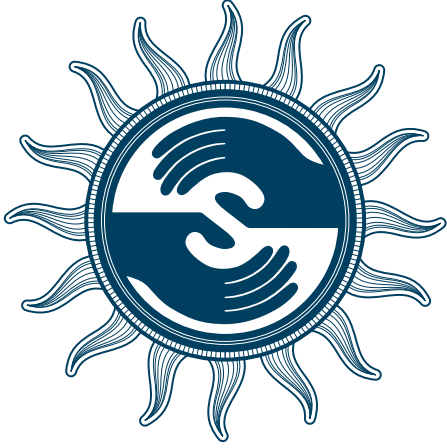


# PASSPORT

to the

## SOLAR SYSTEM



### SAGAN PLANET WALK

Sciencenter, Ithaca, NY

### HOW TO USE THIS PASSPORT

Before you begin your journey, record your name and other vital facts on the first page of your passport. To find each planet station, use the map as your guide. After visiting each station, get your passport stamped at a nearby location as proof of your visit to each planet.

If you are unable to get your passport stamped at one or more locations, you can get it stamped at the Sciencenter. (*Passports downloaded from [www.sciencenter.org](http://www.sciencenter.org) do not qualify for free admission.*) For school group reservations and group passport purchases call the Sciencenter at 607.272.0600.

### AUDIO TOUR

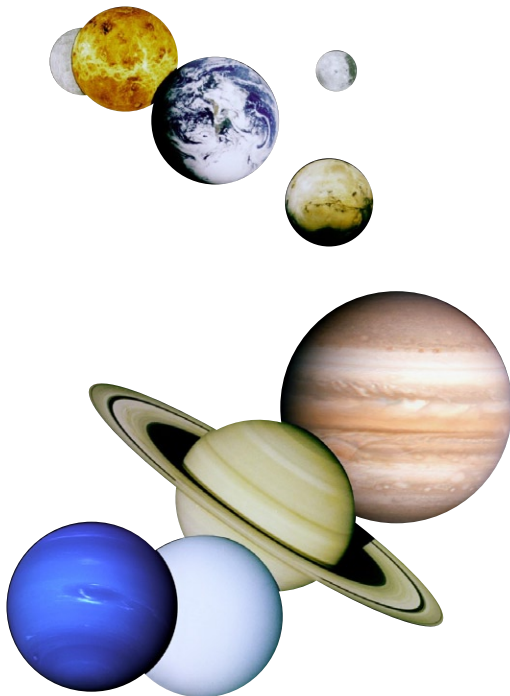
Learn more about the Solar System and the planets as you explore the Sagan Planet Walk! This **free** tour is narrated by Bill Nye the Science Guy. Listen to the tour by phone at: **703.637.6237**

Download the tour as a podcast from iTunes or: [www.sciencenter.org/saganpw](http://www.sciencenter.org/saganpw)

### PACE THE SPACE

The Sagan Planet Walk is a model of our Solar System at one five-billionth ( $1/5,000,000,000$ ) of the actual size. Starting with the Sun on the Commons in downtown Ithaca, this  $\frac{3}{4}$  mile (1200 meter) walking tour leads to the Sciencenter. Both the size of the planets and the distance between them are accurately scaled and displayed.

1



The text about the Solar System in this passport was written by Ann Druyan. Portions consist of excerpted passages from: PALE BLUE DOT: Copyright ©1994 by Carl Sagan; COSMOS: ©1980 by Carl Sagan Productions, Inc.; and COMET: ©1985 by Carl Sagan and Ann Druyan. Portions ©1997 by Ann Druyan and the Estate of Carl Sagan. All rights reserved.

