Space Lifestyle
MAGAZINE

Summer 2007

YN: Universal Party

Contest Winner Exclusive

Beyond Earth...Living the Dream

The Bad Astronomer Debunks Space Myths

Habitable Planet Gieise 581c: So Close, Yet So Far Away

CONTENTS

SUMMER 2007 • ISSUE 1 • NO. 1

Features

Space Lifestyle
MAGAZINE

Departments

26

editor's letter

Greetings and welcome to the first issue of Space Lifestyle Magazine!

When initially putting into action the idea of a magazine on space and the space sector, much of the news and ideas around NASA, astronomy, and personal commercial spaceflight were positive and exciting. Many of them still are, but with five weeks left till launch of this publication, I am writing this editor's letter and finding that in one weekend everyone's perceptions and realization can change.

Among the first pages in the premier issue of SLM you'll find some of the most recent developments in the space sector. They are also the most controversial.

As institutions and populations grow bigger and more numerous, disaster has a greater chance of rearing its ugly head. And instead of solely looking for other individuals and institutions to prevent disaster from occurring, maybe the best and first way to prevent disaster is through a better examination of oneself.

These times may call for all of us to give our best in all we do.

When former president John F. Kennedy, said, "Ask not what your country could do for you, but what you could do for your country," he was asking for Americans to take action and do, and to naturally assume, do their best at what they could do. Now may be the time to give our best again: be it for one's country, one's family, one's community, one's job, for one's contribution to a space effort, or just simply in one's daily encounters. The ability to bounce back with our best and prevent loss may be truly called for during these times.

For the past six months, we here at SLM, have tried to do our best for you. We hope this launch will give you an issue in which you could take the best time from your schedule in which you can enjoy and experience a digital magazine about space. It does not come without mistakes, but with an earnest effort to deliver objective, honest, accurate and timely feature articles on the lives and happenings of those in the space sector. I hope you can take at least a sliver of the magazine with you, inspiring you to give your best in some way.

Thanks to all that made this digital publication possible.

I truly hope you enjoy the first issue.

Starward dreams,

David Bullock
Editor-in-Chief
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Space Lifestyle MAGAZINE

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Three Dead in Mojave Tragedy: Three Others Hospitalized

Replica of SpaceShipOne — Photo: David Bullock

While testing a hybrid fuel tank, often claimed "relatively safe" compared to other types of fuel tanks, an explosion on July 26th, injured six members of the pioneering commercial personal spaceflight company Scaled Composites, LLC, killing three of them. The three others affected by the blast remain hospitalized, two in critical condition as of early reports. Scaled Composites, of which 40 percent was acquired by aerospace giant Northrop Grumman just days before, is Burt Rutan's acclaimed company. Rutan had lead Scaled to win the X-Prize for the first successful private spaceflight with SpaceShipOne in 2004.

The tragedy sent shockwaves through the space industry, especially for those involved in commercial personal spaceflight, all during a weekend in which space news events were at their most controversial in years (see the other three stories on these two pages).

Most of the major industry players commented under a personal commercial spaceflight industry organization known as the Personal Spaceflight Federation. (http://www.personalspaceflight.org/) Within their comment to the press and the public, they made this pledge:

"As individuals and as an industry, we pledge that:

• We will always be open and honest to the public and our customers about the risks of our activities and about any incidents that may occur.

• If there is an incident, a proper and methodical investigation will be conducted to determine the cause.

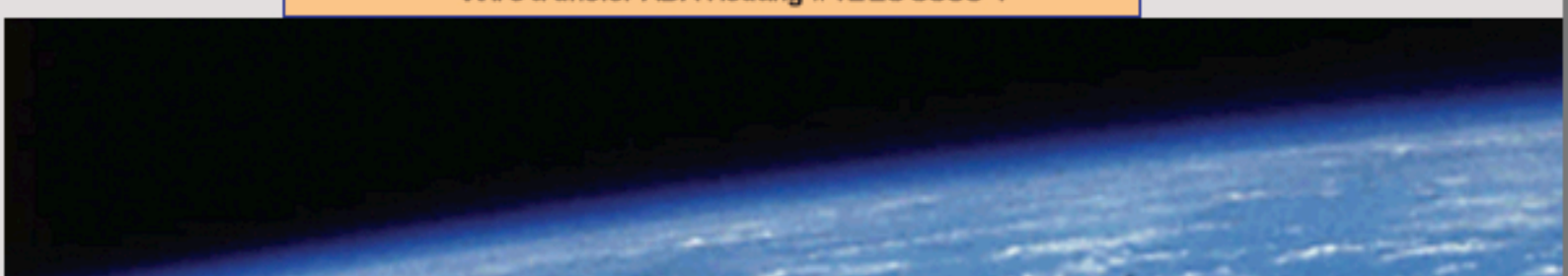
• We will apply the lessons of the investigation now underway and work to prevent this from happening again.

• We will persevere – we believe that we can best honor those pioneers who were involved by carrying on their work."

Since the accident was not during flight, federal authorities are not involved in the investigation of the accident. Instead California authorities are looking in to the tragedy.

Contributions for the victims can be sent to:
Scaled Family Support Fund
c/o Scaled Composites • 1624 Flight Line • Mojave, CA. 93501

Acct # 04157-66832
Wire transfer ABA Routing #1220-0066-1



X-Prize Cup

Photo: X-Prize Foundation

The energy and excitement generated at the annual X-Prize Cup in New Mexico could definitely take a space-craft out of this world Held this year October 26-28th, 2007 in a new location at the Holloman Air Force Base in New Mexico, the 2007 Wirefly X-Prize Cup is the finest NewSpace event for the public, drawing in crowds from all over the world. For more information go to http://space.xprize.org/

Major Players in the NewSpace Arena

- Armadillo Aerospace - www.armadilloaerospace.com
- Benson Space Company - www.bensonspace.com
- Bigelow Aerospace - www.bigelowaerospace.com
- Blue Origin - www.blueorigin.com
- Da Vinci Project - www.davinciproject.com
- Interorbital Systems - www.interorbital.com
- Masten Space Systems - www.masten-space.com
- PlanetSpace - www.planetspace.org
- Rocketplane Kistler - www.rocketplane.com
- Space Adventures - www.spaceadventures.com
- Space X - www.spacex.com
- Starchaser - www.starchaser.co.uk
- Virgin Galactic - www.virgingalactic.com
- XCOR Aerospace - www.xcor.com

NASA's VSE

Photo; NASA Archives

Do you know what the VSE is? If you are from the U.S. maybe you should know. If you are from at least 13 other countries including, Australia, Canada, China, France, Germany, Great Britain, India, Italy, Japan, Russia, the Republic of Korea and the Ukraine, you should get to know it. The VSE stands for the Vision for Space Exploration, a national initiative put forth by President George W. Bush, in 2004, to explore the Moon, Mars and Beyond. This year, NASA and 13 other space agencies, including the multi-national European Space Agency, have agreed to talking about a strategic global framework to explore the solar system together. Called the Global Exploration Strategy, discussions on the topic by global leaders took place on and around the end of May 2007. A voluntary, non-binding agreement is in the works.

Bigelow Aerospace

Space hotel hopeful Bigelow Aerospace successfully launched its second orbiting module June 28th. The module, Genesis II, is a precursor to the orbiting hotels BA hopes to make a reality for the future. Both, the first module, Genesis I and Genesis II are inflatable habitats, with skins made of several impact resistant layered materials. Tourists would go to one of the final BA inflatable habitat products from this series by means of a spacecraft. To track Genesis I and Genesis II in the sky go to the site "Our Planet Earth from Space" http://satellite.ehabich.info/genesis.html

Here's a picture of Genesis II, orbiting the Earth and another picture from inside Genensis II.

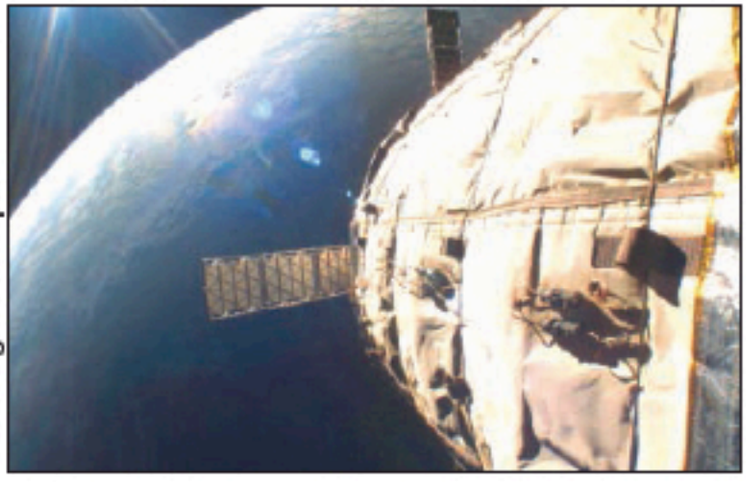
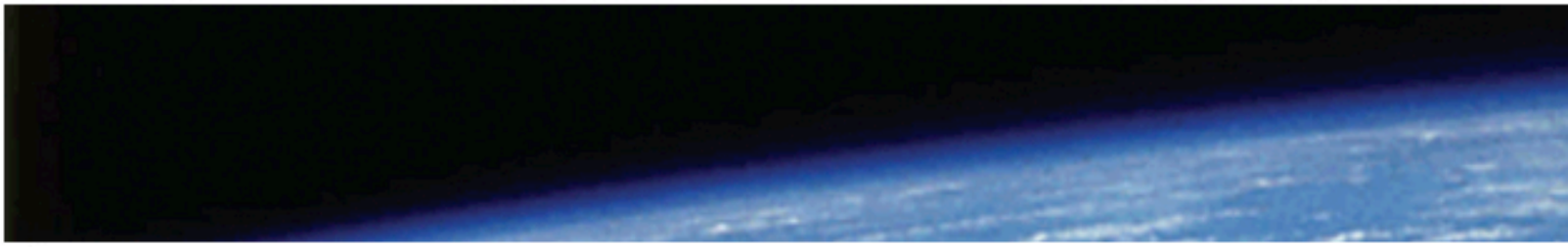


Photo: Bigelow Aerospace



Report: Astronauts Flew Intoxicated Before Flight

When NASA senior flight surgeons raised concerns on finding that some astronauts were drunk or had medical or behavioral issues that could causes mission problems, an astronaut health-care system review committee report, issued July 27th, states that they were repeatedly ignored.

There were two instances drunkenness brought up by flight surgeons and/or fellow astronaut, according to the report. The report stress that medical advice had been disregarded. The disregarding of information has been prevalent in NASA culture. Based on the reports following both the *Columbia* and *Challenger* disasters it was disregarding of information from within NASA that could have prevented those disasters from occurring.

This report came amid a former NASA employee's guilty plea to embezzling public money as part of an agreement made with the U.S. Attorney's Office. The employee is accused of stealing more than $150,000.

Sabotage Found for ISS Destined Computer

NASA's associate administrator for space operations, Bill Gerstenmaier, informed reporters July 26th of damage made to a computer destined to go aboard the International Space Station (ISS), as intentional and obvious. NewScientistSpace wrote that wires on the computer system had been cut. The sabotage seem to have been done by a NASA subcontractor, apparently someone from a company that builds equipment for the government space and aeronautics organization.

The computer technology damaged were three External Wireless Instrumentation System Network Control Units (EWIS NCU), according to SpaceRef. The three EWIS NCU were supposed to go on the August Shuttle *Endeavour* flight to the ISS, but went through the needed repair before that flight. The August Shuttle Endeavour flight had teacher-astronaut Barbara Morgan aboard. Morgan trained 22 years before, as a back-up teacher-astronaut to Christa McAuliffe, the teacher-astronaut who died in the 1986 Shuttle *Challenger* Accident.

Cosmic Choices:
Not-for-profits in the Space Arena

By David Bullock

When the President of the United States informed the public in April that he was "a decision-maker," he wasn't lying. In many ways, it should be noted that it is each person who is truly a decision-maker. And whether we try to advocate, sponsor, purchase, elect, downplay or ignore space issues, space-addressing politicians, or space-related products, it is a decision we each make either by intention or through reaction.

Below are descriptions of several space non-profits that have decided to make influencing others their mission to achieve their organization's desired space goals. Some of these organizations are the political founders and organizers that have survived the 50 year-long period of space exploration in the United States. And as always, they are each and collectively trying to implement direction for the future.

Unearthed from meetings of an earlier organization called the Mars Underground, The Mars Society takes an active role for the exploration of the red planet.

This organization created by advocates Chris McKay, Penny Boston and space author and advocate Robert Zubrin takes pride in sponsoring research initiatives. Scientists and engineers are encouraged to get involved with this 7,000 member organization. The Devon Island Mars Research Facility is one way that Mars researchers could practice their research.

