NOVA

SEDS

Students for the Exploration and Development of Space

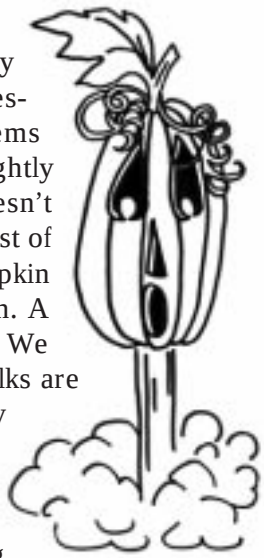
United States of America

Volume 4
Issue 2

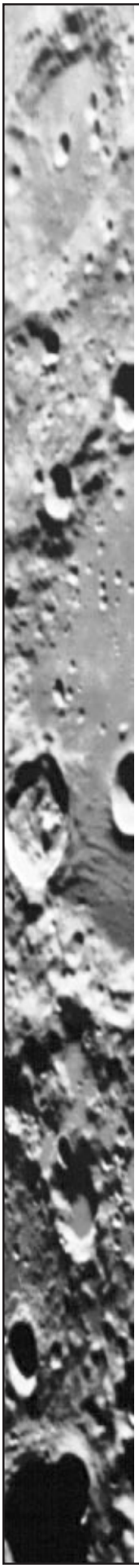
October 1996

HALLOWEEN "FLYING PUMPKINS"

The University of Alabama at Huntsville SEDS has come up with an innovative way to tie two seemingly distant events such as Halloween and space exploration. An annual event like this is a promising way to get people involved in your chapter and looking forward to the fall season. Read on! **SAFETY FIRST** - The biggest safety precaution is to announce before and several times during the event that it is not a SEDS function. That way, the school doesn't get in trouble for the loony actions of the students, and SEDS doesn't get its charter revoked. (I suppose if we implemented a few other safety procedures such a precaution wouldn't be necessary.) We also have the designer of the pumpkin launch it so that there's no questions about liability. We always have a fire extinguisher handy (even at the regular rocket launches since people are prone to fly experimental rockets), and people stand especially far back at pumpkin launches. Recommended distances are -30 feet for a regular pumpkin apparatus, and -60 feet for anything large (such as a hollowed out regular-size pumpkin and a "G" rocket engine). Another consideration is the parachute ejection charge. Be careful to remind people to wait until it has gone off before approaching the pumpkin (or what's left of it). Most pumpkins go up about 10 feet, spiral, and crash into the ground, putting them on the ground well before the ejection charge goes off, especially with a "C6-5" or some such engine with a high second number. As for organizing the thing, we just make sure plenty of people know when it will be and what we'll be up to, convince people that putting a rocket engine behind a pumpkin is a fun thing to do, then drag them to the grocery store (usually the day of the event), and the local rocket supply store to stock up on the necessary ingredients. Smaller pumpkins go farther, and pumpkin squash seems to work well provided that you can fasten the rocket engine on tightly enough. A "D" engine on pumpkin squash tends to be overkill and doesn't do much besides spiral around (come to think about it, that's what most of 'em do). "D" engines are by far the most popular method of pumpkin propulsion, but they are probably not the best method of propulsion. A launch rod/lug assembly would be helpful though it is seldom used. We usually put a pumpkin on a concrete brick and launch from there. Folks are welcome to come to ours (e-mail for date before attending) if they happen to be in the neighborhood (Georgia Tech folks came to a previous launch) and would rather participate in our festival than have their own. We can provide couch/floor space for a great many people to sleep. We've found that there's some resistance locally to having the pumpkin launch on a weekend since it's not Halloween. We selected a weekend so that we could have visitors from out of town, but some folks would rather do it on the night. The pumpkin launch is steeped with tradition, and imposing safety restrictions (like saying that there can be no more than one rocket engine designed to ignite at once on a pumpkin, that the engines must be securely affixed to the pumpkins, engine force to pumpkin weight ratio, and so on) is not realistic because folks have seen what can be done without abiding by rules, and they don't want any now. Perhaps starting with a set of rules would allow for more safety at a pumpkin launch. Lastly, report your event to the rest of the chapters to let them know how your launch went: Yes Pumpkins will fly!! 3 pumpkins were launched, all used high power engines. The first was launched using a cannon technique, and had a complete recovery system. The second won highest and farthest flight. It used 3 E rocket engines, all of which fired and it may never be seen again. The third pumpkin to fly (barely) weighed in at about 5-6 pounds and had 3 D engines and 2 E engines... Don't have too much fun!



