[1.head]
Earth from Apollo 17

[1.body]
Of all the dozens of planets and moons in our solar system, only one supports life: Earth. Our planet is a delicate island of life alone in the vast, harsh sea of space—a fact that is best appreciated from afar. For example, as the astronauts of Apollo 17 headed home after the final lunar-landing mission in December 1972, they snapped this beautiful image of Africa, Antarctica, and the Indian Ocean. The photograph clearly shows the Sahara Desert (top), the lush Congo, and dozens of weather systems rippling through our life-sustaining atmosphere.

Photograph courtesy of the Astronomical Society of the Pacific
[2.head]
Optical Photo of M20, the Trifid Nebula

[2.body]
This pretty cosmic flower is the Trifid Nebula, a vast cloud of interstellar gas and dust. Gas glows pink or red, while cooler dust forms dark streaks across the nebula. Near the center of the Trifid Nebula is a triple star system—three stars that move through space together, bound in perpetual troth by their mutual gravitational attraction.

[3.head]
The Sun: A Looping Prominence

[3.body]
The surface temperature of our Sun averages a toasty 11,000 degrees Fahrenheit. But dark magnetic "storms" about 2,000 degrees cooler than their surroundings mar its surface. These storms trigger giant "prominences" that spray radiation and subatomic particles throughout the solar system. The prominence pictured here follows the contours of a powerful magnetic field from one sunspot to another, creating a bright, hot loop above the Sun's surface.

[4.head]
Peculiar Spiral Galaxy NGC 1097

[4.body]
The bright hearts of spiral galaxies are forbidding places. They may harbor giant black holes—objects so densely packed that not even light can escape their crushing gravitational grip. The core of this unusual galaxy, NGC 1097 (shown here in a computer-enhanced view), may be a case in point. Wispy jets of hot gas stream from the galaxy's core. The jets might be the remains of stars that spiraled too close to the black hole, only to be ripped apart by its powerful gravity, then hurled away from the core by strong magnetic fields.

[5.head]
Eclipse Above Stonehenge

[5.body]
More than 4,000 years ago, an ancient culture erected a mammoth ring of stones in present-day England to help mark the changing seasons. The site, called Stonehenge, might have served as an astronomical observatory, perhaps even allowing its builders to predict eclipses. Historians don't know for sure what rituals might have taken place at Stonehenge during ancient eclipses. Here, the remaining boulders of Stonehenge—some of them weighing as much as 50 tons—form silhouettes against the impressive sight of a solar eclipse.

[6.head]
Jupiter

[6.body]
The giant of the solar system, Jupiter measures about 88,000 miles in diameter—11 times greater than Earth's diameter. This ball of hydrogen and helium gas rotates on its axis so quickly that its clouds spread into broad belts that completely encircle the planet. This planetary giant houses another giant: the solar system's largest storm, named the Great Red Spot.

Photograph courtesy of the Astronomical Society of the Pacific
[7.head]
The Great Red Spot

[7.body]
The solar system's biggest blow-out is Jupiter's Great Red Spot, first seen in 1664. In more than 300 years of observations, the size and color of this monstrous hurricane have varied, but the Great Red Spot has never disappeared. A storm befitting the solar system's largest planet, the Great Red Spot is wide enough to swallow three Earths, and winds reach 1,000 miles an hour at its rim.

Photograph courtesy of the Astronomical Society of the Pacific
[8.head]
Ganymede

[8.body]
Ganymede, the solar system's largest moon, is a 4.5-billion-year-old iceball. Like a frozen confection, a layer of ice 600 miles thick surrounds its small, rocky core. The moon's most prominent feature, Galileo Regio, forms the dark circular area that covers the upper-right quadrant in this Voyager 1 photo. Galileo Regio probably is the oldest portion of Ganymede's crust.

Photograph courtesy of the Astronomical Society of the Pacific
[9.head]
Pele: Io's Largest Volcano

[9.body]
Io, one of the largest moons of Jupiter, is one of the most active bodies in the solar system. Giant volcanoes—including this one named Pele—belch tall plumes of sulfur. Some sulfur escapes Io entirely to form a doughnut-shaped ring around Jupiter. Observations by ground-based telescopes indicate that Pele remains active, just as it was when the Voyager probes glimpsed it in 1979.