Those not interested in research can be included. Volunteers are needed to learn about space topics, like Mars prototype technology or space politics. These volunteers are asked to later pass along their education on Mars to the public.

The society is also looking for research papers on any type of Mars topic. Their site, www.marssociety.org, has its published Mars papers reviewed before an official release to the public.

"The National Space Society mission is to push all of space forward," said George Whitesides, Executive Director of the NSS (www.nss.org). With 70 chapters for around the world, the term "National" in the NSS acronym is a misnomer, as the organization proves to be international in scope.

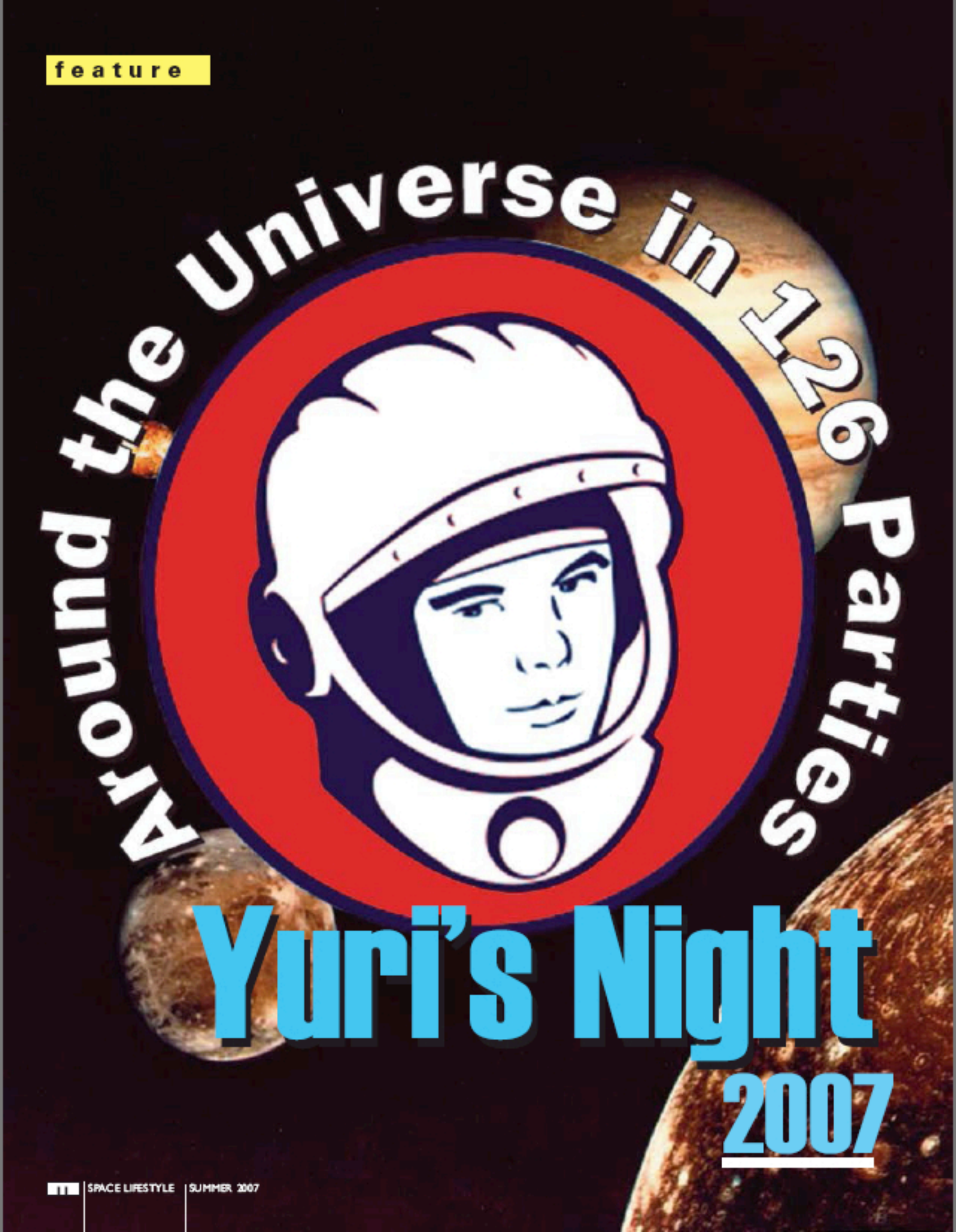
The organization publishes the magazine Ad Astra and has annual conferences bringing enthusiasts and space leaders alike to the event. Enthusiasts are rewarded with a free subscription to Ad Astra, the opportunity to get discounts on zero-gravity parabolic flights, and optional membership in the NASA federal credit union. The organization has also been an incubator of ideas for space leaders, such as Robert Zubrin of the Mars Society and the X-Prize's Peter Diamandis, who first published a description of the X-Prize in Ad Astra.

Covering "some of the technical dimensions that go across space and air," the goal of the American Institute of Aeronautics and Astronautics (AIAA) (www.aiaa.org), "is to advance aerospace," according to Robert Dickman, Executive Director of the 160 chapter organization.

Attracting aerospace engineers, aeronautical engineers, scientists, and anyone involved in technical and policy issues that have to deal with aerospace, the organization is a major producer of technical literature for the space and aerospace sectors. With eight journals and three technical books for educational purposes, this organization is popular with the set producing scientific papers on space and space engineering. An example of another academic competitor on space and space engineering is the American Institute of Physics (www.aip.org).

AIAA has shown strong support for the Presidnet's visionfor Space Exploration, and ties to NASA are strong, as NASA has come to AIAA for help for conferneces. But it should be noted that ties to the X-Prize and other NewSpace organizations remain just as strong.

Other non-profits outside the three mentioned above include the Space Frontier Foundation (SFF) (www.spacefoundation.org), who organized The Space Investment Summit for commercial space, in New York City, ProSpace (www.prospace.org), an active congressional lobbying organization, and the Planetary Society (www.planetary.org), an organization who seeks to engage the public in space exploration. Many of the organizations mentioned above have banded together to form the Coalition for Space Exploration (www.spacecoalition.com), an umbrella organization that specifically advocates the Vision for Space Exploration.



Yuri's Night 2007

By Lois Elfman

Are you ready to rock? Or should that be rocket? For one major space holiday, it may depend on the venue.

"Yuri's Night celebrations around the globe have ranged from raves to symposia—ours was somewhere in between," said Adrienne Klein, co-director of Science & the Arts at the Graduate Center of the City University of New York (http://web.gc.cuny.edu/sciart) and coordinator of New York's first Yuri's Night.

On April 12, 1961, Russian cosmonaut Yuri Gagarin became the first human being to leave the Earth's atmosphere. On that date, 20 years later, the first Space Shuttle launched. And 20 years after that, Loretta Hidalgo Whitesides—who coincidentally was born on April 12—created Yuri's Night (www.yurisnight.net), a worldwide celebration of space exploration.

P. Waldvogel, CUNY Graduate Center

At YN New York, Greg Olsen, the third private citizen to orbit the Earth, stands in front of a screen with scenes from his spaceflight.

"Space has always been something that I found could bring the whole planet together," said Whitesides. "I saw a unique opportunity to celebrate space that everybody could get behind."

In this age of the Web and global communication, it's sometimes hard for the 18 to 35 generation (the number one target audience for Yuri's Night) to wrap their heads around the notion that the space race had been part of the Cold War. Now it has transcended into an international accomplishment and something around which people from all over the world share a common interest. So on April 12, 2007—give or take a couple of days for logistical considerations—126 parties took place in 35 countries over six continents on two worlds (the other being Second Life). In its seventh incarnation, Yuri's Night brought together scientists, astronauts, space aficionados, science fiction fans, the curious and their friends for a look at the past, the present and the maybe some day possibilities of space.

"My interests in space exploration are a hobby and also professional," said Talal Ali Al-Bahri, who organized a gathering for 20 people in Kuwait City, Kuwait. A like-minded friend introduced him to Yuri's Night a couple of years ago. "My objectives were to introduce people to Yuri's Night and also make them interested in space. I felt after the event that I made people interested in space and it was a good feeling."

People for whom space is a career or a passionate hobby—Klein said she brings her telescope wherever she travels outside of New York City (where you can't really see too much in terms of the stars, unless you're at the Hayden Planetarium)—live or create their own space experiences. But Yuri's Night gives them an opportunity to engage people who have casual interest and curiosity. It also provides events where space fans whose paths may not usually cross have a forum to come together.

Mark Rocket of Christchurch, New Zealand, has already bought his ticket for the first launch of Virgin Galactic. He's also started a company called Rocket Lab (www.rocketlab.co.nz), with the aim of launching rockets into space. He said his plans for his 2007 Yuri's Night event was "to support the concept and encourage people in Christchurch to contemplate space exploration." Around 100 people attended a festive gathering that included food and drink. The event received good feedback, and Rocket said they would continue the enthusiasm year-round. "We are starting up an online forum for the budding New Zealand space industry."

What's extremely appealing about Yuri's Night is that people for whom space is a career eagerly embrace people who are simply avid fans or just plain curious. Often people who work in complex, sophisticated professions see little in common with the less informed, but when it comes to space, barriers seem to drop. Astronauts such as Tom Henricks, who from 1995 to 1997 flew four Space Shuttle missions as commander or pilot, enthusiastically answered questions from the New York audience, which included quite a few children.

When asked if astronauts have a sense of on-

Photo: Mark Rocket

Photo: Mark Rocket

Kacee Collis, Greta Simpson and Claire Stanley live it up to the stars (above). Scenes from YN New Zealand (left).

Houston Yuri's Night included a meticulously decorated cake commemorating the events of Gagarin's first space flight (insert). Photo: Yuri's Night 2007 website.

entation in micro-gravity, he replied, "What happens is your vestibular system essentially shuts down, because there is nothing to cause the follicles in your inner ear to move. So your brain stops using that input. Then you look for visual clues.... You have to give up on up and down. That's induced a lot of space sickness. People kept trying to establish up and down. I encouraged my crewmates to try and forget about it. Just relax and go with the flow."

Such information makes great material for high school science teacher Seth Guinals-Kupperman, who attended the New York event. "I frequent a lot of science and arts events to get interesting ideas about what to do in my classroom," he said.

Klein said that the mission of Science & the Arts is bringing science, technology and math topics to the public through the arts—making Yuri's Night a perfect fit. "We suggest to people in the arts that the sciences can be the content of their work," she noted. The evening began and ended with musical presentations set against video images of space. In between, the speakers included Hennicks, mathematician and artist Edward Belbruno, and Greg Olsen, the third private citizen to orbit the earth.

"We always try to tap into a new audience if we can," Klein said. "I networked and contacted space interest groups in the area." About 200 people attended New York's inaugural Yuri's Night. Klein said it is possible the Graduate Center may play host again next year, but probably not. "We like to bring new combinations of sci-


Photo: Michael Frostad

YN Houston, like YN Ames, was one of the more popular Yuri's Nights. Some Yuri's Night venues had poor showings, while other were packed.

ence and art to our public all the time. Also, we like to seed ideas. Sometimes we'll do an event then hope other people pick it up. If people who've attended say, 'We've got to do that too,' we'd be really proud."

If next year's New York event moves to a location that provides more of a party atmosphere, it will have a new dynamic. Although the speakers captivated the audience, a lecture hall only lends itself to so much festivity. Klein said Whitesides and Yuri's Night HQ in Washington, DC, did provide info about how other events were organized and also sent along supplies such as decals, temporary tattoos and prizes to giveaway, such as moon tree seeds.

Benjamin Howard of Austin, Texas, went to a Yuri's Night event at the University of Texas last year and decided he wanted to throw the party this year. He created a page for his event on MySpace, helping to propel excitement.

"I wanted to be an astronaut, like just about every other young boy did at some point," said Howard of his earliest interest in space. "My objective for Austin is to get a couple of hundred people together to see some great live music and art that either includes space-related themes or involves instrumentation that wouldn't be possible without the benefits of space-age technology (synthesizers, digital projectors). I do intend to have an educational element, mainly a display of some Soviet space propaganda posters and random facts and background about the Voshkod program and NASA's Orion program. The main objective is to have fun with human spaceflight as the theme, in an effort to increase general awareness and concern for manned spaceflight."

Lifelong sci-fi fan, screenwriter Mark Lund attended the Los Angeles Yuri's Night event at the Griffith Observatory (where Whitesides also spent the night of April 12 before heading to San Francisco's Yuri's Night, www.worldspaceparty.org, on April 13). He found former *Star Trek* cast member George Takei an appealing speaker, but it was writer Ray Bradbury who left the audience mesmerized.

