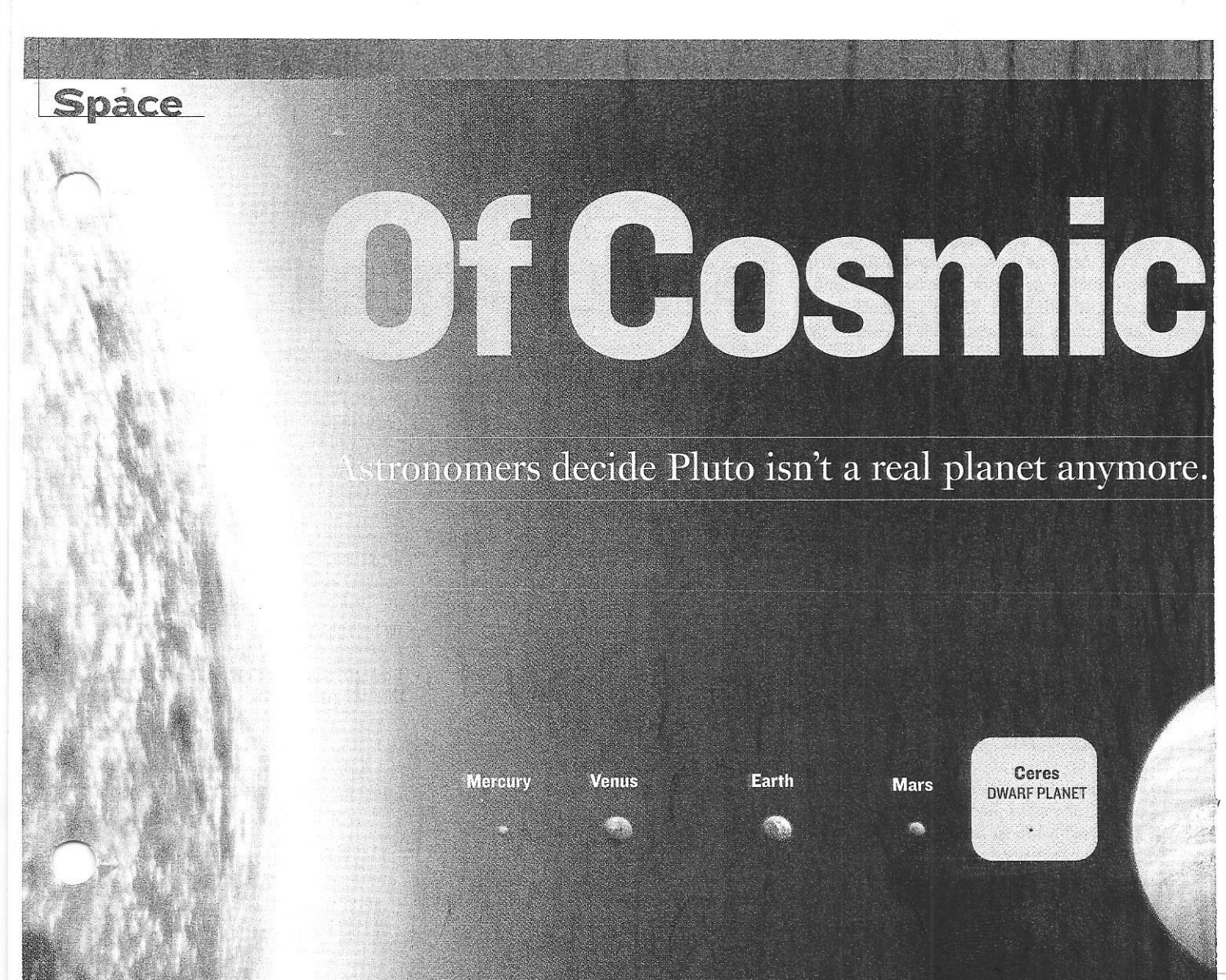
Of Cosmic

Astronomers decide Pluto isn't a real planet anymore.