*The Sciencenter of Ithaca, New York, U.S.A. hereby requests all whom it may concern to permit the citizen of the Solar System named herein to pass without delay or hindrance and in case of need to give all lawful aid and protection.*

NAME:

ADDRESS:

COUNTRY:

YOUR EARTH AGE:

TODAY'S EARTH DATE:

PEOPLE TRAVELING WITH YOU:

\_\_\_\_\_  
Signature of Bearer  
NOT VALID UNTIL SIGNED

2



# SAGAN PLANET WALK

PASSPORT to the SOLAR SYSTEM MAP

PLUTO •

NEPTUNE ●

URANUS ●

SATURN ●

JUPITER ●

ASTEROIDS

MARS ●  
EARTH ●  
VENUS ●  
MERCURY •

SUN



## PASSPORT STAMPING LOCATIONS

### Sun, Mercury, Venus, Earth and Mars

**1 M&T Bank**  
The Commons  
Customer Service Desk

**2 15 Steps Gallery**  
171 The Commons

### Asteroids

**3 Tompkins Trust Company Drive Thru**  
Inside at the Teller Line  
116 E Seneca St.

### Jupiter and Saturn

**4 The Cat's Pajamas**  
DeWitt Mall

### Saturn and Uranus

**5 Kinney Drugs**  
513 N. Cayuga St.

### Neptune

**6 P&C Market**  
212 Hancock St.  
Customer Service Desk

### Pluto

**7 Sciencenter**  
601 First St.

*If you are unable to get your passport stamped at one or more locations, you can get it stamped at the Sciencenter.*

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The Sagan Planet Walk is a model of our Solar System at one five-billionth (1/5,000,000,000) of the actual size. Starting with the Sun on the Commons in downtown Ithaca, this ¼ mile (1200 meter) walking tour leads to the Sciencenter. Both the size of the planets and the distance between them are accurately scaled and displayed.

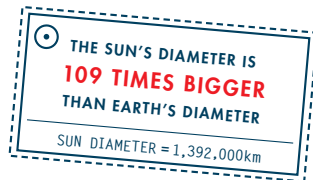
# Traveler beware:

## Five-billion-year-old nuclear fusion reactor in operation!

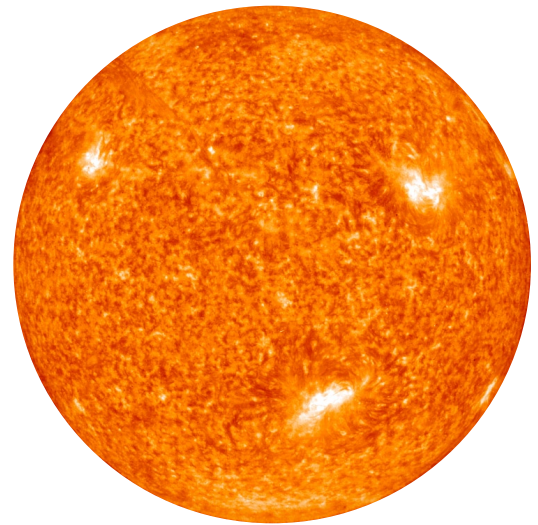
Think of the Sun's heat on your upturned face on a cloudless summer day; think how dangerous it is to gaze at the Sun directly. From 150 million kilometers away, we recognize its power. What would we feel on its seething, self-luminous surface, or immersed in its heart of nuclear fire? And yet, our Sun is just an ordinary star, one of *400 billion* in the Milky Way Galaxy, which is one of billions, perhaps hundreds of billions, of galaxies in the Universe.

Someday, five or six billion years from now, when all the hydrogen fuel in its interior has been converted into helium, the Sun will begin to evolve into a Red Giant. Ruddy and bloated, it will envelop and devour the planets Mercury and Venus—and probably the Earth as well. The inner Solar System will then reside within the Sun.

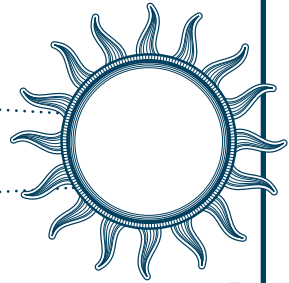
### Fun Facts



4



## Sun



5

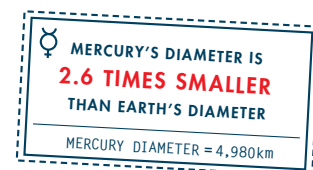
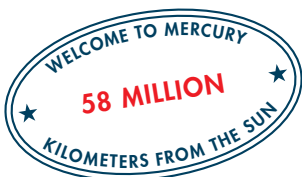
# Hot days, cool nights

