ATOM & COSMOS

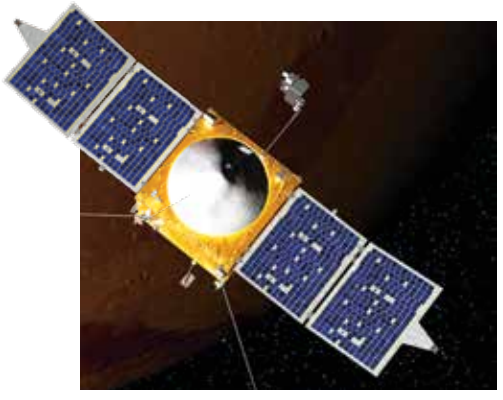
Extreme gas loss dried out Mars

The Martian atmosphere definitely had more gas in the past.

Data from NASA's MAVEN spacecraft indicate that Mars has lost most of the gas that ever existed in its atmosphere. The results, published in the March 31 *Science*, are the first to quantify how much gas has been lost with time and offer clues to how the Red Planet became a cold, dry place.

Charged particles from the sun constantly bombard Mars. Without a magnetic field to deflect this solar wind, the planet loses about 100 grams of its now thin atmosphere every second (*SN: 12/12/15, p. 31*). To determine how much atmosphere has been lost during the planet's lifetime, Bruce Jakosky of the University of Colorado Boulder and colleagues measured and compared the abundances of two argon isotopes at different altitudes. Using those measurements and an assumption about the amounts of the isotopes in Mars' early atmosphere, the team calculated that about two-thirds of all of the planet's argon has been ejected into space. Extrapolating from these data, the team estimates that Mars has lost the majority of its atmospheric carbon dioxide.

A thicker atmosphere filled with CO_2 and other greenhouse gases could have insulated early Mars and kept it warm enough for liquid water and possibly life. Losing an extreme amount of gas may explain how the planet morphed from lush and wet to barren and icy, the researchers write. — *Ashley Yeager*



Over Mars' lifetime, solar wind has expelled much of the planet's atmospheric gas, data from the MAVEN probe (illustrated) suggest.

GSFC/NASA

EARTH & ENVIRONMENT

Thinning ice creates undersea greenhouses in the Arctic

Sea ice skylights formed as Arctic temperatures rise increasingly allow enough sunlight into the waters below to permit phytoplankton blooms, new research suggests. Conditions favorable for blooms were probably rare two decades ago but now extend to about 30 percent of the ice-covered Arctic Ocean in July, scientists report March 29 in *Science Advances*.

Phytoplankton need plenty of light to thrive, so scientists were stunned by the discovery of a sprawling bloom below the normally sun-blocking Arctic ice in July 2011 (*SN: 7/28/12, p. 17*). Satellites can't peek below the ice, so scientists didn't know whether the bloom was an oddity.

Harvard University oceanographer Christopher Horvat and colleagues have now created a computer simulation of sea ice from 1986 to 2015. Warming has thinned the ice, the team found, and increased the prevalence of meltwater pools that allow more light to pass through than bare or snow-covered ice.

Whether blooms, which would alter food webs and soak up more planet-warming carbon dioxide, are more common under the ice remains unclear. The study didn't consider whether there are enough nutrients for budding blooms. — *Thomas Sumner*

BODY & BRAIN

Food odors entice tired brains

SAN FRANCISCO — The nose knows when you're tired.

Sleep deprivation seems to increase the brain's sensitivity to food smells, researchers reported March 27 at the Cognitive Neuroscience Society's annual meeting. That might make snacks more enticing, helping to explain why people who burn the candle at both ends tend to eat more and gain weight.

In a new study, adults who'd had only four hours of sleep inhaled food odors such as those from potato chips and nonfood smells like fir trees while undergoing functional MRI scans. (The scientists controlled food intake during the day.) A few weeks later, the participants repeated the test but after eight hours of sleep.

When tired, people had more brain activity in areas involved in olfaction — the piriform cortex and the orbitofrontal cortex — in response to food smells than when well-rested. That spike wasn't seen for nonfood odors, said Surabhi Bhutani of Northwestern University's medical school in Chicago. Though preliminary, the results fit with previous work showing a link between sleep deprivation and both excessive calorie consumption and weight gain (*SN: 8/24/13, p. 18*). — *Laurel Hamers*

BODY & BRAIN

More brain differences seen between girls, boys with ADHD

SAN FRANCISCO — Girls and boys with attention-deficit/hyperactivity disorder don't just behave differently. Parts of their brains look different, too. The cerebellum can be added to that mismatch, researchers reported March 25 at the Cognitive Neuroscience Society's annual meeting.

For boys, ADHD symptoms tend to include poor impulse control and disruptive behavior. Girls more often have difficulty staying focused. These differences are reflected in brain structure: Boys are more likely to show abnormalities in premotor and primary motor circuits, Stewart Mostofsky of Kennedy Krieger Institute in Baltimore has reported.

Now, Mostofsky and colleagues have looked at the cerebellum, which helps coordinate movement. Girls ages 8 to 12 with ADHD showed differences in the volume of various cerebellum regions compared with girls without the condition, MRI scans revealed. A similar comparison of boys showed abnormalities, too. But the types of differences didn't match what's seen between girls. So far, researchers have looked at 18 subjects in each of the four groups but plan to quintuple that number in the coming months.

Differences between boys and girls seem most prominent in areas that control higher-order motor functions. Those circuits help regulate attention and planning versus directing basics like hand-eye coordination, which may help explain why ADHD affects girls' behavior differently than boys'. — *Laurel Hamers*