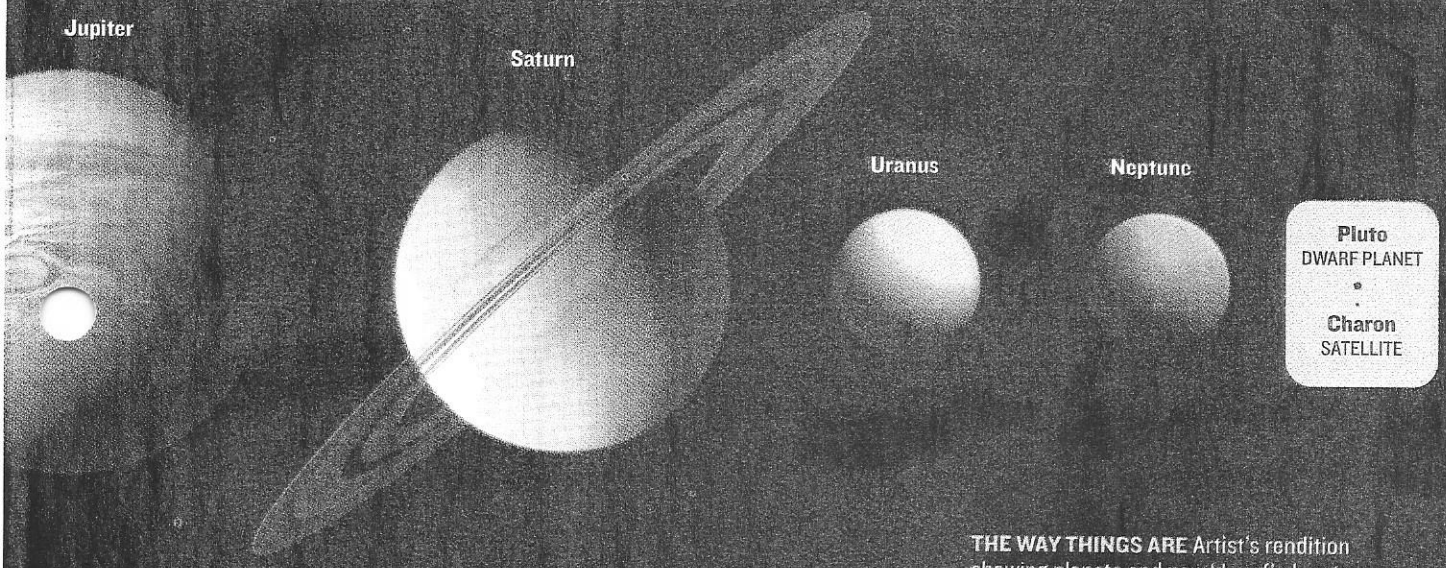


BY JERRY ADLER

IT'S A MERCIFUL THING THAT CLYDE TOMBAUGH WASN'T AROUND to see this day. Tombaugh, the ambitious Kansas farm boy who discovered the ninth planet, Pluto, in 1930, departed Earth in January 1997, when he died at the age of 90. And then Tombaugh departed it again last January, when his cremated ashes were blasted into space aboard the New Horizons space probe. But while New Horizons was streaking through the asteroid belt last week en route to a rendezvous with Pluto in 2015, a group of astronomers on Earth decreed that its destination now belonged to a new category of heavenly body, a "dwarf planet." Tombaugh knew something like that was afoot before he died, according to his 93-year-old widow, Patricia, who added that as a man of science, he would have understood the decision. For her part, though, she confessed some disappointment. "I feel like I sort of got demoted from my job being the wife of the discoverer of Pluto," she told the

Proportions

Why they did it — and how our view of the universe is changing.



THE WAY THINGS ARE Artist's rendition showing planets and new 'dwarf' planets. Sizes, but not orbits, are to scale.

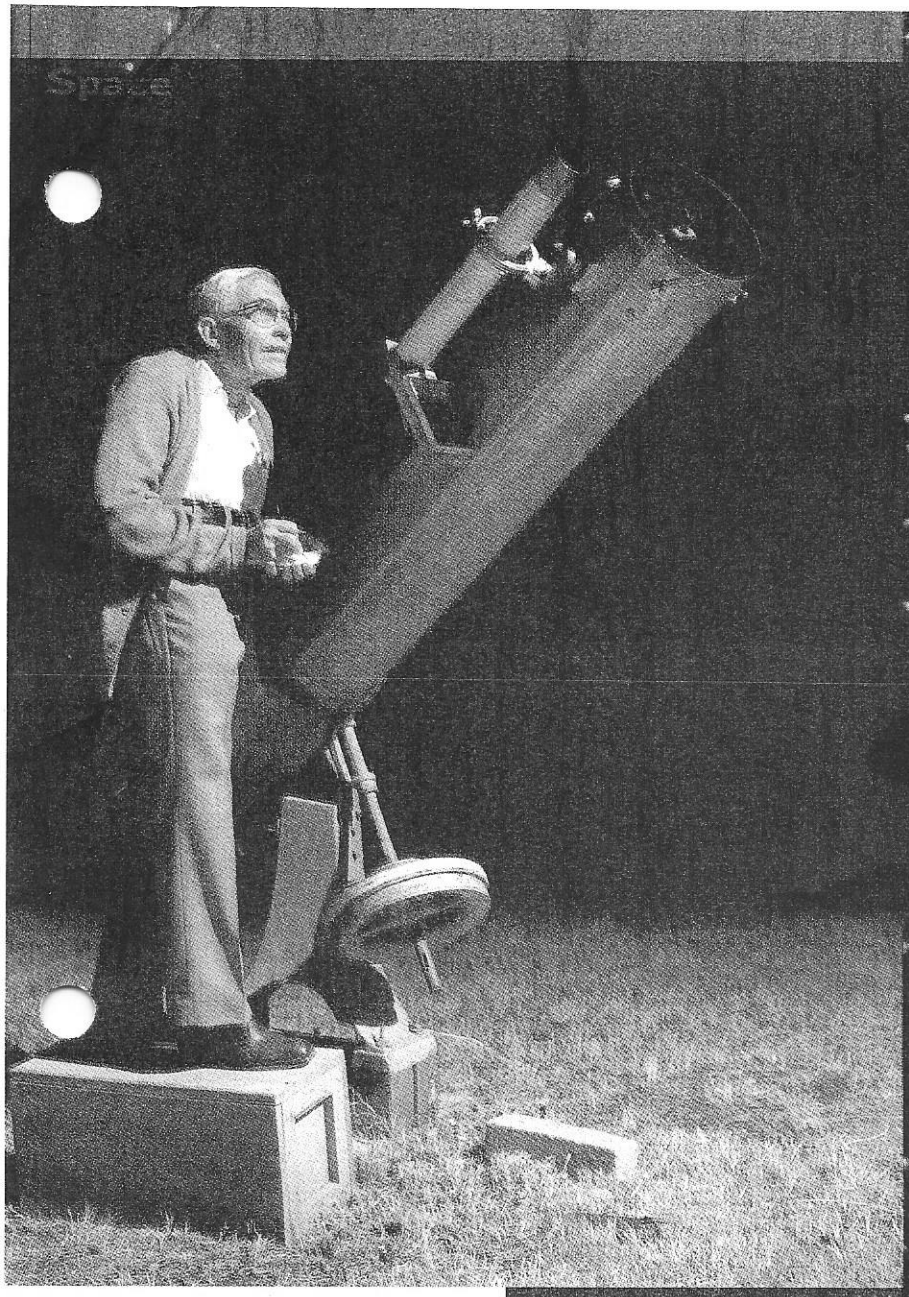
Arizona Daily Star. "Now I'm the wife of the discoverer of a dwarf planet."

