



Project ASTRO UTAH ASTROGRAM

Volume 1, Issue 2 Winter 1998-99

THE CLARK
FOUNDATION

CONTENTS

WELCOME—SEASONS GREETINGS

SHINING STARS

STAR PARTIES

SO, YOU WANT TO BUY A

TELESCOPE...

JANUARY WORKSHOPS

STARSHINE UPDATE

Project ASTRO UTAH Is

Sponsored By

The Clark Foundation

PO Box 9007

Salt Lake City, UT 84108

(801) 583-5500, (801) 583-5522 fax

www.clarkfoundation.org

And By

Hansen Planetarium

15 South State Street

Salt Lake City, UT 84111

(801) 531-4926, (801) 531-4948 fax

www.utah.edu/Planetarium

ASTRO UTAH is an

expansion site for the

national Project ASTRO

program, created by the

Astronomical Society of

the Pacific

COALITION MEMBERS

The Space Dynamics

Laboratory at Utah State

University

Weber State University

Department of Physics

University of Utah Department

of Physics

Hansen Planetarium Education

Department

Utah Valley State College

Department of Physical

Sciences

Brigham Young University

Department of Physics and

Astronomy

Ogden Astronomical Society

Salt Lake Astronomical Society

Utah State Office of Education

WELCOME!

Merry Christmas, Happy Hanukkah, Super Solstice, and Seasons Greetings to you all!

We at the Clark Foundation hope that the coming new year is good to you.

This newsletter is dedicated to several things: How to buy telescopes (for those of you still out there shopping), hosting star parties, the January Project ASTRO Teacher-Astronomer workshops, Project Starshine, and desktop computer astronomy software.

Mainly, though, I want this newsletter to be a resource for people who think they might be interested in buying a telescope, but have not yet made the purchase. If you are already knowledgeable about telescopes, then please be sure to share your knowledge with a friend or colleague who may not be.

Years ago when I worked at Hansen Planetarium there was a maddening phenomenon that took place each January, and I am sure it continues there to this day. During the first few weeks after Christmas I could expect at least one little boy or girl and one or both parents appearing in the planetarium lobby with a telescope that the child had received as a Christmas present. They wanted to know why they couldn't see planets, nebula, and galaxies the way they were advertised on the telescope's box. They were worried that either the telescope was broken or they didn't know how to operate it correctly. The salesperson at the department store from which they had bought the telescope was unable to answer their questions, and had referred the unhappy telescope owners to the planetarium.

Why wasn't the telescope working as advertised, nurturing a young mind's budding interest in science and introducing them to a wonderful family activity? Why did their first experience with a telescope sour so many children to astronomy, instead of stimulating a life-long love of the night sky?

Their problem had nothing to do with an equipment malfunction or operator error. The problem was that so many of the telescopes bought in department stores by well-meaning parents for their beloved children are junk. My otherwise abundant Christmas cheer evaporates when I think of the disappointment and lost interest in science created by the telescopes that department stores have on display next to their camcorders and VCRs.

Giving a child a department-store telescope in the hope that it will lead to an interest in astronomy is like making a child listen to Roseanne's screeching rendition of the "Star Spangled Banner" in the hope that they will develop an interest in music and a sense of patriotism.

More harm than good is done by giving a child a cheap telescope, so let us all make a New Year's resolution to do what we can to help people avoid making that mistake.

Astronomy education will benefit from our efforts.

Seth Jarvis, Project ASTRO UTAH Coordinator

SHINING STARS

I've seen some incredible things since Project ASTRO UTAH got started last year. As far as I'm concerned all our site's teachers and astronomers deserve "shining star" status for one or more reasons.

One Project ASTRO partnership that I believe is particularly worth celebrating is sixth-grade teacher Don Robb and Hansen Planetarium's Ruth Sullivan. Don teaches at Columbia Elementary School in Kaysville.

I observed Ruth and Don lead a class of energetic sixth graders through the "Can You Planet?" activity from the Astronomical Society of the Pacific's *The Universe At Your Fingertips*. As Ruth began with a slide presentation about the planets of the Solar System, a commotion erupted in the back of the room. A student had lost a contact lens, and kids in a growing radius devoted themselves to the search.



Hansen Planetarium's Ruth Sullivan leads a Project ASTRO activity at Columbia Elementary in Kaysville

Ruth didn't skip a beat and kept going. Don remained calm, confident of his students' ability to control themselves and Ruth's ability to capture their interest.

The slide presentation ended, the lights went up, and the lost contact lens faded as a source of distraction. The students were following closely Ruth's description of the scientific value of classification according to similarities and differences. The students were organized into groups of four and began sorting planets according to their moons and atmospheres.



Project ASTRO's "bottom line" — astronomy is interesting!

