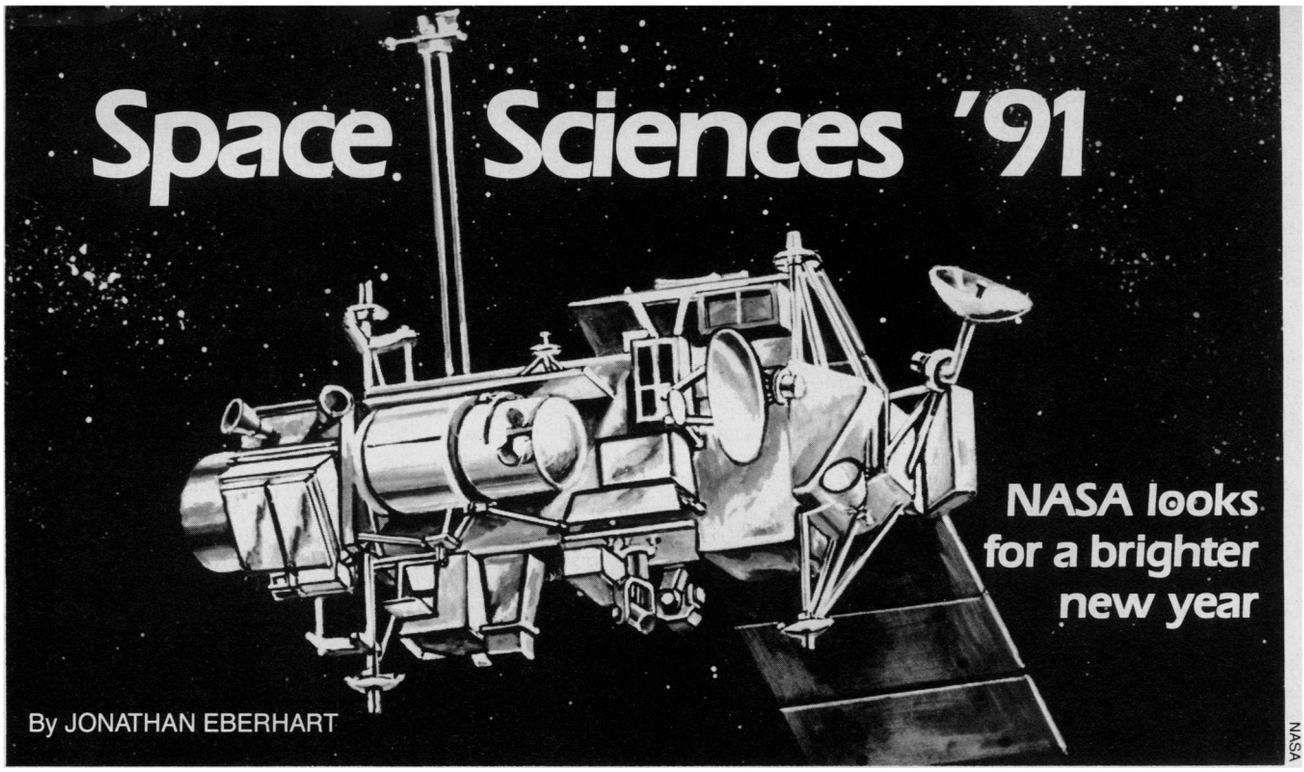

The Upper Atmosphere Research Satellite, scheduled for launch in November.

NASA hopes for better luck in 1991 than last year as it plots a series of diverse scientific feats, ranging from the first close look at an asteroid to mapping extraterrestrial sources of the most energetic radiation in the electromagnetic spectrum.

Besides the Hubble Space Telescope's flawed mirror, NASA found itself contending in 1990 with communications problems on the Venus-orbiting Magellan radar mapper, multiple woes with the shuttle-borne, multi-telescope package called Astro, and hydrogen leaks that grounded the shuttle fleet for five months.

Looking ahead, the agency's latest flight schedule for 1991 takes a more cautious approach to specific mission launch dates than did past manifests. Previously, NASA listed an exact date for each upcoming liftoff. The new schedules, released Dec. 5, specify launchings only by the month—"a reasonable expectation as to when the launch will occur," according to one of the manifest's notes.

"This manifest, we think, more accurately reflects the realities of flying space shuttles," says Brian D. Welch of NASA's Johnson Space Center in Houston. Acknowledging the range of potentially unforeseeable complications, he says, "You just can't always make a launch by a specific date."

