

Almost immediately the US released its own response. "The US believes China's development and testing of such weapons is inconsistent with the spirit of cooperation that both countries aspire to in the civil space area," said National Security Council spokesman Gordon Johndroe. "We and other countries have expressed our concern regarding this action to the Chinese."

China's recent test "is comparable to what has been done by the US in the past, but in the context of the current state of space usage it is an escalation," says Harvard astrophysicist Jonathan McDowell, who tracks rocket launches and activity. "The debris issue is particularly worrying." The US and Russia abandoned the testing of anti-satellite weapons in 1985 and the early 1990s, respectively, because of the risk that the debris produced would destroy active satellites.

Since 2002, Russia and China have pushed for discussions with the US over the development of a new treaty outlawing a space arms race. However, the US refused to join such talks and the National Space Policy (NSP) released by the White House last October states that the US "will oppose the development of new legal regimes or other restrictions that seek to prohibit or limit US access to or use of space."

The NSP also states that the US will "seek to minimize the creation of orbital debris" because of NASA's planned human spaceflight missions, the dependence of the US military on spy satellites, and the significant number of commercial and weather satellites in low-Earth orbit that could be affected by debris. At a meeting last month in Vienna, Austria, the United Nations Committee on the Peaceful Uses of Outer Space discussed draft guidelines on mitigating debris. A looming concern is that low-Earth orbit might soon suffer from the Kessler syndrome, in which the amount of orbital debris becomes so high that collisions cause a self-generating cascade that could limit satellite and human spaceflight operations for decades.

"If there is any silver lining to the Chinese testing cloud," says Theresa Hitchens, director of the Center for Defense Information, a Washington, DC, think tank, "it is that the whole world is now extremely aware of the dangers of space debris. It is my hope that this will spur nations not only to take stronger mitigation measures but to push for a binding agreement to bar any future testing or use of debris-creating weapons."

Paul Guinnessy

Experimenting with plagiarism detection on the arXiv

Starting this summer, submissions to the arXiv, the online server where many physicists check daily for new preprints, will be compared with the server's existing 400 000—and counting—manuscripts to check for plagiarism.

When plagiarism is suspected, the submission will be flagged, and the authors will get a message saying "your article has x% overlap with article 'a.' Do you really want to do this?" says Cornell University physicist Paul Ginsparg, the creator and overseer of the arXiv. The authors whose papers were copied from will not be notified.

"This will be a fun experiment," Ginsparg says. "Will we train people to be more clever and to make more word

changes? Or will there be a real change in their behavior?"

Behavior did change when University of Virginia physicist Louis Bloomfield began using software to see if his students were cheating. Checking new arXiv submissions is a good idea, Bloomfield says. "People should know it's not okay to steal. It's not even okay to publish your own stuff over and over." After he reported students who had copied, they were prosecuted. Forty-five students either left the university or were found guilty, and three degrees were revoked. "I was immersed in seemingly endless honor trials. Two years of my life were burned up. There's a lot of trouble when you open this can of

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In lieu of the traditional confrontation between theory and experiment, superstring theorists pursue an inner harmony where elegance, uniqueness and beauty define truth.

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Is further experimental endeavor **not only difficult and expensive but unnecessary and irrelevant?** Contemplation of superstrings may evolve into an activity as remote from conventional particle physics as particle physics is from chemistry, to be conducted at schools of divinity by future equivalents of medieval theologians. For the first time since the Dark Ages, we can see how our noble search may end, with faith replacing science once again. Superstring sentiments eerily recall "arguments from design" for the existence of a supreme being. Was it only in jest that a leading string theorist suggested that "superstrings may prove as successful as God, Who has after all lasted for millennia and is still invoked in some quarters as a Theory of Nature"?

... might be the sort of thing that Wolfgang Pauli would have said is "not even wrong."

... Not even a politically popular "Superstring Detection Initiative" with a catchy name like "String Wars"...

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Instead of the traditional confrontation between theory and experiment, superstring theorists pursue an inner harmony of truth and beauty.

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Is further experiment **not only difficult and expensive but unnecessary and irrelevant?** Contemplation of superstrings may evolve into an activity as remote from conventional particle physics as particle physics is from chemistry, to be conducted at schools of divinity by future equivalents of medieval theologians.

Superstring proponents eerily recall "arguments from design" for the existence of a supreme being. Was it only in jest that a leading string theorist suggested that "superstrings may prove as successful as the geocentric universe, which has after all lasted for millennia and is still invoked in some quarters as a Theory of the Universe", but is not even wrong?

...

A warning will be sent to authors who submit a document that overlaps with other material in the arXiv. This mockup was constructed by Paul Ginsparg from an article he and Sheldon Glashow wrote for PHYSICS TODAY (May 1986, page 7).

worms. Plagiarism shouldn't be tolerated, but you need a professional organization to handle the heat."