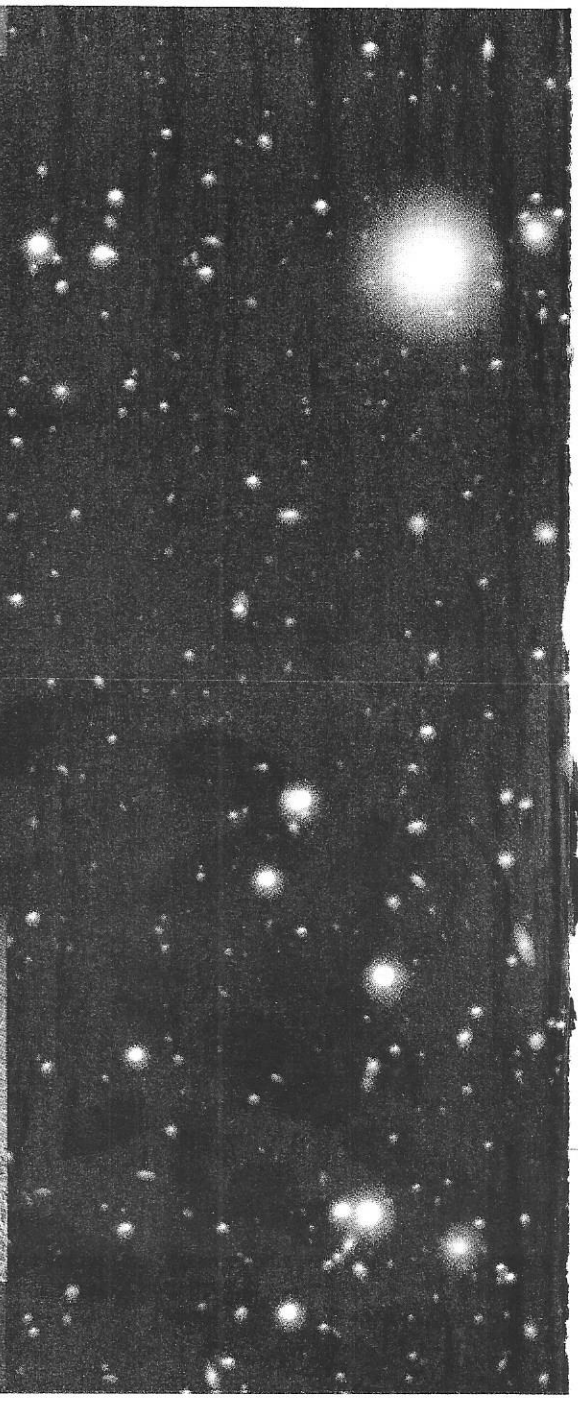
It's not surprising that she should care. But what about the rest of us? Why is the world so captivated by the fate of this remote and almost invisible world that, if it landed on Earth, would barely stretch from Boston to Tulsa? This knob of rock and frozen nitrogen dwells so far out in the solar system—averaging about 3.6 billion miles, or almost 40 times the distance from Earth to the Sun—that in the 76 years since its discovery it didn't get to complete even a third of its orbit. And, of course, it [illegible] not really its "fate" that was at stake, but an arbitrary designation whose impact will largely fall on textbook publishers, planetarium gift shops and astrologers. The debate and vote by the International Astronomical Union at its meeting in Prague was a little reminiscent of the earnest discussions a few years back about whether the 21st century began on Jan. 1, 2000, or 2001.

But then why was Matthew Malkan, a UCLA astronomer, deluged with e-mails from people he hadn't heard from in years, wanting to talk about the IAU meeting (which he skipped, although he says now if he'd realized what a big deal it would turn out to be he might have attended). Why did Jan Weiss, visiting the Rose Center for Earth and Space at the American Museum of Natural History, feel a pang of sadness at the news about Pluto? "You grow up and there are nine planets, and now there aren't," she mused. "Imagine all those dorm rooms where they have to scrape Pluto off the ceiling."