## Don't pack light for a trip to the Sun's nearest neighbor.

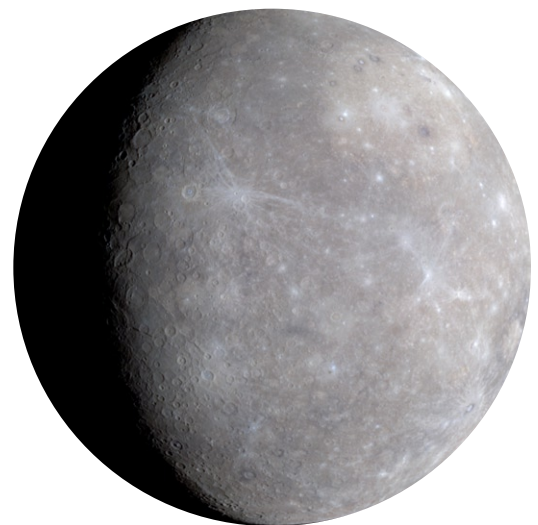
With daytime temperatures usually peaking at nearly 400 degrees C and plummeting at night to a nippy 150 degrees C below zero, we advise bringing both your parka and your swimsuit when you travel to Mercury. While the weather may be a bit extreme (a little like Ithaca), we can guarantee that during your stay, time will seem to fly by: One year on Mercury is only 88 Earth days long.

Thought to be composed mostly of magnetic iron, Mercury is not much larger than our Moon and is similarly scarred with impact craters from the cosmic collisions of eons.

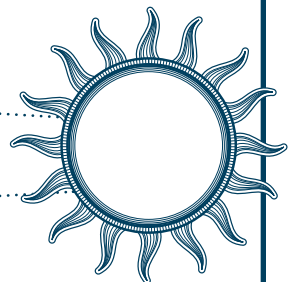
### Fun Facts



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## Mercury



7

# Acid rain on the horizon

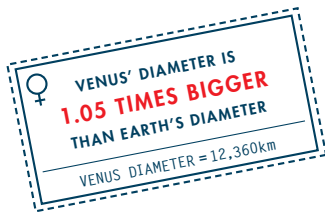
**It's always raining sulfuric acid on Venus, all over the planet, and not a drop ever reaches the surface.**

With searing heat, crushing pressures, noxious gases, and everything suffused in an eerie, reddish glow, Venus seems less the goddess of love than the incarnation of hell.

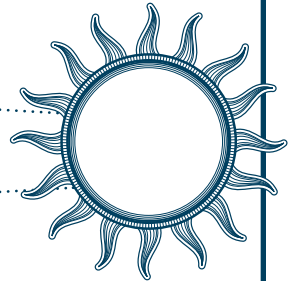
It appears at least some places on the surface are strewn fields of jumbled, softened, irregular rocks—a hostile, barren landscape relieved only here and there by the eroded remnants of a derelict spacecraft from a distant planet, utterly invisible through the turgid, cloudy, poisonous atmosphere. (Are you sure you want to go there?)

The thick atmosphere moves sluggishly because it's so dense. The winds are feeble at the surface. It may take only a soft gust to raise a cloud of fine particles, but in that stifling inferno, a gust is hard to come by.

*Fun Facts*



Venus



# The water planet

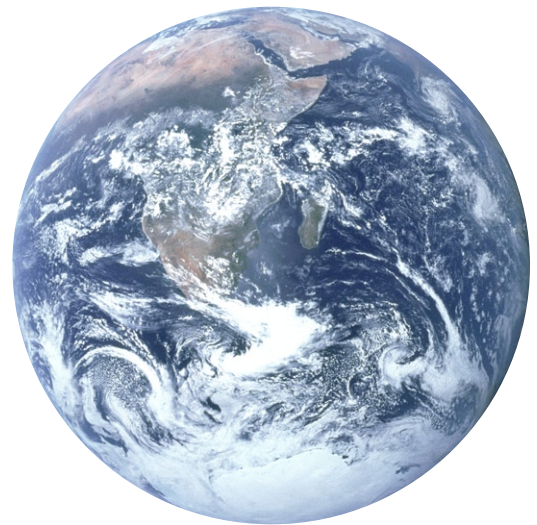
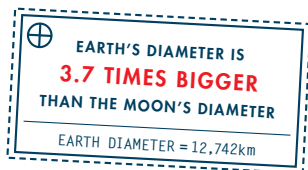
**Imagine you're an extra-terrestrial, viewing Earth from far, far away.**

As you approach from space, your first impression of Earth is white clouds, white polar caps, brown continents, and some bluish substance that covers two thirds of the surface.

