



NOVA

Above: A light Echo from V838 Mon courtesy of Hubble Space Telescope

From the President:

Greetings to All,

As we enter another SEDS trimester with the issue of NOVA Spring 06, I would like to congratulate Director of Publications, Emily Hardegree-Ulman and her team for putting together the newsletter, which not only reflects the achievements of the last three months but also the upcoming plans and goals.

The biggest emphasis over the past months has been in the area of National Projects by getting the Zero-G flight underway. Director of National Projects, Josh Nelson worked tirelessly with the six participating chapters and Kirk Kittell from University of Illinois to get the projects and the funding ready in order for chapters to fly.

Vice-Chair Todd Romberger and UCF SEDS are already on their way of putting together Space Vision 2006 at Orlando, Florida.

SEDS is also progressing towards getting its 501(c)-3 status with the state of Massachusetts as Director of Finance, John Evans is mustering the bits and pieces of all the necessary documents.

Director of External Affairs, Jennifer Kissinger is chalking out plans and prospective sponsors for accelerating fund-raising for sending SEDS members to various aerospace/ space related events.

SEDS Outreach Activity has picked up as our Outreach Director, Liz Newton is streamlining plans for making the SEDS Academy idea a working reality.

SEDS-USA Secretary, Stephanie Jones has proposed a new project under her domain which attempts to re-organize the past SEDS literature, including projects and achievements

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SEDS members lose some weight!

From the desk of the Director of National Projects:

Atkins not working for you? South beach too south of the border for your tastes? Why bother losing mass when it is the weight that you abhor! This Spring/Summer, a group of 6 SEDS chapters will be shrugging off that eternal downer of gravity for a taste of space!

These enterprising chapters will take to the sky aboard Zero-G corporation's customized Boeing 727 for

the research flight of a lifetime. Each chapter will bring aboard a unique research project representative of their school. These projects range in topic from Astrobiology to soldering circuit boards in low gravity.

Take a look at pages 3 and 4 at the fascinating projects your fellow SEDS members have come up with!

- Joshua V. Nelson

Director of National Projects

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This month in Space History:

- ♦ Mar. 13, 1781: William Herschel Discovered Uranus
- ♦ Mar. 16, 1926: 1st Liquid Fuel Rocket Launch By Robert Goddard

Also this month:

- ♦ Mar. 20: Vernal Equinox (a.k.a. First Day of Spring)

Alumni Spotlight: Jim Brice

By Kirk Kittell

Students for the Exploration and Development of Space has an impressive list of alumni who have gone on to important posts in the space industry. This time we'll focus on Jim Brice, a senior principal engineer at the Orbital Sciences Corporation in Dulles, VA. Jim is the founder of the University of Central Florida SEDS chapter, graduating from UCF in 1990 with a bachelors degree in industrial engineering.

Jim has spent 7 ½ years at Orbital, starting as a systems lead on the X34 program. Currently he works as a lead systems engineer on the test and development of the Kinetic Energy Interceptors program for the U.S. Missile Defense Agency. "On the ballistic missile program I am getting experience in 'nuts and bolts' systems engineering and taking a program from design to hardware." He also serves as a docent at the nearby Smithsonian Air and Space Museum's Steven F. Udvar-

Hazy Center.

Jim attended the second edition of the International Space University summer session in Strasbourg, France in 1989. His experience at ISU motivated him to start the SEDS chapter at UCF with friends Fernando Santos and Glenn Lockwood, both of whom he still maintains contact with. After graduation, Jim worked for the International Space University as the Director of Academic Affairs and eventually the Deputy Program Director. In 1993, Jim reported to the Goddard Space Flight Center in Greenbelt, MD to develop the program for NASA Academy, an educational program for university students who want to become leaders in the space industry.

After three years working on the Academy program, Jim moved into a new position at GSFC in the Earth Science Program Office. "I still had an eye on engineering, and asked to be transferred into a technical position." Jim had no difficulties moving from an educational position back into a technical posi-

tion: "If you do a good job, and people think you're competent, they will allow you to do anything."