[10.head]
Jupiter's Galilean Satellites

[10.body]
In 1610, the great Italian astronomer Galileo Galilei turned the universe inside out. Using a small, crude telescope, he discovered four moons orbiting the planet Jupiter. The moons (clockwise from top left) are Io, Europa, Callisto, and Ganymede. Collectively, they're called the Galilean satellites in the astronomer's honor. Religious dogma of the day held that all celestial objects orbited Earth. By proving Jupiter the center of its own system of moons, Galileo disproved that belief. The Inquisition forced him to recant his findings, and he spent the final years of his life

under house arrest. Galileo's crime? He endangered the existing religious and social order by finding new order in the heavens.

Photograph courtesy of the Astronomical Society of the Pacific
[11.head]
Landsat Photo of the Amazon Basin

[11.body]
Maps of remote, sparsely populated regions are sometimes sketchy, but satellite photos can fill in some of the blanks. This picture, snapped by the Landsat spacecraft, shows details of the Amazon River at its junction with the Rio Negro. Similar photos help scientists track the destruction of the giant Amazon rainforest.

[12.head]
Comet West, March 9, 1976

[12.body]
Comets are tiny, no more than a few miles in diameter, yet their tails can stretch across hundreds of thousands of miles. Comets actually sprout two tails. One contains dust (white in this 1976 photo of Comet West), while the other contains gas. The Sun causes the two tails to point in slightly different directions.

[13.head]
Comet Halley, March 4, 1986

[13.body]
For more than a hundred generations, this was the most terrifying object in the solar system: Halley's Comet. Until modern times, comets were considered omens of evil. Because it visited Earth's skies more often than any other comet, Halley was the most feared. Today, we know that Halley—shown here in an image computer-enhanced to bring out subtle details in its tail—is little more than a "dirty snowball" that sprouts a bright, beautiful tail every time it sails near the Sun. Next scheduled appearance: 2061.

[14.head]
GOES Image of North America

[14.body]
One of the great inventions of the Space Age is the weather satellite. With the aid of these high-flying eyes, meteorologists track hurricanes and other weather systems as they develop. This image, snapped by one of the GOES series of weather satellites, shows several storm systems, including one over Central America and another just off the eastern Canadian coast.

[15.head]
Antares and Gas Clouds

[15.body]
To take a star's temperature, just look at its color. For example, the red color of the large star (named Antares) at the lower-right part of this photo indicates a surface temperature of about 5,000 degrees. Compare that to our hotter yellow Sun, at about 11,000 degrees Fahrenheit. Color also tells astronomers a great deal about the clouds of gas and dust between the stars. A pink or red cloud, called a nebula, glows like a neon light, the result of extra energy pumped into the

cloud by nearby hot stars. A blue nebula, on the other hand, merely reflects the light of nearby stars, much like the bottom of an Earthly cloud illuminated by the glow of city lights.

[16.head]
Saturn

[16.body]
Beautiful, ringed Saturn is the planetary equivalent of a cork: If you could drop it into a giant ocean, it would float. That's because Saturn is composed almost entirely of hydrogen, the lightest chemical element. Its low density gives Saturn a bit of a spare tire around the waist. As Saturn spins on its axis, centrifugal force pushes material inside the loosely packed planet outward, making Saturn about 9,000 miles thicker through its equator than through its poles.

[17.head]
Saturn's Rings

[17.body]
For centuries, astronomers thought a few broad but widely separated rings encircled Saturn, but this Voyager photograph shows thousands of individual rings. Combined, the rings measure about 150,000 miles wide, but only a few feet thick. The seemingly delicate rings really contain countless pieces of ice and rock—some as small as a snowflake, others as big as a house.

[18.head]
Earthrise

[18.body]
Because the same half of the Moon always faces Earth, our planet can never rise or set for viewers on the Moon's surface. There's only one way to see Earth rise above the surface of the moon, and that's from lunar orbit. Only 24 humans have witnessed Earthrise. They were Apollo astronauts, like the three-man crew of Apollo 10 that snapped this photo.

[19.head]
Tycho's Supernova

[19.body]
One evening as he walked home to supper in 1604, the Danish astronomer Tycho Brahe noticed a bright new star in the heavens—a star so bright that it was visible during daylight. The star really wasn't new, though. Instead, it was a supernova, or a cataclysmic explosion that blasted a "normal" star to smithereens. Today, radio telescopes give astronomers electronic "ears" to listen to radio waves and study what remains of the supernova—a giant shell of hot gas that's expanding at several thousand miles an hour.

