

tinuing resolution, such as the \$3 billion taken from military base closings. The statement also called for more money for science, saying Congress should have added another \$450 million to basic research funding.

With the continuing resolution crisis apparently averted and all sides in Washington seemingly supporting increased science funding, can Lubell and other science advocates declare victory and relax?

As the administration pushes for

the elimination of the federal deficit—predicted to be about \$340 billion for FY 2007—and as Democrats in Congress adopt a “pay as you go” approach to funding, the competition for money will only become more intense. And because, as Lubell said, “science isn’t a spending program, it’s an investment program,” it is more difficult to sell to members of Congress who like to bring tangible projects back to their constituents.

Jim Dawson

China raises stakes on space arms race

China’s 11 January shooting of a satellite with a ground-to-space medium-range ballistic missile sparked concern worldwide about space debris and about the threat of a reinvigorated space arms race. The destruction of the Feng Yun-1C, an 850-kg retired weather satellite, marked China’s first successful test of an anti-satellite weapon. Ironically, the test came just weeks before China was to host the 25th meeting of the Inter-Agency Space Debris Coordination Committee.

According to NASA’s orbital debris program estimates, the collision scattered more than 35 000 shards larger than 1 cm. The North American Aerospace Defense Command has counted 2500 pieces of debris larger than 5 cm, making the collision the largest space debris event in recorded history (see page 100 in this issue).

“Of the 2782 satellites we have data for, 1860 satellites pass through the region now affected by debris from the Chinese test,” says T. S. Kelso from the Center for Space Standards and Innovation in Colorado Springs, Colorado. He adds that

trying to calculate whether a piece of debris will hit an active satellite is like “trying to assess the risk of someone in a group of people you know getting killed over the next 10 years.”

“How long debris stays in orbit depends on the altitude of the breakup,” says David Wright of the Union of Concerned Scientists. Wright and Wang Ting of the Beijing University of Aeronautics and Astronautics have calculated that more than half of the debris will stay in orbit for at least 20 years, compared to months for a lower-altitude collision.

The test came as a surprise, even to some parts of the Chinese government. The Second Artillery Corps, which fired the missile from Xichang Space Center, answers only to President Hu Jintao. “No one is exactly sure why or how the decision to test was made,” says Wright. The world waited 10 days for an official response from the Chinese government: On 21 January, foreign ministry spokesperson Liu Jianchao stated that the test should not be considered a hostile act and that China was not participating “in any arms race in outer space.”

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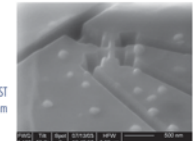
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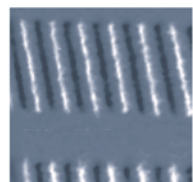
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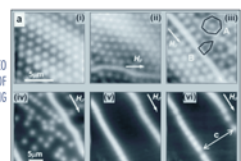
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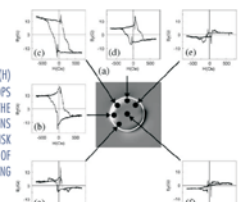
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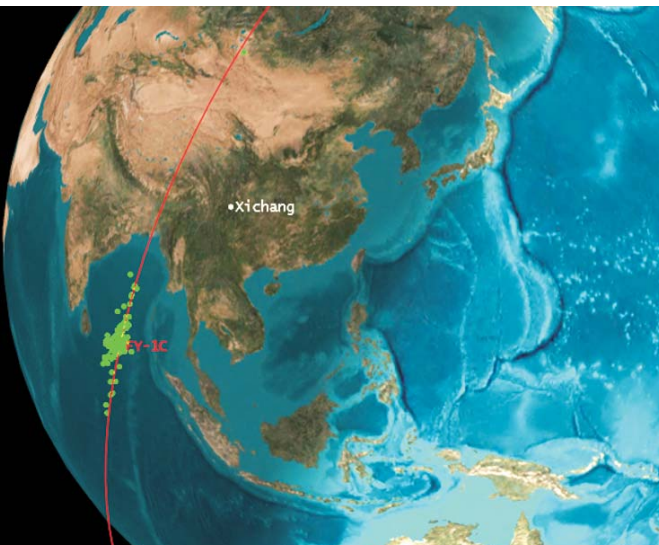


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A threat?

Space junk from the weather satellite annihilated by China’s anti-satellite missile test spreads into a polar orbit. This composite image was made two hours after the collision; for an image at a later time, see page 100.



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

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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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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?

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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).