"George Takei has public speaking down to a science. He's a very good orator," Lund said. "I personally thought his speech went a little off base from the reason we were there.

"The highlight for me was Ray Bradbury, who is a preacher of all things science and science fiction. He'd be the first to tell you that he's not a scientist. He's a writer of science fiction. The way he talked was very motivating—getting people to believe in the space program and the importance of Yuri's Night and what Yuri represented and how we should keep looking toward space for mankind's future.

"There was an electricity and an enthusiasm in the audience when he spoke. People were raving over his comments."

In Stuttgart, Germany, Juergen Schlutz was intending to have an event for 100 people and ended up with 300 (www.yurisnight.de). A year ago, he didn't know much about Yuri's Night, but he learned about it when he participated in the Space Generation Congress in Valencia, Spain. "I liked the idea and thought about doing something small with friends," he said. "But then I started asking local clubs and partners in the space biz and noticed the huge interest in the event."

Schlutz has a degree in aerospace engineering and is working on his PhD in human space mission design for lunar exploration. He is currently teaching courses on space stations and human space flight. He intended for the event to be enlightening, which it certainly was, but "I just tried to share space and its fascination with as many people as possible, and it simply turned out towards having a wonderful party." The event received considerable press coverage and there is already excitement across Germany for Yuri's Night 2008.


Photo: Robert Vogel

Juergen Schlutz holds a model of Space Shuttle Columbia provided by the IRS (Universitaet Stuttgart).

Close to NASA's Johnson Space Center, new Houston resident Michael Frostad (www.yurisnighthouston.net), an engineer with the Engineering and Sciences Contract Group at the JSC, saw Yuri's Night as a chance to follow his passion outside of work. "I see it as an opportunity for a world unifying event, one that the entirety of humanity can be proud of, be inspired by and learn from as well as giving a good reason for people to get out, come together and have fun," he explained. They had 400 people, which was more than they expected, and "we sold out of our shirts for girls!"

"Being 27 when I founded Yuri's Night, one of our intentions has always been to make space cool and make space accessible to everyday people," Whitesides said. "Having musicians performing and having art on display really adds that element of fun and celebration and that human spirit.

"The intention is to have that spirit," she added. "We call it the overview effect, which is the impact that space can have on how people see the bigger picture. What do your problems look like from 370,000 feet? Anything starts to seem small in comparison when it's the scale of the universe."

From a love of space, an inspiration and a big step forward (a theme space lovers understand) came 126 parties in 35 countries over six continents on two worlds. As Gagarin said just before takeoff, "Let's Go!"t


Photo: Talal Ali Al-Bahri

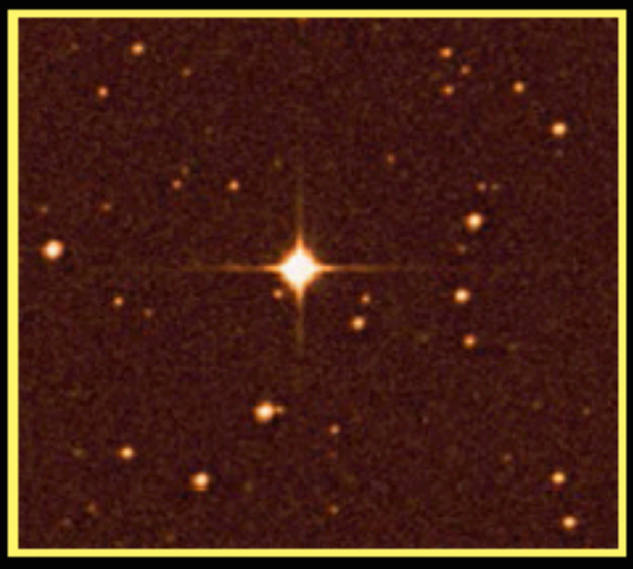
Space fans in Kuwait City. Yuri's Night was held all over world, on the International Space Station and even online in the virtual world, Second Life.

Lois Elfman is an NYC-based sci-fi film producer, freelance journalist and winner of the New Forks Space Journalism Contest in the "unpublished" category. The winning story on Prof. Lunine can be found in this issue of SLM.

feature

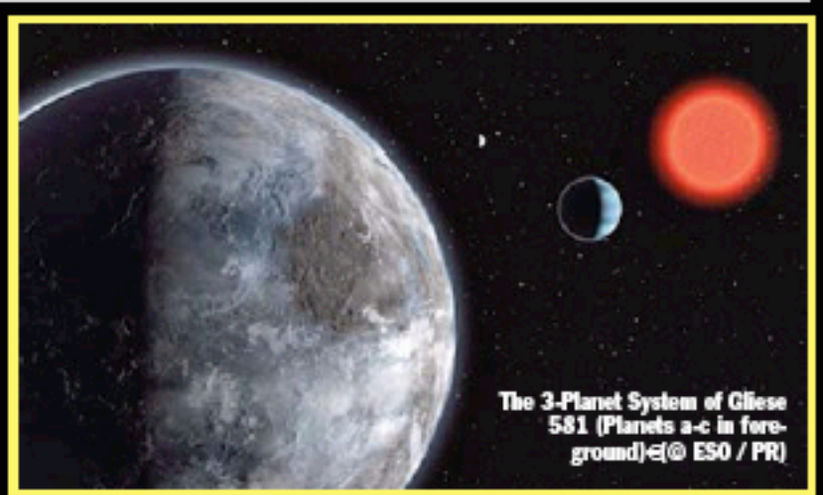
So Far, Yet So Close

by Michael Ricciardi



The Star Gliese 581, in the constellation Libra (© ESO / PR)

Gliese 581c: Most Earth-like Planet Found Outside Our Solar System To-Date



The 3-Planet System of Gliese 581 (Planets a-c in foreground)€(© ESO / PR)

In the celestial neighborhood that we inhabit, Gliese 581–a 'red dwarf' star in the constellation Libra–at 20.5 light years distance is, galactically speaking, just a stroll down the block (120 trillion miles). Although it would take 400,000 years to reach it in our fastest rocket (assuming we had enough fuel), its relative closeness currently holds a special interest to astronomers and astrobiologists. Gliese 581 (pronounced 'glee zuh') is now designated a three-planet system–one of which is the most 'Earth-like' planet yet to be found outside our solar system.

In late April, an international team of astronomers working at the LaSilla, Chile ESO (European Southern Observatory), using a 3.6 meter radio telescope outfitted with a special spectrographic sensor, detected a tiny 'wobble' in Gliese 581's spin. It was one of those cosmic 'eureka!' moments-the wobble had indicated a small, orbiting planet 'tugging' on its parent star. On April 25th, the team announced its discovery in a press release on its official website. It was the astronomical 'shot heard round the world'; for within a few hours after this announcement, the story had hit the wire services and made global headlines.

Since 1995, over two hundred other exoplanets (planets outside our solar system) have been found–but this one was special: it was small and 'earth-like' and just the right distance from its parent star. Earth-like enough so that it could possess a liquid water surface! In what is probably an instructive lesson for would-be planet hunters, Gliese 581had been checked twice before by other astronomers-each time with negative findings for planetary bodies. Many astronomers simply gave up looking at red dwarf stars, as there has always been some debate on whether such 'M3

The first known planet circling a sun-like star outside our solar system was not discovered until 1995. That enormous gas giant, called 51 Pegasi b, or Peg 51 b for short, located in the constellation Pegasus, is seen hugging its star tighter than Mercury does our Sun. So it hardly resembles Earth, or affords conditions friendly to life. Fast forward to 2007 and the number of discovered extrasolar planets, or "exoplanets," has swelled to nearly 230 and counting.

class' stars were suitable progenitors of low-mass planets. This is because stars like *GI581* have low 'metallicity', making them less likely to 'spin off' enough heavy metal to form a core to build a planet from, like Earth. Other astrophysicists, such as Greg Laughlin (University of California at Santa Cruz), argue that such low mass stars are *ideal* for yielding low mass, Earth-like planets.

When it comes to looking for planets, it seems that even astronomers have their biases. To date, ten times the number of Sun-like stars have been surveyed for planet,s as have the number of red dwarf stars. In 2005, the La Silla team began using an enhanced spectrographic detection system, taking a third look at nearby red dwarf stars, like Gliese 581. The third time proved a charm. For the La Silla team, this discovery was the result of many factors coming together-not least of which was simply, stubbornly, bucking the trend.

"Red dwarfs are ideal targets for the search for low-mass planets where water could be liquid," asserts Xavier Bonfils, an ESO team member. "Because such dwarfs emit less light, the habitable zone is much closer to them than it is around the Sun." Although that in itself does not mean there will always be planets bearing water around M dwarfs (it is still a 'working hypothesis'), it is a claim much easier to put forth now that Gliese 581 c has been found. The statistical trend seems to be confirming that "low mass planets (Neptune mass and below) are more frequent than giant planets around M dwarfs (6 very low-mass detections against 3 Jovian planets)", wrote Stephane Udrey in his team's published paper, found in Astronomy and Astrophysics.

Not only had this star been checked twice before by others, but the La Silla team had also twice previously discovered planets orbiting it. Two years earlier, the first planetary body ('b'), a giant 'hot Neptune' (15 Earth masses - M_E), was discovered in tight orbit around Gliese 581-completing a solar cycle in just 5.4 days. And earlier this year the same researchers at La Silla had found another 'light' planet (now named 'd') orbiting farther out around Gliese 581. This second planet was also dubbed a 'super Earth' (that's any planet less than 20 times the Earth's mass), though it was only half as massive as 'b'-weighing in at 7.7 M_E, with an orbital period of 84 days. These discoveries did not merit great fanfare; in the former discovery, the planet was deemed both too massive and too gaseous to sustain life as we know it; in the latter case, the 'super Earth' was found to be orbiting too close to the outer, cooler edge of the star's 'habitable zone' to support the possibility of liquid water.

The 'habitable zone' refers to the spherical region around a star within which a planet's temperature can sustain liquid water on its surface. The exact dimensions of any star's habitable zone are based upon several factors: the temperature of the star (its luminosity, 'hotness'), the size of the planet, and its proximity to the star in question (too far away = too cold, too close = too hot)...this is known as the 'Goldilocks' problem, or effect ('not too hot, not too cold'), which describes a fuzzy, complex relationship between the three variables. Gliese 581c orbits within the warm region of its parent star's habitable zone. The other light planet, 'd', orbits at the outer edge of the zone. The team notes that there are uncertainties in determining the edges of this star's habitable zone, which are "mainly due to the lack of realistic cloud models", according the published paper. Cloud model are computer simulated atmospheric models. As a result of the dearth of models, the team awaits for more atmospheric data from visible light and other wavelengths, or more specifically the "spectral characterization of their atmospheres," to determine the actual limits of Gliese 581's habitable zone.

In the rush to get the story out and attract readers, some journalists ventured to claim this exoplanet a 'twin Earth'. One can certainly understand the excitement surrounding this discovery-and the tendency to 'hype' a good story (well before the scientific paper was published). But, in reality, Gliese 581c is not even a fraternal twin. For example, one 'year' (one solar cycle) on 'c' would pass in just under 13 days. The planet is more than five times the mass of the Earth. You would weigh considerably more if you were to walk (or swim) its surface. Its gravitational 'pull' is estimated at 1.6 times that of Earth. We would need much denser bones to support our increased weights. The parent star, GI581, would appear huge in the sky, as the newest planet orbits 14 times closer to its parent than does Earth to the Sun. Fortunately, such red dwarf stars are about 50 times cooler than stars of our sun's magnitude. Life on the 'sunny side' of 'c' would be bathed in a permanent, reddish-orange glow-akin to a continuous 'sunset.'

Gliese 581c is, however, the smallest and most Earth-like exoplanet yet found (but, it turns out, not the closest), and the La Silla team estimates its average surface temperature to be in the 32° - 104° F range (0° - 40° C), just the right range for liquid water to persist. Many astronomers speculate that its surface is most likely both 'rocky' or oceanic. Based upon this rocky surface scenario, GI581c would have a diameter about 50% larger than Earth's with an estimated 5.5 M_E. But 'c' could also be ice-covered, which would make it even larger. On the other hand, at that mass, and with a possible thick, icy surface, it could also be a 'twin Neptune'. As of this writing, either is possible.

And there is another unknown about 'c': whether or not this exoplanet spins on an axis as it orbits, creating a cycle like on Earth. It may in fact only orbit without spinning, possessing a permanent dark side like our Moon.

The most obvious factor in finding an extra-solar planet is size-both of the planet and its parent star: the bigger the planet, the easier to detect signs of its presence (especially those orbiting brighter stars), conversely, the smaller (and less luminous) the star, the easier it is to find an orbiting planet. There are several techniques for

Overlay YouTube Video: An ESO production on the discovery featuring Michel Mayor, member of the La Silla team, Geneva Observatory

http://www.youtube.com/watch?v=5w7NUsBcgyw

So, Who Is this Gliese Anyway?

