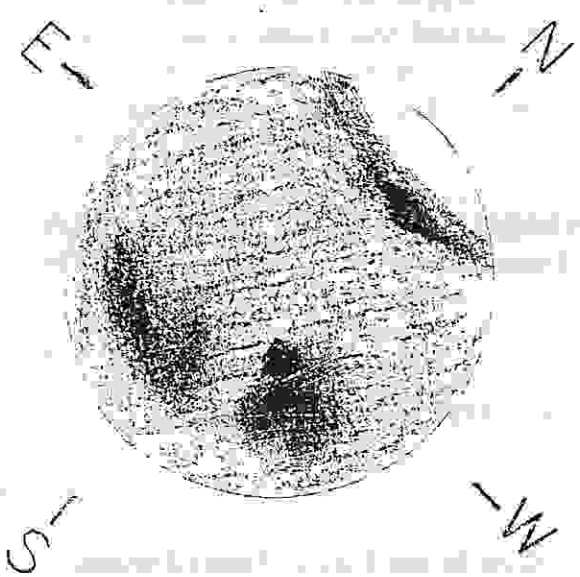
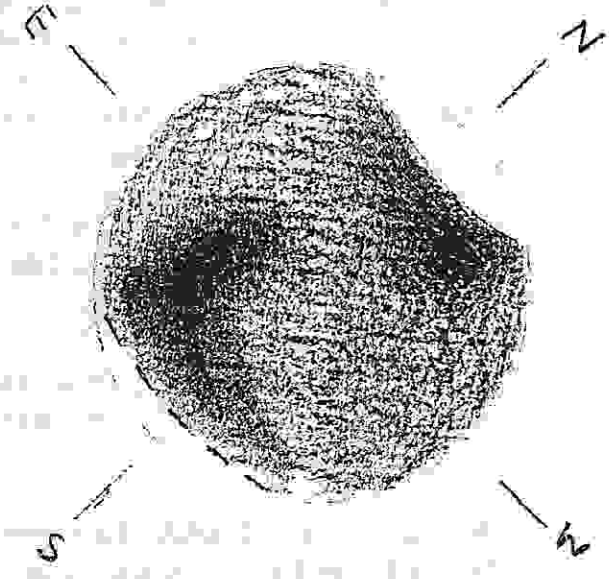
Desert Skies

FEBRUARY 1993

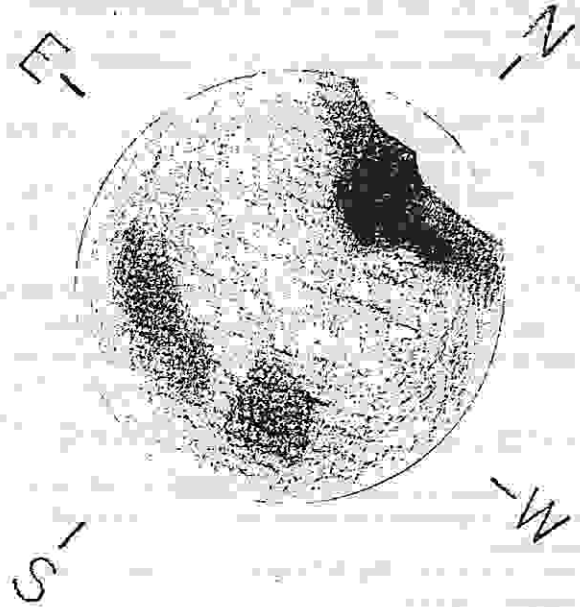
Cover drawings
by Jeff Bridges



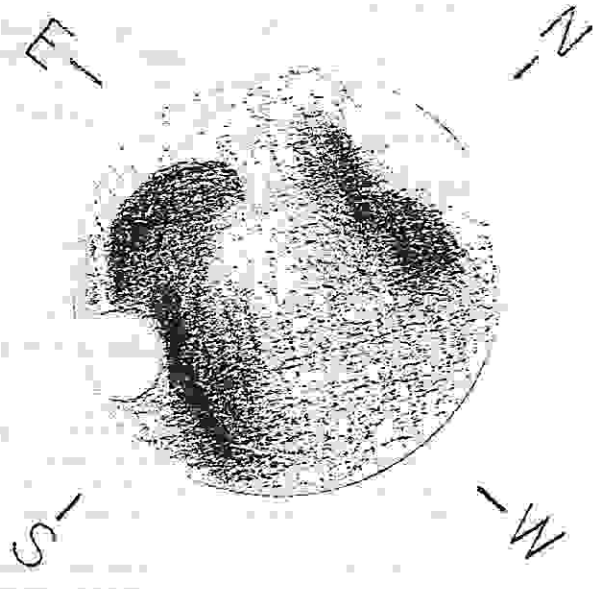
TIME: 5:10 a.m. MST DATE: Dec. 9, 1992
INSTRUMENT: 3" F16 Refractor at 100-133X
SEEING: Very Steady, Full Moon CM: 135°
FEATURES: North Polar Cap, Polar Collar, Sirenum Mare, Solis Lacus



TIME: 5:15 a.m. MST DATE: Dec. 21, 1992
INSTRUMENT: 6" F8 Reflector at 133X
SEEING: Very Good, Steady Images CM: 268°
FEATURES: North Polar Cap, Protonilus, Syrtis Major, Tyrrhenum Mare, South Polar Haze



TIME: 5:12 a.m. MST DATE: Dec. 10, 1992
INSTRUMENT: 3" F16 Refractor at 100-133X
SEEING: Good, Frost, Cold, Full Moon
CM: 125° FEATURES: North Polar Cap, Polar Collar, Solis Lacus, Sirenum Mare



TIME: 10:21 p.m. MST DATE: Dec. 9, 1992
INSTRUMENT: 3" F16 Refractor at 133X
SEEING: Good, Cold CM: 268°
FEATURES: North Polar Cap, Syrtis Major, Hellas Frost, Tyrrhenum Mare

GENERAL MEETING - Friday, Feb. 5, 7:30 P.M. at the NEW Steward Observatory Auditorium. TAAA member Mark Trueblood will present a talk on "Its about time".

