

September 2004

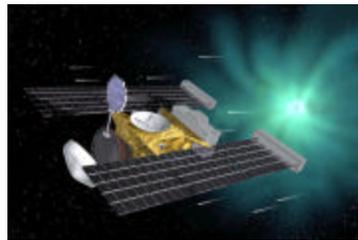
**Special points of interest:**

- What's next for SAS Dark Sky site
- Learn about Aerogel
- New class of planets that orbit stars other than our Sun

## September Meeting:

### "Dr. Brownlee to Discuss Stardust Mission Results"

Professor Brownlee is the principal investigator for NASA's Stardust project, a mission to return samples of the solar wind and



particles from a comet to Earth. On January 2, 2004, Stardust flew within 236 kilometers of Comet Wild 2 and captured thousands of particles in its aerogel collector. Professor Brownlee will present results from this historic comet encounter.



## Meeting Information

*Speaker:* Professor Donald Brownlee

Stardust Mission Results

Wednesday, September 15  
7:30 p.m.

Physics-Astronomy Building  
Room A102  
University of Washington  
Seattle

*Come early at 7 p.m. for coffee and snacks and to visit with your fellow members!*



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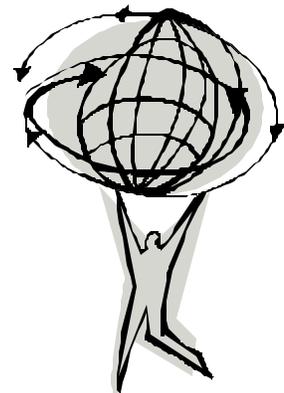
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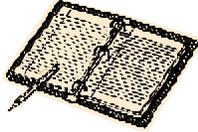
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## From the President's Desk...

*By Stephen Van Rompaey*

First, I want to remind everyone that the Third Annual Goldendale star party will be held during the weekend of September 11th. Karl Schroeder is the organizer and you should contact him if you would like more information at [KSchroe225@aol.com](mailto:KSchroe225@aol.com).

As advertised, the August meeting was held to discuss the idea of obtaining land for a club dark sky site. Mark de Regt and Thomas Vaughn led the discussion and sufficient interest was expressed at the meeting that the board feels it's reasonable to move forward. So, what does moving forward entail? Well, the first order of business is to raise \$25,000 - \$30,000. Recently, when Mark and Thomas investigated land prices for 20+ acres they determined that we could probably find a piece of property fitting our needs in the range of \$30,000 to \$50,000. Because of the nature of our organization, in order to obtain a mortgage we should expect to come up with one half of the purchase price. We are conservatively anticipating a land price of \$50,000, requiring \$25,000 as a down payment, and another \$5,000 to cover initial land improvements.

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**The August meeting  
was held to discuss  
the idea of  
obtaining land for  
a club dark sky site**

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I want to express my complete confidence in Mark and Thomas as leaders of the SAS Dark Sky Committee. Within the next couple of months, the club will establish an escrow account to deposit funds collected for this project. In the event that the whole effort falls through, contributors can expect to have their money refunded. Mark and Thomas are now researching what other clubs have done to raise funds for observing sites and how they have structured access. In the coming months they will generate a proposal for club member discussion and approval. If you are interested in making a contribution for the dark sky site, or if you have some ideas that you want to share, please feel free to contact Mark ([publicity@seattleastro.org](mailto:publicity@seattleastro.org)) or Thomas ([secretary@seattleastro.org](mailto:secretary@seattleastro.org)). ✕

# Catching the Wild Dust

*This article was provided by NASA, Jet Propulsion Laboratory, California*

The primary objective of the Stardust mission is to capture both cometary samples and interstellar dust. Main challenges to accomplishing this successfully involved slowing down the particles from their high

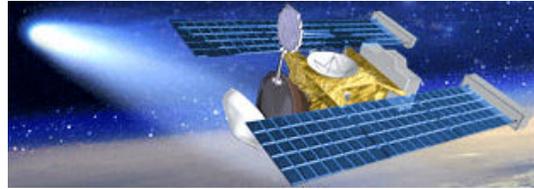


Photo Courtesy NASA , Jet Propulsion Laboratory

velocity with minimal heating or other effects that would cause their physical alteration. When the Stardust Spacecraft encountered the Comet Wild 2, the impact velocity of the particles were up to 6 times the speed of a rifle bullet. Although the captured particles are very small—smaller than a grain of sand, high-speed capture can alter their shape and chemical composition - or even vaporize them entirely.