But the solar system we thought we knew is changing faster than most of us can keep up with—part of a larger process of expanding our view of the universe. Who imagined, even a few decades ago, that we would someday see upclose giant hurricane-like storms sweep across the surface of Saturn? The revisions began as long ago as the 1970s, when the Apollo mission brought back evidence that the moon had been formed out of a tremendous collision between Earth and another large object. Planets, once thought to form gradually out of coalescing dust and gas, are now viewed as the survivors of a vio-

IAU—AFP/GETTY IMAGES





THE FINAL FRONTIER Pluto discoverer Tombaugh in 1980 (above), Hubble telescope image of deep space

lent process of collision and accretion, the winners in a Darwinian competition to build up enough gravity to control one's own orbit. A planet the size of Pluto has no place in the 21st-century solar system. But it still has a role to play in science, along with the hundreds of other nearby objects discovered in just the past decade. Understanding them offers us a window on how planets like our own are born and give rise to life.

The sad truth is, Pluto's claim to planethood has been shaky ever since its discovery, which came about more or less by mistake. It is by far the smallest of the canonical nine planets—about 2,300 kilometers (1,400 miles) in diameter, smaller even than Earth's moon—and with a unique orbit, [illegible] at an angle to the plane in which the other eight planets all travel (graphic). Too faint to be seen by the naked eye and barely crawling across the night sky, it remained unknown to the ancients, who recognized five heavenly planets (Mercury, Venus, Mars, Jupiter, Saturn) traversing the unchanging backdrop of the stars. By 1846, astronomers had discovered Uranus and Neptune, which together with Earth made eight relatively large bodies circling the Sun—some, like Earth, with smaller moons in orbit around them as well.

No one suspected there might be another until the early 1900s, when astronomers—notably Percy Lowell, who founded the observatory that bears his name in Flagstaff, Ariz.—detected a perturbation in the orbits of the outermost planets, suggesting they were being tugged by the gravity of something not yet seen. Lowell, who died in 1916, devoted the last years of his life to the fruitless search for this "Planet X." (He was better known up to that point for his regrettable speculations about the "canals" on Mars, which he thought had been built by Martians.) In 1929, the job of looking for Planet X was turned over to Tombaugh, an amateur astronomy buff who had built a homemade telescope using parts from an old Buick. Tombaugh hadn't even been to college—he later graduated from the University of Kansas and went on to a distinguished career as an astronomer—but he must have had exceptional eyesight and iron patience. His job was to take two photographs of the same part of the sky on different nights—using the observatory's new 13-inch telescope—and compare

FROM LEFT TO RIGHT: DALE WITTNER—AP, NASA

them, looking for objects that had moved. Each photographic plate contained hundreds of thousands of stars. Yet in less than a year, he picked out of some 15 million specks of light the one that would be called Pluto, in just the part of the sky that Lowell had predicted. This was hailed as a triumph of American science, only slightly tarnished when astronomers later realized that Pluto was actually much too small to have any effect on the orbits of other planets. The perturbations Lowell had noticed resulted from incorrect values for the masses of Uranus and Neptune. Pluto just happened to be in the right place at the right time to be found.

At first, no one really knew the size of Pluto—some calculations suggested about as big as Earth—so calling it a planet was uncontroversial. But as more was known, astronomers began to question whether it belonged in the same category as the other eight planets. Some even wanted to call it a "comet"—a class of generally much smaller balls of ice and dust that swoop in and out of the vicinity of the Sun on highly eccentric orbits. When the Rose Center opened in 2000, its solar-system exhibit had only eight planets—provoking a flood of angry letters from second graders, according to Michael Shara, curator of astrophysics. "We're trying not to gloat," he said after the IAU vote, "but it's hard not to say we told you so."

This has nothing to do with Pluto's inherent scientific interest. "Whether you're

THE SAD TRUTH IS, PLUTO'S CLAIM TO PLANETHOOD HAS BEEN SHAKY EVER SINCE ITS DISCOVERY.

A New World Order

Last week astronomers relegated tiny Pluto to "dwarf planet" status, altering the long-established map of our solar system. Over the last few decades, astronomers have used new telescopes and data from spacecraft exploring the planets upclose to study what's out there:

Getting to Know the Planets

Since launching Explorer 1 in 1958, the U.S. has led a global effort to get a better look at the solar system. Recent missions to our planetary neighbors:

JUNE 1983: Pioneer 10, which took the first vivid shots of Jupiter in 1973, becomes the first spacecraft to fly beyond the orbits of all the planets.

JAN. 1986: NASA's Voyager 2 gives an upclose view of Uranus; its rings, 10 new moons and a boiling ocean of water are discovered.

MAY 1989: Launched from the space shuttle Atlantis, Magellan orbits Venus and sends back new [illegible]s of the planet's surface—85% [illegible]hich is covered by lava.

AUG. 1992: After years of searching, astronomers detect a reddish object just beyond Neptune's orbit. The sighting confirms the existence of a region on the solar system's edge—the Kuiper Belt—that's home to Pluto and thousands of comets and other icy bodies.

JUNE 1994: Sent into space to explore Jupiter, Galileo captures a comet smashing into the gaseous planet. Eighteen months later Galileo releases a special probe to investigate the planet's atmosphere.