Jim is excited about the opportunities that are coming up for this generation of students, especially the directive for NASA to return to the Moon. "Once NASA and Congress get things worked out, you'll be set for life. You get to step in on the ground floor." Jim is positioning himself to be a leader in the new exploration programs through his work at Orbital.

"SEDS was a great experience. You never know where an opportunity will come from. Get out there. Get business cards. The experience will pay off."

For more information about Jim Brice's path, visit Orbital Sciences Corporation (www.orbital.com), UCF SEDS (www.mmae.engr.ucf.edu/~sed), NASA Academy (www.nasa-academy.nasa.gov), and the International Space University (www.isunet.edu).

Chapter Spotlight: South Dakota School of Mines and Technology

Hello from South Dakota School of Mines and Technology. Our first organizational meeting was in October and we have met twice since then. Currently we have six students that are active in SEDS and are in the final stages of forming a local SEDS chapter. We have drafted a constitution, elected officers and are awaiting word from the Student Association on our official acceptance as a recognized student organization. Our primary goals for the upcoming year are the recruitment of new members, educational outreach, and funding. Additionally, we hope to have a website up and running before summer's end.

South Dakota Space Grant Consortium (SDSGC) has been instrumental in the formation of our chapter. In addition to initial funding, they have also helped with advertisement on campus. In the future we will continue our close relations with SDSGC as they are an invaluable resource to our interests.

We do not have a technical project picked out as we would like to become better established before we take on such an endeavor. However, we have been brainstorming and hope to have one in the near future. We are excited about being a new chapter and the renewed inter-

est in SEDS. We look forward to meeting and possibly working with all of you some day.



Members of brand new SEDS chapter at the South Dakota School of Mines and Technology

From the President, Continued

over several years and tie it all together in a form which is not only usable as guidance tool for the current and forth-coming SEDS leaderships but is also a valuable SEDS history resource.

As vital as it is, continuous interaction between the various SEDS chapters and SEDS National remains on the forefront and this interaction has been attempted to be attained by the bi-weekly Council of Chapters Meeting conducted by Director of Chapter Affairs, Liz Bozek.

I also take this opportunity to welcome four of our new chapters, St Louis University, North Dakota School of Mines, Illinois Institute of Technology and Iowa State University and congratulate Expansion Director Matt Cruce for assisting them and the other incoming chapters.

I would like to ask you to take a few minutes to visit the SEDS official website www.seds.org which our Webmaster Ryan McLinko revamped and overhauled, a change that was long overdue. Our website by no means is com-

plete to perfection so please feel free to share or add your ideas and suggestions.

Working for a common goal of striving towards space exploration, we at SEDS need your constant support and input to make it happen. Hope you enjoy Nova 06.

Onwards and Upwards,

Megha Sharma

Chapter Spotlight: Embry-Riddle Aeronautical University SEDS

Pathfinder rocket launch successful

By Curtis Ewbank

On December 3, 2005, Project Icarus successfully tested its payload on a flight of the Pathfinder rocket from a field near Melbourne, Florida.

Preparations for the flight began on Friday, and team members Mike Stackpole, Markus Zimmerman, and Ron Driggers worked through the night to prepare the rocket. They were joined early in the morning by other Project Icarus and Embry-Riddle Future Space Developers and Explorers Society members for the drive down to Melbourne. At dawn, the five-car convoy arrived at the launch site and began setting up the primary ground station. Pathfinder would be transmitting data from its payload; including GPS, spin sensor, accelerometer, and barometric data. These data were recorded by computers at the ground station.

While some group members helped set up the launch rail, others prepared the rocket's class N motor, packed its parachute, and conducted final preparations of the payload. The payload was thoroughly ground tested, as the main purpose of the launch was as a payload test. By noon, the Pathfinder was on the launch rail. A second ground station was set up about a mile away. At approximately 12:15, air traffic control gave the launch an extended waiver to 15,000 feet. Shortly after, the ignition button was pressed. Pathfinder roared skyward on a nearly perfect straight pillar of smoke and fire. Approximately 30 seconds later it reached an apogee of 12,075 feet.