As Ruth and Don went from group to group, the students became completely absorbed in the task of creating a planetary taxonomy. Don eventually made his way to the rear of the classroom and watched with me while Ruth continued to move among the tables answering the students' questions, typically with a question of her own. After a minute, Don leaned over to me and whispered, "The bell's not working today. They were supposed to go to recess ten minutes ago."

Ruth, Don, you shine!

STAR PARTIES

Few things can be as deeply satisfying as introducing a group of people, especially young people, to the wonders of the nighttime sky. There is no better place to make this happen than at a "Star Party." These can be elaborately planned public events involving hundreds of people and dozens of telescopes. They can also be small, impromptu affairs in your front yard where the attendees are your neighbors and the folks who thought they were only out for an evening stroll until they encountered you and your telescope.

Somewhere in between these two extremes is the School Star Party. A volunteer astronomer sets up and operates one or two battle-scarred telescopes on a school playground while a brave teacher rides herd on a group of students, their parents and siblings.

There are a few basic rules that if followed maximize the probability that the event will be regarded as worth repeating, both by the astronomer and the students and teachers.

1. Find a responsible person with the backbone and grit to be in charge of the weather for the night of the Star Party, and hold them accountable!

That was a test. If you found yourself muttering "harrumphs" of approval to the preceding sentence, then you have serious unresolved control issues in your life and perhaps you shouldn't be trying to organize a Star Party.

Face it, clouds happen. If research astronomers cannot banish by fiat all clouds in the vicinity of their mountaintop observatories, then why should you, a mere mortal, be any different?

Make it clear to all prospective attendees that in the event of bad weather the Star Party will either be cancelled or rescheduled for a date to be announced.

If you are a gambler, you can have a bad-weather backup date included with your promotion of the Star Party's primary date.



Meet BOB: The "Big Ogden Bucket" 18-inch reflector owned by the Ogden Astronomical Society. Note that this telescope uses removable braces, instead of a solid tube, to hold the secondary mirror and eyepiece.



Star Parties are great family activities.

Even if you announce that cloudy skies mean the Star Party is cancelled, plan to be at the site the night of the Star Party regardless of the weather. A blizzard could be ushering the return of the next Ice Age and people will still show up expecting to see Saturn's Rings.

Alternatively, you could make plans for a bad-weather indoor activity such as an astronomy-related slide presentation or "invent an alien" contest. Let attendees know in advance that clear skies or not, there will be an astronomy activity that night.

2. One astronomer and one telescope can generally handle a maximum of about 30 people. If you need to deal with more people, get another telescope and astronomer to help. Otherwise, your telescope waiting lines will get too long and people won't be able to hear what you're saying.

3. Try to schedule your Star Party for a date on which the Moon is within a day or two before or after First Quarter. The Moon is easily visible at sunset and makes a nice object to look at while waiting for the dark of night to settle in. Also, at First Quarter the Moon is illuminated by sunlight from a relatively low angle, creating long shadows and dramatic contrast on the lunar surface. Most people haven't seen the Moon through a good telescope, and the outbursts of "Wow!" and "No Way!" from the first-time viewers are a lot of fun. Best of all, a three- to six-day-old Moon sets within a few hours, giving you and your group the best of both worlds, an impressive view of the Moon at sunset and a dark sky soon thereafter.

4. Select your site carefully. If the Star Party is to be held on the school grounds, can you control the outdoor lighting most schools have? Will the lawn sprinklers come on in the middle of the Star Party? Does the site have adequate horizons to let you see what you plan to show your audience? Whenever possible, inspect a proposed site *at night* in advance of the Star Party.

5. Encourage attendees to bring their binoculars. Few people realize how many deep space objects can be seen through the binoculars most people have lying on their closet shelves. For many of them, this will be their first opportunity to explore the nighttime sky with binoculars, which is a terrific way to initiate people to amateur astronomy.

6. Encourage attendees to dress warmly. Milling around a telescope doesn't generate much body heat, and even in the summer people find that a jacket is required to stay comfortable outdoors at night.

7. Use Telescope Slaves. Don't worry, you'll free them later. A few volunteers willing to help maintain order in the telescope line and haul equipment to and from the observing site are invaluable.





PROJECT ASTRO UTAH So, You Want to Buy a Telescope ...

THE CLARK
FOUNDATION

Biologists categorize life on Earth by Kingdom, Phylum, Class, Order, Genus, and so on. However, a little-known but critically important taxonomy is all too often ignored by instructors of Biology. Stuck in between “Kingdom” and “Phylum” is the “Telescopum,” a division that distinguishes between those members of the Animal Kingdom who purchase telescopes wisely and those who do not.

Biology instructors usually overlook this classification because identifying animals by their Telescopum is so incredibly simple they probably feel the distinction is self-evident. Those who buy telescopes wisely are happy, intelligent, personally and professionally successful, enthusiastic, financially secure, fun to be with and are highly attractive to movie stars and super-models. Those who don't, well...aren't.