The arXiv's automated scanning for overlapping text is a refinement of an algorithm used last year by Cornell computer science graduate student Daria Sorokina to look at the server's then nearly 300 000 documents. The algorithm assigns unique numbers to word sequences and then compares those numbers across documents. Common phrases such as "this work was supported in part by" are excluded. "There is nothing new about document fingerprinting," says Cornell computer scientist Johannes Gehrke, an adviser on the project. "The novelty here was the application to the arXiv."

In the study, about 10% of arXiv manuscripts had text blocks that overlapped with other documents. After removing instances of authors reusing parts of their own text, different collaborators on a single project using the same text in separate conference abstracts, and other apparent false positives, less than 1% of manuscripts were still suspect, says Sorokina.

Close examination of 20 pairs of documents with among the highest levels of overlap exposed 16 as plagiarism. "In one case, an author copied descriptions of five or six methods that he was comparing," says Sorokina. "He didn't cite the sources. But the work of comparing was his own." One of the most common types of plagiarism found was the lifting of introductory or background material, especially in PhD theses, says Ginsparg. "The surprising thing is that people sub-

mit to the same database where they found [what they copied]. It's mind boggling, given the existence of Google, given the existence of searching on full text, that people wouldn't have an intuition that they would be caught."

"Some of it is different ethical norms," Ginsparg adds. "People in different countries, with different intellectual backgrounds, will sometimes argue that what they are doing is completely correct." The reassuring thing, he adds, "is that the most creative people, who are generating the ideas, don't have to start from someone else's article as a template. We'd be very surprised if authors of prominence showed up as perpetrators as opposed to victims."

Document fingerprinting catches only word-for-word plagiarism. But work is under way in the data-mining community on author identification and detection of the flow of ideas, says Gehrke. "Detecting content-based similarities with more sophisticated methods on a macroscale will be the next step."

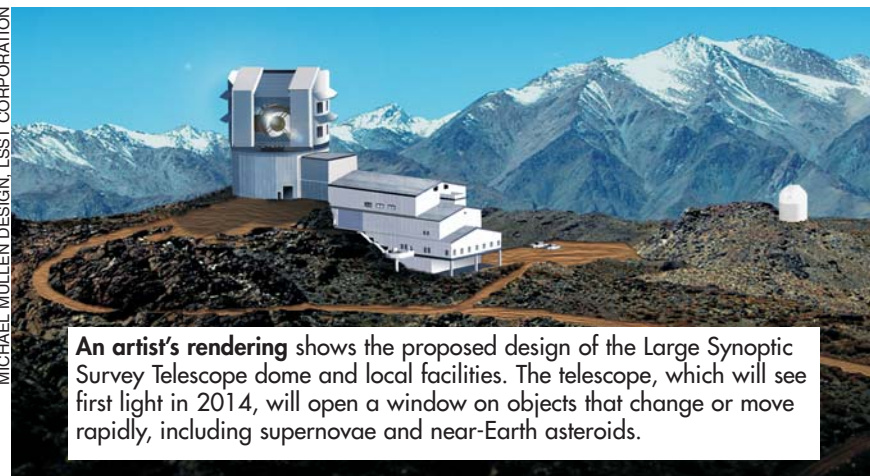
In addition to implementing a check on new submissions to the arXiv, Ginsparg is talking to the editors of *Physical Review Letters* about applying the method to it and other American Physical Society publications. "More work needs to be done to include papers outside of the arXiv, and to go across journals," says Marty Blume, the recently retired APS editor-in-chief. "We have 30 000 submissions a year. We'll have to see how much [of the editors'] time it takes to run. And if we do it, what do we do with the results?" **Toni Feder**

Google to handle telescope data

Nearly a decade ago, Anthony Tyson and some colleagues at Bell Labs were mulling how dark matter and dark energy might be studied, a notion that later led to the idea of designing a huge tele-

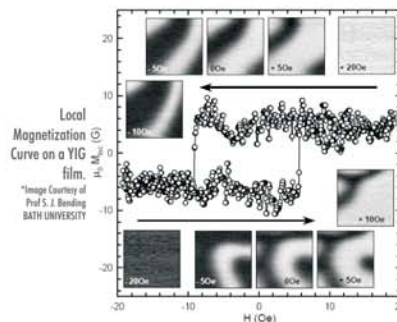
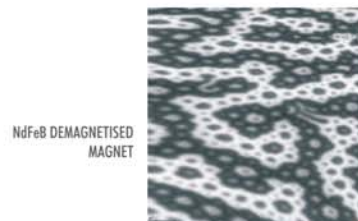
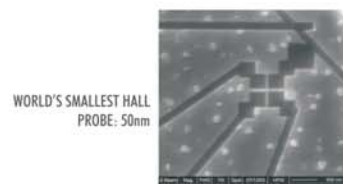
scope. Meanwhile, another group at Bell wondered how to manage gargantuan amounts of data. Over the years, members of the two groups worked together on a telescope concept even as many left

MICHAEL MULLEN DESIGN, LSST CORPORATION



An artist's rendering shows the proposed design of the Large Synoptic Survey Telescope dome and local facilities. The telescope, which will see first light in 2014, will open a window on objects that change or move rapidly, including supernovae and near-Earth asteroids.

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