Twentieth Century German astronomer, Wilhelm Gliese (the proper way to say it is 'Glee-zuh'). The astronomer Gliese (1915-1993) surveyed thousands of stars, including the 581 stars that comprise from our perspective on Earth, the constellation Libra. These stars are located within a 25 parsec (81.5 light year) radius of Earth. His record of identification of all stars within this radius is known as the Gliese catalog (first published in 1969, updated in 1991.)

detecting the presence of large planetary bodies orbiting distant stars. One technique–the transit method–looks for a slight dimming in brightness of the star as a planet passes between the star and Earth. But the technique is limited to a planet's transiting on a plane parallel to the line of observation from Earth.

Another technique–gravitational micro-lensing–makes use of an effect described by Einstein's General Theory, long-since verified, to reveal a slight bending and brightening in a background star's light due to the presence of a planet in orbit around a weaker, foreground star. This technique is limited by the happenchance in which a planet-harboring star happens to pass in front (from the Earth's viewpoint) of a second, more distant star.

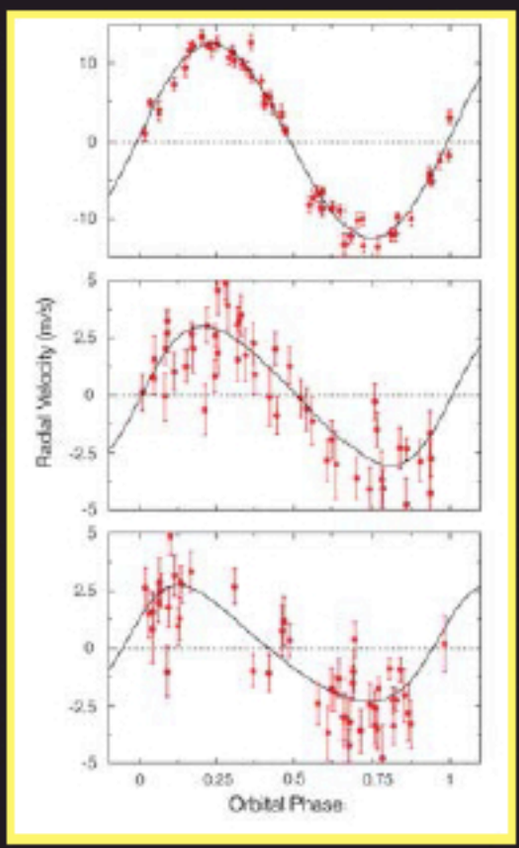
There is also the Infrared Array Camera on NASA's Spitzer Space Telescope. This type of camera–which 'sees' only infrared wavelengths–is advantageous for reducing the difference in brightness between a star and a planet, thus greatly increasing the chances of detecting an orbiting planet. However, owing to its method of detection, the Spitzer Telescope can only detect relatively large, hot planets–deemed too inhospitable for 'life as we know it.'

The discovery of Gliese 581c was accomplished by a special radio telescope outfitted with a type of spectrographic analysis machine that detects small 'wobbles' in a star's rotation.

The La Silla team found 'c' using a technique known as radial velocity, which detects slight 'tugs' on a star's rotation. These tugs, or 'wobbles', allow astronomers to estimate, with a good degree of accuracy, the distance of the planet from its sun, its period (duration of one solar cycle), and its minimum mass. Up until recently, astronomers were only able to detect larger 'wobbles' and 'jitters'. This newest telescopic system-known as HARPS (High Accuracy Radial-velocity Planet Searcher)–can detect parent star wobbling on the scale of two or three meters per second (which is a very small amount, for a spinning star). Now, with such high precision spectrography, astronomers are eagerly focusing on other red dwarfs within a 25 parsec radius (81.5 light years) from Earth. There are some 100 red dwarfs within this radius–the most plentiful type of star in our galactic neighborhood–and their low mass (and luminosity) makes it easier to detect light planets, defined as less than 7 M_E.

"HARPS is a unique planet hunting machine," said Michel Mayor, from the Geneva Observatory, and HARPS principal investigator. "Given the incredible precision of HARPS, we have focused our effort on low-mass planets. And we can say without doubt that HARPS has been very successful: out of the 13 known planets with a mass below 20 Earth masses, 11 were discovered with HARPS!"

Despite its success rate, radial velocity is not 100% fool proof. Errors can arise due to photon 'noise', spectrographic 'drift', and instrument calibration uncertainties. In its paper, the La Silla team acknowledges some 'measurement noise' in their readings. Further, there is the remote possibility that 'c' is not a planet at all, but rather, a signal variation due to a sun spot on Gliese 581's surface.



Velocity Variations of Gliese 581— middle panel shows the 'phase folded curve' of planet 'c'; top panel is planet 'b', the giant 'hot Neptune'; the bottom is planet 'd' with a cycle of 84 days.

Udrey dismissed this in the Astronomy and Astrophysics paper: "A spot responsible for the observed variation would need to cover 2.6% of the stellar surface. Such a large spot would only be expected in a fairly active star, which Gl581 is not." The team is planning a battery of 'chromospheric' and 'photometric' follow up tests to settle the question permanently, "but we are already confident that the third planet is real", wrote Udrey.

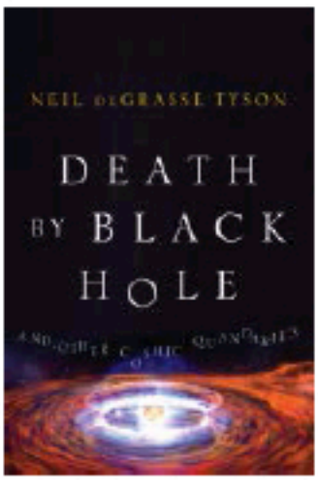
With the discovery of 'c', the inevitable speculations about its suitability for life immediately flooded the blogosphere and the space news websites. It wasn't simply the size of this planet, nor its relative closeness, nor even its estimated surface temperature that provoked the speculation, although that was a big factor. Rather, it was the fact of finding 'c' so soon after the utilization of the new HARPS technology. Were the astronomers just plain lucky? Red dwarfs outnumber other types of stars in our neck of the galaxy. Does this discovery indicate even more low mass planets awaiting us as we aim our telescopes closer to home? Are Earth-like worlds more common than some supposed?

Though interested in all such exoplanetary research, many scientists adhere to a firm belief in our Earth's singular evolutionary history. For these, Gl581c might be home to a few strains of microbial life, at best; our planet's bio-evolutionary history has been far too idiosyncratic to make 'Life as we know it' common, or even statistically probable, throughout the Universe.

Michael Ricciardi is a trained naturalist and former field science instructor for grade school youth. As a science writer/reporter, he has interviewed several famous scientists, including the 1978 Nobel Laureate for Chemistry, Ilya Prigogine, and string theorist Brian Greene, author of 'The Elegant Universe.'

Death By Black Hole: And Other Cosmic Quandaries

by Neil deGrasse Tyson



Astrophysicist Neil deGrasse Tyson gleefully says that he can't keep the universe contained within him: it's too wonderful not to share with others. Thank heavens for that. In his various professions as director of the Hayden Planetarium, host of PBS's "Nova scienceNow," and author of several books, he's become one of the best communicators of science to the public.

He confirms this again with his latest book *Death By Black Hole and Other Cosmic Quandaries*, a "greatest hits" of Tyson's best and most requested essays written for *Natural History* magazine, the publication of the Natural History Museum in New York City, home of the Hayden Planetarium.

The book is divided into seven sections and runs the astronomical gamut from the beginnings of the universe, to the dangers lurking in space, to how science and religion might perhaps peacefully coexist. The 42 essays that comprise the book were written over an eleven year span. Therefore, *Death By Black Hole* doesn't have the seamless continuity as though it were written as a single work, and some information is repeated. But that's alright...most is worth repeating.

A common theme throughout the book is how much we don't know about the universe, and how a large percentage of us keep bungling the astronomical information we are supposed to know. It took humans quite awhile to figure out that a large portion of the universe is invisible to us, and Tyson muses what else might be out there that we haven't yet identified, since that stuff astronomers call Dark Energy (up to 85% of the universe) is just a placeholder for our ignorance.

Tyson shares what we've learned from the recent inventions of telescopes, microscopes, mass spectrometers, particle accelerators and detectors across the electromagnetic spectrum, and honors the scientists and astronomers who have come before him. Conversely, Tyson also relates the amazing amount of astronomy that can be done with just a stick.

Tyson writes with clarity, humor, and intelligence, although he did err in the fates of two robotic space missions: the *Genesis* capsule is the one that crash-landed back to Earth, not *Stardust*.

Like much of Tyson's previous work, *Death By Black Hole* will appeal to a wide variety of readers and provides a cosmic perspective to our little corner of the universe. —*Nancy Atkinson*

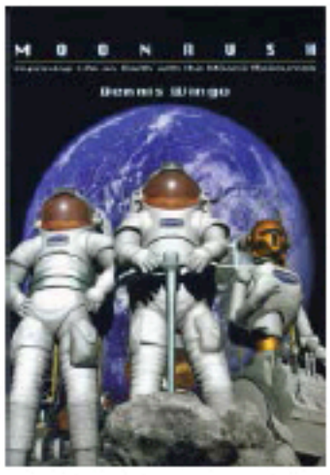
Moonrush: Improving Life on Earth with the Moon's Resources

by Dennis Wingo *(an Apogee Books publication)*

The premise of Dennis Wingo's book, *Moonrush*, is made clear by its subtitle, and more so with pithy, back-cover statements like *'We go to Mars to take our Civilization there. We go to the Moon to save our Civilization here.'* offering the would be reader the full scope of the book's philosophical view point. Though focusing on colonizing the Moon, and extracting its resources, the author also makes his case-speaking for a community of like-minded folks-for future missions to Mars, as well as other moons (and even asteroids) of our solar system. If there were any precluding doubt about a need to inhabit and exploit the Moon's resources, a case is made with a reference to the World Wildlife Federation's declaration that 'it would take the equivalent of two more Earths to sustain our planetary population *at the level of affluence* that the western world enjoys'(Italics reviewer's).

In clear, readable language, Wingo presents a nearly exhaustive compendium of past, present, and future mission proposals, technologies, and designs, which are all geared towards the habitation and exploitation of our Moon. Some are still on the drawing board, some were stalled, and some were abandoned (e.g., there's NERVA, a streamlined nuclear thrust engine for low-earth to lunar orbit transport, designed and tested 30 years ago!). Charts, photos, diagrams, and graphs abound here. *Moonrush* might come as a bit of a surprise to many readers; an interested newcomer might not realize the extensive research and work already amassed towards this long-unfulfilled promise of 'humans inhabiting space'.

Though Wingo acknowledges NASA's important and continuing scientific contributions (as well as support technologies), he makes a case that only the private sector can successfully accomplish the stated mission (i.e., 'exploit the Moon, save the World'). A centralized government bureaucracy like NASA, the author asserts, cannot cost-effectively get us to the Moon, permanently, and establish a new lunar economy. This is the proper function and domain of a competitive, privatized, 'moon rush'.



I do note that many of the plans/schemes put forth in the book for establishing a moon base, and also resource exploration missions, would make use of the International Space Station (ISS), as a space-based staging facility. The ISS is an internationally financed, *governmental* project, and so, these privatized lunar expeditions may depend (at least initially) on *past* and *ongoing* government space programs (as well as on tax breaks or subsidies to space industries).

Certain underlying assumptions in this book go unchallenged. There is, expectedly, a clear bias in these pages toward the private sector, as well as towards the U.S. However, Wingo does manage, ultimately, to strike a reasoned balance in his weighing of economic, environmental, and public benefit issues, while consistently moving from his primarily U.S. economic considerations, to those impacting the entire developing world. —*Michael Ricciardi*

The One and Only Bad Astr

By Nancy Atkinson

Phil Plait Promotes Good Science

ronomer

Astronomer Phil Plait likes to start his public presentations by standing an egg on end. Sometimes he will stand a half dozen or so just to prove his point: eggs can be stood on end any day of the year, anytime, no vernal equinox needed. "Eggs have little bumps on their bottoms, like stool legs," says Plait. "That's why you can stand them up."

So begins another presentation by Plait, whose alter ego the "Bad Astronomer" works tirelessly to defend the world against astronomy myths, misconceptions and just plain bad science.

And really, he's quite good.

Egg standing essentially started Plait's career in debunking astronomical and scientific misunderstandings. In March of 1993 he watched a local television report of students trying to stand eggs on end on the first day of spring. "Every fallacy on this topic that you can imagine was all rolled up into one little news segment," Plait said. He ran to his computer, wrote up a scientific commentary blasting the erroneous equinox egg-standing notion and posted it on a webpage he created called "Bad Astronomy."