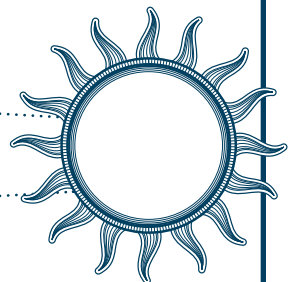
Any sign of intelligent life? Not from out here. Not visually, at least. There *are* radio signals. (But whether they are intelligent or not is open to debate.) You'll have to get closer. At 100-meter resolution, everything changes. The planet is revealed to be covered with straight lines, squares, rectangles, circles and checkerboards.

A more thorough examination reveals a tiny world composed of rocks, minerals, liquid water, oxygen, carbon dioxide, methane, and other gases, graced by a stunning diversity of exquisitely interconnected life forms.

*Fun Facts*



Earth



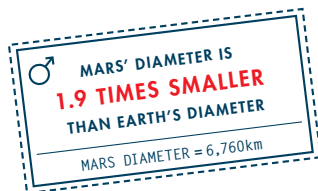
# The next tourist attraction?

**The forecast is for cold temperatures, global sandstorms, and a chance of humanity landing.**

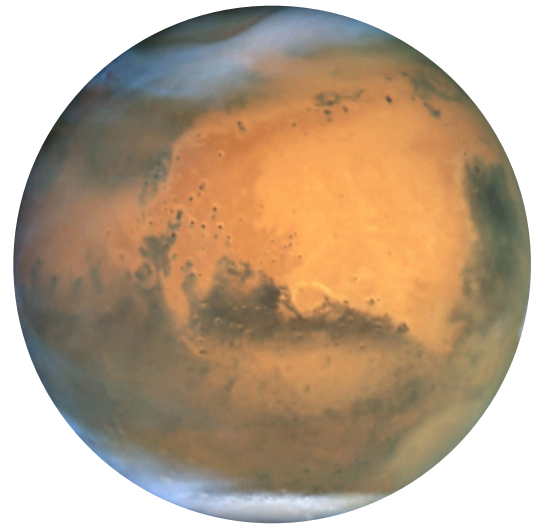
Although it is sometimes as warm as an Ithaca October, Mars is a chilly place, so cold that some of its thin carbon dioxide atmosphere freezes out as dry ice at the winter pole.

Still, this world of wonders has plenty to offer spacefaring tourists. Into mountain climbing? How about a trek up Olympus Mons? At a height of 25 kilometers (15 miles!), this volcano is two and a half times taller than Mt. Everest. The great 5,000 kilometer-long rift valley known to earthlings as the Vallis Marineris makes our Grand Canyon seem, well... less... grand. And when you get there, don't forget to visit the Carl Sagan Memorial Station, headquarters for the plucky robotic rover *Sojourner*.

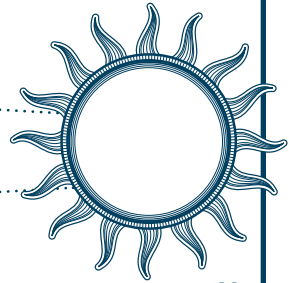
## Fun Facts



12



# Mars



13

# Look out! Look out!

**Big rocks ahead! Asteroids are smaller than planets, but still huge compared to you!**

You are in a part of the Sun's neighborhood where traffic is particularly heavy. Here, in between the orbits of Mars and Jupiter, are hundreds of thousands of tiny rocky worlds, left over from the formation of the Solar System.

Why didn't they collide with each other to form planets the way so many other little worlds did? We think it's because of Jupiter's massive gravitational hold on them. With Jupiter orbiting just outside this lane of asteroids, its gravitation pull keeps them from getting together. If you should want to visit one of them, remember to bring plenty of oxygen. Asteroids don't have atmospheres.

