giving emissions reductions a financial value will spur companies to cut down on their atmospheric garbage — even in countries that have not signed Kyoto, such as the United States. But no one yet knows if it will really reduce overall emissions.

Meanwhile, Hollywood's blockbuster *The Day After Tomorrow* gave the public a vivid snapshot of abrupt climate change, when it portrayed the entire Northern Hemisphere freezing solid in a matter of days. That may be a ridiculous exaggeration of what could happen in real life, but science continues to uncover evidence that dramatic temperature swings have occurred in the distant past, taking place over thousands or even hundreds of years. This year, for instance, researchers found hints of a warm Arctic climate in

the Cretaceous period some 70 million years ago. Data from samples taken during this year's Arctic Coring Expedition may soon tell us how the North Pole once turned into a mild Mediterranean basin.

"A big budget Hollywood movie epic that will make scientists the new idols of today's youth, causing a burst of interest in careers in science. Back off, rock stars, TV actors and athletes!"

Francis Collins
Director, National Human Genome Research Institute, Bethesda, Maryland

If *The Day After Tomorrow* wasn't good enough for Collins, there's plenty to look forward to — perhaps with mixed feelings. Among the films due out in 2005 is *Fantastic Four*, in which a group of astronauts gain superpowers after being exposed to cosmic radiation. Also set to hit the screens is the cult classic *The Hitchhiker's Guide to the Galaxy*, in which a spaceship with an improbability drive can do the seemingly impossible (as long as it knows how improbable it is). And in a new version of *War of the Worlds*, we will be treated to Tom Cruise's portrayal of life as a scientist. The gulf between celluloid and reality looks unlikely to be bridged any time soon, although even fantasy is sure to spark some interest in science — of a sort.

"A brightly coloured parrot that sits on my shoulder and every time I look at new data it screeches in my ear: 'But what does this really mean and is it important?'"

Brandon Wainwright,
human geneticist,
Institute for Molecular
Bioscience, University
of Queensland,
Australia



“A bonfire of much of the idiotic new health and safety regulations that say I am supposed to put on a space suit before I can enter the animal house to study my chickens.”

Steven Rose, neuroscientist, Open University, Milton Keynes, UK.

C. HUGHES/PANOS

“Very high on my wish list of discoveries for 2005 would be the development of a molecule that would elicit broadly reactive neutralizing antibodies against HIV.”

Anthony Fauci

Director, National Institute of Allergy and Infectious Diseases, Bethesda, Maryland

Those attending July's XV International AIDS Conference in Bangkok, Thailand, heard one refrain repeated over and over: we have the tools to treat the epidemic — but they're not reaching the majority of the 39 million people living with HIV. The epidemic is deeply entrenched in sub-Saharan Africa, home to more than 60% of people with HIV; and it threatens to take off in Russia and China, as well as India, which has the second highest number of HIV infections. But the antiretroviral medications that could treat patients are still too costly for most to afford. Faced with this daunting prospect, leaders are calling for preventative treatments that can stop the spread of AIDS once and for all.

But progress on an AIDS vaccine is slow. Although there are at least a dozen vaccines in clinical trials, researchers do not have high hopes that any will completely prevent people from contracting HIV. Many experts are convinced that what is needed to meet this goal is a vaccine that will stimulate antibodies that recognize and neutralize all forms of HIV. Structural biologists are now hard at work trying to identify these ‘broadly neutralizing’ antibodies.

“A time controller. This would allow — at least subjectively — the flow of time to be increased, decreased or stopped. I believe some drugs have this effect!”

Arthur C. Clarke
Science-fiction author



“We are facing increasing risk of new emerging infections. I wish for constant vigilance, and for the resources to combat this threat with good science, surveillance and public policy based on science not politics.”

Paul Tam

Acting pro-vice-chancellor, University of Hong Kong

Severe acute respiratory syndrome, or SARS, may now seem like a distant threat, with no new cases so far this winter. But there are other viruses to worry about. This year, bird flu led to the death by disease or slaughter of tens of millions of birds in countries across southeast Asia, and it killed at least 32 people in Thailand and Vietnam.