To collect particles without damaging them, Stardust uses an extraordinary substance called aerogel. This is a silicon-based solid with a porous, sponge-like structure in which 99.8 percent of the volume is empty space. By comparison, aerogel is 1,000 times less dense than glass, which is another silicon-based solid. When a particle hits the aerogel, it buries itself in the material, creating a carrot-shaped track up to 200 times its own length. This slows it down and brings the sample to a relatively gradual stop. Since aerogel is mostly transparent - with a distinctive smoky blue cast - scientists use these tracks to find the tiny particles.



Particle captured in Aerogel

Link: <http://stardust.jpl.nasa.gov/tech/aerogel.html> ☒

**How is aerogel made?**

Mixing four chemicals, which react to form a wet gel, similar to a gelatin dessert creates Aerogel. The gel is then dried in an autoclave, in essence a pressure cooker that applies pressure and heat.

**What is it used for?**

The Stardust Project used aerogel as a capture media to collect very small interstellar and cometary particles as they embedded themselves in the porous aerogel. Because of its unique physical properties, aerogel has also been proposed for a wide variety of uses, including thermal insulation, acoustical insulation, optical components, catalytic supports and filters.

**What does it feel like?**

The microstructure of aerogel is extremely porous, so it feels like volcanic glass pumice or even a very fine, dry sponge, except that it is much lighter.

**Why is it blue?**

Aerogel has a blue cast for the same reason that the sky is blue. The very small particles that compose the aerogel scatter blue light, the same as our atmosphere scatters blue light. Similarly, when you look through the aerogel the light appears yellowish or reddish, like that of a sunrise or sunset.

**What makes aerogel so special?**

Because of their highly porous quality they are characterized by extremely high surface area, high thermal and acoustical resistivity, low dielectric constant, and low refractive index.

**Is it solid?**

Aerogel is made up of microscopic beads or strands connected to form a continuous network. Since the network fills space and supports itself, it is considered a solid.

**What happens if I touch it?**

Silica aerogel is semi-elastic because it returns to its original form if slightly deformed. If further deformed, a dimple will be created. However, if the elastic limit is exceeded, it will shatter catastrophically, like glass.

# Resisting Retirement: Earth Observing 1



By Patrick L. Barry

*This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.*

The Hubble Space Telescope isn't the only satellite that scientists have fought to keep alive beyond its scheduled retirement. Scientists also went to bat for a satellite called EO-1, short for Earth Observing 1, back in 2001 when the end of its one-year mission was looming.

The motivation in both cases was similar: like Hubble, EO-1 represents a "quantum leap" over its predecessors. Losing EO-1 would have been a great loss for the scientific community. EO-1, which gazes back at Earth's surface instead of out at the stars, provides about 20 times more detail about the spectrum of light reflecting from the landscape below than other Earth-watching satellites, such as Landsat 7.

That spectral information is important, because as sunlight reflects off forests and crops and waterways, the caldron of chemicals within these objects leave their "fingerprints" in the light's spectrum of colors. Analyzing that spectrum is a powerful way for scientists to study the environment and assess its health, whether it's measuring nitrate fertilizers polluting a lake or a calcium deficiency stressing acres of wheat fields.

Landsat 7 measures only 8 points along the spectrum; in contrast, EO-1 measures 220 points (with wavelengths between 0.4 to 2.5  $\mu\text{m}$ ) thanks to the prototype Hyperion "hyperspectral" sensor onboard. That means that EO-1 can detect much more subtle fingerprints than Landsat and reveal a more complete picture of the chemicals that comprise the environment.