## Fun Facts

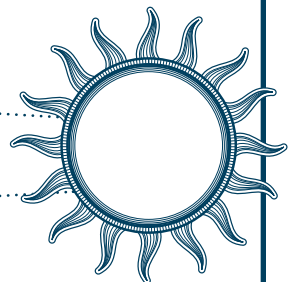


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Asteroids come in many shapes and sizes

# Asteroids



15

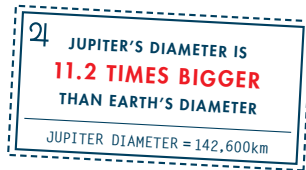
# The giant planet

## The star that failed.

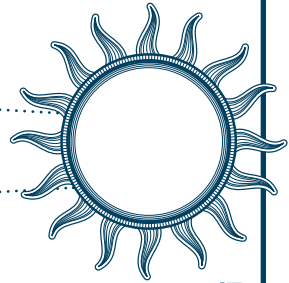
As the Solar System condensed out of the interstellar gas and dust, Jupiter acquired most of the matter that was not ejected into interstellar space and did not fall inward to form the Sun. That was a lot of stuff—so much that it resulted in a planet more than twice as massive as all the other planets of the Solar System put together.

However, had this giant planet been even larger, say twelve times larger, the matter in its interior would have undergone thermonuclear reactions, and Jupiter would have begun to shine by its own light. Even so, its interior temperatures are high enough to generate twice as much energy as the planet receives from the Sun.

*Fun Facts*



# Jupiter



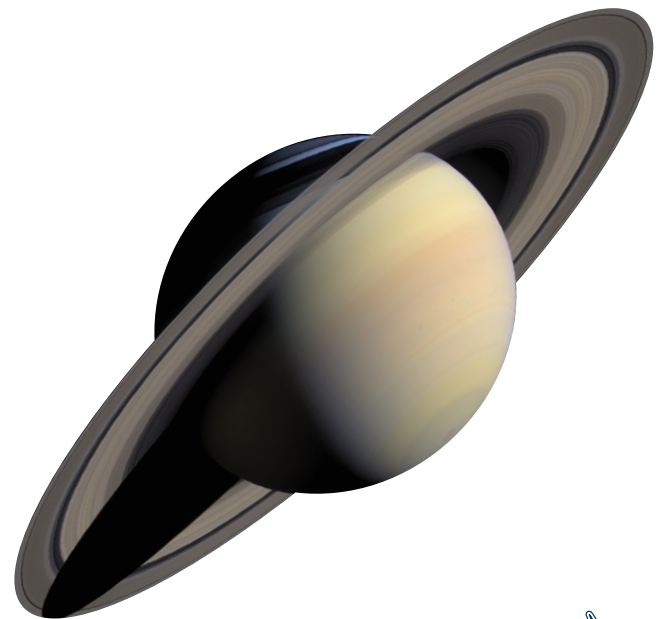
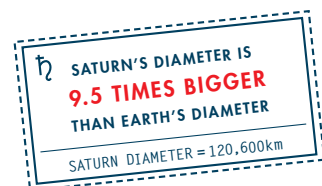
# Think the Ithaca winter is long?

## Try hitching a ride on Saturn for one of its thirty-year-long trips around the Sun.

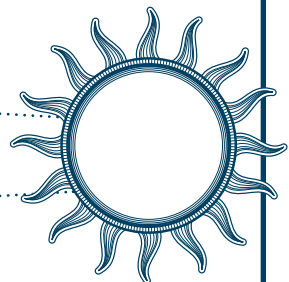
*We know, we know:* You know about the rings. But what about Saturn's largest moon, Titan? Titan is a world, midway in size between the Moon and Mars, where the upper air is rippling with electricity, streaming in from the archetypical ringed planet next door, where the perpetual brown overcast is tinged with an odd burnt orange, and where the very stuff of life falls out of the skies onto the unknown surface below.

Saturn is so far away that light takes more than an hour to get there from the Sun. Spacecraft take years. Much about it is still a mystery—including whether it holds great oceans. We know just enough, though, to recognize that within reach may be a place where certain processes are today working themselves out that eons ago on Earth led to the origin of life.

*Fun Facts*



# Saturn



## It could've been worse:

**William Herschel, the eighteenth century musician who discovered the first planet unknown to the ancients, wanted to name it "George."**

There are places on Jupiter and Saturn where the pressures are so great that atoms sweat electrons, and the air becomes a metal. That does not seem to happen on less-massive Uranus. That's the good news.