–Jim Scarborough, University of Alabama at Huntsville (UAH) SEDS.



ASTROPHOTOGRAPHY FOR AMATEURS

BY Oliver Thizy, Kalamazoo Astronomical Society

I always receive questions on astrophotography for amateurs, and I would like to share my experience. Of course, it will not replace books that one can find on the subject. I strongly recommend ''Astrophotography for the Amateur" (Michael Covington) as the book to own if you want to start in this field. Everything described here is from my own experience, and covers only the basics of astrophotography. I'll try to explain my own evolution, from simple pictures of the sky to prime focus. It is not the only way, but it helps to practice the basics before going to long focal deep sky astrophotography.

(1) GETTING STARTED: PHOTO ON TRIPOD

Before even starting with photography with a telescope, I recommend practicing photography using a simple tripod. There are many things to do with a simple tripod:

Moon and Planets at dawn or dusk: Choose a nice foreground landscape (trees, mountains, etc.). Evenings just after the New Moon are very nice for that. Full Moon set above cities is very nice too. I usually use a 100 - 400 ASA slide film.
Constellations: Using a fast film (like Kodak Ektar 1000) and short exposures (30" - 45" for a 50mm lens), one can record a lot of details on constellations. I got some nice results on the Milky Way, especially around Sagittarius. Those pictures are also a perfect test for the photo shop: is the sky coming back black from their lab?
Star Trails: Long exposures will record star movement over the sky. Combined with a nice foreground, you can get some pretty nice results. I like to use a flash light or a camera flash to show some trees or my telescope on the pictures. I usually use a 400 ASA film for those pictures, except when I want to do a very long rotation around the north pole, for which I use a 100 ASA film.
Other: There are several other pictures to take with a tripod: bright comet, aurora, eclipses (lunar or solar).

To do astrophotography on a tripod, you need very minimal material:

A camera: If possible, use one that doesn't run off a battery for long exposures. Some exposures like star trails need very long exposures, and a camera that runs off a battery will die during the night, usually in the middle of an exposure! There are several discussions on what is the best camera for astrophotography. If you want to invest in a camera at this point, I strongly recommend an Olympus OM1. It is easily available on the second market for $150 - $200 with a simple lens, and it takes nice outdoor pictures too.

A lens: At this point, a short focal is recommended (35mm - 50mm). The more open is the lens, the better it is (f-ratio around 1.5).
A cable-release: It allows the camera to remain open during the exposures. One can find it in any photo shop. Choose one that has an automatic lock system, it is easier than the one with a screw.
A tripod: Choose a lightweight one that you can take with you during your observing trip. I really enjoy the search for the perfect foreground, the perfect composition. Nothing can be more enjoyable than taking a photograph of the crescent moon in the morning after a long observing (or photographing!) night.

(2) TRACKING?

Tracking is essential to do long exposures on the sky and have round stars. With tracking, you can use slower film with less grain, or use longer focal lengths to show more details on the sky. A very simple way to track is to use three pieces of wood and a screw! It is both cheap and fun to build, and you can have very nice results. If you have a simple telescope, you can fix your camera on top of it (piggy backed). I built a camera stand for my old 4.5" using a piece of wood and some rope (I also replaced the flexible cable with electronic buttons that created much less vibration). You can buy a piggy back mount, which is very expensive for what it is but it works fine. You can also buy a rotating head for fixing your camera from a local photo shop or from Orion for example; it will help in orienting the camera to get the field of view you want.