Because the consequences of buying a telescope wisely or unwisely are so dramatic, let's quickly review the eight basic rules of wise telescope shopping.



Small binoculars such as this set of 8x25's (8 power magnification, 25 mm apertures) may work well in daylight but don't gather enough light for use at night.

1. ASK YOURSELF, DO YOU REALLY NEED A TELESCOPE?

It's amazing how often this question is not asked when it is, in fact, the first question that should be answered. An enormous amount of deeply satisfying sky-gazing can be had with nothing more than a good pair of binoculars. True, binoculars are simply low-power, wide-angle, side-by-side telescopes, but let's not complicate the issue.

The Andromeda Galaxy, so large and bright that even from a distance of 2 million light years it is visible to the naked eye, is



Giant binoculars such as these 11x80's (11 power magnification, 80 mm apertures) are great for night use, but are heavy and require a tripod for a stable view.

impressive when seen through a \$150 pair of binoculars. Those same binoculars also provide excellent views of the four Galilean moons of Jupiter, the Pleiades star cluster and the Lagoon Nebula. For exploring the rich star fields of the summertime Milky Way, binoculars are without equal. Remember Comet Hale-Bopp? Almost no one was looking at it through telescopes. Savvy comet watchers were all using binoculars. No telescope can give the observer the wide field of view and instinctive sense of where in the sky they are looking the way binoculars can.

In addition to being relatively inexpensive, binoculars are highly portable, simple to operate and store, pretty much goof-proof, and are just plain handy to have around. They make excellent gifts. A few eccentrics have even been known to use binoculars during the *day* and take them to sporting events, on hikes, or even to just watch birds.

If you are not 100% certain that you are ready to be a telescope owner, then spare yourself the expense and effort associated with a telescope and start out with a set of decent 7x50 binoculars. If one night you find yourself straining through your binoculars in an attempt to view the Ring Nebula, then you know you are ready for a telescope.



A good quality pair of 7x50 binoculars are ideal for a beginning amateur astronomer. (Image courtesy of Orion Telescopes)

2. BIGGER BUCKETS ARE BETTER

The Universe is awash with tiny packets of light called photons. At this moment, trillions and trillions of photons are bouncing off the ink and paper of this newsletter and finding their way into your eyes, making it possible for you to read these words. These photons originated in a nearby light bulb or possibly a mere (in the astronomical scheme of things) 93 million miles away inside the Sun.

When photons of visible light are abundant, we think the world around us is bright. When these same photons become scarce, we perceive this as dark. An analogy can be made between photons and water. Standing outside on a sunny day is similar to standing beneath a waterfall—you are drenched in an instant. A clear moonless night is like a fine misty rain. If you want to collect even a small amount of water from a drizzling rain, you are going to need a big bucket.

A telescope is to starlight as a bucket is to rain. Bigger buckets catch more, whether it is a wooden bucket collecting rain or an optical bucket (a telescope) collecting starlight.



Weber State University astronomer John Sohl removes the primary mirror from a Meade 16" reflector. Note the simple-but-strong "Dobsonian" alt-azimuth mount. Six or eight-inch reflecting telescopes on Dobsonian mounts make excellent first telescopes.

In general, telescopes with large apertures (the diameter of the opening that catches light), are better than telescopes with small apertures. The length of a telescope is not a good predictor of how well it will perform. On the other hand, the aperture is a good initial predictor of a telescope's performance.

Most department-store telescopes have apertures of between 60 and 80 millimeters (two to three inches.) This is not much of a bucket, and their buyers learn too late that these telescopes that worked so well in the department store perform miserably at night. Remember the starlight-water analogy. If you are collecting water under a waterfall (daylight), just about anything will catch enough to give you a drink. If you are trying to catch water in a misty rain (nighttime), those tiny droplets are few and far between, and the diameter of your bucket becomes critical.

Most good-quality telescopes used by amateur astronomers have apertures of at least four inches, and amateur telescopes with apertures of six to twelve inches are common.

Get a telescope with the biggest aperture your budget can afford.

3. THIRTY POWER OF MAGNIFICATION PER INCH

Have you ever heard the great telescopes of the world referred to by their magnifying power? Of course not, they are known by their aperture. Famous telescopes include the "200 inch" telescope in California at Mt. Palomar, the twin "10 meter" Keck telescopes atop Mauna Kea in Hawaii, and of course, the "2.4 meter" Hubble Space Telescope in orbit above us. Why then, do department stores and cable shopping channels advertise telescopes by their "power" instead of their aperture? They do it because they think we are gullible rubes.