However, unlike any other planet of which we know, Uranus seems to be lying on its side. One possible explanation is that this was the result of a really big accident, a run-in with a very large planet billions of years ago.

Don't bother to bring your sunglasses. Uranus is so far from the Sun that noontime there is no brighter than it is after sunset on Earth.

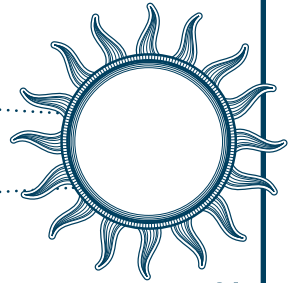
### Fun Facts



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## Uranus



21

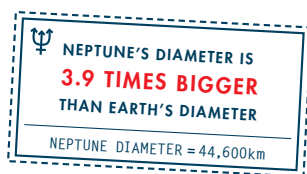
## Far out! How far?

**Neptune is so far away, it takes nearly 165 Earth years to make a trip around the Sun. In July 2011, Neptune completes its first full orbit since its discovery in 1846.**

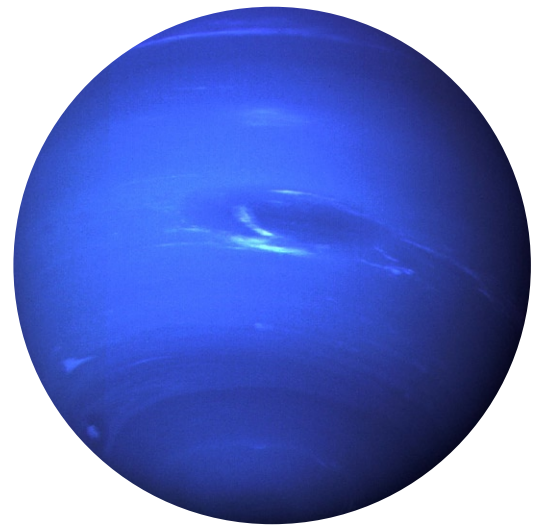
When we look down on its cool, austere blueness, we are only seeing atmosphere and clouds—no solid surface. Neptune's atmosphere is mainly hydrogen and helium, with a dash of methane and traces of other hydrocarbons. There may also be some nitrogen.

The bright clouds, which seem to be methane crystals, float above thick, deeper clouds of unknown composition. From the motion of the clouds we discover fierce winds, approaching the local speed of sound.

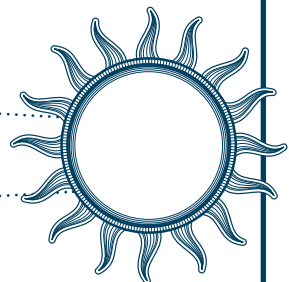
### Fun Facts



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## Neptune



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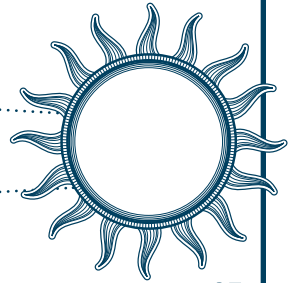
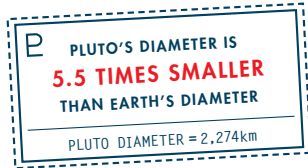
# Much ado about Pluto

**No longer a planet, but still a world of mystery.**

Even though it is smaller than its eight siblings and doesn't orbit the Sun in the same plane of the Solar System as they do, Pluto was considered a planet from its discovery in 1930 until 2006.

As scientists discovered other Pluto-like worlds, some of them even larger, it became more difficult to justify Pluto's planetary status. This is one of the great powers of science: as new evidence comes in, scientists systematically evaluate it. If it proves to be solid, then, we have to admit that we were wrong and change our view.

*Fun Facts*



**Pluto**

# Our Sun is the closest star to Earth

**The next closest star to Earth is Alpha Centauri.**

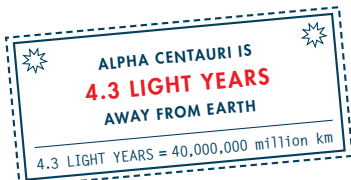
On this 1 to 5-billion scale model of the Solar System, if the Sun is on the Ithaca Commons and Pluto is 1,200 meters away at the Sciencenter, where do you think the nearest star, Alpha Centauri, should be located?