A lot of people with an equatorial telescope are wondering how to start in deep sky photography. I really think that the best way is to do piggy back. You will need an equatorial mount for long exposures, as Alt-Az mount will have field rotation. With short focal lengths (50 - 150mm), you won't need a very good polar alignment. If you want to do long exposures (1 hr for example) or use a long focal lens (200mm - 500mm), you will certainly need a good polar alignment. I personally use the drift method to align my telescope (a SCT 8"). It takes approximately 30' for a good alignment for a 500mm focal lens. First, level your tripod and orient it to Polaris (not necessary, it just helps). If you have a Polar alignment circle, it can also help to use them. Look at a star near the Equator, South. Track the star in RA only, and look if the star goes up or down in your eyepiece (supposing you're are looking straight). Rotate the base of your telescope to adjust it until the star is not moving anymore. Then, move to a star at East (West works also). Do the same, but adjust the latitude this time (the angle between your telescope axis , and the horizon plan). By switching several times from South to East (West), you should be able to adjust your polar alignment quite quickly. Of course, the first time you will spend a lot of time; take notes of what you are doing, and it will be much quicker the next time. To practice polar alignment is very important if you want to move to prime focus deep sky photography. That's why I always recommend to start with piggy back first: it is much easier to do! Piggy-back photography offers a wide range of new projects:

Constellation: You will get much more detail than exposures on a tripod, and you can use finer grain films. And why not your own photographic atlas? Great as a finder chart later!
Milky Way: Why not a mosaic of the Milky Way? In two hours, I did the Milky Way in August using a 50mm lens and Ektar 1000 film, 3 minutes each picture. Great results!
Comet or Asteroids: Bright ones are easily accessible with a 50mm - 150mm focal lens. 10-20 minutes with Ektar 1000 and a 135mm (F/2.4) gives nice results.
Movement of planets over the sky: show how a planet retrogrades over a constellation.
Shooting stars: Add a friend at several miles from you, and you can calculate the position of the meteors; Add a rotational screen in front of your lens and you can calculate the speed!

(3) PRIME FOCUS

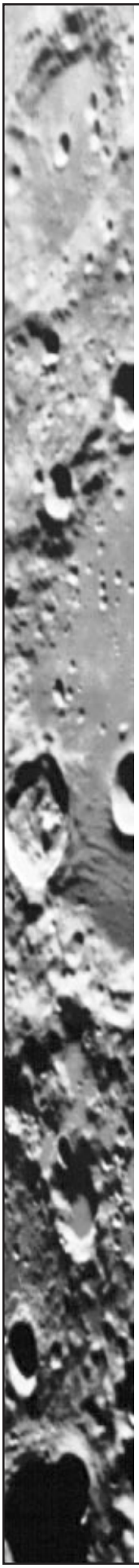
Prime focus is certainly a goal for a lot of people: to be able to record faint objects, show spiral arms in galaxies, record the central star of a planetary nebula. But there are certainly a lot of traps not to fall into! First of all, material is very important for deep sky astrophotography:

Telescope: Large aperture is a plus, especially if you have a fixed observatory. If you need a portable solution like me, SCT's have great advantages. I personally choose Celestron Ultima 8, which is very good for astrophotography, at least a good price/performance ratio. If you have a location where you like to observe, it is nice to build a fixed tripod. Then, you will just have to come and install your telescope, the polar alignment will be almost already done. Of course, your telescope should have a drive corrector to track on RA and allow correction.
PEC: Periodic Error Correction is a great invention. You spend some time (usually ten minutes) to setup the PEC, but guiding is much easier.
Reducer/Corrector: A short f-ratio is nice for deep sky astrophotography, it allows shorter exposures. For SCT, there are reducers that also correct the field of view. It also allows to have a full image on the film. I've heard that one can stack reducer/corrector but I never tried it. Even if it is optional, I strongly recommend this accessory. Celestron has a very nice one for SCTs.
Off-Axis Guider: Guiding is critical for nice round stars on long exposures. Lumicon has an excellent one, I use the Orion Ultra Guider which is nice too. Finding a guiding star is not always easy. Usually, I use a low power eyepiece to find the star, then switch to a higher reticle eyepiece. A 9mm is nice for a SCT 8" f/lO or f/6.3; a 12.5mm eyepiece is not enough power. If I can't find a guiding star, I just change target.
Front Cover: I usually use a plain carton. I cover the telescope with it, then open the camera and wait for the vibration to be stabilized, then I remove the cover. Most of the time, the guiding star is still centered. Very useful. While you have the carton, save a piece to make a dew protector!
Deep Sky Filter: If you live in a light polluted area, a Deep Sky filter can help you to limit the sky fog effect. It is an optional accessory; but after several pictures, it will become necessary. We already talked about polar alignment. Of course, alignment for prime focus is much more important than for piggy back; I usually spend two hours to do it, and I can do up to 60' exposures without field rotation. Focusing is also very important for prime focus astrophotography. Do not expect to have proper focus just by looking through the camera, it is not precise. I always use a razor edge to cut a star beam (well, also my finger sometimes, so be careful). The principle of this 'Foucault' method is easy. Point the telescope to a star, and do approximate focusing through the camera. Then, open the camera body (without film!), and open the shutter in B exposure. You should see the star pattern, as a donut shape through a SCT telescope. Take a razor blade, and tape it on the camera, exactly where the film should be. By moving the telescope (I usually tape the razor blade in order to be able to cut the beam just by moving in DEC), the razor edge will cut the star beam. If the razor is out of focus, the star pattern will disappear slowly from one side or the other depending if you are inside or outside of focus. At the focus point the star pattern disappears suddenly and it is hard to tell from which side. This is an easy method, and it takes around 5'-10' to do. It is very precise, and pictures will gain in sharpness. A DEC motor is also useful, even if one can still take pictures with the Ultima 8 without a DEC motor; it just makes life easier.

Choosing a film for deep sky astrophotography is not easy. There are hundreds of articles on this subject, and it is changing all the time as new films come out. Basically, Hyperfilms are the best; I got the best results using TP2415 Hyper and Ektar 1000 Hyper. Lumicon sells Hyper films, it is a good alternative if you don't have your own Hyper system. Otherwise, Ektar 1000 is a nice film for bright objects. I've heard about Kodachrome 1600P, but never had a chance to try it. TMAX 3200 is a very good Black & White film to practice the technic, including the photo lab technic. I would use those films to try and improve the technic, and then buy Hyper film for better results.

Now, the most difficult part may be to find the object and to center it. Long hours practicing visual observation will certainly help. I am a Star Hopping fan, I enjoy following star patterns in my finderscope and having the object right in the middle! Several computer programs can help to create perfect charts for the search; I use Guide CD-ROM or Megastar. The SKY, a little bit expensive, looks nice too. Of course, digital circles can also help. I spent several hours calibrating my telescope. I draw pictures to show where the camera field of view was in the finder depending on the camera orientation. I calibrated my finder with Guide charts too. Now, I am able to imagine the object position inside the finderscope (especially when there is a group of galaxies and you want all of them in the field). I also know where the guiding eyepiece field is. Sometimes, I use a low power eyepiece and try to locate the object within the guiding field (through the prism in the off-axis guider). It works pretty well for 12-13 magnitude galaxies. Then, I just move the telescope to center the object, and try to find a guiding star. There are hundreds of projects to do with prime focus astrophotography, beyond the simple art of photographing what you see.

Let go your imagination!



CHAPTER SPOTLIGHT - CWRU

Case Western Reserve University -SEDS

The Case Western Reserve University chapter has grown tremendously in the 4 years it has been active. From a fledgling club developed an organization that was committed to bring the space sciences to campus.