Six minutes later, Pathfinder landed under its main parachute about a half mile from the launch site. With the help of the transmitted GPS data, the rocket was found a few minutes later. Path-

finder performed flawlessly; the glossy black and white paint suffered nary a scratch.

The Pathfinder launch day operations were carried out with an incredible amount of success. Although one ground station was not fully operational and the main parachute was delayed in opening completely, the rocket was launched safely and recovered effectively. This launch paves the way for a successful launch of the main Project Icarus rocket in May. Video of the launch can be found at <http://www.icarusrocket.com>.



ERF SEDS members

Zero-G: University of Washington SEDS and Pasco High School

SEDS-UW is performing a fluid mechanics experiment involving microgravity testing of varying acceleration on Rayleigh-Taylor flow. Rayleigh-Taylor flow is a fluid mechanics phenomenon involving the mixing of immiscible fluids of different densities. The key parameter tested was the rate of entrainment, or the amount of mixing over time. The applications with interest to the project include weather patterns, geophysical flows, supernovas, and, most notably, inertial confinement nuclear fusion. The post-flight activities are mainly data re-

duction leading into a Masters thesis, but further potential includes experimentation on a more advanced test bed.

During the development of the project, SEDS-UW noticed that the 2004 WASL results showed an alarming disparity in math and science scores for Washington's most economically disadvantaged students. To help stimulate interest in math and science in these high schools, SEDS-UW organized a joint science competition between five Washington high schools for designing a second microgravity experi-

ment. Long term results of this project include the establishment of an annual high school outreach program for the UW.

A group of four selected students and supervising teacher from Pasco High School in Pasco, Washington will create, test, and analyze the results from their own experiment. Their experiment is a study of the water-air interface in microgravity. The four students and supervising teacher will have the opportunity to fly alongside their experiment on the "Weightless Wonder."

Zero-G: Massachusetts Institute of Technology SEDS

MIT is investigating the effects of gravity on the formation of a nanostructured material called silica aerogel. Aerogels are the lowest density solid materials ever developed--some possessing densities a thousandth that of water.

In addition to extremely low density, aerogels hold the world record for at least six other materials properties as well including the lowest thermal conductivity of any solid material. In fact, an inch-thick pane of silica aerogel is as effective of an insulator as a stack of 30 panes of window glass.

This makes silica aerogel of great interest for use as window insulation -- sandwiching a piece of aerogel between two panes of glass

would give you a window three times better insulating than the surrounding wall, and unlike today's current thermal pane window technologies, aerogels does not lose their insulating ability over time. There's just one catch -- because of the way aerogels are structured at the nano level, they scatter blue and violet light (similar to dust particles in the upper atmosphere) and as a result, the bulk material exhibits a sky-blue cast -- people don't want to see the world through blue-colored glass.

The origins of this scattering effect arise from certain inconsistencies in the nanostructure of the aerogel. It is believed that these inconsistencies are largely due to the effects of buoyancy and convec-

tion during the formation of the gel material aerogels are derived from. Buoyancy and convection, however, can be eliminated in a weightless environment. That means in microgravity, it might be possible to produce transparent, non-blue aerogels!

MIT's goals in flying this experiment are to complete the last in a series of four experiments studying the formation of gel materials in various gravitational environments, to determine how the presence or absence of gravity translates into the bulk materials properties of aerogels, and in the process, possibly figure out how to get rid of that darn blue cast!

Zero-G: University of Central Florida SEDS

The University of Central Florida will be conducting experiments for soldering in microgravity. Weightless soldering is one of the problems that has to be overcome for long duration missions in

space. Currently, if an electrical system in a space ship malfunctions, it has to be replaced with a spare. By discovering a better way to solder in microgravity, these spare parts won't be needed and

money as well as space will be saved. Solder samples from the flight will be returned to UCF and analyzed in the Nano Technology Laboratory.