*Boston?* No. Guess again.

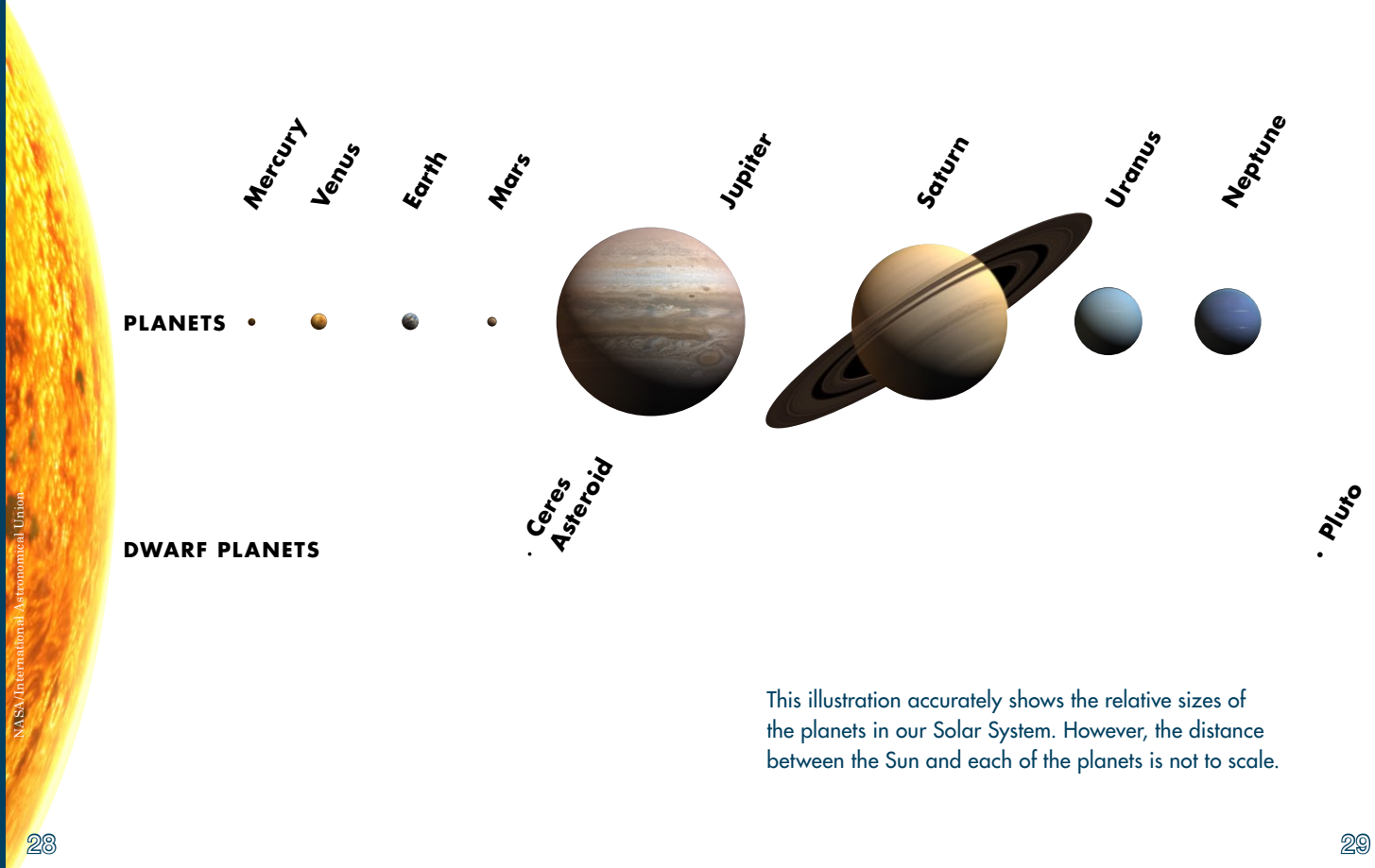
*Los Angeles?* No. Not far enough away.

The staggering answer is that even on this radically reduced scale, the next closest star station would be somewhere in the state of Hawaii!