JULY 1997: The Mars Pathfinder lands on the Red Planet, releasing a rover to explore its surface.

OCT. 2002: Astronomers at Caltech identify Quaoar in the Kuiper Belt. One of the largest objects found since Pluto was named in 1930, it consists of rock and ice, and orbits the Sun once every 288 years.

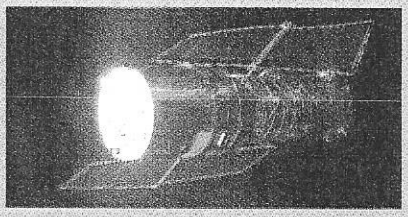
MARCH 2004: A second NASA Mars explorer, Opportunity, confirms there was once water on this planet.

JULY 2004: Cassini—launched through a partnership between NASA and two European space agencies—becomes the first spacecraft to orbit Saturn.

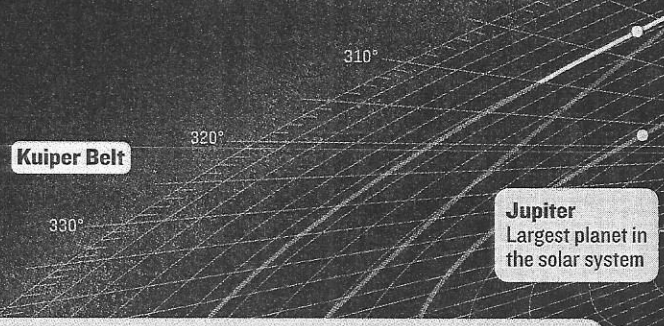
JAN. 2006: New Horizons sets off to explore Pluto and the Kuiper Belt. First shots: 2015.

Hubble Telescope

Since it orbits above Earth's atmosphere, its images of space are better than those taken from the ground. It needs repairs. Will it be fixed?

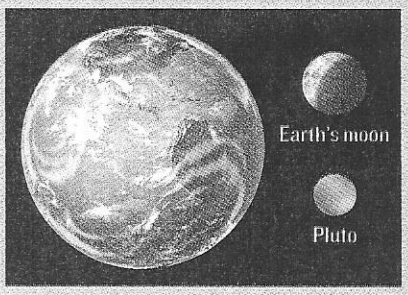


Launched: 1990
Mission duration: Up to 20 yrs.
Length: 43.5 ft.
Weight: 24,500 lb.
Diameter: 14 ft.
Altitude: 380 mi.
Power: Solar panels



Pluto: The Numbers

Pluto's mass is 1/500th that of Earth. And its diameter is just 1,400 miles: the distance between Las Vegas and Des Moines. A look at how Pluto compares with Earth and our moon.



	EARTH	MOON	PLUTO
Diameter (mi.):	8,000	2,100	1,400
Orbit around Sun (yr.):	1	n/a	248
Min./max. temp. (°F):	-126/136	-387/253	-387/-369
Orbital circumference (mi.):	574 mil.	1.4 mil.	20.4 bil.

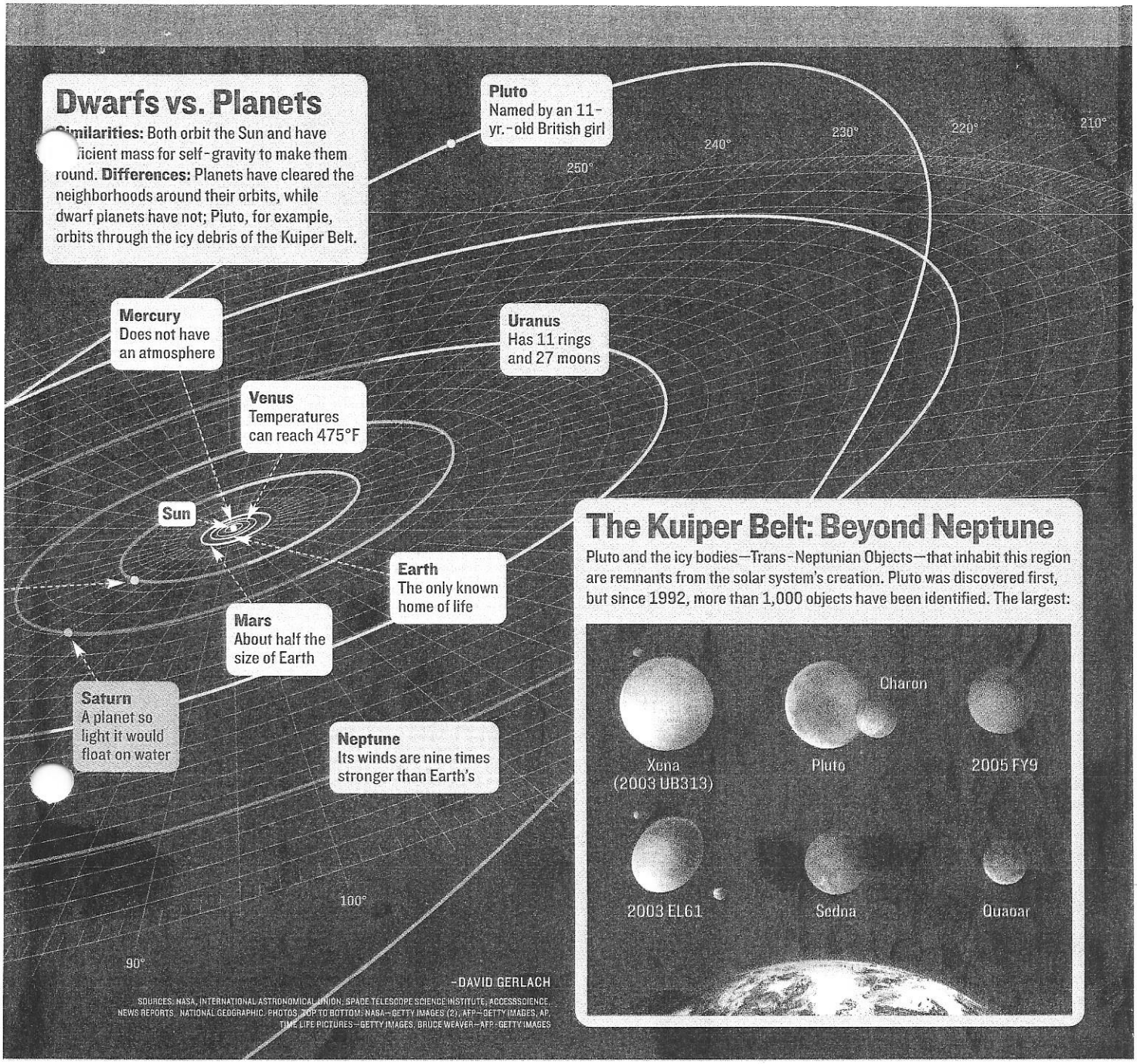
in favor of Pluto being a planet or not, every astrophysicist is cheering on the New Horizons mission," says Shara. "We've never been to a dwarf planet before. What's it like? Is it smooth, like an ice cube, or does it have cracks, which would indicate radioactive or volcanic activity?" Pluto's orbit runs through the Kuiper Belt, a doughnut-shaped region of rocks at the very edge of the solar system that astronomers have just begun to explore.