As a NASA New Millennium Program mission, the original purpose for EO-1 was just to "test drive" this next-generation Hyperion sensor and other cutting-edge satellite technologies, so that future satellites could use the technologies without the risk of

flying them for the first time. It was never meant to be a science data-gathering mission.

But it has become one. "We were the only hyperspectral sensor flying in space, so it was advantageous to keep us up there," says Dr. Thomas Brakke, EO-1 Mission Deputy Scientist at NASA's Goddard Space Flight Center.

Now, almost three years after it was scheduled to be de-orbited, EO-1 is still collecting valuable data about our planet's natural ecosystems. Scientists have begun more than a dozen environmental studies to take advantage of EO-1's extended mission. Topics range from mapping harmful invasive plant species to documenting the impacts of cattle grazing in Argentina to monitoring bush fires in Australia.

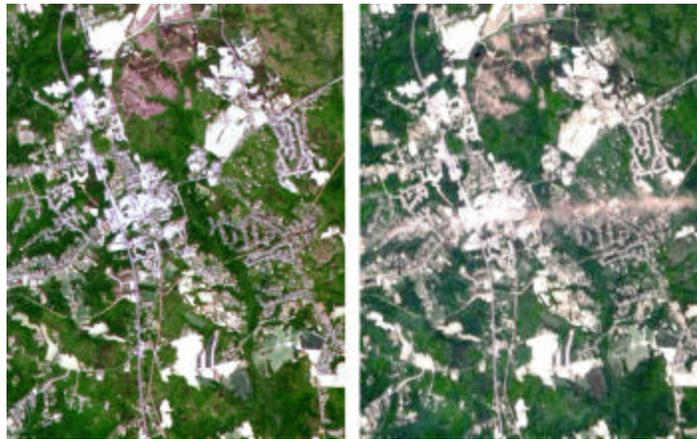


Image credit NASA/JPL/Space Science Institute.

These images, made from EO-1 data, are of La Plata, Maryland, before and after a tornado swept through May 1, 2002.

Not bad for a satellite in retirement.

Read about EO1 at <http://eo1.gsfc.nasa.gov>. See sample EO-1 images at <http://eo1.usgs.gov/samples.php>. Budding young astronomers can learn more at [http://spaceplace.nasa.gov/eo1\\_1.htm](http://spaceplace.nasa.gov/eo1_1.htm). ☒



# September 2004

Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	31	1 UW Public Viewing Night 9:00 pm	2	3	4
5 Astrophotography/ Imaging SIG Meeting 2:00 pm	 6	7	8	9	10	11 Tiger Mountain/Poo Poo Point Star Party (members only!) Third Annual Goldendale star party
12 Third Annual Goldendale star party	13	 14	15 Monthly SAS Meeting UW Room A102 7:30 pm UW Public Viewing Night 9:00 pm	16 Orion Nebula Star Party	17 Orion Nebula Star Party	18 Orion Nebula Star Party Green Lake Star Party Paramount Park Star Party
19	20 SAS Board Meeting 7:00 pm	 21	22	23	24	25 Amateur Telescope Makers SIG Meeting 6:30 pm
26	27	 28	29	30	1	2



# October 2004

Sun	Mon	Tue	Wed	Thu	Fri	Sat
26	27	☉ 28	29	30	1	2
3	4	5	☾ 6 UW Public Viewing Night 9:00 pm	7	8	9
10	11	12	13	● 14	15	16 Tiger Mountain/Poo Poo Point Star Party (members only!)
17	18	19	☾ 20 Monthly SAS Meeting UW Room A102 7:30 pm UW Public Viewing Night 9:00 pm	21	22	23 Green Lake Star Party Paramount Park Star Party
31 24	25 SAS Board Meeting 7:00 pm	26	27	☉ 28	29	30 Amateur Telescope Makers SIG Meeting 6:30 pm

## Genesis Probe — Stunt Pilots on a Real Mission

Two Hollywood helicopter stunt pilots will snag a capsule full of stardust as it parachutes back to Earth this month, the U.S. space agency said.