Zero-G: University of Illinois SEDS

Cerianthus Membranaceus, commonly known as brown tube anemone, are of the order Ceriantharia and phylum Cnidaria. The tube anemones behavior and orientation is strongly determined by three important aspects. One is stereotropism, the reaction to physical contact. The other two are phototropism (movement away or towards a light source) and geotropism (reaction to orientation in a gravitational field). In most situations, the tube anemone orients itself so that its oral disk is facing towards a bright light source, thus

exhibiting phototropism. In order for this to occur, however, the anemones posterior portion must be in contact with a surface. This stereotropic requirement must also be fulfilled in order for the anemone to exhibit its geotropic behavior or to even feed.

It is impossible to determine, through ground based experimentation, the role gravity or geotropism plays in the anemones behavior. It is possible that geotropism is as important to the anemones disposition as stereotropism. If so, the anemone would be unable to

endure long periods of microgravity. To answer this question, four *Cerianthus Membranaceus* will be taken aboard the B-727 aircraft. In microgravity, their phototropic responses will be recorded and compared to those responses with geotropism. The tube anemones reactions will be indicative of their acclimation to the new environment and shed light on the possibility of use in microgravity ecosystems.

Zero-G: Caltech SEDS

Time is something most of us take granted. From the moment we wake up until we are fast asleep, time seems to flow smoothly and inexorably. Yet recent neuroscience research has shown that this may not be the case. Reports of temporal distortions, for instance the perception of time slowing down during a car accident, are now the subject of serious scientific inquiry.

Research experiments con-

ducted aboard the ZERO-G B-727 offer an exciting opportunity to re-evaluate the affects of microgravity on the perception of time. This project proposes to investigate such affects using the latest psychophysics techniques. Subjects will be presented visual stimuli at various temporal frequencies and asked to make judgments about whether two stimuli occurred simultaneously or separately. The cause of micrograv-

ity induced temporal distortions will also be investigated. This research is the first step in reviving interest in microgravity induced temporal distortions. It is hoped that this work will lead to further studies that will aid in our understanding of how the brain perceives and processes time. Understanding how the brain processes time may be crucial to treating certain diseases where timing is thought to play a role.

Zero-G: University of Arizona SEDS

The classic model of planetary formation involves small grains colliding to form bigger bodies, which in turn form even bigger bodies. These collisions then continue over time until you have planetary size bodies colliding to form bigger planets. These "rock piles" are held together by the Van der Waal's force for particle size bodies, and gravity for kilometer size bodies.

The mechanism behind the formation of these kilometer-sized planetesimals from centimeter-sized bodies is not well understood. UofA SEDS will experimentally examine collisions in microgravity between simulated pre-planetesimals with varied levels of water ice. This will allow us to determine the feasibility of low velocity collisions (~ 5cm/s) between these bodies as the mecha-

nism for pre-planetesimal growth. This project has implications for numerical simulation of this epoch of planetary formation, as well as for theoretical models.

If you are interested in finding out more about any of these chapter projects, and/or are willing to help fund these student researchers, e-mail Josh at projects@seds.org. Every cent counts!

New Horizons

By Kirk Kittell

University students today have a long list of successful robotic space missions that they can look to for inspiration — the successful collision of Deep Impact and the never-ending Mars Exploration Rovers, among others — and now there is a new mission heading to the end of our solar system that students can follow as they graduate and enter the industry. The New Horizons mission was successfully launched on January 19, 2006, from Cape Canaveral to visit the last unexplored planet, Pluto, and the Kuiper Belt. The Kuiper Belt is a region of icy, primitive planetary debris that lies beyond Pluto's orbit.

Dr. Alan Stern of the Southwest Research Institute is the Principal Investigator for New Horizons and took some time with SEDS to discuss his path from student to interplanetary mission leader. When Stern was a student at the University of Texas, his major interest was getting involved in planetary missions, but "there was no such job category as 'scientist leading a mission.'" So, he tailored his education to combine a science and engineering background —