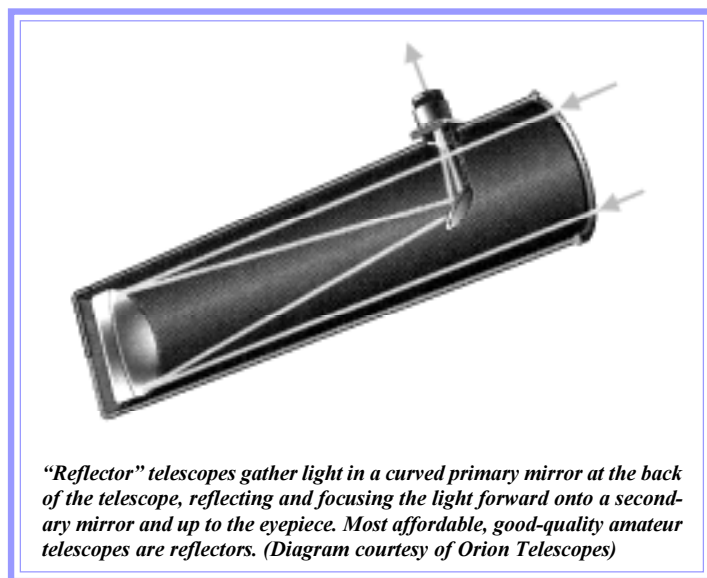
Fortunately, we have the "thirty power per inch of aperture" rule. The maximum useful power (magnification) that a telescope can provide is about 30 power per inch of aperture. That 60 millimeter telescope in the department store may be promoted as "200 power!" but since 60 mm is about 2.3 inches, you shouldn't expect decent nighttime viewing beyond about 70 power ($30 \times 2.3 = 69$).

True, the optics of that 60 mm telescope might in fact be producing 200x magnification, but the point is that anything much beyond about 70x is only going to produce dark, fuzzy images. A 60 mm "bucket" just can't catch enough light from the night sky to make magnifications much beyond 70x of any use to you. During daylight hours, even a 60 mm aperture can gather enough light to support very high magnification. After dark, however, the 30-power-per-inch rule applies. Very few amateur astronomers ever use their telescopes at magnifications higher than about 200x, and most stay well below 100x. (Saturn's rings are breathtaking at 50x.) A typical eight-inch amateur telescope, even at 100x, is using its optics at only about 12 power-per-inch, ensuring a bright, high-resolution image.

4. MIRRORS GIVE MORE BANG-FOR-THE-BUCK THAN LENSES

Another distinction shrewd telescope shoppers keep in mind is that most of the great research telescopes of the world are "reflecting" telescopes that gather light using a single curved mirror instead of "refracting" telescopes that use multiple lenses. What is it that the folks who build such telescopes know that the sales clerk in the department store doesn't?

They know that the "light bucket" of a reflecting telescope requires precision polishing of only one large surface—the mirror at the bottom of the telescope tube that gathers and focuses the light into the eyepiece. Refracting telescopes (large versions of the "spyglass" so popular in pirate movies) gather light by bending it through multiple lenses. Each lens has two surfaces—a front and a back—and



5. THE TELESCOPE MUST USE 1.25" INTERCHANGEABLE EYEPIECES

The aperture of the telescope determines how much light it collects, but the eyepiece (the part of the telescope you look into) is where most of the magnification process takes place. Changing eyepieces lets the viewer change levels of magnification and the field of view. Amateur astronomers usually have an assortment of eyepieces with them during an observing session.

The magnifying power of a telescope can be easily calculated by dividing the focal length of the telescope by the focal length of the eyepiece. For example, an amateur telescope with a 1,000 mm focal length using a 22 mm eyepiece will produce a magnification of 45 power ($1,000 / 22 = 45$).

To obtain greater magnification (but with a narrower field of view, a darker image and a smaller opening in the eyepiece to look through), the telescope operator changes to an eyepiece having a shorter focal length. For example, a 1,000 mm focal length telescope using an 8 mm focal length eyepiece will achieve 125 power magnification.



A telescope that accepts interchangeable eyepieces gives the user a wide variety of options for magnification and field of view. (Image courtesy of Orion Telescopes)

Department-store telescopes seldom use interchangeable eyepieces, typically limiting the user to either a single multi-power "zoom" eyepiece or a few eyepieces specifically made for that telescope. These eyepieces were doubtless constructed with the same level of care as the rest of the telescope, which bodes ill for your viewing experience. If they do accept interchangeable eyepieces, they are usually the smaller .965" diameter eyepieces. While there are a few good telescopes worth buying that use these, finding quality .965" eyepieces is more difficult and they cost just as much as 1.25" eyepieces.