*Fun Facts*







This illustration accurately shows the relative sizes of the planets in our Solar System. However, the distance between the Sun and each of the planets is not to scale.

## Acknowledgments

*This exhibition was developed by the Sciencenter in memory of Carl Sagan for the citizens of the Earth.*

### Special Thanks to:

Ann Druyan and the Estate of Carl Sagan  
 Charles Trautmann, *Concept and Project Director*  
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 Yervant Terzian, *Cornell University, Technical Advisor*  
 Jim Bell, *Cornell University, Technical Advisor*  
 Jim Holahan, *Metalsmith*  
 New York State  
 City of Ithaca

### Fabrication

**Planet models:** William Bassett, Skip Davis, Advanced Design and Fabrication Facility, Cornell University  
**Planet stations:** Superior Precast, Cortland Granite  
**Sun and Pluto stations:** Marchell Monuments  
**Asteroids Station:** AccuFab, Inc.  
**Planet station installation:** City of Ithaca Department of Public Works, Eric Poysa, and Andy Hillman, with assistance from many others  
**Signage printing:** Enameltec and Fossil Industries

### Station Sponsors

**Sun** ..... Ann Druyan  
**Mercury** .. Clarity Connect, Inc.  
**Venus** ..... The CBORD Group, Inc.  
**Earth** ..... Goodrich Corporation – Ithaco Space Systems, Inc. and its Employees  
**Mars** ..... Cornell University Astronomy Department and NASA/New York Space Grant Consortium  
**Asteroids**.. NASA/New York Space Grant Consortium; Tompkins County Tourism Board; AccuFab, Inc.; Meteorite donated by Michael I. Casper, Meteorites Inc.  
**Jupiter**..... Friends and Family of Bob Engel  
**Saturn** ..... The Planetary Society  
**Uranus**..... Tompkins County Tourism Board and The Gannett Foundation, Inc.  
**Neptune**... M&T Bank and the Children of Tompkins County  
**Pluto** ..... William and Jane Bassett

### Images

Planet and Solar System images courtesy of NASA

### Audio Tour

Narration: Bill Nye  
 Post Production: Hester Blom and Dawid Vermaak  
 Sponsored by the Tompkins County Tourism Board



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The Sciencenter dedicates this exhibition to the memory of

## Carl Sagan

1934-1996

Astronomer • Teacher • Author • Activist  
Space Science and Exobiology Pioneer

As a child of seven, Carl Sagan asked the question: “*What are the stars?*” To his good fortune and ours, his parents took him straight to the nearest library. That was the first step in a lifelong journey that opened the way for him and countless others to a deeper understanding of the universe.

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## Dedication

This model of the Solar System is named in honor of the late Carl Sagan—a great scientist, an inspirational advocate of science, a valued advisor and supporter of the Sciencenter, and a member of the Ithaca community for nearly thirty years. The *Sagan Planet Walk* aspires to excite future generations about the romance of the scientific enterprise and to convey something of the preciousness and fragility of our tiny world in the context of the vastness of the Cosmos.

Carl Sagan was Professor of Astronomy and Space Sciences and Director of the Laboratory for Planetary Studies at Cornell University. He played a leading role in the American space program since its inception. He briefed the *Apollo* astronauts before their flights to the Moon and was an experimenter on the *Mariner*, *Viking*, *Voyager*, and *Galileo* expeditions to the planets. He helped solve the mysteries of the high temperature of Venus (caused by a massive greenhouse effect), the seasonal changes on Mars (caused by windblown dust), and the reddish haze of Titan (caused by complex organic molecules).

A Pulitzer Prize winner, Dr. Sagan was the author of many best-selling books including *Cosmos* and *Contact*. More than 500 million people in 60 countries have seen the Emmy and Peabody award-winning thirteen-part PBS television series *Cosmos*. He received numerous awards for his scientific achievements, such as the Public Welfare Medal, the highest award of the National Academy of Sciences. In a posthumous award to Dr. Sagan, the National Science Foundation declared that “his research transformed planetary science... his gifts to mankind were infinite.”

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**Sciencenter**

601 First Street  
Ithaca, NY 14850  
607.272.0600

[www.sciencenter.org](http://www.sciencenter.org)

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