[20.head]
Solar Prominence

[20.body]
Our Sun is a seething cauldron of superhot gases. Occasionally, the cauldron bubbles over, and geysers of hot gas, called solar prominences, erupt into space. The prominence in this photograph extends more than 200,000 miles from the Sun's surface—a distance equal to 25 Earths stacked atop one another.

[21.head]
Orion Nebula

[21.body]
Some of the most beautiful celestial objects are bare wisps of nothingness. One example is the Orion Nebula, a colorful cloud of gas and dust in the constellation Orion. Although it shines brightly in this photograph, the nebula is little more than a vacuum. But several hot, young, bright stars inside the nebula make it glow like a gigantic neon light—a wispy beacon that's visible across 1,500 light-years of space.

[22.head]
Full Moon

[22.body]
Of all the sights in our night sky, none is more impressive than the full Moon. But as time passes, the view is becoming less and less impressive. That's because the Moon is moving away from Earth at a rate of about an inch and a half per year. At the same time, the length of Earth's day is increasing. Sometime in the far distant future, the length of the day will exactly match the time it takes the Moon to orbit our planet. When that happens, the Moon will remain suspended in Earth's sky, never to rise or set again.

[23.head]
Bootprint on the Moon

[23.body]
A million years from now, or 10 million, or perhaps even 100 million, this bootprint will still look sharp and fresh because the Moon has no wind or rain to wipe it away. One of Neil Armstrong's first steps on the surface of the Moon left this mark on July 20, 1969. In all, 12 American astronauts trotted across the stark lunar landscape. The last to leave its surface, Eugene Cernan, departed in December 1972. Hundreds of years from now, lunar tourists might follow the tracks of these first lunar explorers.

[24.head]
Galaxy M33

[24.body]
We live inside a vast "island universe" of stars called the Milky Way Galaxy. As a "spiral galaxy," the Milky Way resembles a cosmic pinwheel, with a series of delicate spiral arms encircling a bright, fat core. From inside the galactic disk, we can't see the Milky Way's structure. But if we could see it from afar, the Milky Way would look much like this galaxy, M33, which is about 2.4 million light-years from Earth. Both M33 and the Milky Way are members of the Local Group, a collection of galaxies that move through space together.

[25.head]
Neptune

[25.body]
As Voyager 2 stared at Neptune when it raced past the planet in August 1989, Neptune stared back. Like Jupiter, the planet is dominated by a monstrous storm, in this case a storm big enough

to swallow Earth. Jupiter's storm is called the Great Red Spot, so astronomers decided to call Neptune's storm the Great Dark Spot. Heat deep inside the planet's interior feeds the storm. Wispy white clouds in the upper reaches of Neptune's atmosphere accompany the Great Dark Spot.

Photograph courtesy of the Astronomical Society of the Pacific
[26.head]
Triton

[26.body]
This is the coldest spot in the solar system: Triton, the largest moon of Neptune. Almost 400 degrees below zero Fahrenheit, the moon's surface is solid ice covered by a pink methane frost. Because Triton orbits backwards around Neptune, many astronomers suggest that Triton formed elsewhere in the solar system, only to be captured by the giant planet. The unusual orbit dooms Triton to an early death: In 100 million years or so, it will spiral so close to Neptune that the planet's gravity will rip it apart. Eventually, the moon's remains will form a spectacular system of rings.

Photograph courtesy of the Astronomical Society of the Pacific
[27.head]
Europe from Space

[27.body]
The only boundaries visible from space are natural ones: oceans, seas, mountain chains, and other features. In this false-color image of Europe, for example, the Pyrenees mountains separate Spain from France, while the Alps mark the northern edge of Italy.

[28.head]
Venus in Ultraviolet

[28.body]
Venus is named for the Roman goddess of beauty, but it's not a pretty place to visit. Sulfuric-acid clouds completely blanket the planet, hiding its surface from view. The temperature at the surface is a sizzling 900 degrees Fahrenheit, and the atmospheric pressure is 90 times greater than Earth's. As a result, no spacecraft has ever survived at the Venusian surface for more than a few minutes.

Photograph courtesy of the Astronomical Society of the Pacific
[29.head]
Region Around the Horsehead Nebula

[29.body]
One of the easiest constellations to find, Orion is also one of the most interesting to study. Part of its beauty comes from Orion's Belt, a short line of three bright stars marking the constellation's center. The belt's easternmost star, Alnitak, shines brightly at the left of this image. It appears near the Horsehead Nebula, two clouds of interstellar gas and dust that form the dark outline of a horse's head. The horsehead itself spans about one light-year—almost six trillion miles.

