

## Space Junk

"The Junkyard in Orbit" by Bhupendra Jasani and Martin Rees, in *The Bulletin of the Atomic Scientists* (Oct. 1989), 6042 S. Kimbark, Chicago, Ill. 60637.

Space may be the Final Frontier, but it is also fast becoming the Ultimate Junkyard.

In addition to the roughly 350 active satellites orbiting the Earth in "inner space," there are some 7,000 hefty pieces of space garbage—including upper stages of launchers, booster motors, and dead satellites. Far more hazardous are the 30,000–70,000 pieces of junk, ranging in size from one to 10 centimeters, that are too small to track from Earth. These include fragments of exploded satellites, screwdrivers left behind by absent-minded astronauts, and assorted other detritus. Then there are billions of even smaller bits and pieces from the same sources.

It's an accident that's not waiting to happen, write Jasani and Rees, researchers at

Britain's Royal United Services Institute and its Institute of Astronomy, respectively. In July 1983, for example, the U.S. space shuttle *Challenger* was hit by a speck of paint (0.2 millimeter in size) that chipped one of its windows. Several mysterious satellite failures over the years may well have been caused by collisions with space trash. It is only good luck that no lives have yet been lost, the authors say.

Jasani and Rees favor a treaty among the space-faring nations to stop the expansion of Earth's Junk Belt. Much of the space junk is needlessly lost in space: spent rockets are left in orbit, and defunct satellites are frequently blown up for security reasons. In the future, such leftovers could be safely returned to Earth.

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## RESOURCES & ENVIRONMENT

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### Apocalypse: The Sequel

"The End of Nature" by Bill McKibben, in *The New Yorker* (Sept. 11, 1989), 25 W. 43rd St., New York, N.Y. 10036, and "A Reconnaissance-Level Inventory of the Amount of Wilderness Remaining in the World" by J. Michael McCloskey and Heather Spalding, in *Ambio* (No. 4, 1989), Pergamon Press, Maxwell House, Fairview Park, Elmsford, N.Y. 10523.

"I believe that we are at the end of nature," announces Bill McKibben, a frequent contributor to the *New Yorker*. "The rain will still fall and the sun will still shine," he says, but as the greenhouse effect inevitably reshapes the earth's climate, and the face of the world itself, "our sense of nature as eternal and separate" will be overturned.

Automobiles, industrial smokestacks, coal-burning powerplants, and the burning of forestland in Brazil and British Columbia all contribute to the build-up of carbon dioxide in the atmosphere that is chiefly responsible for the greenhouse effect. There is little doubt, McKibben asserts, that the average global temperature will increase by three to 10 degrees Fahrenheit within the next 80 years.

The change in climate and its impact on

the landscape—forests will retreat, deserts grow—will transform the very workings of the world. Heat waves and hurricanes, for instance, will no longer be seen as "natural" occurrences but man-made phenomena. The idea of nature as an untamed force, "such as man never inhabits," as Thoreau put it, will cease to exist.

As McKibben observes, environmentalists have warned of various global ecological catastrophes ever since Rachel Carson's famous *Silent Spring* (1962). He tends to agree with those optimists, such as economist Julian Simon, who believe that human ingenuity will ultimately prevail over such challenges as pesticides, nuclear wastes, and even the greenhouse effect. But the solutions, he believes, are part of the problem. We can invent new ways to keep ourselves alive on an increas-