Last year, with a new infusion of members, CWRU-SEDS increased its presence in the campus community. In the 1995-1996 year, CWRU-SEDS sponsored several lectures featuring speakers from the NASA Lewis Research Center and the Case School of Engineering. With the CWRU Film Society, we were able bring movies like The Right Stuff and Apollo 13 to the campus. The crowning event of the year was the visit from astronaut Donald A. Thomas; a CWRU alumnus. A formal banquet followed by a lecture were attended by the campus community and CWRU alumni.

The 1996-1997 promises to be another productive year. With a new executive cabinet, we hope to greatly increase the campus community interest in the space sciences. CWRU-SEDS has already kicked off this year with a lecture by Astronaut Ellen S. Baker; who lectured on her experiences on her three shuttle missions. A general meeting for all members is scheduled later in the fall. Upcoming events we are planning include more lectures from professionals, excursions to NASA and related sites and a space sciences symposium on a regional scale.

- James W. Chang <jwc5@po.cwru.edu>
SEDS-CWRU Executive Cabinet

HIGHLIGHTS OF THE OCTOBER SKY

Date	Highlight
1	The moon passes 0.8° north of Aldebaran, 6 p.m. EDT
3	Mercury is at greatest western elongation (18°), 2 a.m. EDT
	Venus passes 0.2° south of Regulus, 8 p.m. EDT
4	Last quarter Moon is at 8:04 a.m. EDT
	Asteroid Juno is at opposition
6	The Moon is at apogee (404,791 kilometers from Earth), 1:54 p.m. EDT
7	The Moon passes 6° south of Mars, 11 a.m. EDT
8	The Moon passes 4° south of Venus, midnight EDT
12	New Moon is at 10:14 a.m. EDT; partial solar eclipse
18	The Moon passes 6° north of Jupiter, noon EDT
19	The Moon passes 5° north of Neptune, 1 p.m. EDT
	First quarter Moon is at 2:09 p.m. EDT
	The Moon passes 6° north of Uranus, 11 p.m. EDT
21	Orionid meteor shower peaks
22	The Moon is at perigee (368,350 kilometers from Earth), 4:46 p.m.
24	The moon passes 3° north of Saturn, 6 a.m. EDT
26	Full Moon is at 10:11 a.m. EDT
28	Mars passes 1.2° north of Regulus, 11 p.m. EDT
29	The Moon passes 0.9° north of Aldebaran, 3 a.m. EST

Caltech-SEDS Advisor to Fly in Space

Dr. John Grunsfeld is scheduled to fly aboard the Space Shuttle Atlantis (STS-81) on his second orbital journey next January. Dr. Grunsfeld served as advisor to Caltech-SEDS before joining the astronaut corps, and continues to serve as the primary advisor for the Caltech SEDS GAMCIT project. Dr. Grunsfeld made his maiden flight on STS-67 in 1995.

OTHER ANNOUNCEMENTS/INFORMATION

INTERNATIONAL SPACE UNIVERSITY UPDATE
(co-founded by SEDS founder, Peter Diamandis)

The summer session program recruitment has begun for summer '97, when the program will be held in the US (it will also be held in the US in summer '98 at Cleveland State University – Ohio). The design projects for this summer are: Transfer of Technology and Strategies for Exploration to Mars. Contact information for ISU is: admissions@isu.isunet.edu or http://www.isunet.edu

– Jim Brice, Program Manager for the NASA Academy, an alum of ISU '89, and founder of the University of Central Florida SEDS.

FROM THE EDITOR
– SEDS-USA Director of Publications, Birgit Dahlberg

A big "thank you" to all the people that submitted articles for the October issue of NOVA (sadly, there weren't as many as I had hoped for). If I did not use your submission in this issue, I will do my best to do so in the future. Please continue to submit articles to me directly (birgit@seds.org) or to the NOVA e-mail address (nova@seds.org). Please start submitting articles for the next issue as soon as possible!