With that as a given, the calendar calls for a rich assortment of projects in the new year:

• NASA expects its first 1991 science mission to begin in April, when the shuttle Atlantis lifts a satellite called the Gamma Ray Observatory (GRO) into a 450-kilometer-high Earth orbit. Although gamma rays constitute the highest-energy radiation in the electromagnetic spectrum, Earth's atmosphere blocks them from reaching observers on the planet's surface.

As astronomers seek evidence of black holes and neutron stars, GRO's four instruments will measure gamma-ray emissions from the Milky Way and beyond over a range of 50,000 to 30 billion electron-volts.

Though the craft is designed to last at least two years, NASA says it might extend GRO's lease on life another eight years by using an on-board propulsion system to occasionally raise its altitude.

• The calendar's next space milestone has a particular date—May 16—but this does not mark a launching. On that day, Magellan should begin radar-mapping the surface of Venus for a second time. A primary objective of this second mapping is to determine the heights of surface features. By imaging the features at a different angle this time, scientists will be able to construct three-dimensional pictures for topographical mapping.

This recharting exercise should also fill in two data gaps, says spacecraft systems engineer John P. Slonski at NASA's Jet Propulsion Laboratory in Pasadena, Calif. The first gap occurred when signal losses from Magellan forced engineers to delay the initiation of the first mapping from late last August to Sept. 15. The sun's blocking of the craft's data transmissions to Earth last October caused the second gap.

• Also in May, the shuttle Columbia will orbit Earth for eight days with Spacelab—a European-built, multipurpose science workshop—in its cargo bay. This mission, Spacelab's fourth outing, will focus on life sciences research. For example, as part of NASA's continuing effort to assess potential ill effects of long-term stays in space, the four physicians included in Spacelab's seven-person crew will test one another's physiological responses to the near-weightlessness experienced in space—including effects on balance, the lungs and the cardiovascular system.

• In July, NASA's schedule calls for astronauts aboard Discovery to deploy another of the Tracking and Data Relay Satellites. NASA uses these satellites to

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Month	Event	Vehicle
April	Gamma Ray Observatory	Shuttle Atlantis
May 16	Magellan's 2nd Venus mapping	
May	Spacelab life sciences	Shuttle Columbia
July	Tracking and Data Relay Satellite-E	Shuttle Discovery
August	Extreme Ultraviolet Explorer	Delta rocket
Oct. 29	Galileo's Gaspra flyby	
November	Upper Atmosphere Research Satellite	Shuttle Discovery
December	International Microgravity Laboratory	Shuttle Atlantis

dae to the person who suggested the best name for a newly discovered gene that left flies healthy at 22°C but caused partial paralysis and a staggered gait at 29°C. A laboratory technician won the contest by coming up with hot shi^{TS}. Shi is short for the Japanese word shibire, which means in essence "walks like a drunk." TS stands for temperature sensitive, while the prefix hot indicates that the mutant trait emerges only at warmer temperatures.

That's the way it goes sometimes, Kaufman says. "You start with the word you want to use, then you try to think of an excuse so you can get ca-ca humor into the journals." Adds Thomas A. Grigliatti, who was working in the Suzuki lab when hot shi^{TS} was named: "These things happen when people need more sleep than you recognize."

Other bizarre examples abound. A mutation that causes purplish-brown eyes goes by the name prune. A separate mutation that proves lethal only to flies carrying the prune mutation bears the name killer of prune.

Along similar lines, a family of names has sprung up around a mutation called sevenless, which leaves its victims missing the seventh of eight light receptors normally present in a fruit fly's eye. Phenotypically similar mutations now bear names such as bride of sevenless, son of sevenless and sevenless in absentia.

Another mutation, which proves nearly fatal and which, in the words of one researcher, makes flies "look like they have no right to be alive," goes by the name living dead.

Other names relate to the bristle patterns on fruit fly larvae. Hedgehog lacks the bald segments that normally intervene between bristled segments, giving larvae an especially furry appearance, while shaven baby lacks bristles altogether.

The technical knockout gene, commonly called *tko,* leaves fruit flies so exquisitely sensitive to shock that a tap against the walls of their container leaves them flat on their backs and catatonic for a few seconds or longer. And for a fruit fly whose larvae have only half the usual number of segments, there's *fushi* (Japanese for "segment of bamboo") *tatazu* ("not enough").