Evidence has emerged that the viral strain of greatest concern, H5N1, is present in pigs in China — an animal that could provide the perfect place for bird and human viruses to meet and mix, producing a lethal, highly transmissible version. Alarming, H5N1 seems to have passed from person to person in one case, when a Thai girl probably passed the disease to her mother. If the virus adapts to pass more easily between people, a deadly pandemic similar to those in the twentieth century is likely.

“The next pandemic is inevitable. In fact it's overdue,” says David Ho, an infectious-disease expert at Rockefeller University in New York. And surveillance and healthcare systems in the developing countries may not be able to cope, he says.

Scandals

Missing plague

After reporting several vials of plague bacteria missing from his lab, and then admitting he might have accidentally destroyed them himself, US microbiologist Thomas Butler was sentenced to two years in prison for fraud this March. This is more lenient than the penalty sought by US prosecutors, who called for millions of dollars in fines and at least ten years in prison. But some researchers say it was unfair to make an example out of a 62-year-old, respected researcher with no terrorist ambitions.

For art's sake

A US university geneticist and an artist were accused of mail and wire fraud because of the way they allegedly obtained bacteria for art exhibitions. The investigation began when laboratory equipment, bacteria and books on biowarfare were found in the home of performance artist Steven Kurtz. The bacteria were found to be harmless, but both he and Robert Ferrell were accused of defrauding the supplier by using the organisms for non-research purposes outside the lab. Kurtz's case is set for a hearing on 11 January, while Ferrell's has been put on hold due to illness.

Autism paper 'flawed'

Medical journal *The Lancet* took the unusual step of distancing itself from one of its own papers and attacking its findings. In February, editors declared that Andrew Wakefield's 1998 paper linking the measles, mumps and rubella vaccine with autism was “flawed” owing to conflicts of interest and should not have been published. Wakefield said that there was no conflict. The paper caused many parents in Britain to decline the triple vaccine, and, as a result, measles incidence increased.

Cloning paper pulled

Fertility researcher Panayiotis Zavos had a peer-reviewed paper on human cloning pulled — because he publicized his work. Zavos pulled a fuss in the newspapers in September when he announced that he had created cloned embryos by mixing genetic material from dead people with cow eggs. The *Journal of Assisted Reproduction and Genetics* then pulled a paper on similar work, although Zavos claims it was a different study.

Locked out

A vetted Iranian physicist was banned from his workplace at the Stanford Linear Accelerator Center, a US Department of Energy lab in California. Colleagues told *Nature* that no explanation was offered for his expulsion. Shahram Rahatlou suspected his ban resulted from heightened security checks after 11 September 2001. Other Iranians said that it was now harder for them to work at, or even visit, government facilities. Rahatlou has since been offered a four-year position in Rome.

Odds & ends

Down with a bang

NASA's Genesis mission, which was designed to bring samples of the solar wind back to Earth, crashed into the Utah desert in September. The craft had such delicate detectors that mission designers had planned for Hollywood stunt pilots to swoop in and catch the capsule by its parachute, allowing for the softest possible landing. But the parachute didn't open, owing to an error in the design drawings that led to some crucial switches being installed upside down.

A whale of a time

An otherwise ordinary day in a busy Taiwanese street was interrupted in February by 60 tonnes of exploding sperm whale. The dead whale was being delivered by truck to a laboratory for an autopsy, when the carcass exploded after gas from decomposition built up inside. Luckily, only some of the internal organs fell into the street. The focus for the post mortem — the heart and lungs — was still intact.

Newton revealed

A 300,000-word interpretation of the biblical book of Revelation that Isaac Newton wrote in the late seventeenth century was published online in August. The eye-opening text, peppered with references to dragons and reflections on distrust of the Catholic faith, revealed Newton's intense interest in spiritual matters. More than half of Newton's works seem to have been predominantly about religion rather than science.