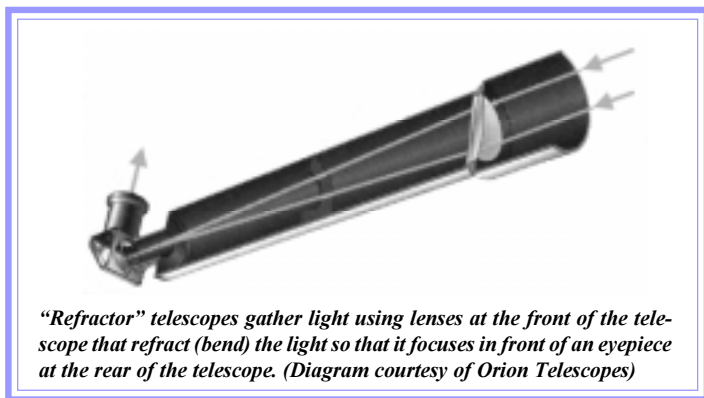
Interchangeable 1.25" eyepieces are available in a huge variety of focal lengths and features. Astronomy magazines and astronomy supply catalogs contain page after page of listings for all types of high-quality interchangeable eyepieces, with prices ranging from less than \$30 to more than \$300 apiece.

The odds are that if the telescope you are thinking about buying uses 1.25" interchangeable eyepieces, it's worth further consideration. If not, then the telescope probably won't perform well at night, no matter how impressive it may seem in the bright lights of the store.

6. PAY ATTENTION TO THE MOUNT

A telescope's mount needs to be strong enough to keep the instrument from moving while you are looking through it. A cheap mount will make even the best optics impossible to enjoy. Department-store telescopes are notorious for coming with flimsy mounts attached to equally flimsy tripods that make the telescope wiggle crazily with every gust of wind.

Dobsonian-mounted reflecting telescopes are increasingly popular among amateur astronomers. The Dobsonian mount is a simple, robust design that cradles the telescope on an altitude-azimuth adjustable swivel base. Teflon pads in the mount allow the user to aim the telescope by simply grabbing it by the tube and pointing in the desired direction. The Dobsonian's rigid construction and low center of gravity provide excellent stability for their reflector telescopes and place the eyepiece at a comfortable height for most observers.



"Refractor" telescopes gather light using lenses at the front of the telescope that refract (bend) the light so that it focuses in front of an eyepiece at the rear of the telescope. (Diagram courtesy of Orion Telescopes)

each surface needs to be polished with the same precision and care as the surface of the primary mirror in a reflecting telescope. Refracting telescopes require at least two such lenses, meaning that in order to attain roughly equivalent optical quality, a refracting telescope needs at least four times as much work as a reflecting telescope. The only way the department-store telescopes can be priced low enough to get people to buy them is for their manufacturers to use inexpensive lenses that haven't been polished and assembled with much precision.

Because reflecting telescopes deliver the most starlight for the lowest price, most amateur astronomers use reflecting telescopes with apertures measuring between six and fourteen inches. These telescopes sell for anywhere between a couple of hundred to several thousands of dollars.

A few amateur astronomers do have, use and lovingly maintain refracting telescopes with apertures between four to eight inches. These telescopes are heavy, large, delicate and time-consuming to set up. A well-made refracting telescope can deliver more finely detailed images of planets and stars than a reflecting telescope of equivalent aperture, but this type of performance comes at a price. A six-inch reflecting telescope can be bought new for a few hundred dollars. However, if you have to ask how much a high-quality six-inch refracting telescope costs, then you can't afford one.



Refractors are capable of producing sharper images than reflecting telescopes of the same aperture, but are big, heavy and expensive. Siegfried Jachmann's nine-inch Clark Refractor offers eye-popping views of the planets, but taking it to a Star Party is not a simple task.

The advent of the Dobsonian telescope mount has created a dramatic drop in the price of good-quality reflector telescopes. Their only drawback is that they are not suitable for long-exposure astrophotography, which requires a system of electric motors and gears in order to track objects over time. Unless you are seriously planning on taking up astrophotography as a hobby, a Dobsonian-mounted reflector will give the best return on investment for a beginning amateur astronomer.

7. Do a Little Reading



Buy and read at least two issues of the magazines read by amateur astronomers. This is important because it gives the prospective telescope buyer a chance to see what is available in the way of good quality optics from reputable dealers.

If you knew nothing about automobiles but were thinking of buying one, would you visit "Slick's O.K. Kar Koral" without first reading a few issues of "Car & Driver" and "Consumer Reports"? Let's hope not.

Much derision has been heaped upon "department-store telescopes," but that doesn't help the buyer learn who supplies telescopes worth owning and how much they cost. Fortunately, there is a relatively painless way a novice may learn what is worth buying while at the same time acquiring astronomical knowledge.

The two preeminent monthly magazines read by amateur astronomers are **Astronomy** (www.kalmbach.com/astro/astronomy.html) and "**Sky & Telescope**" (www.skypub.com). In addition to many excellent articles on the subject of astronomy, these magazines contain many advertisements for high-quality telescopes and binoculars.



8. ATTEND A STAR PARTY

This may well be the most important rule of all. People learn best when they are sharing information with other people. After all, we are social animals, and "Star Parties" hosted by local astronomy clubs or planetariums are great places to meet and talk with other telescope owners. Information about the relative merits and different types of telescopes, eyepieces, mounts and accessories flows freely among participants, and novices with questions about buying telescopes are enthusiastically welcomed.