"That was back when the web was brand new, and probably nobody saw it," said Plait. "But that's alright; I just needed to blow off some steam. But over the years the website grew and grew."

This isn't the equinox: standing eggs in Plait's kitchen.

Phil Plait's first book, "Bad Astronomy." Far left: Plait during one of his TV interviews at Goddard Spaceflight Center.

Plait's Bad Astronomy website (www.badastronomy.com) now covers a range of topics such as exposing flaws in pseudo sciences like astrology and the belief in alien UFO's, explaining how the Coriolis Effect does not determine the direction of flushing water in a toilet, and answering basic science questions like why the sky is blue. The website eventually led to writing a book, "Bad Astronomy: Misconceptions, and Misuses Revealed, from Astrology to the Moon Landing 'Hoax.'" published in 2002. The book recently went into its sixth printing, and in December of 2006 was listed as one of the top five books about space exploration in the Wall Street

No Hoax: The Bad Astronomer with a model of the Apollo 11 landing site.

Journal.

In 2005, Plait added a blog section to his website that he updates several times daily, and it's become one of the most popular scientific weblogs out there. The "BA" site and blog now receive about 20,000 hits every day, according to Plait.

In addition, Plait frequently writes articles for the magazines *Astronomy, Sky and Telescope*, and *Muse*; and several websites including Huffington Post (http://www.huffingtonpost.com), and Space.com (www.space.com). He has appeared on CNN, MSNBC, and numerous local news shows, and is heard frequently on radio programs including NPR's "Tech Nation," the late night radio show "Coast to Coast AM" and podcasts like "Skepticality," SETI Institute's "Are We Alone," and his own "Q and BA" video podcast.

Moreover, he regularly hits the road with his Bad Astronomy presentations, speaking at museums, universities, conventions and various scientific venues.

And, oh yes, he's also appeared in a superhero comic book.

So, who is this 'Bad Astronomer' guy who is seemingly everywhere? Plait is a real astronomer who received his Ph.D. in astronomy from the University of Virginia in 1994. Most recently he worked at Sonoma State University in California as a NASA Education Resource Director (NERD) developing educational activities and presenting workshops to teach people, particularly educators, about space science. Before that, Plait spent several years as a research astronomer and programmer at NASA's Goddard Space Flight Center assisting with the Space Telescope Imaging Spectrograph (STIS) instrument on the Hubble Space Telescope.

In March 2007, Plait announced he was leaving his job at Sonoma State to write his second book, titled "Death From the Skies." "The common wisdom among writers is not to quit the day job until after the third book," Plait wrote in his blog, "but I like to flout common wisdom; it's usually based on an urban legend." The new book discusses the numerous ways that astronomical events can destroy, or seriously make a mess of life on earth. But don't expect a volume full of hype and dire predictions. "I'm really tired of doomsday criers scaring people and scamming their money," said Plait, "so this should act as something of a mitigation. I want to be accurate, and I want to make sure that people understand that while the effects of something like a galactic gamma-ray burst would truly suck, the odds are vanishingly small." The book is due out around the vernal equinox in 2008.

When he first began as the Bad Astronomer, Plait tackled just the misconceptions: misunderstandings of the reasons for seasonal change or moon phases, or incorrect idioms such as "light-years ahead" and "quantum leap." Later he started taking on what he calls "pathological bad science" where, he says, people distort reality for their own benefit. "It's relatively immaterial to me whether they honestly believe what they're saying is true, or whether they are horrifying, vulture-leaching, blood-sucking, con men," he said. "The problem is that they are wrong and people are buying into it." This includes companies that sell "naming rights" to stars, astrologers, Area 51 UFO-ologers, and those who believe there's a giant face on Mars, or that a rogue planet will smash into Earth. Some of these are multi-million dollar industries based on, Plait says, total hogwash.

Perhaps Plait is most famous for his fight against those who claim that NASA faked the Apollo moon landings. This belief has been lurking around for years, but was heightened after a show aired on the Fox Network in 2001, "Conspiracy Theory: Did We Land on the Moon?" Plait effectively addresses the claims made by this "documentary" point by point on his website and says, "This program is an hour-long piece of junk, loaded with bad thinking, ridiculous suppositions and utterly wrong science." Should anyone ever encounter an "HB" ("Hoax Believer," as Plait calls them) Plait's scientifically sound clarifications will provide all the ammunition needed to ward off attacks of this particular type of bad science. His "Moon Hoax Hoax" presentation is the most requested public talk in his repertoire.

Plait has also become a champion for critical thinking and skepticism, and a voice against the anti-science movement that appears to be afoot among some political and religious circles. He has been accused of being anti-religious, but Plait feels that is an unfair assessment. "What I'm fighting is when a religious belief clearly goes against all of reality," he said, "such as when something like Creationism is trumpeted as a potential alternative theory to evolution. That burns me up because it's absolutely not true. Creationism is wrong. We know in several different ways, in terms of independent scientific fields, that the Earth is 4.5 billion years old, not the 6,000-10,000 years old the young-Earth Creationists claim."

Plait acknowledges that science and religion are both trying to answer some of the most fundamental human questions, such as "where did we come from?" and "are we alone?" But he feels science takes a more practical and logical approach. "Science is not a matter of belief," Plait insists. "It's a question of does something exist or doesn't it?"

But like a good scientist, Plait can admit when he's wrong. "I've gotten angry and written up a blog entry and said something stupid,

or written something before I had all the facts," he said. "And if you make a mistake, believe me, people comment or send emails. Then I have to sit back and rethink it." But Plait loves the interaction that a blog provides. "It's wonderful that people post comments. It's almost like being back in school, sitting around with my friends arguing about things. And others become a part of it; you build up a community. If you're really trying to change people's minds, engage them in a dialogue.

While Plait has his critics, among his peers, he's much sought after for advice, alliances, and guest appearances. Fraser Cain, publisher of the Universe Today (www.universetoday.com), and collaborator with Plait on their BAUT Forum bulletin board (www.bautforum.com) recognized Plaits influence. "Phil's such a great writer, science communicator and skeptical thinker," said Cain. "I don't think my rational, skeptical side really happened until after I met Phil and I learned to appreciate the way he looks at the world." As much as Plait enjoys writing, he loves speaking in front of a crowd. His audiences get caught up in his enthusiasm and see the twinkle in his eyes as he shares his love of science.

"I try to make it fun. I could stand in front of an audience and lecture about why shadows on the Moon don't look parallel, and why a flag [on the moon] waves due to inertia, and everyone listening would fall asleep," said Plait. "So instead, I make jokes. I show them pictures I took of a baseball field near my house with non-parallel shadows, and tell them NASA helped me fake the park in the 1960s. I take my belt off (yes, at formal lectures) and blow as hard as I can on it (noting I played trombone for 25 years), showing that air won't make it move much. Then I wiggle my hand, and the belt flaps. Tadaa!"

"It's great," Plait continued. "And it's really effective; you can show people how to debunk nonsense with nothing more than, literally, the clothes on your back."

So how can anyone become a scientifically logical skeptic? "Ask questions. Demand evidence," said Plait. "When someone says 'So and so is true' think of ways it might not be instead of just accepting it. Is there another explanation? It's easy to just believe what someone tells you; it's harder to question, investigate and experiment to determine the truth. But do it."

Admittedly, there are ups and downs in the business of debunking scientific myths. A February 2007 report released by the American Association for the Advancement of Science revealed that the percentage of scientifically literate Americans has nearly tripled in the past twenty years from 10 to 28 percent. Wonderful. But at the same time there has been an unsettling rise in the number of people who put their faith in astrology, alien UFO visits, and creationism. That's why Plait is as busy as ever these days.

"There are times that I have to write up a web page on something that is so ridiculous that I can't believe I'm writing it. I wonder how this can actually happen, how people can actually believe some of this stuff. It's discouraging sometimes," he said.

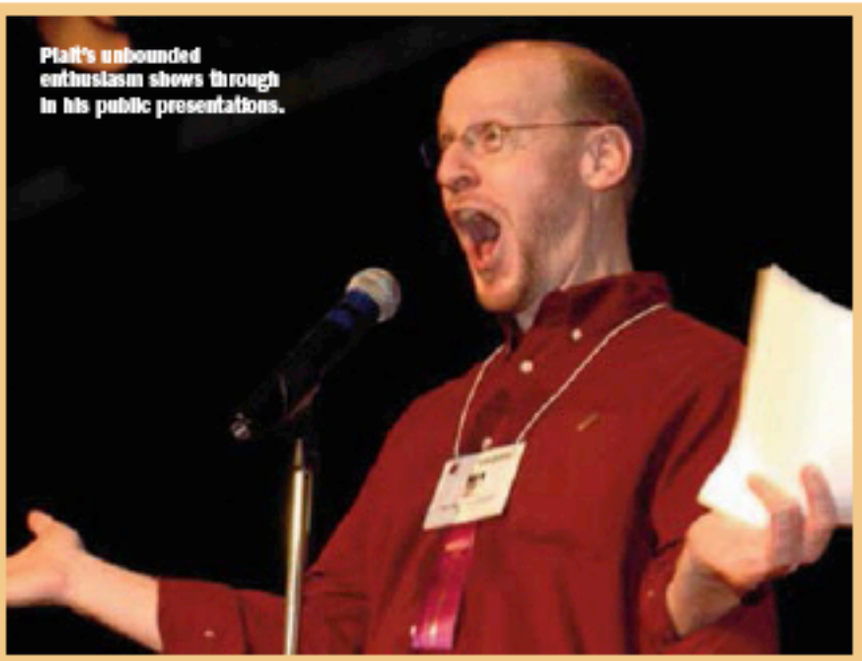
But Plait says there are many reasons why he chooses to continue his quest to fight bad astronomy. "The personal reasons are I love science and astronomy, and I love sharing the wonders of the universe. But I also hate seeing science abused. And what some of these people are doing is wrong. They are scaring people, or taking money from people. I just hate to see that. It's liberating to know that you are thinking clearly, applying logic to your life, and it's liberating to be able to show other people how to do that, too."

And for Plait, science lies at the heart of it all. Plait subscribes to Carl Sagan's adage, "Science is more than a body of knowledge. It's a way of thinking."

"A lot of people say they don't like science, and to me that's shocking, because science is everything," explained Plait. "It's watching trees blossom, watching the sun rise, feeling the wind in your face. Saying 'I hate science' is like saying, 'I hate rainbows,' or 'I hate sunny days.' Science is nature and reality. I think people hate the way they were taught science as just rote memorization instead of a process, almost like a living, breathing thing that grows and repairs itself."

Plait has a theory that if he teaches enough people the joys of discovery and skeptical thinking, maybe the misconceptions and attacks on science will wither on their own. That's the motivation that keeps him going.

"There is more than a little thrill seeing something I've written or created come alive for another person," he said. "I've seen it happen. That light in their eyes is almost a tangible thing, and every time I see it I feel like I'm breathing in the science and wonder again for the first time. I love that moment."

