

## Case 12: Space Junk

Most people agree that pollution and littering are bad for a variety of reasons. Pollution poisons the water and the air, killing or injuring many species of animals and plants. Some toxic chemicals leach into the soil and may even affect aquifers. Some airborne chemicals affect the ozone layer. Plastic waste may be ingested by animals or may entangle them as in a trap. The list of harms to the environment or to sensitive ecosystems goes on and on. However, pollution is a common byproduct of manufacturing and is sometimes quite costly to prevent, while we humans seem to shed trash everywhere we go.

We are now seriously contemplating the prospect of colonizing space and other planets. A number of entrepreneurs, including Sir Richard Branson, Jeff Bezos, and Elon Musk are pushing technology toward space flight, space tourism, and ultimately space colonization. Governments, too, are pouring resources into their space programs. NASA hopes to send astronauts to Mars around 2035, and China plans to have its own orbiting space station and lunar colony about the same time.

A predictable consequence of humans going into space is that we will take our pollution and litter with us. Free-floating space litter presents a serious threat to most spacecraft. Small debris can act the same as small meteorites by puncturing the skins of spacecraft or space suits. Large debris can collide with spacecraft with catastrophic results or can tumble to Earth. There are in fact many abandoned space vehicles still in orbit or drifting out of orbit.

Such “space junk” is dangerous mostly because floating litter doesn’t stay put. But what about litter left on the surface of extraterrestrial planets? We have already littered the surfaces of the Moon and of Mars with abandoned equipment, but, one might reason, a handful of spaceship parts will not do great damage to an entire planet. For that matter, neither would billions of tons of trash, since the Moon— and Mars for all we know—are dead planets with no ecosystem to damage. There are no plants or animals to poison, no water to pollute, no breathable atmosphere. In fact, if an economical mode of transportation were to be invented, the moon might serve as a perfect place to dump dangerous chemical or nuclear waste.

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