Which is more likely to give a person genuine telescope-buying proficiency—seeing how well the department-store telescope can show you the "EXIT" sign at the back of the store, or looking through a variety of telescopes that are actually viewing planets, stars and galaxies?

Good telescopes can provide a lifetime's enjoyment. If handled with a little care, a high quality telescope will rarely (if ever) break or require adjustment. Prices for a good telescope range from about \$300 and up. (Sometimes way, WAY up, but that's for someone seriously bitten by the astronomy bug.)

Those are the rules. Follow them, and you will attain a state of bliss. Ignore them at your peril.



RECOMMENDATIONS

Under \$250: A good set of 7x50 binoculars is a must. Consider the Orion *Explorer* (\$120), Orion *UltraView* (\$180), or Celestron *Ultima* (\$240). You can, of course, spend much more than this for binoculars, but these are good examples of high-quality binoculars with minimal sticker-shock.

Under \$500: Consider a Dobsonian-mounted reflector, such as the Meade *Starfinder* with 6" (\$350) or 8" (\$450) aperture. Also consider Orion's *Deep Space Explorer* (\$360 for a 6", \$470 for an 8" aperture), or the Celestron 8" *Starhopper* (\$420). Dobsonian-mounted reflectors give the user a large-aperture telescope with simple, rugged construction for a minimal investment.

Under \$1,000: Consider a larger Dobsonian-mounted reflector, such as the Orion 10" *Premium Deep Space Explorer* (\$820) or Meade 12" *Starfinder* (\$900). A 10" telescope gathers about 57% more light than an 8" telescope (the 12" collects 126% more light), giving the user brighter images of faint deep-sky objects such as galaxies and nebula.

Over \$1,000: It's hard to go wrong with a Schmidt-Cassegrain (a type of reflector) telescope made by either Celestron or Meade. These compact instruments are the "work-horse" telescopes of many amateur astronomers and are ubiquitous at Star Parties. Prices for Schmidt-Cassegrain telescopes with 8" or 10" apertures begin at just over \$1,000 and continue past \$3,000 depending on mounts, features and accessories. When used with the proper motorized drives, they make excellent telescopes for astrophotography.

Sources: Orion Telescopes (www.orientel.com)
Meade Instruments (www.meade.com)
Celestron International (www.celestron.com)



Schmidt-Cassegrain telescopes (foreground) are compact reflector telescopes, that use its secondary mirror to reflect light to the rear of the telescope.

PROJECT ASTRO UTAH ASTRONOMER-TEACHER WORKSHOP

JANUARY 15 & 16, 1999, WEST JORDAN
JORDAN HILLS ELEMENTARY SCHOOL
JANUARY 22 & 23, 1999, OGDEN
WEBER STATE UNIVERSITY

FRIDAY, JANUARY 15 (JORDAN HILLS); JANUARY 22 (WSU)

- 2:15 – 2:30 **Check-In**
Sign-in Sheets and
Continuing Ed. Registration
Distribute *The Universe at Your Fingertips*
Distribute *Project ASTRO How-To Manual*
- 2:30 – 3:00 **Overview & Introduction**
Project ASTRO UTAH
Expectations
Goals and Philosophy
- 3:00 – 3:30 **Ice-Breaker**
Partners interview each other and introduce each other to the group.
- 3:30 – 4:00 **Unraveling Student Preconceptions in Astronomy**
Experiential Activity
Discussion of Learning Theory
- 4:00 – 4:15 **Break**
- 4:15 – 4:45 **What to Expect**
Brett Moulding, Science Curriculum Specialist for the Utah State Office of Education, will lead a discussion on what sixth-grade students are like and their differing needs and expectations.
- 4:45 – 5:45 **Quality Astronomy Activities That Work: Activities from *The Universe at Your Fingertips***
Investigating Phases of the Moon (Section A, "Our Moon's Phases and Eclipses" from *UAYF*)
- 5:45 **Adjourn for the Day**

SATURDAY, JANUARY 16, (JORDAN HILLS); JANUARY 23 (WSU)

- 8:30 – 9:00 **Check-in, Coffee, Juice, Pastries, etc.**
- 9:00 – 10:00 **"A Grand Tour of the Universe"**
- 10:00 – 10:45 **Roles and Concerns of Teachers and Astronomers**
Group discussion(s): What should astronomers know before going into the classroom? What should teachers know? What tips and suggestions are available? Refer to the *Project ASTRO How-To Manual*.
- 10:45 – 11:00 **Break**
- 11:00 – 12:00 **More Classroom Activities That Work**
Investigating Size and Scale using activities from *The Universe At Your Fingertips*
- 12:00 – 1:00 **Lunch**
- 1:00 – 2:30 ***Starry Night* Software & Classroom Activities**
- 2:30 – 2:45 **Break**
- 2:45 – 3:30 **Planning With Your Partner:**
Sign-up for your first visit.
- 3:30 – 4:00 **General Discussion and Follow-Up**
Discuss follow-up activities and how the group will stay in touch during the school year.

