SIDELINES

ON THE RECORD

"Had the decision been mine, we would not have built the space station we're building in the orbit we're building it in."

NASA administrator Michael Griffin attacks the International Space Station.

"Having a moon is just inherently cool — and it is something that most self-respecting planets have."

Astronomer Michael Brown talks about the discovery of a moon orbiting the Solar System's 'tenth planet'.

Source: USA Today, Caltech

SCORECARD

Dogs
Labradors with osteoarthritis are the focus of a study launched at the University of Liverpool, UK. Researchers will use magnetic resonance imaging to track disease progression in the dogs.

Nuclear safety
Ukrainian officials have recovered 14 pieces of nuclear fuel stolen from the now-defunct Chernobyl power plant. The rods, found in a plastic bag near the plant's perimeter, had been missing for a decade.

Archaeology
Embarrassed Czech archaeologists have found that a statuette thought to represent a fifth-century Persian goddess came from a mould made in 1968 by a local pensioner.

NUMBER CRUNCH

60% of PhD-granting physics departments in the United States report visa problems for foreign students returning after trips abroad.

48% of the physics departments had at least one foreign student who was denied entry or considerably delayed by visa problems.

13% is the fall in the number of first-year enrolments by foreign graduate students in the United States between 2000 and 2004.

Source: American Institute of Physics

One to one: tailoring prescriptions to patients' genes could help to reduce side effects.

AP/AHA

Japan jumps towards personalized medicine

TOKYO

Japanese companies say they have built a desk-top machine that will allow doctors to assess patients' DNA from a single drop of blood, and so tailor treatment to an individual's genes. The machine can deliver results within an hour, they say, and will be on sale for 5 million yen (US$44,000) by autumn 2006.

Safe dosage, effectiveness and side effects for any given drug vary from patient to patient. And determining which drug and dosage is best for any given individual is a critical challenge facing healthcare specialists.

But the announcement about the Japanese machine on 27 September came just a week after scientists in the United Kingdom spoke out against the hype surrounding personalized medicine. A report produced by the Royal Society warned that prescriptions tailored to a patient's genes are at least 15 to 20 years away.

The Japanese device was developed by the genomics facility of the Institute of Chemical and Physical Research (RIKEN) in Yokohama, the printing company Toppan in Tokyo, and the Kyoto-based maker of scientific equipment Shimadzu. Shimadzu's Takaaki Sato, who led Shimadzu's development efforts, says the key advance is a chip that analyses DNA in a blood sample, thereby bypassing the time-consuming DNA purification steps currently needed.

Although Sato will not give further details, he says that any health worker could use the machine to test a drop of blood for a particular genotype, and get a result in an hour. "Patients do not want to wait a week or even a day for results before being able to take a medicine, especially if they have an infectious disease," says Sato.

According to RIKEN and Shimadzu, the machine will first be tested on patients being prescribed one of two medicines: an antibody called irinotecan, which can cause hearing loss in people with a certain mutation in their mitochondrial DNA, and the anticoagulant warfarin, which causes excessive bleeding in some patients.

But there is scepticism over how useful the device will be. David Weatherall of the Weatherall Institute of Molecular Medicine at the University of Oxford, UK, who worked on the Royal Society report, says the metabolism of warfarin is related to at least two genes whose interaction is not understood. Other factors, such as the patient's age or additional drugs being taken, also need to be considered, he says.

"There is no way around these problems except to test each drug independently in large population studies, and to monitor all these issues over several years," he says. "There is still a huge gap between the scientists who do this kind of work and its application for practical purposes."

Sato admits that initially his machine will be most useful for research. But judging from the "unbelievable number of responses" received since announcing the test, he says there is no way that 15 years will pass before doctors are using such devices for day-to-day diagnosis and treatment. ■

David Cyranoski

Physics prize puts spotlight on optics

M. CLOH ELD, SCIENCE PHOTO LIBRARY

Work by this year's physics laureates led to a better understanding of the nature of light.

Three researchers who applied quantum theory to light, and built devices that are now providing the best-ever measurement of fundamental constants, have been awarded this year's Nobel Prize in Physics.

Half the award goes to the theoretician who laid the groundwork for the advances: Roy Glauber. A professor of physics at Harvard University since 1976, Glauber is a former member of the Manhattan Project — the effort that led to the development of atomic weapons during the Second World War.

John Hall of the University of Colorado in Boulder and Theodor Hänsch of Ludwig Maximilians University in Munich, Germany, share the other half for developing techniques to measure the frequency of light emitted by atoms and molecules.