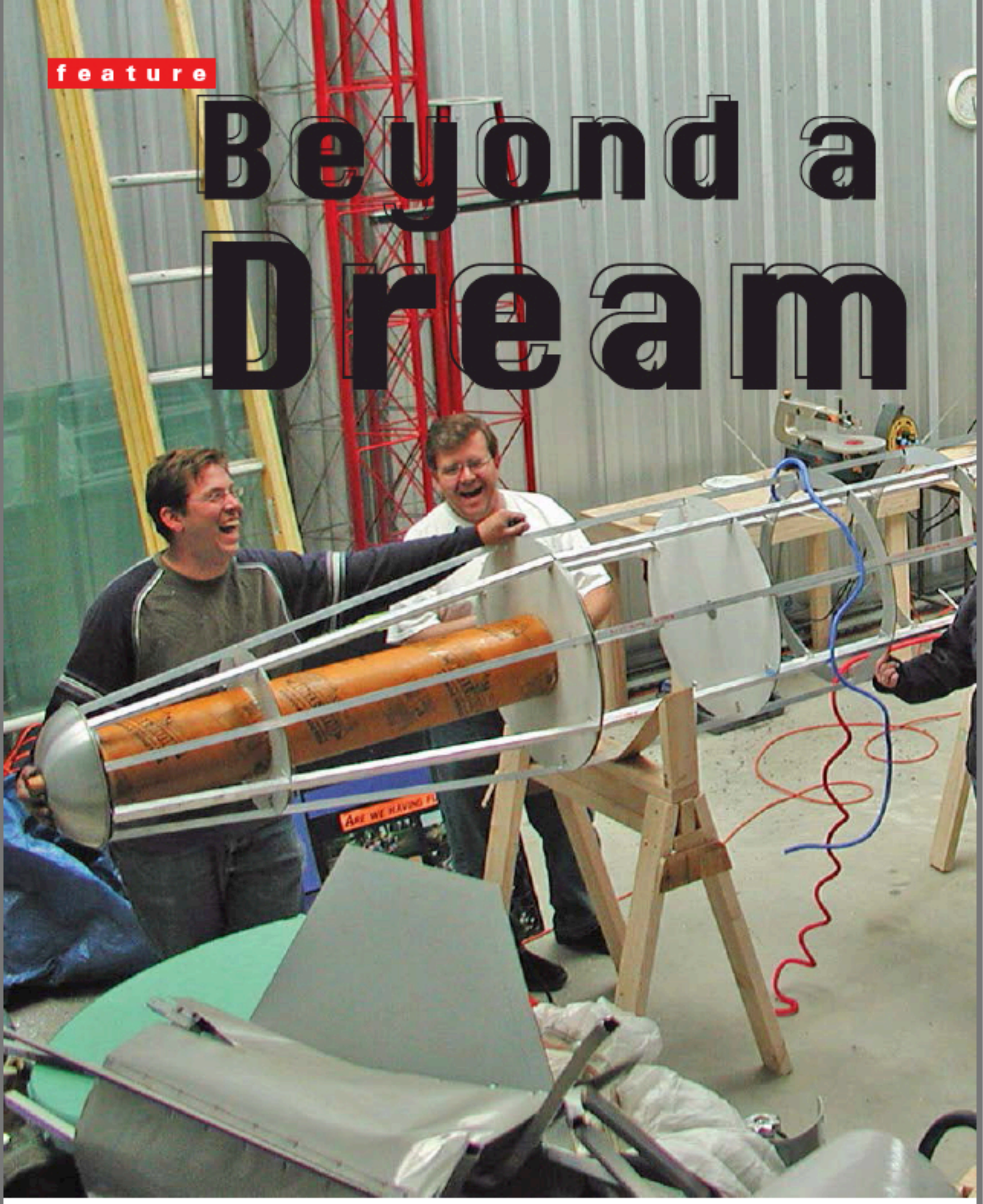


Plait's unbounded enthusiasm shows through in his public presentations.

Nancy Atkinson is a freelance journalist, a librarian, and a NASA/JPL Solar System Ambassador. She is also the winner of the New Forks Space Journalism Contest in the "published" category for her work on a NASA scientist with a local paper.

feature

Beyond a Dream



Sam Schaffer, Jeff Boyes, processing engineer, Tracey Craft, and John Jameson just complete the skeleton for Beyond Earth's Launch Craft-2 (LC-2) prototype.

Photo: Beyond Earth Enterprises

Rocket Company *Beyond Earth Enterprises* Lives the Space Life

by Robert Yeiser

Joe Latrell has always been interested in space. An interest that was instilled on him, by his father. Together they knew all the names of the astronauts. They kept up on the new missions. Latrell even remembers watching the Apollo 11 Moon landing on his family's new 25 inch color RCA television, and also his fathers reaction to the realization that it was being broadcast in black and white. His father, a master carpenter, helped run the family's construction company. The business was a family heritage. One of the earliest memories for Latrell involved working on construction sites. He broke the mold, however. Latrell turned to computer science, before entering the realm people in the industry call "NewSpace." Latrell now stands as CEO of Beyond Earth Enterprises, one of the new commercial spaceflight companies, sprouting up around and about U.S. space locations, like at the company's new headquarters in Roswell, New Mexico.

The company has had ten launches so far, with the flight with the highest available data recording at 20,000 feet, or four miles above the Earth. Although this may not seem as great as the few commercial ventures that have reached space, the company has a proven track record with eight successful launches in a row. The highestever altitude launched is planned for September 2007. Although the overhead is "a killer," according to Latrell, every flight has made a return on investment for that individual flight. Funding for flights have come from consumers, gained mostly through BeyondEarth's website at (www.beyondearth.com), but primarily from corporate and academic interests, looking to obtain data from Beyond Earth launches.

Like most start-ups the early years were challenging for Beyond Earth Enterprises. The company started as a chance idea between Latrell and his friend TChristopher Gardner. It began when they attended the 2003 Space Access Society meeting in Phoenix, Arizona. There, several different companies put on presentations about space and their space companies. But afterwards, the two realized that not one of these companies really had a market analysis. "Nobody had defined a market. They had defined all these wonderful ideas and technologies, but no market." So during the conference, the two began to ask questions like these: "Well, what do you do when you build it?" "How are you going to make money off it?" Latrell recalls lots of questions, until "finally, they asked both of us to sit down and shut up."

After the conference, Latrell and Gardner began coming up with market analogies, practical ways to make money from launching rockets they knew they were capable of building. This strategic planning grew, and before long, more friends of theirs became involved to fill in the missing pieces of their planning. For their final analogy, they had decided that allowing customers to send small kits to space and back could be very marketable. They set a short-term business goal to design, build and launch a rocket in one year.

Originally, it was the imagination, hard work and financing of Gardner, Latrell, and friend and later company employee, Tracey Craft, that got the company started. "We spent three

Photo: Beyond Earth Enterprises

Company CEO, Joe Latrell stands before a Goddard Memorial, outside Roswell, New Mexico. Robert Goddard is considered the father of modern-day rocketry.

An LC-2 put up for display at the Frederick, Oklahoma celebration

Photo: Beyond Earth Enterprises

years basically pouring our hearts, souls, money, 'blood, sweat and tears' into our company," said Latrell. "We don't believe in powerpoints," said Gardner, who is now Operation Manager for the company, "We believe in building things."

That first year in business had its challenges. Work was strictly on weekends. The closest bathroom from shop reached a block and a half away. In their first rocket's aircraft hanger, there wasn't any running water. There was no insulation and no heat. "It was weird working out there for awhile," summed Gardner. Half of the first year encompassed designing everything and determining ways to build it. Federal regulations were also kept in mind-Latrell stating that these regulations were intended for hobby rocketry instead of commercial rocketry.

Soon, they began experimenting with construction techniques. "We started going down the carbon fiber composite route," Latrell said, "and it just wasn't working. The material is very expensive, for one, and unless you have the proper gear, it is very difficult to work with. I've found that working with carbon fiber was one of the most unenjoyable experiences in my life." Eventually the company switched to a rib and spar aluminum design, which is skinned like a modern aircraft. Latrell noted that aluminum is malleable and easy to work with. After running through the design-test-analysis sequence several times, they reached their goal in building a rocket in a year.

Originally, Craft learned the machining processes and came up with a way to assemble all the rings and Latrell and Steve took over from there. "Now we have it down where we can build a strut framework for space class vehicles in about three days-from cutting the first part to assembling

it. We find this approach much simpler... than a fiberglass layout."

Beyond Earth's rockets are fully equipped with gyros, parachutes and communications equipment and rely on solid fuel for propulsion. Latrell prefers to purchase off the shelf components whenever they are available and have a price that's reasonable, tipping SLM by saying, "There are some folks in the aerospace game who charge a whole lot of money for not a lot of product." He stated that one needs to be creative to start a company like his, disavowing a myth that you need to be an engineer to succeed, "If I were an engineer, a full blown engineer, there is no way I would start a company like this knowing the challenges." Latrell thinks that sometimes it is best to not know what you can't do and having the drive to make things happen. "If I knew then what I do know about rocketry, then I would not have gotten into this."

As of just this year, Beyond Earth now has six full time employees, and has landed a contract to obtain test data for altitudes greater than 130,000 feet. They uprooted, recently, from Colorado Springs, Colorado to Roswell, New Mexico. Latrell noted that Roswell is where Robert Goddard did some of his first experiments with rocketry. He says that Roswell's people really love having them there: "The city of Roswell has been incredibly supportive. They even helped us find a building that was in our price range."

"I loved Colorado Springs. Although the mountains were beautiful, there is also Peterson Air Force Base and Fort Carson and NORAD and the Air Force Academy... and, they really don't like the idea of someone having a rocket living in the area. We were visited by the Office of Special Investigations and the Air Force Base. They had detailed questions about our rockets and what our capabilities were." Additionally, in Roswell, they are near three commercial spaceports-Oklahoma Spaceport, West Texas Spaceport, and New Mexico's Spaceport America, making Roswell, ironically amid the stories about aliens and abductions, an ideal place to start a space business.

June's their next launch, where a version of their next rocket will be tested. "The June flight is prepared to go 140,000 feet," said Latrell. The rocket's version will be a half scale one compared to others launched. Latrell stressed the importance testing in making rockets, a notion common in the space industry.

Uncommon to the industry though, having the customer as a part of the rocket experience has become the Beyond Earth vision. "Our consumer space vehicles have multiple cameras on the launch site," said Latrell, "As a purchaser of a kit, two weeks before the launch, you get the user name and password so that you can log into the website and watch the launch in real time." Of course, this also means that the customer can see an explosion if that were to occur. But one way or another, the company's customers stay involved.

As far as the financial side of the company goes, Latrell has not shown any interest in federal money even though he recognizes it can be easily acquired if one is willing to jump through hoops. He says that you almost have to have people who just push paperwork all day. These people do not really become part of the team. Watching his father deal with all the paperwork on government clients for the family construction company has definitely influenced his position. Additionally, he stated that once you become reliant on government money, it is very hard to wean yourself from it.

He does, however, admit that he would pursue federal funds as a last resort. In the future, Latrell hopes his company will be established enough to make a public stock offering, even including a share of stock with every customers purchase to help them further share in the experience. Lately, he has been visiting with investors, and promoting some of Beyond Earth's business accomplishments.

Beyond Earth spends most of its money on the company's staff, rent, and support structure, according to Latrell. Besides the initial three investors, no other funding, except that of their customers have been accrued.

All ten rocket launches carried the customer cargo from these customers, with their first two launches becoming mishaps. They did, however, manage to recover over 98 percent of each of these mishap rockets' remains. The first of these rockets, filled with customer collectibles and weighing over 120 lbs, reached over 8000 feet before the nosecone ripped apart. Latrell said, "We still managed to recover 98 percent of the payload, though."

As much as Latrell hates dealing with government agencies for his business, he still has to still deal with the Federal Aviation Administration (FAA) to acquire licenses for his rockets. "All of our rockets have fallen under FAR part 101. They are not required to be licensed, but we are working with the FAA on licensing these vehicles." FAR part 101 is an FAA regulation intended to regulate rockets that fall under the model rocket category. Latrell emphasises that a rocket will have to acquire a license to carry a person, relating that cargo can easily experience 14 G's without any problems, but a person would not be so lucky under so much pressure. For a rocket to fall under the regulations of part 101, if must adhere to certain standards. For example, the nosecone cannot take more than a certain amount of pressure, and the vehicle may not have greater than a certain amount of thrust. There is even a time constraint on how long the engine may burn-15 seconds-beginning immediately once the rocket is fired, even if it is not off of the launch pad yet. The FAA also wants to see that all the appropriate safety measures are in place, like a parachute and proper avionics. Before each launch, plans and a proposal must be sent to the FAA and any pertinent spaceport authorities, and must come under scrutiny of a safety review board who will want to know what altitude they intend to reach and any other specifics of their particular mission. As far as insurance is concerned, Latrell has thus far worked with several different organizations and does not consider it to be a big deal thus far.

(l-r) Steve Adams, Tracey Craft, State Senator Gilmore Capps (D-Synder, OK), James Russell, John Jameson, and Joe Latrell pose for a 4th of July launch in Frederick, Oklahoma. Jameson did the design work for Beyond Earth Russell performed outside launch services.

Photo: Beyond Earth Enterprises

Beyond Earth has had a website since 2003, though Latrell says they have not been keeping up on it lately and plan to renovate it eventually. The company has also advertised in Launch Magazine. They like the fact that their ad reflects that "space is only 60 miles away-an hours drive."

Latrell did not originally look to make a career out of rocketry. In 1991, he pursued a degree in computer sciences, but found different business opportunities and did not finish a degree. Various technology companies picked him up, and he eventually found himself in Colorado Springs working for HP. Soon, he would begin to look at life differently.

In 1998, one of his sons passed away from Sudden Infant Death Syndrome (SIDS). It was looking back on one of his memories of an Estes model rocket launch with an older son, Joshua, which made him realize life had a different calling for him. Latrell made a change and started to look for careers in space.

Others that work for Beyond Earth include Sam Schaffer, a full time fabrication technician. Similar to Latrell, he never finished college, but was in the Army Special Forces, and according to Latrell really "knows his hardware." In his spare time, Shaffer likes to make armor using his personal forgery. He also has demolition experience. So, working with the charges, necessary to blow off a nosecone and to launch a parachute, come naturally to him.