The next issue will be a combined November/December issue. There are several reasons for this. In order to return to a "beginning of the month" schedule for NOVA distribution, I need to skip a month (sending an issue out on the 18th and another on the 1st is not feasible with the amount of material that I have been receiving). In addition, I have a number of final exams in December that will require most of my attention.

SEDS GAMCIT Update
– Ben McCall Caltech SEDS GAMCIT Coordinator <bjmccall@uchicago.edu>

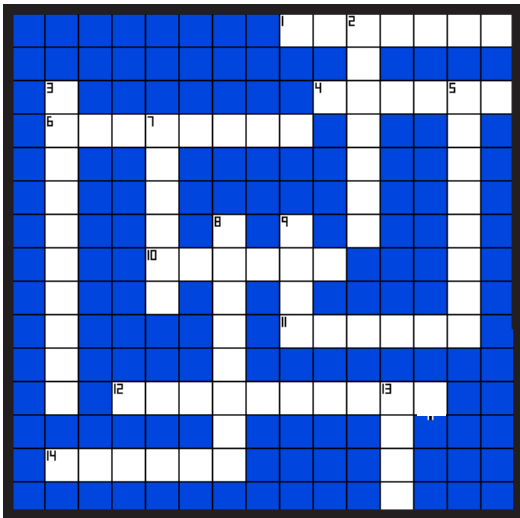
Caltech SEDS's first Shuttle payload, GAMCIT (Gamma-ray Astrophysics Mission, California Institute of Technology), flew aboard STS-77 this past May. The purpose of the mission was to study cosmic gamma-ray bursts, which have puzzled the astrophysical community for nearly three decades.

The flight went very well, with the exception of NASA's mistaken impression that our motorized door had closed during flight. Because of this supposed closure, NASA intended to shut off the experiment, but we were able to convince them to "wait and see if it closed again." It later turned out that the report of the closure was, indeed, in error.

The experiment gathered about 2 gigabytes of data, and we are still in the process of extracting and analyzing the data. Early indications are that the experiment did function pretty much as expected, and that at least some gamma-ray bursts were observed. Stay tuned to this forum as the data analysis progresses.

SEDS - USA T-SHIRT CONTEST

Do you desire fame and fortune? Your name on the big screen? Do you want your design worn by famous movie stars? If so, enter the 1996-97 SEDS T-Shirt Design Contest!! Designs should be submitted to Chris Lewicki, Space Science, Building #92, University of Arizona, Tucson AZ 85721-0092 by December 13, 1996 for review. The chosen design will be marketed as a fund-raiser for the SEDS-USA Endowment. Winner will receive a really great prize (we're not sure what it will be yet) and a free t-shirt.



DOWN

2 First identified Cepheid variables
3 The Hubble Space Telescope is what type of telescope.
5 The age of the ____ is estimated to be between 15 and 25 million years old.
7 The brightest star as seen from Earth (other than the Sun).
8 The most powerful (and common) astronomical telescope is a _____ refractor.
9 First theorized an inflationary era for the Big Bang.
13 The Big Dipper is also know as ____ Major.

ACROSS

1 Also known as the North Star.
4 The Pleiades is a cluster of stars found in the constellation _____.
6 First described curved spacetime.
10 Discovered by William Herschel in 1781.
11 The first person to show that the universe was expanding.
12 First described a heliocentric universe.
14 Galileo saw, but did not accurately describe, the rings of _____.

Answers will be printed in the November/December NOVA.

CLASSIFIEDS

This section will (hopefully) be an area for members to post their **informational** needs and wants. Material items will be okay if they are project oriented. If you need help with a project or an idea or just want to bounce ideas off of someone who has been there, do it here! Send your information to birgit@seds.org with a subject line of "classifieds" and it'll be printed in the next issue of the NOVA.

Editor: Birgit Dahlberg, KAMSC SEDS

Mail requests for chapter and individual membership information to the SEDS National Headquarters.

SEDS
MIT Room W20-445
77 Massachusetts Avenue
Cambridge MA 02139