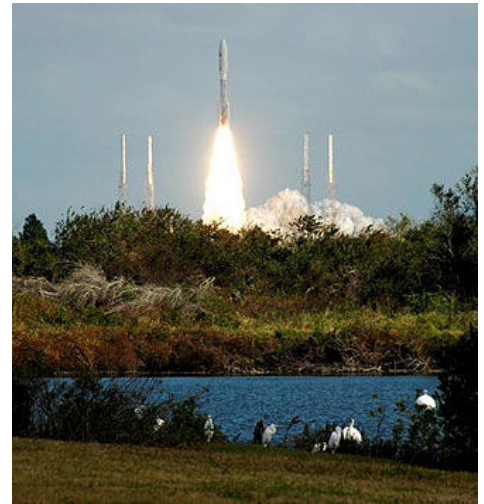
Pluto, center and its previously known moon Charon, below Pluto and right of center, shine brightly. Two newly discovered moons appear more faintly to the right of the pair. Image Credit: National Aeronautics and Space Administration

completing degrees in physics, aerospace engineering, astronomy, and planetary atmospheres — that would serve as the background for future activities. "I've found that having both science and engineering backgrounds has been crucial; I don't think one or the other could have done the trick."

After finishing his masters degrees at Texas in 1981, Stern took a job at Martin Marietta Aerospace (now Lockheed Martin), eventually leaving for a position building hardware at the Laboratory for Atmospheric and Space Physics at the University of Colorado. At the time of the Challenger accident, Stern decided that he "liked science better than engineering" and began a doctoral program at the University of Colorado in astrophysics and planetary science. Following this, he went to work at the Southwest Research Institute (SwRI), a research and development organization specializing in engineering and physical sciences in San Antonio, Texas. Currently Stern is the Executive Director SwRI Space Science and Engineering Division in Boulder, Colorado.

The launch in January marked a transition in the New Horizons team from "several thousand people on the project to about a dozen — it doesn't take many people to fly it across the solar system." While there are no longer any job opportunities for graduating students available with the mission, there will be data to analyze from the Jupiter flyby in 2007 and the Pluto encounter in 2015 and students will have the opportunity to work on it.

Stern will continue to serve as the PI on New Horizons until the spacecraft finishes its mission. In the meantime, during the quiet interplanetary travel phase, he will be occupied with an instrument on the



Launch of New Horizons atop a mighty Atlas V rocket. Image Credit: National Aeronautics and Space Administration, Kennedy Space Center

Lunar Reconnaissance Orbiter mission, an instrument on Rosetta, which is a spacecraft headed for a comet, and helping with the Mars Express and Venus Express teams. Stern says that his goal is to "architect the first half of the 21st century for robotic exploration in an exciting way." Asked whether he had any advice for students, he suggested to "find the thing that you're very best at and apply that. Everyone's got a different ambition. Find people to shore up your weaknesses and explore your own strengths."

SEDS wishes continued success to Alan Stern and the New Horizons team as they survey the unexplored reaches of our solar neighborhood. For more information, visit the New Horizons web page (pluto.jhuapl.edu) and the Southwest Research Institute web page (www.swri.org).

Note: There is an article in the February 23 issue of Nature that describes the discovery of two new moons around Pluto using images from the Hubble Space Telescope.

Chapter Spotlight: University of Central Florida SEDS

The University of Central Florida chapter of SEDS launched their Daedalus II rocket to approximately 25,000ft on January 8, 2006. Four SEDS-UCF students



Launch

and one alumnus made the 24-hour straight drive, with launch pad and equipment in tow, from Orlando to the small town of Argonia, Kansas to launch the ~10,000 lbs rocket. The Dae-

dalus II rocket was designed as the upper stage of a larger two-stage suborbital rocket to ultimately reach 70,000 ft. After a scrubbed launch on Saturday due to high winds and payload issues, the rocket finally lifted off on Sunday morning. The launch was a success, although transmission issues caused a loss of GPS data and the rocket was not recovered. It was an



Launch

excellent learning experience for the group, and work is underway on a new and improved version of the rocket featuring several aerodynamic changes and an external antenna. SEDS-UCF is looking forward to the next launch!



UCF members with their rocket

Chapter Spotlight: Worcester Polytechnic Institute American Institute of Aeronautics and Astronautics

WPI AIAA is still working hard on WARRIORS. Improvements were made to the vehicle, but more importantly we were able to get a lot of reliability testing done so we have higher confidence than we did in December. Alas, a huge cold air mass came down from Canada over the New England area just a couple days before our February 18th launch date. The result? 15-20 mph winds with gusts up to 30mph. Since our rocket is on the heavy side and suffers from underpowered motors, we can't fly in winds above 7mph, especially for our first flight. So, we scrubbed... Again...