Hänsch was busy at his university, packing for a flight to the United States, when he heard the news. Half an hour later, he was trying to deal with the attentions of the hundred or so reporters who had arrived at his office, eager to know everything about his life. He says he never expected to win the award. "I'm overwhelmed," he says. "I haven't absorbed it yet."

A. ABBOTT

Theodor Hänsch is beseiged by reporters after winning a share in this year's physics Nobel.

Hänsch and Hall's work is rooted in two papers published by Glauber in 1963, which built on the excitement in the physics community generated by the development of lasers in the 1950s. The papers focused on the working of the devices that are used to measure photons of light from lasers and other sources. Glauber showed that normal statistics failed to describe the interaction between photon and detector; only an understanding of the

California prepares to roll out stem-cell funding

SAN FRANCISCO

The funds for California's stem-cell research initiative may finally start flowing. The California Institute for Regenerative Medicine (CIRM) has been unable to use the US$3-billion that it was granted by California voters nearly a year ago because of ongoing legal wrangles. But on 3 October, state officials began the process of selling up to $55 million in bond anticipation notes for the first grants.

Sixteen research institutions are anxiously awaiting the first $12.5 million, awarded last month as training grants for 170 graduate students, fellows and postdocs over the next year. And last weekend, leading stem-cell researchers met in San Francisco to discuss what to do with the money.

The CIRM was formed to conduct studies that the US government will not fund because of restrictions laid out by President George W. Bush. The grants are part of the institute's unprecedented effort to create a huge research programme from scratch, while fighting off legal and political challenges from those who oppose studies involving human embryos (see *Nature* 434, 694–696; 2005).

"Despite the ongoing legal and political battles, grant awardees and universities are charging ahead."

At the San Francisco meeting, prominent stem-cell researchers, including those from Canada and Sweden, joined US colleagues to help the CIRM chart research paths. The nearly 150 scientists in attendance called for basic research with an eye to advancing to clinical trials as quickly as possible. Suggested topics include how stem cells differentiate, the immunological barriers to stem-cell transplantation, and creating new imaging techniques to track stem cells transplanted into humans.

Among those at the meeting, stem-cell researcher Andras Nagy of Mount Sinai Hospital in Toronto disclosed that he and his colleagues had developed an embryonic stem-cell line from dogs, which they hope may shed light on species differences and so help researchers apply the results of studies in mice to humans.

Legal challenges have slowed the CIRM's plan to issue about $250 million annually in grants over the next decade. Three Sacramento-area groups — the People's Advocate, the National Tax Limitation Foundation and the California Family Bioethics Council — filed lawsuits earlier this year in the state court. They claimed that Proposition 71, which California voters overwhelmingly approved last November to create the CIRM, was technically flawed.

Two of these suits were combined into a single action at a superior court in August; a judge is to issue a crucial ruling on 17 November, when state attorneys will request that the lawsuits be dismissed.

If they are dismissed, the state will still have to wait about a year for the appeals process to finish before it can start selling bonds to fund the full annual research amounts. Meanwhile, on 3 November the state announced plans to sell bond anticipation notes to philanthropic

quantum nature of the device could explain it.

Such breakthroughs turned Glauber into a major player in the emerging field of quantum optics, which applies established quantum theory to light. The fruits of the discipline were a better understanding of lasers and the process by which excited atoms and molecules emit photons of light. Hall and Hänsch independently used such results to build optical combs, which are laser devices that can measure the frequency of light sources with great precision.

Fields as diverse as navigation and cosmology are benefiting from optical combs, which are being used to develop a new generation of optical clocks — potentially capable of a precision of 1 part in 10^{18}. Researchers studying the fine-structure constant, which determines the strength of the interaction between light and matter, are using the clocks to study whether the constant changes slightly with time. The devices could also lead to a redefinition of the second, and help to improve the precision of the navigation signals emitted by global positioning systems. ■

Jim Giles

Additional reporting by Alison Abbott

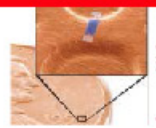
The Nobel Prize in Chemistry was announced after *Nature* went to press. For coverage see www.nature.com/news

organizations that could serve as a financial bridge for the first $55 million.

Despite the ongoing legal and political battles, CIRM officials, grant awardees and universities are charging ahead. Even though no money is yet available, the University of Southern California in Los Angeles will soon announce plans for a large new building with a wing devoted to stem-cell research, says Francis Markland, associate dean of scientific affairs, the construction of which is to begin early next year. The university is working to recruit six to eight professors to positions there.