[30.head]
Spiral Galaxy M81

[30.body]
Once every few years, a celestial discovery sends astronomers scrambling for their telescopes. In

March 1993, one such discovery took place in this spiral galaxy, called M81. The event? A supernova explosion—a blast so powerful that it ripped a giant star to shreds. The supernova was clearly visible across the 10 million light-years that separate Earth and M81. The explosion might have left a bit of cosmic ash, such as a neutron star.

[31.head]
Shuttle Discovery: Return to Space

[31.body]
Space shuttle Discovery awaits the first shuttle launch since the destruction of Challenger more than 32 months earlier. With new booster rockets and more than 400 other improvements, Discovery safely put the American shuttle program back in business on September 29, 1988.

[32.head]
Mars with Starfield

[32.body]
Orson Welles once scared the pants off America by broadcasting a mock invasion from Mars. In future centuries, Earthlings are likely to invade Mars instead. Aside from Earth, Mars is the most hospitable planet in the solar system, with a thin atmosphere, bearable (if frigid) temperatures, and frozen water locked in its polar ice caps. Centuries from now, people might melt the ice caps to transform Mars into a warm, wet world—a second home for humanity and a stepping stone to the stars.

[33.head]
Olympus Mons Caldera

[33.body]
Millions of years ago, Olympus Mons belched billions of tons of molten rock onto the stark surface of Mars. Today, this giant volcano is extinct, but its caldera—the pit at the top of the volcano—is clearly visible. The caldera actually consists of two separate pits, indicating that the volcano flared to life twice. Stretching about 70 miles across, the caldera is so wide that you couldn't see the opposite side if you stood atop the rim.

Photograph courtesy of the Astronomical Society of the Pacific
[34.head]
Candor Chasma

[34.body]
Mars is a desert planet, with only a tiny amount of water frozen in its icecaps or suspended as water vapor in its thin atmosphere. But several billion years ago, giant rivers and seas probably criss-crossed the Red Planet. Scientists see traces of these ancient waterways in such features as Candor Chasma, which looks like it was carved by a lake.

Photograph courtesy of the Astronomical Society of the Pacific
[35.head]
Viking 2 Lander View with Frost

[35.body]
It's always sweater weather on Mars. Temperatures almost never climb above freezing. During the harsh winter in the southern hemisphere, the temperature can plunge to more than 200 degrees below zero Fahrenheit. The planet's thin atmosphere holds just enough water vapor to create frost, such as that blanketing the Utopian Plains where Viking 2 landed in 1976.

Photograph courtesy of the Astronomical Society of the Pacific
[36.head]
Alone in Orbit

[36.body]
Two spacecraft orbited Earth during this February 1984 space shuttle mission. One was the shuttle Challenger. The other was astronaut Bruce McCandless, who became the first human to fly free of his ship. During all prior American and Soviet spacewalks, the astronaut or cosmonaut remained connected to the mothership by a lifeline. However, McCandless successfully tested the Manned Maneuvering Unit—a Buck Rogers-style backpack that uses small gas jets to push the astronaut through space.

[37.head]
Aurora Borealis

[37.body]
The Sun might not shine on the frozen north during the long winter months, but it makes its presence known. The aurora borealis fills the sky with shimmering sheets of color—reds, blues, and greens dancing like cosmic veils. The northern lights (and similar displays in the southern hemisphere) occur when electrically charged particles from the Sun bombard the Earth. In turn, Earth's magnetic field directs the particles toward the magnetic poles, where they ram into atoms high above our planet's surface. This atomic "kick" causes the atoms to glow, giving skywatchers a thrilling light show.

[38.head]
Uranus

[38.body]
To human eyes, the planet Uranus looks like a featureless blue-green orb, like a giant Christmas-tree ornament. The color results from frozen methane, which absorbs red light, high in the planet's atmosphere. Fortunately, though, scientists aren't limited to what their eyes can see. As the image at right demonstrates, computer processing can highlight subtle differences, allowing scientists to learn even more about Uranus and its frigid atmosphere.