Talk to

Jerry Adler about Pluto on Wed., Aug. 30, at noon, ET, at xtra.Newsweek.com on MSNBC

What they are finding there [illegible] clues to the origins of plan[illegible]nd of life itself. "When I was a kid, astronomy books would talk about planet formation as if it were a miracle," says Richard Terrile, a planetary astronomer at the Jet Propulsion Laboratory. "It was a very unlikely event. The fact that we were on Earth and had life here seemed to be 20 serial miracles that all had to happen one after the other. And now we know that all of these events are fairly common." The question of how solar systems form is particularly interesting in light of the recent discoveries of planets' circling other stars, one of the biggest changes in our mental map of the universe in the last decade. Astronomers have found more than 100, some of them potential candidates to harbor life.

What forced the issue of Pluto's status was a discovery last year by a Caltech astronomer named Mike Brown. Since 1998, Brown and his collaborators, David Rabinowitz at Yale and Chad Trujillo of the Gemini Observatory in Hawaii, have been doing more or less what Tombaugh did back in 1930: taking repeated pictures of the sky and looking for things that move. The pictures are now digital, of course, and computers do the initial screening, flagging as many as 100 objects a night for Brown to look at the next morning. The great majority are meaningless, but every now and then he turns up a new Kuiper Belt object, glinting in the light from the distant Sun. The one he spotted one morning last January, in an image originally recorded in October 2003, was unusual, uncommonly bright and in an orbit that took it far beyond Pluto. No Earth-based telescope can measure the size of a planet

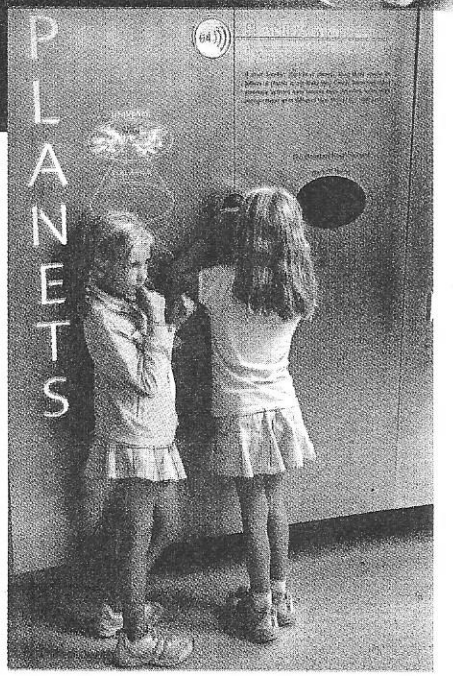


at that distance, so Brown had to wait until he could get time on the Hubble Space Telescope. By April of this year, he had his answer: the pinpoint of light—officially designated 2003 UB313, but temporarily nicknamed Xena—was about 2,400 kilometers across, around 5 percent bigger than Pluto.