Elsewhere, young researchers and senior faculty members have put career decisions on hold as they consider moving to California institutes in search of CIRM research funds. "This does cause some anxiety," says physician Robert Mahley, president of the J. David Gladstone Institutes in San Francisco, which is to receive $2.4 million in training grants over three years. "But we are prepared to wait it out." ■

Rex Dalton



METAL DETECTORS GET SHRINKING FEELING
Tiny prototype promises better military reconnaissance.
www.nature.com/nature

LUCENT TECHNOLOGIES/BELL LABS

Gut feeling secures medical Nobel for Australian doctors

Barry Marshall and Robin Warren have won this year's Nobel Prize in Medicine or Physiology for discovering that most stomach ulcers are caused by the bacterium *Helicobacter pylori*. Despite original resistance to the findings, their work at the Royal Perth Hospital has revolutionized the treatment of gastric disease.

Plain-speaking Barry Marshall has long been a folk hero in his native Australia. But in the years after his 1982 discovery, he was dismissed as an upstart who was pushing a hypothesis that had no credibility. That pushiness, combined with dogged determination and sharp insight, kept alive the heretical idea that gastric and duodenal ulcers could be caused by a bacterial infection.

At the time, ulcers were treated with drugs that reduced acid secretion in the stomach. The drugs worked, so acidity was assumed to cause ulcers. But pathologist Warren had noticed spiral-shaped bacteria in biopsies from ulcerous stomachs, and that these were always associated with inflammation. He was convinced that the bacteria were linked to the ulcers.

He recruited a young medical intern — Marshall — to isolate and grow the bacteria in culture. The bacteria looked like *Campylobacter*, a newly discovered family known to cause gut infection in poultry. But Marshall's initial attempts in 1982 failed — until Easter, when culture plates were accidentally left over the four-day break. It turned out that the bacteria grow extremely slowly, and earlier attempts had simply been abandoned too soon. The bacteria were then shown not to be *Campylobacter*, but an entirely new genus, named *Helicobacter*.

Marshall and Warren went on to show that patients with ulcers can be treated with antibiotics. Unlike patients given acid-suppressing drugs, their ulcers do not return.

But gastroenterologists resisted the idea. Francis Mégraud, a bacteriologist at the Victor Segalen University in Bordeaux, France, remembers attending the 1988 meeting of the American Gastroenterological Association in New Orleans and hearing outraged physicians. "They seemed insulted, saying, 'we are being asked to treat stomach ulcers with antibiotics, as if it were gonorrhoea!'" he says. "It was hard for them to accept that the disease could be a simple infection."

Drug companies that profited from the anti-ulcer drug market were also actively resistant, says Mégraud, who is secretary of the European Helicobacter Pylori Study Group. Even some bacteriologists were suspicious — the stomach had long been assumed too acidic to host bacteria.

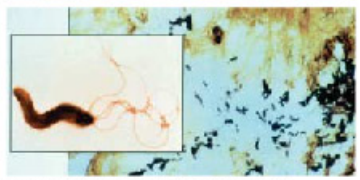
In frustration, Marshall did the ultimate cause-and-effect experiment. He swallowed a solution containing the bacteria, and promptly came down with an aggressive attack of the sort of gastritis that leads to ulcers. "My colleagues were alarmed, and so was my wife," he recalls.

Marshall's forthright attacks on doubters did little to soften critics. Their prejudices were deepened by his youth, and the fact that Perth had no strong academic reputation. "Fortunately, I'm very thick-skinned," he says. "There was also an advantage to being isolated in Perth. I don't think I realized just how heavy the opposition was."

His untiring advocacy, and further research with Warren, subsequently repeated and extended around the world, eventually won the day. In 1991, a meeting of the Centers for Disease Control and Prevention in Atlanta, Georgia, formally declared the link between *H. pylori* and gastric disease.

It is now accepted that most gastric ulcers are caused by *H. pylori*. The bacterium is usually acquired in childhood, being transferred through faeces or vomit between family members. It then lies dormant until adulthood. Untreated cases can lead to gastric cancer. ■

Alison Abbott



W. EDWARDS/REUTERS; J. HAY V. VIRGINIA/AP

Robin Warren (left) and Barry Marshall found that *Helicobacter pylori* (bottom) causes stomach ulcers.