Photograph courtesy of the Astronomical Society of the Pacific
[39.head]
Blue Planet

[39.body]
Earth is a world of water. More than 70 percent of our planet's surface is covered by oceans; the largest, the Pacific, dominates this satellite photo of much of the western hemisphere. The oceans provide moisture for the storm systems that rake Earth's land masses. Because they store heat, they also act as thermostats, regulating temperatures in our atmosphere.

[40.head]
Mercury

[40.body]
No, this isn't the Moon. It's a Mariner 10 view of Mercury, the planet nearest the Sun. Mercury is similar to our Moon, though—a waterless, airless world covered with thousands of impact craters. Because it's so close to the Sun, Mercury is hotter than the Moon, with daytime temperatures at

the equator soaring to 700 degrees Fahrenheit. Even so, astronomers have detected possible ice caps at Mercury's north and south poles.

[41.head]
Solar Max Studies of the Sun's Corona

[41.body]
This psychedelic image is the Sun's corona, a tenuous outer atmosphere where temperatures can reach three million degrees. The Solar Maximum Mission satellite—Solar Max for short—used electronic instruments to capture this image, which was computer-enhanced to show highlights in the corona's structure.

[42.head]
Repairs in Orbit

[42.body]
Sometimes things work right, sometimes they don't. In April 1985, astronauts deployed a communications satellite from the space shuttle Discovery. But the satellite didn't work, so two crew members tried to turn it on during a three-hour spacewalk. Here, astronauts Jeffrey Hoffman (left) and S. David Griggs (right) attach some of their equipment to a Canadian-built robot arm. The astronauts flipped the right switch, but the satellite still didn't work. Another shuttle crew completed the repairs four months later.

[43.head]
Horsehead Nebula

[43.body]
When we watch clouds roll by on a lazy summer afternoon, we often "see" familiar objects in their shapes. The same thing happens when we watch vast clouds of interstellar gas and dust. One example is the Horsehead Nebula—the dark silhouette of a horse's head against a bright background. Like a neon sign, the bright region glows brightly as stars inside the nebula pump energy into the gas. The darker region, called the horsehead, consists of colder material located between Earth and the bright gas cloud. This cold dust blocks our view of the light beyond, creating an interesting picture among the stars.

[44.head]
Total Solar Eclipse, Mexico; July 11, 1991

[44.body]
A total solar eclipse offers both a marvelous astronomical coincidence and a marvelous astronomical laboratory. An eclipse is possible because, although the Sun is 400 times larger than the Moon, it's also 400 times farther from us. So when the Moon passes directly between Earth and the Sun, it blocks our star's light for a few minutes. As it does, the Sun's hot outer atmosphere, called the corona, glows brightly around the dark hole in the daytime sky, allowing astronomers to study it in great detail.

[45.head]
A Spectacular Aurora

[45.body]

The northern lights (aurora borealis) often look close enough to touch. Really, though, these curtains of light are at least 100 miles above Earth's surface, where they extend several hundred miles into space. Most of the time, only far-northern latitudes enjoy the dazzling spectacle of the northern lights. But when the Sun is especially active, spewing huge doses of electrically charged particles into space, skywatchers as far south as Texas might see the aurora borealis, too.

[46.head]
Whirlpool Galaxy (M51)

[46.body]
Few celestial sights are more impressive than this one—the Whirlpool Galaxy, a large spiral galaxy that's just south of the handle of the Big Dipper. It is a virtual twin to our own galaxy, the Milky Way. A spiral galaxy gets its distinctive whirlpool appearance from hot, bright, young stars that form in the spiral arms. The dark areas between the arms contain stars, too, but the stars are older, cooler, and fainter than the ones inside the arms.

[47.head]
Halley's Comet

[47.body]
Look! It's Halley's Comet! When the fabled comet last swept through Earth's region of the solar system in 1986, spacecraft from Europe, the Soviet Union, and Japan studied the comet from close range. They returned important information about its size, structure, and composition. But perhaps the best way to enjoy Halley—or any comet, for that matter—is from Earth, where it looks like a cosmic missile racing through the night sky.

[48.head]
The Sun in Ultraviolet

[48.body]
The surface of our sun is violent. Dark, cool magnetic storms—called sunspots—race across its surface. Sometimes, sunspots trigger solar flares—hot geysers like the one at the top of this photo that blast radiation and energetic particles into space. This image, recorded by Skylab astronauts in 1973, shows the Sun in ultraviolet wavelengths, which are invisible to human eyes. Computers assigned different colors to different wavelengths to create the image.