Finally, students of European history will appreciate Trudi Schupbach's work at Princeton University. Schupbach discovered several mutations that cause flies to bear sterile offspring. She named them after European royal families with sterility problems – such as Tudor, Valois and Vasa – whose reigns were cut short for lack of heirs. And in an elegant twist, she gave the name staufen to one of the grandchildless mutants that has an additional inherited defect causing it to lack a proper head – in memory of the infertile Holy Roman Empire family named Staufen whose last surviving member was ultimately beheaded.

Some fruit fly geneticists complain that younger researchers lack the imagination of their predecessors, and that the wild and woolly days of gene naming may be drawing to a close. In the past, says Grigliatti, "people were willing to poke fun at themselves. Now people have begun to name their genes with very serious names. People are much more conservative these days."

Kaufman concurs: "It's degenerating these days. The art is dying, I'm afraid."

Still, others say, there seems something about the field of fruit fly genetics that guarantees a continuing lineage of wackiness. Fruit fly research "bubbles with chaos," says Hall, noting that compared to almost any other field of science, "there's very little orchestration."

Quinn agrees, but says the future of Thomas Morgan's legacy is ensured by more than that. The real reason that fruit fly nomenclatural inaneness remains secure, Quinn maintains, is that most fruit fly geneticists "are not very restrained by the bounds of good taste."

And with that in mind, this story will sidestep any description of a rather peculiar mutant called tricky dick. □

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link communications between ground stations and most of its Earth-orbiting satellites.

• The Extreme Ultraviolet Explorer satellite (EUVE) will get an August launch from an unmanned Delta rocket. This 2½-year mission aims to make the first sky survey of spectral emissions between ultraviolet light and X-rays. These wavelengths are particularly useful for studying stars that have matured into compact, ultrahot "white dwarfs."

EUVE will carry four telescopes to chart about 95 percent of the sky to an accuracy of 0.1 degree. It will also conduct follow-up observations of particularly interesting extreme-ultraviolet sources and measure the opacity of the interstellar medium.

Engineers designed this satellite so that when its original mission ends, shuttle astronauts can replace its scientific instruments with another batch. This in-orbit substitution will transform EUVE into the X-ray Timing Explorer, a probe to measure fluctuations in the brightness and spectrum of bright X-ray sources for studies of neutron stars and black holes.

• On Oct. 29, the Galileo spacecraft will become the first satellite to closely examine an asteroid. Since its launch on Oct. 18, 1989, Galileo has sped through an intricate route of speed-increasing gravity maneuvers that have already whipped the craft around Venus and Earth. The probe's ultimate goal is to orbit Jupiter in 1995.

On its way, Galileo will pass "minor planet" Gaspra. This rocky asteroid seems unlikely to prove a star of the mission, since the limited spectral measurements available from Earth suggest it is just a chunk of stone some 15 km across. Galileo should whip by Gaspra at a relative top speed of more than 28,800 km per hour, taking pictures and spectral measurements as it passes within 1,600 km of the asteroid's surface.

The spacecraft will continue along a circular route carrying it past Earth again on Dec. 8, 1992. After this second, accelerating rendezvous with its home planet, Galileo will finally head for Jupiter, possibly passing a second asteroid named Ida along the way.

• The protective ozone layer in Earth's upper atmosphere – imperiled by some chemicals including the chlorofluorocarbons – will be the focus of the Upper Atmosphere Research Satellite (UARS), set for release from the shuttle Discovery in November. Expected to operate for three years, UARS will carry nine instruments to compile a planet-wide data base about the chemistry and motions of the upper atmosphere, the effects of the sun's radiation on the upper atmosphere, and changes in the amount and distribution of ozone and other atmospheric gases.

• In December, the shuttle Atlantis will carry the International Microgravity Laboratory aloft to study how the reduced gravity of space affects the properties of different materials and the workings of mechanical devices. NASA hopes the microgravity study will, like Columbia's biomedical mission in May, help write the textbooks for astronauts working on space station Freedom. The European Space Agency, France's National Center of Space Studies, the National Research Council of Canada, Japan's National Space Development Agency and the German Aerospace Research Establishment helped NASA develop the mission.

Scientists continue to await the detection – which may or may not occur this year – of the shock wave formed where the solar wind collides at supersonic speed with a similar flow of charged particles coming in from other stars. The only craft that might do the job are Voyagers 1 and 2 and Pioneers 10 and 11. Launched between 1972 and 1977, all four are now headed away from the sun toward an invisible zone called the heliopause – a region that some scientists define as the true edge of the solar system. □