Suddenly, the cozy certainties about the solar system with which an entire generation had grown up were called into doubt. Was Brown's discovery the 10th planet? It certainly looked that way—and if it weren't, then why should Pluto be one? But would the solar system stop at 10? There is no reason to think that the Kuiper Belt didn't hold more objects that are larger. Would they be planets, too? What if one were just a little *smaller* than Pluto? The whole episode called attention to the fact that astronomers had never formalized exactly what they meant by "planet." It had always seemed obvious, but the definition that seemed to be emerging by default—"something orbiting the Sun, about the size of Pluto, or bigger"—seemed embarrassingly ad hoc.

So the IAU proposed, at first, to set a threshold for planethood defined by shape. Planets form out of an accumulation of dust and rocks. Below a certain diameter, roughly 1,000 kilometers, they tend to stay in whatever random shape emerges from that process; above that size, their own gravity molds them into a sphere. So the first criterion was that a planet had to be round. But many moons are large enough to be round, so the second part of the definition was that a planet had to orbit the Sun, and not another planet.

That at least had the virtue of intellectual consistency. But it led to a complicated, 12-planet solar system, not counting all the Kuiper Belt objects that could qualify once their sizes are determined. The definition would include Pluto and UB313, but also Ceres, an asteroid just under 1,000 kilometers across, which in fact had been considered a planet when it was first discovered, in 1801. And, confusingly, it would also include *Pluto's own moon*, Charon. All other moons in the solar system are much smaller than the planets they orbit, so there's no question about which is which. But Charon is almost half the size of Pluto itself, so in the mathematical description of their orbits, the two ob-



IT'S HISTORY Astronomers vote in Prague (above), visitors ponder Pluto's position at New York's Cullman Hall of the Universe

jects actually appear to be circling each other. If you wanted to keep Pluto, you'd get all these others as well.

So the IAU—perhaps anticipating endless future wrangling over which objects would make the cut, who would get credit for the discovery and what to name them—decided that the solar system had enough planets already. More than enough: it added a third condition that a planet had to dominate its own orbit, clearing the immediate region of smaller objects, that in effect draws the line at eight. No asteroids can qualify, no Kuiper Belt objects. And no Pluto. They are now "dwarf planets."

Was this fair? Was it just? It depends on whom you ask. Shara, of the Rose Center, seems happy to be rid of Pluto. "Pluto is a chunk of ice which controls nothing," he says. "Its orbit is a slave to Neptune's orbit." Brown, who lost out on the honor of finding the first new planet of the 21st century, says he's saddened personally, but that it was the correct scientific choice. To single out the object he found among everything else flying around the Kuiper Belt "would be like saying you found the biggest piece of gravel in the pile. It would feel like cheating."

But others considered it an outrage. Some had a vested interest in Pluto, like the researchers involved in the New Horizons spacecraft project, who will now be devoting the next 10 years of their lives to a mission to a "dwarf" planet. "I'm troubled by the possibility that people will think that objects smaller than the eight planets are less interesting in some sense, and that's not true," says David Stevenson of Cornell, an authority on planet formation. "Pluto is a very interesting object, and so are the others. Some have atmospheres, there are fluids or gases that leak out from the interiors. It's not just size that matters."

Unfortunately, it *is* size that matters for some things, like getting money from Congress; at least one prominent astronomer said it was a lucky thing that the New Horizons mission got funded years ago, while Pluto was still a planet. Joel Parker of the Southwest Research Institute, one of the New Horizons' lead institutions, said he didn't think American astronomers would take the vote lying down, and predicted there might be a move to revise the definitions when the IAU meets again in 2009. His preferred solution would be to give Pluto "special dual citizenship" as both a Kuiper Belt object and a planet, in recognition of its special cultural status.

In other words, we are fond of it. "A lot of kids like Pluto because it has a cute name," says Parker, and if even one of those kids grows up to be the next Einstein—or, almost as good, the head of the House appropriations committee—shouldn't that be reason enough to keep it? "I have a 6-year-old and a 9-year-old, and it was embarrassing to explain it to them, this definition of a planet that sounds like it was written by a lawyer," says Terrile. But Louis Friedman, executive director of the Planetary Society, doesn't think kids will mind memorizing the name of one fewer planet. "It won't upset the schoolchildren," he predicts. "It's those of us who used to be schoolchildren."

As it happens, the IAU vote wasn't the only astronomy news last week. Researchers at the University of Arizona said they had found the first proof of the existence of "dark matter"—an invisible substance, unlike any known atoms or particles, whose gravity holds galaxies together. If their finding holds up, it could be a major step toward understanding the creation of the universe. But that wasn't what most people wanted to talk about. You don't have to be an astronomer, or an astrologer for that matter, to feel a special kinship to the planets, which, set against the immensity of intergalactic space, seem almost cozy: not "dark matter" or "black holes" but clumps of "rock" and "ice" circling our very own Sun. If people seem unduly concerned with the definition of a planet, perhaps it's for the very good reason that we live on one.

With MARY CARMICHAEL in Boston, NOMI MORRIS in Los Angeles and A. CHRISTIAN JEAN in New York

RESEARCHERS SAY THEY HAVE FOUND THE FIRST PROOF OF THE EXISTENCE OF 'DARK MATTER.'