From the archive

A theoretical physicist aired his life history, including stories of growing up as a Polish Jew in occupied France during the Second World War, in an unusual medium this year. He put it all on the arXiv physics preprint server, which more usually hosts original research. But the archive won't put everything up online. Researchers who feel they have been unfairly excluded from the server banded together this year to form their own 'archive freedom' website, to protest at the site's selection criteria.

Beagle wrangling

No one really knows what happened to the ill-fated Beagle 2 lander when it went missing on its descent to Mars this time last year. But the bigger question may be who will pay for the failed attempt. The European Space Agency (ESA) 'lent' mission leaders in the United Kingdom €16 million (US\$21 million) for the project, and this autumn some ESA-funded researchers were beginning to grumble about whether, and how, the space agency would ever get it back. Britain may or may not want to repay in kind with goods and services, but space scientists were quoted as saying a cheque would be best.

"To find an organism in ocean sampling that would help to eliminate the world's dependency on carbon-based fuels."

Craig Venter, head, J. Craig Venter Science Foundation, Rockville, Maryland

"Five minutes with Charles Darwin. Or, failing that, a modern genomics laboratory for the Charles Darwin Research Station in the Galapagos."

Hunt Willard
Geneticist, Duke University, Durham, North Carolina.

The Galapagos Islands are a living laboratory for studying evolution, and naturalists have been drawn there for more than a century. The islands once helped spark revolutionary theories about evolution, but experts say that the archipelago's Charles Darwin Research Station on Santa Cruz now desperately needs better equipment to keep pace with twenty-first-century genetics — and to unravel some remaining mysteries of evolution.

Biologists tend to assume that evolutionary changes arise from rare genetic mutations becoming fixed in a species population thanks to environmental pressures. But, says Willard, changes on the Galapagos Islands seem to be happening too quickly for this to be the only mechanism at work. More dramatic, large-scale genomic changes may be occurring as a result of coupling between different subspecies, he says. But until a 'Galapagos revisited' project does thorough genomic studies, we won't know what's really going on at the DNA level, he says.

Such genetic studies have already proved useful for some of the lonelier species on the islands. An analysis of tortoises helped to find the best potential subspecies match for Lonesome George — a giant tortoise thought to be the last of his line on the island of Pinta. George has not yet been introduced to any of these chosen females, but scientists are hoping that he won't ignore them in the same way that he has rejected the other potential mates now in his enclosure.



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"A spell check for English (Euro-speak) to add to my computer languages of English (UK) and English (US). And a dictionary to go with it, so I can work out what the Euro-words actually mean."

Anon

Coffee-breaks at European science conferences this year were alive with

complaints about the increasingly difficult application process for European 'Framework' grants. Scientists say that the forms, riddled with neologisms such as 'sideground', are becoming increasingly impossible to read, let alone to fill out.

There actually is a glossary for the Framework programme (see <http://fp6.cordis.lu/fp6/glossary.cfm>), but sadly neither it nor the *Oxford English Dictionary* includes the word 'sideground'. If you dig through the European Commission's Intellectual Property Rights Helpdesk website, you'll find that the word means "information and rights acquired in parallel with a project".

Scientists say that the increasingly complex application forms seem to want them to prove that they will help cure Europe's economic and social ills, while doing a bit of science on the side. Writing the research project is the easy part, they say; trying to work out how to handle the political add-ons is a full-time job.

The details of the Seventh Framework Programme, to begin in 2006, will be hammered out during 2005. But it's a good bet that any wish for simplicity in the new application forms won't be granted. Researchers instead set their hopes on the creation of the planned European Research Council, which should be distanced from politics in Brussels.

Add your thoughts to *Nature's* wish list at www.nature.com/news/specials/wishlist

"A firm commitment by the European Commission to earmark enough money for the European Research Council, no matter whether the research budget will be doubled or not."

Erwin Neher, biophysicist, Max Planck Institute for Biophysical Chemistry, Göttingen, Germany