Gardner is a test engineer by trade and also holds a degree in education, which he has used to teach middle school, high school and college. He believes in the company mission that space should be for everyone. Like Latrell, Gardner does not think space travel should be as expensive as it is. He is, as Latrell would put it, "one of the more professional ones" and is in control of quality control and test analysis.

Steve used to fly satellites for a living, working for companies like TRW, and has an engineering degree. As the Lead Engineer, he is responsible for all the systems and mechanisms for trajectory analysis and rocket systems.

Craft, one of the initial investors, met Latrell at his previous job at Agilent Technology. She has a degree in education and understands finance. Latrell says that these days she gives out the checks and manages what they can and cannot spend, "A very, very, very important job," Latrell noted, in this industry of high investments.

Things have really cooled off since Burt Rutan won the X-Prize in 2004 with SpaceShipOne. That, of course, hasn't stopped the progression of Beyond Earth, from achieving a greater goal, to actually reach space with one of their rockets. Latrell was recently happy to witness another NewSpace company, UP Aerospace, successfully make it to space on April 28th, 2007. "YES! Somebody did it," Latrell said, with some NewSpace pride. Although in early industry, it should be noted that it is rare for someone to actually achieve commercially an altitude that is considered officially space.

With eight commercial launches without failure, Beyond Earth, itself, has proven to be one of the successful commercial rocket companies, with dreams of reaching space.

FOLLOWING

Photo: Lori Stiles, University of Arizona

by lois elfman

A SCIENTIST &

Our Contest Winner's Account of Her Former Classmate JONATHAN L. LUNINE & HIS PASSION

Two weeks prior to my high school reunion, the school's alumni director emailed to say she didn't know the whereabouts of 31 people out of the 47 total students from my graduating class. Before hitting the net, I sat down with my yearbook from the class of 1976, and took matters in my own hands.

Since Franklin was a small prep school, each senior got his or her own page. There was Jonathan Lunine with a cheesy collage of him positioned next to an astronaut and a space ship. Jonathan was a good guy-smart, kind, studious and utterly obsessed with Star Trek.

I did a Google search and found the following entry:

"Jonathan I. Lunine is Professor of Planetary Sciences and of Physics at the University of Arizona. He is a Distinguished Visiting Scientist at NASA's Jet Propulsion Laboratory, where he serves as a member of the Director's Advisory Council. His research interests include the evolution of giant planets and brown dwarf stars, the formation of planets, the evolution of Titan's atmosphere and surface processes, and organic chemistry leading to the origin of life. Lunine is an interdisciplinary scientist on the Cassini mission to Saturn and on the James Webb (Next-Generation) Space Telescope. He is a co-investigator on the Juno mission under development for a launch to Jupiter, and on a Spitzer Space Telescope team investigating the evolution of planet-forming disks."

After locating Professor Jonathan I. Lunine, a day or two later I asked Lunine to answer my questions-both about what it is he does and perhaps more importantly about how he resolutely followed a childhood ambition.

Lunine's inspiration to follow his ambition came with the publication of Carl Sagan's book, The Cosmic Connection, in 1973. "At the time, Sky & Telescope and Astronomy magazines were kind of my great escapes from family troubles. My father was an alcoholic. My mother divorced him. Then he died in late 1973. It was kind of a grim time," Lunine recalled.

"I really had decided that space was what I wanted to do in some way," he continued. "As a little kid I wanted to be an astronaut. Then things morphed into something more realistic, which was to be a scientist of some kind-space scientist, astronomer."

Sky & Telescope ran a review of The Cosmic Connection, which Lunine immediately purchased. "It was totally captivating because Carl Sagan had basically described in a book what-maybe 25 years later-we would call the science of astrobiology, the search for life elsewhere," he said.

"I showed the book to my mother and we talked about it," he added. "She said, 'Why don't you write to Carl Sagan and tell him you want to be an astronomer.' I said, 'That's the most ridiculous thing you've ever said to me.' Here's this really famous professor and space scientist. The last thing he's going to want is a letter from some nerdy kid saying I want to be an astronomer. My mother said, 'I don't think so and what could it hurt to actually do it.'"

After a bit of waffling, Lunine typed a letter to Sagan at Cornell University asking for advice. A few weeks later a personal reply arrived. "It was a pretty long letter and it included some reprints of articles on the Mariner 9 mission that he had been involved in. [Mariner 9 was] the first mission to orbit Mars and send pictures from orbit," Lunine said. "He encouraged my interest. He explained it was very important to do well in science and math in high school. He talked about applying to colleges with strong physics programs. He said, 'Please write to me again.' That was really thrilling."

"Years later, after graduate school, in the late 1980s, I began going to scientific conferences. I'd done some work on Saturn's moon, Titan, which was an interest of his. At scientific conferences

we would meet and he said he remembered those letters. He told me to tell my mother that she was absolutely right in encouraging me to write to him," said Lunine.

Others in Lunine's life were not quite as positive about him pursuing an unconventional career, and toward the end of high school he found himself considering other options. A neighbor said the fact that Lunine wore glasses made it impossible for him to become a pilot and ultimately an astronaut. His grandmother kept telling him he would "make a great lawyer."

"A couple of years after my father died, I had this increasing sense that maybe being an astronomer wasn't the right thing to do, because I wouldn't really be helping people," Lunine recalled. "I started getting this glamorous, almost mythical perception about what being a medical doctor would be like. I volunteered as a high school intern at Mt. Sinai Hospital, working in the office of a cancer doctor. [They] had me making graphs for presentations and so on. On all of my college applications where there was the entry for what you think your major is going to be, I put down pre-med and astronomy, because I was on the fence."

"It's quite possible I would have gone pre-med, except that in my senior year I was getting a checkup at my pediatrician and I asked him about medical school," Lunine continued. "He gave me a couple of old catalogues. He said, 'By the way, I have a ticket that I can't use to a Cornell alumni event. There is this guy Frank Drake who is going to talk about astronomy.' Frank Drake was a radio astronomer at Arecibo Observatory, and he was going to talk about the science that Arecibo was doing after its recent refurbishment."

"I'd never been to a talk like this, so it was kind of exciting. He was a reasonably good speaker. I remember quite clearly leaving and going down in the elevator thinking to myself, There's no way I could become a medical doctor because I really, really am interested in astronomy. The content of that talk relit my fire. That was where the medical school dream came to an end."

"Did my pediatrician do that because he knew I was interested in astronomy? Or did he do it because he had an intuition that I'd make a really lousy medical doctor? I never asked him. Whichever it was, that was a pretty influential evening."

At the University of Rochester, Lunine was a physics and astronomy major. He says the course options were pretty clear-a lot of physics and math. The biggest decision he faced was what he would study in graduate school-astronomy or the fairly new field of planetary science, which truly solidified as a field after NASA began sending probes to planets and after the manned missions to the Moon. The field of planetary science is interdisciplinary and involves not just astronomy, but also geology and chemistry.

There were no planetary scientists at Rochester in the late 1970s, but Lunine's advisor, Hugh Van Horn, was very interested in the field and they discussed it at length. Lunine applied to graduate programs in both astronomy and planetary science and was accepted everywhere he applied.

His decision was swayed by a summer internship between his junior and senior years at the Lunar and Planetary Institute in Houston, which was an adjunct to the NASA Johnson Space Center. The Lunar and Planetary Institute was founded for the study moon geology data, a subject of study that would be extremely revered by a planetary scientist.

It became natural that as he began his senior year of college, he knew planetary science would be his path. For grad school, he chose to begin at Caltech, where planetary science was not part of the astronomy department but was its own division, geological and planetary science.

Lunine eventually completed his Ph.D. at Caltech, and was later accepted as a post-doctoral fellow at the University of Arizona. At U of A, he learned Tucson actually had beautiful mountains and lovely women, one of whom he started dating. In time, he began applying for faculty positions. In the middle of that process, he was invited to be a visiting professor at UCLA. While there, he received job offers from SUNY Stony Brook and the University of Arizona. With a woman he loved a part of the deal, he chose Arizona, where he has now been based for the past twenty years.

"I teach undergraduate thermodynamics and statistical mechanics, which I really enjoy because a lot of my research work uses those fields," he informed. "It's a chance to work with the basics, and teach the basics to undergraduates, who in this case are there because they want to be."

He also teaches graduate courses and serves as an advisor. "The graduate students are competitively selected, because our

Photo: Lori Stiles, University of Arizona

Scientists, like Lunine, try to think beyond what is given to answer complex problems of truth and the natural world. The big questions of research are compounded with other complex pressures, such as teaching, concerns from students, and responsibilities expected by others in the academic community.

planetary science program is among the best in the country, so they're all quite good," he said. "Advising students on their Ph.D. dissertations is different every time. Personalities are totally different. People do things in different ways. There's no set formula and there are no course notes. It's very much a one-on-one relationship. Sometimes it works out and sometimes it doesn't. It can be a very time intensive thing."

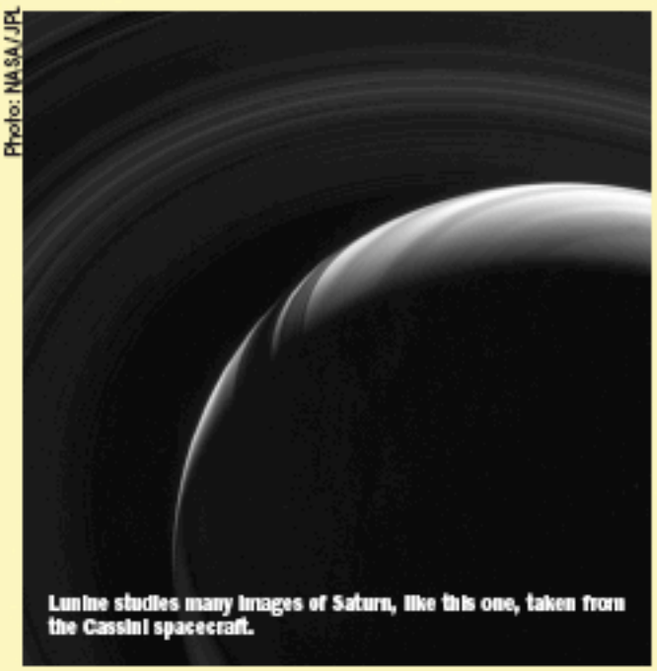
Then there is, of course, research, which is highly competitive. NASA funds most projects, and to a lesser degree, the National Science Foundation does also.

"You write proposals," Lunine said. "They get reviewed by peers. They get accepted or rejected-more often than not rejected. That aspect is very competitive for a limited pot of money. It makes the field very competitive in terms of your research ideas, your use of data and so on."

"What provides a little bit of stability for this research is if you can get involved with a NASA planetary mission," he added. "The initial getting involved part is very competitive. While these missions begin in the form of informal studies that many people do in different universities, eventually, when the mission is ready to start, NASA puts out a call for proposals and you then propose to either build an instrument or be on the science team in some way. If you get selected, then you're there for the duration. Some missions, the duration is five or six years. In the case of the Cassini, when all is said and done, it will be close to 20 years. That provides a certain measure of stability, because you're not in a situation where every three years you have to rejustify your research program.

"Successful planetary scientists mix basic research, which requires grant funding on a triennial cycle, and the planetary missions, which are bigger stakes, but if you get them you're funded very well to build an instrument or be involved in the science team on a longer term basis. I've tried to balance those two," but Lunine summed, "I'm mostly a theorist-I don't build instruments, but I get involved in space missions."

Photo: NASA/JPL



Lunine studies many images of Saturn, like this one, taken from the Cassini spacecraft.

Lunine's primary fields of research involves three main areas. The first is origin and evolution of large bodies in the outer solar system-both the giant planets and their large moons, in particular Saturn's Titan, his focus in the Cassini mission. The second is the overall origin of the solar system and how the solar system we see today came into being. The third is the properties of planets beyond our solar system. By knowing a planets property, Lunine and other scientists can work on modeling the formation of the planets.

Currently, Lunine is part of the development of the next generation space telescope, the James Webb Space Telescope, which will look at the universe through the infrared spectrum. Another mission he's recently been selected for is Juno. Juno will orbit Jupiter and make measurements of the deep interior, providing information about how Jupiter formed and how giant planets, in general, form.

"What's fun about science is to try to solve these puzzles that present themselves in the form of data or an idea, if you can put together a model that can be tested," he said. "If the results of that test actually tell you something deep or insightful about some aspect of the universe, that's good science."

His long-term involvement with Cassini put him in contact with scientists in Europe. When the time came in 1996 to take a sabbatical, his wife, Cynthia, who switched her career from aerospace engineer to landscape architect, said she really wanted to spend it in Italy. Although Lunine had reservations, he agreed.