The mid-air retrieval, 1219 meters above the Utah desert, is the planned climax to NASA's US\$264 million (A\$364 million) Genesis mission, which began three years ago with the launch of a space probe to collect solar wind.

The cargo of solar ions blown from the Sun towards Earth consists of about 10 to 20 micrograms of oxygen, nitrogen and other elements that collectively weigh about as much as a few grains of salt. Mission scientists say the ions will yield key insights about the formation of planets at the dawn of the solar system. The novel scheme for snaring the re-entry capsule was designed to spare the canister from a rocky landing that could damage the delicate instruments and samples inside.



NASA said the return of the Genesis probe will mark the first bits of extraterrestrial matter retrieved from space by human means since the 1970s, when Moon rocks were carried back to Earth by manned U.S. Apollo and unmanned Soviet Luna missions. If successful, it also will make aviation history as the first man-made object captured by aircraft as it entered Earth's atmosphere from space, said Roy Haggard, an aerospace researcher NASA hired to design the Genesis retrieval project. He said helicopters were used in thousands of missions to grab parachuted canisters of film shot by spy cameras over Vietnam and the Soviet Union during the Cold War.

Stunt pilots are the best bet — In recruiting personnel for Genesis, Haggard said all the experts kept pointing to stunt pilots as the best suited for the job. In the end, he hired Cliff Fleming as his chief pilot for the Genesis project and back-up Dan Rudert, both

Hollywood stunt pilots who also fly firefighting missions for the U.S. government. Fleming, who previously flew for the military, is currently on the set of the next Batman movie. Rudert, whose stunt credits include Hulk and XXX, said the precision flying they do for film work was good training. "A lot of the stuff we do is close, and that does help us," he said.

The disc-shaped re-entry capsule is about 1.52 meters wide and weighs about 200 kilograms. It will enter the atmosphere at a speed of 39,600 kilometers per hour.

But once its parachute is deployed, the pod will slow to just over 32 kilometers per hour, dropping at 4 meters per second, by the time it reaches its "intercept point" about 1219 meters over the desert floor.

The two retrieval helicopters, each carrying a three-person crew and hovering several miles away from the target area, will swoop in once they spot the parachute, which also will be tracked by radar. The object is for Fleming to snag the chute with a special 6 meter-long hook. If he misses, he and Rudert will have time to make about 10 passes before the capsule drops to 152 meters, too low for a safe mid-air grab. But Haggard said the pilots successfully hooked the capsule in all 60 practice runs.

Once they snag the pod, it will be flown to a temporary landing spot, where it will be lowered onto a pad and then disconnected from its parachute. The pod will then be flown to a nearby army airfield to be lowered gently into a special cradle and then moved into an isolation chamber.

Link: <http://www.abc.net.au/science/news/stories/s1181155.htm> ✕

# Space Bits

## Privately Funded Falcon-1 Rocket Nears First Flight

Time is drawing closer for the maiden liftoff of the privately financed Falcon 1 launch vehicle, built by Space Exploration Technologies Corp. (SpaceX) of El Segundo, California. But the march to the launch pad has not been easy. The firm has encountered engine troubles, supplier problems, mounds of regulatory paperwork and other costly woes requiring far more money to be spent than initially projected. Falcon 1 is a two stage, liquid oxygen and rocket grade kerosene powered launch vehicle. The vehicle's main engine is called Merlin, with a SpaceX Kestrel engine powering the booster's second stage. Falcon's first stage is also rigged for a water landing under parachute, to be picked up by a ship in a process similar to recovery of the space shuttle solid rocket boosters.



Photo courtesy Space Exploration Technologies

SpaceX is developing a five-engine version of the single-engine Falcon 1 booster -- the Falcon 5 -- that is slated to be completed for launch in mid-2005. For Falcon 1, the likely launch rate is probably five or six a year by 2007.