Lay groundwork for publicity, follow-up workshop, Astrogram contributions, partner portfolios, site visits and evaluation.
- 4:00 – 4:30 **Evaluation / Wrap-Up / Adjourn**
Hopes & Concerns
Workshop evaluation
Collect Cont. Ed. credit registration forms
- 4:30 **FAREWELL!**

WORKSHOP HIGHLIGHTS

A FEW WORDS ABOUT THE WORKSHOPS:

The Project ASTRO UTAH teacher-astronomer workshops are for teachers and astronomers currently participating in new or returning ASTRO partnerships. Teachers and astronomers who attended the January 1998 workshop are encouraged to attend the 1999 workshop, but are not required to. Any newly enlisted teachers or astronomers need to attend one of the workshops.

If you participated as a teacher or astronomer in Project ASTRO in the 1997-98 school year, but have a new partner for the 1998-99 school year, please plan to attend at least the Saturday session of the workshop with your astronomer/teacher partner.

You must pre-register with Seth Jarvis at 801-583-5500 or snj@clarkfoundation.org before attending either workshop.

STARRY NIGHT SOFTWARE

Imagine trying to explain to students what you might see if you could travel to Ganymede, Jupiter's largest moon, and land at that icy world's North Pole.

Sienna Software's *Starry Night* desktop astronomy software (www.sienasoft.com) lets you do it, right down to an impressive view of Jupiter's Great Red Spot and the moons Io and Europa (each beautifully rendered) scooting along their orbits between you and the Gas Giant planet.

How would this view of Jupiter compare to a view of Earth from our own Moon? With a few more mouse clicks you are on Earth's Moon, looking out into space at the Home Planet. Click again and time passes, allowing you to see the Moon's shadow glide across Asia during a solar eclipse.

In the time it takes most people to become seriously confused on the subject of eclipses, *Starry Night* lets you simulate just about every eclipse scenario imaginable and gain an appreciation for Planet-Moon-Sun geometry in a way that no chalkboard drawing or textbook diagram ever could. The abstractions of space become much easier to understand, because with *Starry Night* you have your own personal planetarium on the computer in front of you.

Starry Night comes with disks for installing on both Macintosh and PC (Win95/98/NT) computers, and has a drop-dead gorgeous user interface that actually makes the user want to learn more about astronomy.

In addition to using *Starry Night* in a training activity in the January teacher-astronomer workshops, each Project ASTRO UTAH teacher and astronomer attending the workshop will receive a copy of the software. Equipped with their own copies of this software, we anticipate that Project ASTRO UTAH teachers and astronomers will find exciting new ways to bring a love for astronomy to students.

ADDITIONAL OPTIONS FOR THE WEBER STATE WORKSHOP

Ott Planetarium

Attendees at the January 22-23 workshop will have a chance to see the Ott Planetarium's star theater program, *Voyage to the Planets* immediately after the conclusion of either the Friday or Saturday sessions. This program was written to specifically address part of the Utah core curriculum guidelines for level 6 science and is definitely worth sticking around to see.

NASA Regional Teacher Resource Center

The Regional Teacher Resource Center (TRC) at Weber State University exists to provide educators with tools that will enhance the learning of their students. Some of the hundreds of items and services available are: space, environmental and astronomy lithographs; educational computer software; many NASA-produced videos, slides, filmstrips and posters; lesson plans; e-mail capabilities; access to the Internet and research services for particular questions, to name a few.

The TRC is normally open Tuesdays and Thursdays 4 to 7 p.m., Wednesdays 3:30 to 6:30 p.m., and the 2nd and 4th Saturday 10 a.m. to 4 p.m. To use the TRC during the day, Monday through Friday, just call Becky at the Center for Science Education at 626-6160 to set up an appointment. Ed Douglas, the director of the TRC, will make the center available on Saturday January 23 to Project ASTRO workshop attendees. The TRC web site can be found at weber.edu/sciencecenter/.