"I fell in love with the language and the way people spoke the language, the busyness of life there, the landscapes, the history," he said. When it was time for another sabbatical in 2006, they returned.

Then I asked if space still holds the same sense of awe for Lunine. "When I was a little kid," he began, "I had a dream that was exceedingly vivid. It probably was the result of going to the Hayden Planetarium, where I was constantly asking my mother to take me. The dream was that I was standing in an open field. It got dark and the stars came out, but in far greater abundance than you would ever see them from the center of New York City (where we grew up). There was the whole universe. The planets weren't just points of light, they were the planets. Suddenly, I found myself projected out into this cosmos, sort of flying through it, and then I woke up. I think that was a mental construct, the idea of being able to unfold and discover the universe."

"Here I am today, 47 years old, and I love what I'm doing. I have a passion for all of this," he added. "There is also this sense that I know the things that are possible with the tools that are available as well as the tools that constitute my brain. That sets a certain limit on things. There are a lot of neat possibilities, good things we can discover, but it's not that projection into a mysterious universe anymore. We're discovering exciting things, but the level of discovery is circumscribed by what I know we can do.

"When you move from a child's wonder about the cosmos and watching Star Trek to the real world of astronomy and planetary science, it's just as engaging and absorbing, but in a different, more realistic way," Lunine assessed.

"I'm very satisfied that I followed my passion," he concluded. "There have been moments where I've been one of a few people to see the first images of a world that we've never seen before-the surface of Titan below the clouds. Neptune's moon Triton, which is so far away you can't really see [the moon] through a telescope. Those are real high points. There are downs too. Models that I put together, theories that I advanced that turned out not to be true. You learn something from that."

"My hope is there's more to come. There are certainly missions I'm involved in where hopefully there are some astounding discoveries yet to happen."

For more on the Cassini Mission go to: http://www.nasa.gov/mission_pages/cassini/main/index.html

Online Resources for Space and Astronomy

Complied by Nancy Atkinson

Air & Space Magazine Online http://www.airspacemag.com/
Online version of Smithsonian's Air & Space magazine, with updates on the latest news in aviation and space exploration. Includes sections on the history of flight and military aviation.

Astronomy Cast http://www.astronomycast.com/
A weekly podcast that addresses timely issues in astronomy. Hosted by astronomer Dr. Pamala Gaye and Fraser Cain, publisher of Universe Today (see below.) Covers topics from string theory, to black holes to extra solar planets, to Einstein's Theory of Special Relativity and all points in between. Approaching 40 episodes and counting.

Astronomy Picture of the Day http://apod.nasa.gov/apod/
Every day a different picture of the cosmos is posted, along with a brief explanation written by a professional astronomer. Includes multiple links for more information, a glossary and links for educational purposes. The website includes a discussion forum. APOD archive boasts the largest collection of annotated astronomical images on the internet.

Bad Astronomy http://www.badastronomy.com/
Includes information on space and astronomy myths and misconceptions, with Phil Plait's blog about the latest bad (and good) science and astronomy news and events. Bad Astronomy teams up with Universe Today to provide one of the largest space discussion group forums on the internet, the BAUT Forum.

Canadian Space Agency http://www.space.gc.ca/asc/eng/default.asp
Learn about Canada's many contributions to space exploration. Includes information for media, industry, the scientific community, educators and children.

China National Space Administration
http://www.cnsa.gov.cn/n615709/cindex.html
Provides information about China's space program.

ComSpaceWatch http://www.comspacewatch.com/
An offshoot of NASA Watch and SpaceRef, Commercial Space Watch tracks the latest news in the commercial space sector, including space tourism, the X-Prize, and emerging technologies.

Cosmic Log http://cosmiclog.msnbc.msn.com/
MSNBC.com science editor Alan Boyle blogs about space science and exploration. Includes the latest news and links.

European Space Agency http://esa.int/
The European Space Agency's site detailing missions, science, available publications and upcoming events in spaceflight and space exploration.

Heavens Above http://www.heavens-above.com
Want to gaze at more than just the stars? This site provides ISS, and Space Shuttle and other satellite orbital pass information, as well as astronomical sighting times for comets, planets and constellations. Also available are detailed star charts that show a satellite's track through the heavens. All information is customized for your location and time zone. Select your location from their huge world-wide database of locations, or enter your exact location manually using latitude and longitude.

Hobby Space http://hobbyspace.com/
A collection of resources for space hobbies such as rocketry, modeling, collectibles and satellite observation. Also lists resources for space activism, contests, books, software and more.

Hubble Space Telescope http://hubblesite.org/
Get the latest news, images and discoveries from the renowned Hubble Space Telescope. A wealth of information for both professional and amateur astronomers, educators, science professionals, children and anyone interested in learning more about our universe.

JAXA: Japanese Aerospace Exploration Agency
http://www.jaxa.jp/index_e.html
Learn about Japanese space missions, such as Hayabusa, and other missions under way and those being planned.

Jet Propulsion Laboratory http://www.jpl.nasa.gov/
Find the latest news, images and multimedia from NASA's robotic missions. Includes mission homepages, educational links, info on science and research, and more, as well as a tutorial on the basics of spaceflight.

NASA http://www.nasa.gov
Everything you want to know about National Aeronautics and Space Administration, find it here: press releases, photos, multimedia, mission information, available jobs, educational links, NASA TV, and more.

NASA Spaceflight http://www.nasaspaceflight.com/
The latest news about spaceflight. This site claims to post more breaking, exclusive space flight related news stories than any other site in its field, and its mission is to expand the public's awareness and respect for the spaceflight industry. For even more exclusive news, a subscription service is available.

NASA Watch http://www.nasawatch.com/
As the banner claims at the top of NASA Watch's homepage, "WARNING! This is not a NASA Website. You might learn something." Keith Cowing provides uncensored information on U.S. space policy and NASA operations.

New Scientist Space http://space.newscientist.com/
New Scientist magazine's website that's devoted to space and astronomy breaking news, special reports and job listings in the space sector. Updated throughout the day. Sign up to receive e-zine via email.

New Voyage News http://www.newvoyagenews.com/
A blog that includes news, pictures and links for all the "new space" activities and developments.

Personal Spaceflight http://www.personalspaceflight.info/
Blog by Jeff Foust (The Space Review, Space Politics, Space Today) about the new space industry of space tourism and public space travel.

PhysOrg http://www.physorg.com/
Breaking news headlines about physics, space and earth science, nanotechnology, technology, medicine and health.

Red Colony http://www.redcolony.com/
Developed by an international group of people from all walks of life who are interested in colonizing and terraforming Mars. The site is a venue for members to collaborate on their ideas and spread the word about their privately funded, corporate-invested vision. Includes technical articles and fiction submitted by members, Mars facts and picture of the day, and "The Plan," a peer-reviewed collaboration to develop a blueprint for Mars colonization. Membership is not required to view the site.

the space index

Red Orbit http://www.redorbit.com/
With the tagline of "Your Universe Online," Red Orbit has the latest news headlines in space, science, health and technology, plus streaming video news from the Associated Press. Provides email, personal profile pages, blog space, a discussion forum and social networking "for all things science." Claims to be geared toward the intellectually oriented. Includes a store and gift ideas. Home page also has a quote, fact, and word of the day, and This Day in History.

Rockets Away! http://www.rocketsawaymedia.com/
A media company devoted to promoting and supporting the emerging commercial space industry. Includes news updates, podcast, photos, videos, a blog, and a free eZine. Also provides services like web design and hosting, graphic and logo design, marketing and software development.

Roscosmos: Russian Space Agency http://www.roscosmos.ru/
News and history of the Russian space program. View in English via Google's language tools translation program.

Solar System Ambassador Program.
http://www2.jpl.nasa.gov/ambassador/index.html
This NASA/JPL public outreach program works with volunteers across the U.S. to communicate the excitement of space exploration missions and information about recent discoveries through presentations at schools, libraries and community groups in the Ambassadors' local communities. Find your local Ambassador!

Space.com http://www.space.com/
All the news in space exploration, astronomy and technology, as well as information about education, entertainment and space business news. Detailed articles and breaking news. Email updates available.

SpaceAlumni http://www.spacealumni.com/
A social and professional networking site for the space industry. Offers free tools and services such as a forum, chat room, live interview series, interactive network map, advanced search tools, Q&A feature, News & Notes column, and a calendar listing upcoming space events. Users can have a personal profile with different options for networking.

Space Art http://spaceart.org/
Looking to add a touch of space to your home or office? This site provides links to several space artists' websites. Mediums include paintings, prints, glass art, sculptures, and more.

SpaceDaily http://www.spacedaily.com/
The news and views on this website and its secondary sites, cover all aspects of space..

Space Elevator http://www.spaceelevator.com/
A reference tool for those interested in exchanging ideas on the scientific, engineering, economic and policy challenges inherent in constructing the solar system's first space elevator.

Space Future www.spacefuture.com
For anyone wanting to travel to space. Information on space tourism and space vehicles, as well as the legal, medical, and environmental aspects of space travel.

Space Law Probe http://spacelawprobe.blogspot.com/
News, views, and updates relating to civil and commercial space law and policy.

Space Politics http://www.spacepolitics.com/
Jeff Foust's blog focusing on the activities on Capital Hill that affect the U.S. space program.

Space Pragmatism http://www.spacepragmatism.com/
This blog by Dan Schrimpsher and Veronica Pierce discusses space news, and provides links and commentary about news, articles, editorials, and other blog postings dealing with private and public spaceflight. this person

Space Ref http://www.spaceref.com/
Space news and reference resource with press releases and information about all areas of space exploration and technology. Sign up for daily updates via email.

The Space Review http://www.thespacereview.com/
Thought-provoking and in-depth articles, commentary, and reviews regarding all aspects of space exploration: science, technology, policy, business, and more. New articles posted every Monday. Sign up to receive TSR via email.

The Space Show http://www.thespaceshow.com/
Hosted by business consultant Dr. David Livingston, The Space Show is broadcast live on the internet (and on radio in Seattle, Washington) and is available by podcast. Several times a week, the show airs with guests discussing timely and important issues influencing space commerce and tourism, as well as other subjects of space related interest. Extensive list of archived shows since 2001 available, with many notable guests. Sign up for email newsletter and announcements of weekly guests.

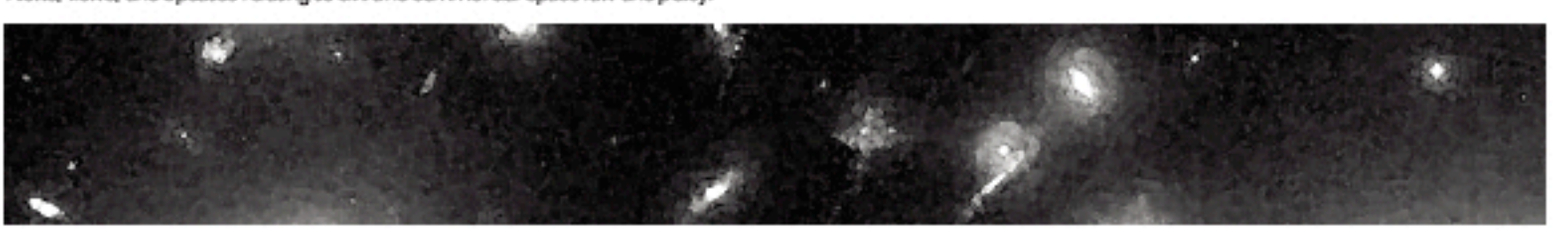
Space Spin http://spacespin.org/
Offers news and information about various missions and spacecraft by NASA, ESA and others, focusing on robotic missions. Also general space science news.

Space Today http://www.spacetoday.net
Summaries of news from around the internet about astronomy, space science, technology, space policy and legislation.

Space Weather http://spaceweather.com/
News and updates about the sun-earth environment. Reports current conditions of solar wind, solar flares, sunspots, and interplanetary magnetic field. Posts unique photos from both amateur and professional astronomers. Sign up to receive notices of auroras, astronomical sighting opportunities and more.

Spaceflight Now http://spaceflightnow.com/
Includes current news and detailed articles about ongoing missions, upcoming launches, as well as archived articles. Provides up-to-the-minute updates on launches, landings, and other spaceflight activities. Sign up for news alerts by email, or subscribe to Spaceflight Now Plus for access to exclusive videos. Includes an online store for space collectibles and memorabilia.

Universe Today http://www.universetoday.com/
A round-up of space and astronomy news from around the internet, focusing on news from space agencies, science journals and university research groups. Home of the BAUT Forum, one of the largest bulletin board forums on the internet. Sign up to receive daily UT updates via email.



Klyde Morris by Wes Oleszewski

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