TOP TO BOTTOM: MICHAL CIZEK-AFP-GETTY IMAGES, MICHAEL BROWN—GETTY IMAGES

Indigo Sam

Who Would Believe a Kid?

by Sam Willey

I am a 14-year-old UFO researcher from a small town in County Durham, North East England, which is located in the United Kingdom. When I was only 12 years old I had an experience that changed my life, an experience that would get me interested in the UFO phenomenon.

It was just a normal, cold November's night back in 2003. It was November 7, to be exact; the night that I, along with two friends, would witness a disturbing triangle-shaped craft. We were outside at around 8 P.M., waiting for one of my friend's parents to come and pick my two friends up. I will not reveal their identity, because I have not got permission to do so. All we were doing was standing there as normal chatting about various topics of interest at the time.

Then all of a sudden a large orange light became visible in the clear night sky. I paid no attention to it, beside the fact that I found it very odd that it just appeared there out of nowhere. I continued on with my conversation, not even pointing the light out to my friends.

A few seconds later I looked at it again and tried to think of an explanation to the phenomenon I was witnessing. I made my mind up that it was just a star and paid it no more thought until it began to move quite swiftly over towards us.

I pointed it out to my friends and all three of us stared at the light coming towards us. We looked at one another, but nobody was speaking until it began to fly over the house at the very bottom of my street. It was now around 2 minutes past 8 and it became apparent that what I thought was an orange light flying over our heads was in fact a triangle craft of some sort.

Indigo Sam

continued from page 8

searching on the internet and after a few more sightings in 2005 I decided that more major research was required.

The sightings affected me so much that I then established **www.Alienationsam.com** in September 2005, and since then I have done extensive research and article writing for my website. My only intention was for the site to be very small, but since September it has expanded and because of the interest shown in the site I have started many new features including hosting my very own 24/7 on demand UFO radio show in April 2006.

Before this date in February 2006 I witnessed a large fleet of UFOs from my home and managed to get some very intriguing and disturbing photographs. Here is an enlargement of one of the photos. So from the very moment of the triangle UFO sighting, my life and views on life were changed in a dramatic way. I am much more aware of things now and I am much more questioning of government activities and do not take everything the government state as fact.

Before the November 7 encounter, I would have thought about extraterrestrial beings on other worlds, but I never believed that we had been contacted by them. After the sighting I am now aware that that is certainly a possibility, and we are most definitely not alone in the universe.

People need to realize the full picture. They need to see past the government smokescreen and cover-ups to see the information they attempt to claim they don't know about. And that is how my interest in UFOs and aliens began. I really enjoy researching and investigating the subject. UFO

I am 14 years of age and am currently living in North East England, U.K. I am interested in anything to do with the unexplained, especially the field of ufology. I have my own UFO website and 24/7 on-demand internet UFO radio show at www.alienationsam.com. I would like to hear from anybody with experiences of UFOs; if you would like to contact me regarding an article at sam@alienationsam.com. I check my mail everyday and would love to hear from some readers.

Editor at Large

continued from page 6

But I could still feel myself desiring an aromatherapy-like afterglow, so when the package from a group in French Polynesia calling itself *Galacteus* arrived in the mail, I thought we (at the time the magazine was called *California UFO*) had at last found the key to the good ETs.

For years I kept the pictures of Appel-Guery and his group lounging on a boat and on the shores of a tropical isle. Run by a handsome beachy-looking man by the name of Jean-Poul Appel-Guery, Galacteus apparently still exists, and its savory mix of cosmic teachings and feel-good vibe can be found at **www.appelguery.com, www.axiel.com** and **www.scienceunitaire.com.**

OK, so I tended to bask in New Age interpretations of the UFO visitors and still privately think that a group of wise and beneficent ETs could be quietly directing the course of the United States of America, fraught with contradictions though she may be. Nice thought, eh?

Decades before the magazine, I had subscribed to George Adamski's "Cosmic Telepathy" courses. Later I spent years in a spiritual "cult" that always inspired me, if it didn't exactly help my personal or financial life. *Ergo,* to assure healthy evolution as a journalist, I admittedly had to scale the temptations of bliss promises and fuzzy thinking. Not all have been surmounted, and I like it that way. As time went on, however, the stark reality of the dark side invaded my dreams of universal love.

Enough has been written about the dark side in these pages, but I was shocked to note that I had corresponded with one of the principal dark siders two years before Sherie Stark and I started the magazine! Before I get to that, I have to pore through my omnipresent stack of papers, several bearing the following leads:

"The Next Buzz You Hear May Be a UFO."

"From 1975 to 1980, I was involved with several projects having to do with ET material ... "

"Tunguska Phenomenon—Superweapon to stop incoming craft?"

"In December of 1962, Dr. Carl Sagan told his audience that mankind must be prepared to face the possibility that we have already been visited by intelligent beings elsewhere in the universe, and that they have—or have had—bases on the averted side of the moon."

"The Bigfoot-UFO Connection: Where's the Proof?

"Do You Suffer from Adult ADHD?"

I'm for sure saving that one.

Now I cannot find the letter from Fair Witness Project, the cottage UFO industry once run by one Bill Moore. I'm sure I had it on my desk here. As soon as I find that 1984 letter you'll hear about it! Then I can toss it. I'll light some incense first. UFO

Vicki Ecker founded *UFO Magazine* in 1986. She continues to inspire, and be inspired, by the mystery at the heart of the phenomenon.