PROJECT ASTRO UTAH

Sponsored by
The Clark Foundation
PO Box 9007
Salt Lake City, UT 84108
(801) 583-5500
(801) 583-5522 fax
www.clarkfoundation.org

and by
Hansen Planetarium
Salt Lake City, Utah

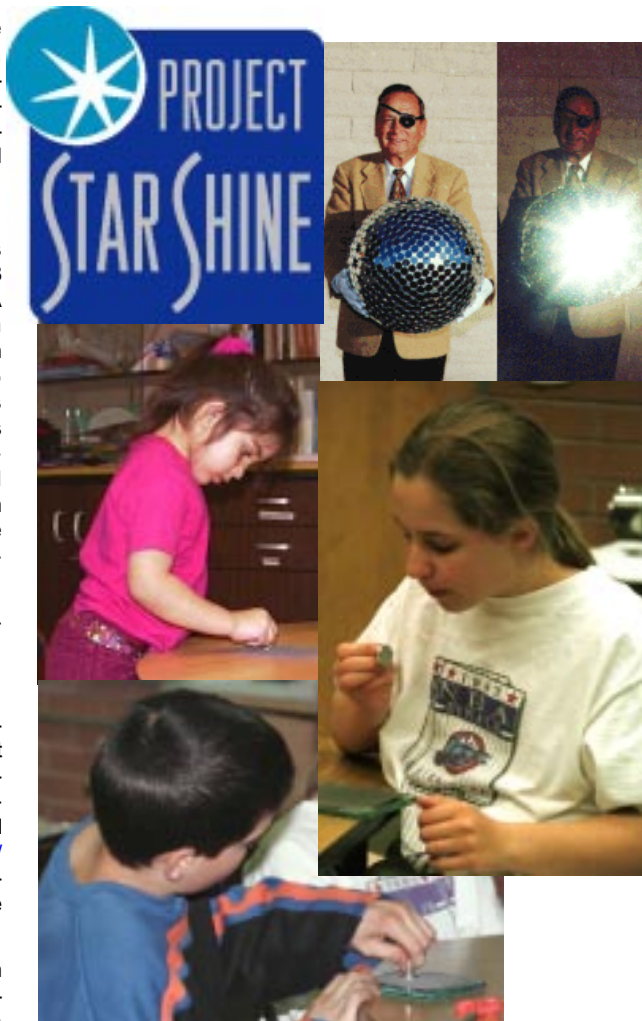
STARSHINE: READY FOR LAUNCH BY RICHARD COX

On May 13, 1999, aboard the Space Shuttle Discovery (STS-96), will be launched a small, seemingly insignificant aluminum sphere, covered with over 800 small mirrors. It will not contain high-tech electronics, it is not built by a billion-dollar corporation. But this small device will be watched by people the world over.

Starshine, as it is called, is a student designed, student built satellite. The Starshine project is now in its second year. On October 24th, 1998 Hansen Planetarium hosted the annual NASA Teacher Workshop at the University of Utah in Salt Lake City. For those of you unfamiliar with this annual event, the NASA Teacher Workshop has been happening in Utah for nearly 10 years now. This day-long workshop brings teachers from all over the state to learn from NASA educators, other informal education institutions and their peers. Look next Spring for information for the 1999 workshop, which we expect to be held in the fall of 1999 at Weber State University in Ogden, Utah.

Starshine is the brainchild of retired professor R. Gilbert Moore (Utah State University, Utah; and the Air Force Academy, Colorado). He wanted to design a project that would give students across the world the opportunity to learn about satellites, learn about space, and help them see the value of science in their lives. The mirrors for the satellite were polished in schools across the world over the last year (www.azinet.com/starshine/schools.htm). The satellite is currently being constructed and tested by the Naval Research Laboratory in Maryland.

While in orbit, Starshine will be visible from most vantage points on Earth, and will appear as a bright flashing light. Students across the globe will be asked to watch for the satellite and report their sightings over the Internet. From student data, new sighting predictions will be made and posted almost immediately. There are three main goals for Project Starshine:



Professor Gil Moore (top) holds a model of the Starshine satellite. Photo by Kerry Kirkland. Students polish Starshine mirrors at Mount Ogden Middle School (center right and lower left) and at the Melba S. Lehner's Children School in Ogden (center left).

1) Students will learn about the night sky, and learn how to locate and observe satellites as they pass across the sky. An understanding of basic astronomy is key to the success of Starshine.

2) As the satellite's orbit decays over its six-month life span, we will learn about the composition and density of the upper atmosphere by measuring the effect of the atmosphere on Starshine, and how the atmosphere slows down the satellite and allows gravity to pull it down to Earth. Starshine will eventually burn up in the atmosphere without causing any danger to the ground.

3) Students who participate in Starshine, either in the mirror-polishing phase or in the observing and tracking phase, will be exposed to the sciences of astronomy, space exploration and engineering. It is our hope that a new generation of excited and prepared scientists and engineers will help further our knowledge and our experiences as we reach out to study the Solar System and enhance the quality of life here on Earth.

To aid in the observation of Starshine, several software options and web sites are being prepared at this time. Using the Internet, students and teachers will be able to find observation times based on their location. They will then be able to send in their sightings which will be used to calculate future observation times. Students will also have the option of calculating on their own future sighting predictions. The Internet is key to the success of Starshine. We have an opportunity to join with students around the world to study and learn about space technology as we watch *our* satellite.

Information about Starshine can be found on Hansen Planetarium's web site, www.utah.edu/Planetarium or from the Starshine web site at www.azinet.com/starshine.