Next launch opportunity is March 18th. We now have a strong

appreciation for why Dr. Robert Goddard (a WPI alum) left Massachusetts to continue his rocketry work in New Mexico.

WARRIORS (still under construction at the time) is pictured on the far right in our recent club photo. Also shown are a couple of our medium-powered-rockets that we build



WPIAIAA members

up to par. I'm also pleased to announce that

we're getting into R/C airplanes now as well, so we hope to start doing fun aerobatics tricks over the Quad as students walk to class! Shown in the photo is a prototype section of lightweight airfoil for a solar powered aircraft made years ago by our chapter. Now we use it as a prop for photos, but we hope to get back into that game again soon.

Stay tuned, for we are far too rocketry oriented to not try melding airplanes and rockets together (air dropped rockets, rocket powered planes, etc). If you're curious about what we're up to, feel free to send me an email at rcaron@wpi.edu.

Chapter Spotlight: Massachusetts Institute of Technology SEDS

Currently MIT SEDS is in the final stages of registering a team for the NASA Centennial Challenges. The group is composed of approximately 17 people from various departments across the MIT campus and is in the process of putting together the actual de-

sign. The competition is in August at Mountain View California. MIT SEDS is also actively working in the MIT community to reestablish astronomy events, as astronomy is currently limited to select individuals and departmental classes. By holding monthly astronomy events

we hope to help individuals interested in space make a connection with others who are interested. Finally, we are in the process of putting together an experiment to fly on the USA SEDS Zero-G flight.

To participate in the publication of NOVA

Email: publications@seds.org

For individuals seeking to become more involved with SEDS on a national level, we are seeking writers to cover topics in space industry and research and to profile prominent people in the space industry and within our organization.



Join SEDS!!!!

It been an exciting year so far for SEDS! In the expansion sector we have seen 6 NEW CHAPTERS form in the United States! This has increased the number of chapters by 27%. Expansion's goal for the year is a 100% increase in the number of chapters.

Encourage your peers at your school to join SEDS. Encourage your friends at a University near you to start a chapter. Encourage anyone interested to attend a conference where SEDS is represented, attend the Space Vision 2006 conference, attend the X-Prize Cup, e-mail us with questions, contact a school near them with a

Calendar of Events

AAS Goddard Memorial Symposium

Date: March 14-15, 2006

Location: Greenbelt, Maryland

Website: <http://www.astronautical.org/>

For Info: 703-866-0020

Yuri's Night World Space Party

Date: April 12, 2006

Location: Your Hometown! Register your party today!

Website: <http://www.yurisnight.net>

For info, contact Loretta Hidalgo at loretta@yurisnight.net

NSS International Space Development Conference

Date: May 4-7, 2006

Location: Los Angeles, California

Website: <http://isdc.nss.org/2006/>

Space Frontier Foundation's Return to the Moon Conference

Date: July 20-22, 2006

Location: Las Vegas, Nevada

Website: <http://www.space-frontier.org/>

Mars Society Conference

Date: August 3-6, 2006

Location: Washington DC

Website: <http://www.marssociety.org/convention/2006/>

X Prize Cup

Date: October 16-22, 2006

Location: Las Cruces, New Mexico

Website: <http://www.xpcup.com/index.cfm>

Volunteer Opportunities Available

AAS National Conference

Date: November 14-15, 2006

Location: Pasadena, California

Website: <http://www.astronautical.org/>

Please email Todd Romberger at vice-chair@seds.org if you or anyone from your chapter is interested in attending (or already planning on attending) any of these events. By communicating and cooperating in our travel plans we can pool resources, save money, and represent SEDS as a cohesive group.

SEDS chapter, or check out the SEDS WEBSITE. This IS the organization for anyone with an interest in space! If you have questions, comments or suggestions for the Expansion Team please e-mail us at expansion@seds.org.

JOIN SEDS!!!!

-Matt Cruce

SEDS-USA Director of Expansion