In the red: costs forced NASA to revise plans for the International Space Station (left), while problems with superconducting magnets (right) helped to push CERN's Large Hadron Collider over budget.

gene-expression studies, from the preparation of samples to the visualization of microarray data. Biologists new to the technology will be able to plan their research using these standards, enter their results into a common global database, and use its software tools to query the pooled data sets.

Meanwhile, human-genome browsers such as Ensembl, run from the European Bioinformatics Institute in Hinxton, near Cambridge, or that hosted by the University of California, Santa Cruz, already give access to layers of comparative genomic, functional genomic, genetic, cytogenetic and clinical data all anchored to the underlying sequence data.

This year saw a lively debate over online publishing in biology, as a grassroots initiative called the Public Library of Science tried to convince publishers to deposit papers in a free-access online database six months after their initial publication. But for a vision of the future of biological communication, speak to those researchers who are most enthusiastically embracing the high-throughput approach. The Alliance for Cellular Signaling, for instance, which involves researchers from 20 institutions across the United States, sees its planned database and associated web pages as the primary means of disseminating its results. Conventional scientific papers simply cannot do the job, argue its leaders.

Declan Butler

problems with financial management are resolved. But ultimately the Young committee called for a fully capable station with a crew of six, clearly dedicated to science.

CERN's problems are not in the same league as NASA's, although its management has faced harsh criticism. Rumours that the LHC project was struggling to keep to its austere budget began circulating in the spring. After months of denials, CERN finally admitted in September that the project was likely to overspend. Its managers pointed to a lack of contingency funds, problems with the development of superconducting magnets and escalating civil-engineering costs; critics blamed financial mismanagement. Either way, CERN's member states are in no mood to bail out the project.

CERN director-general Luciano Maiani remains optimistic that the LHC will still open on time. But how this will be achieved has yet to be determined, and strategic control of the project has effectively been handed to an external review board.

As NASA and CERN attempt to balance their books, researchers working on similarly ambitious projects are watching anxiously. In the current economic climate, they realize, talk of spiralling costs may make politicians nervous about committing money.

High-energy physicists trying to sell the next big machine after the LHC — an enormous electron-positron collider — are likely to face some awkward questions. The same goes for astronomers planning the Next Generation Space Telescope, scheduled for launch in December 2008. Its technical specification is ambitious, jumping from the 2.4-metre mirror of the Hubble Space Telescope to a proposed 8-metre reflector. Some of the project's proponents are already wondering if it might be wise to adopt a more modest plan.

David Adam and Tony Reichhardt

Big science

Down to Earth with a bump

For NASA, 2001 was the year in which the space odyssey that is the International Space Station ran into serious trouble. The script is hastily being rewritten, with the goal of controlling this blockbuster's budget.

The space station is the ultimate big-ticket project. But it was not the only such endeavour to run into serious budgetary difficulties this year. At CERN, the European high-energy physics laboratory near Geneva, a projected overspend of several hundred million dollars has left questions hanging over its next big particle accelerator, the Large Hadron Collider (LHC), which is supposed to start collecting data in 2006.

Few would dispute the judgement of incoming NASA administrator Sean O'Keefe that the space station is in "management and

financial crisis". Early in the year, NASA shocked the new US administration by saying that it would need \$5 billion more than the \$8 billion that had previously been budgeted to finish the project. In being handed over to O'Keefe, a budget and management expert, the space agency resembles a corporation that has gone into receivership. Financial responsibility, not technological and scientific vision, is the new priority.

Even before O'Keefe's nomination, the decision had been taken to freeze the station at an interim stage, with a maintenance crew of three astronauts on board, until costs could be contained. A committee appointed to look into the project, headed by veteran aerospace executive Thomas Young, agreed in November that NASA should stay with a stripped-down station for two years, until