Link: [http://www.spacex.com/falcon\\_overview.php](http://www.spacex.com/falcon_overview.php) ☒

## Another Entrant in the Ansari X Prize Competition

A Canadian team of rocketeers has moved one step closer to launching its own manned spacecraft with the successful parachute drop test of a crew capsule. The backers of Canadian Arrow, a rocket entry in the \$10 million Ansari X Prize competition, watched happily as their crew compartment drifted down into Lake Ontario. This is one of more than two dozen teams competing for the X Prize, an international competition to build and fly a reusable three-person spacecraft twice in two weeks.



Photo courtesy Canadian Arrow

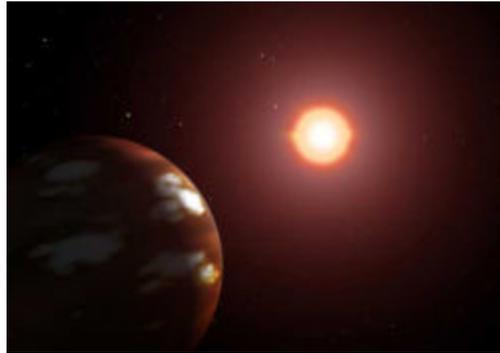
Competing spacecraft must reach an altitude of at least 62 miles (100 kilometers) above Earth to qualify for the \$10 million purse and X Prize trophy. The successful drop tests paves the way for a series of flight tests for Canadian Arrow in upcoming months, starting with a launch pad abort and leading up to an eventual manned launch, team members said.

Link: [http://www.space.com/missionlaunches/xprize\\_arrowdrop\\_update\\_040814.html](http://www.space.com/missionlaunches/xprize_arrowdrop_update_040814.html) ☒

## **Smallest Planet Ever in Extra-Solar Systems**

American astronomers say they have discovered the two smallest planets yet orbiting nearby stars which belong to a new class of "exoplanets" — those that orbit stars other than our sun. They define this new class by the planets' smaller mass — roughly 14 to 18 times the size of Earth and equivalent to Neptune in our solar system.

Today's instruments cannot detect bodies as small as the Earth, however the ability to find planets in the Neptune-mass range tips the scales for finding other Earths sooner rather than later. Researchers don't know the composition of these new, smaller planets — or even what they look like, since they can't actually see them. To detect such bodies, astronomers measure such things as how much a star wobbles from the unseen planet's gravitational tug.



Link: <http://www.kron.com/Global/story.asp?S=2242201> ☒

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### **Some Stellar Facts**

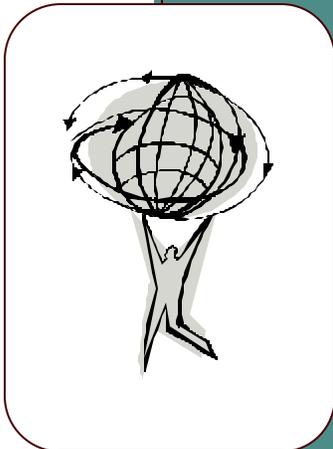
A light particle (photon) generated in the core of the Sun takes about 1 Million years to reach its surface and takes only 8 minutes to reach the Earth .

The mass of the Earth increases every year because of the 3,000 tons of meteorite debris that hits its surface from space.

A supernova is the most energetic single event known in the Universe. Material is exploded into space at a speed of about 10,000 kilometers per second and the energy emitted is 10 to the power of 44 Joules. Our galaxy contains about 100,000,000,000 stars and all these stars would have to shine for six months to produce this much energy.

## **We promise you the sun, moon and stars and we deliver...**

The Seattle Astronomical Society is an organization created and sustained by people who share a common interest in the observational, educational, and social aspects of amateur astronomy. Established in 1948, the SAS is a diverse collection of over 200 individuals. A variety of programs and activities is presented by the SAS throughout the year. Monthly meetings feature speakers on a wide range of topics, from the Hubble Space Telescope to electronic imaging to personal observing experiences. The club holds public observing "star parties" at Green Lake every month, dark sky observing parties outside Seattle, plus such activities as meteor watches, public telescope and astronomy displays, National Astronomy Day, and an annual Awards Banquet.



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