7:00 P.M. - pre-meeting **"Beginners lecture"** by Terri Lappin will be "Cleaning your optics." All are welcome! ("old" Steward obs. room 204)

EXECUTIVE MEETING - Thursday, Feb. 11, 7:30 P.M. at Flandrau Science Center.

30" TELESCOPE DESIGN, LAND & FUNDRAISING MEETING - Wednesday, Feb. 17, 7:30 at the home of Duane & Sharon Niehaus---call to confirm.

STAR PARTIES - **Saturday, Feb. 13** - Star Party at Arivaca.
Saturday, Feb. 18 - Star Party at Camp Cooper.

Welcome new TAAA club members!
Don't forget to pick up your new member packet from Gary Rosenbaum.

TAAA EXECUTIVE

President	Dean Ketelson	293-2855
Vice-President	Terri Lappin	579-0185
Executive Sec.	Dick West	762-9037
Recording Sec.	Sharon Neihaus	299-8541
Treasurer	Duane Niehaus	299-8541
Member-at-Large	Bob Goff	790-1452
Member-at-Large	Ed Vega	747-9323
Chief Observer	Mike Terenzoni	577-6857
Mem. Coord.	Terri Lappin	579-0185
Past President	Tim Hunter	299-2972
Publicist	Rob Nyberg	745-0710
Newsletter	The Committee	

MEMBERSHIP IN THE TAAA

Individual	$20.00/year
Family	$25.00/year
Senior Citizen (over 60)	$18.00/year

Sky & Telescope subscription (optional) $20.00 (as of July, 1992)

Rates for membership in the TAAA are given above. Members may subscribe to Sky & Telescope at the time membership renewal, saving more than 25% off the cost of a regular subscription. The subscription term must match your membership period.

Send one check, made payable to: Tucson Amateur Astronomy Association, to cover both membership and subscription to: TAAA, PO Box 41254, Tucson, AZ 85717. It is best to pay your dues 2-3 months before your membership actually expires.

Desert Skies Publishing Guidelines

* All articles, announcements, news, etc. must be submitted by the **15th of the month.** Materials received after that date will appear in the next issue.
* All submissions are retained by the editor unless prior arrangements are made.
* Articles, artwork, and photos should be camera ready. Photos should be screened.
* We will not publish slanderous or libelous material!

Send articles, announcements, etc. to:
TAAA - Desert Skies
PO Box 41254
Tucson, AZ 85717

Send ADDRESS CHANGES to:
TAAA
Attention: "address change"
P.O.Box 41254
Tucson, AZ 85717

4 EASY STEPS TO MEMBERSHIP RENEWAL

1. Pay your dues 2-3 months early. **Your month of membership expiration is listed on your newsletter mailing label.**
2. a) Decide if you want Sky & Telescope, then add $20 to your membership rate
   b) Include Sky & Telescope's renewal notice, if possible.
3. Write one check, payable to TAAA.
4. Send it to TAAA, P.O. Box 41254, Tucson, AZ 85717.

Call the Treasurer if you have any problems.

A NEW LOOK TO YOUR NEWSLETTER

This newsletter may look different to you! That's because it was assembled by committee. That's right! A group of TAAA members met one Saturday morning and, once we got our act together, we were able to produce this fine piece of news (and artwork!). An official thank you goes out to: Chaz Bufe, Rob Nyberg, Jim Wilmot, Dean Ketelson, Gary Rosenbaum, and Teresa Lappin. (I've been promised a pizza after writing this little article.)

If YOU would like to help out with the March newsletter, contact Dean Ketelson (293-2855). February 20th is the most likely date, but Dean will have details at the February 5th meeting, and yes, we will get more pizzas.

Here's a list of the activities involved in this project:

* Typing of articles (typing skills, correct information for dates and times of events...THIS IS THE MOST DIFFICULT PART OF GETTING THE NEWSLETTER TOGETHER.
* Layout of the pages (use of scissors, glue, tape)
* Typing of little blurbs, like this one (computer available with Wordperfect...if you know how to type then a Wordperfect expert can do the rest)
* Copying of the newsletter (pushing the right buttons at the right time
* Assembly and folding (brain work)
* Stamping (moist tongue---actually, we have something more sanitary)
* Mailing (leg work)

Now, where's the PIZZA!

BEGINNER'S LECTURE

How to Clean Your Optics

It's time to clean my telescope mirror, so I'm taking this opportunity to photograph the procedure and will then show this procedure at the next Beginner's Lecture. (Wish me luck...I hope I don't drop my mirror!) This is a very important step in telescope maintenance as a dirty mirror will scatter a lot of light resulting in poor images. Of course, everyone has the fear of scratching the mirror...or worse...dropping it! There's no sound in the world quite like the sound of breaking glass! It is for this reason that many mirrors are left dirty (the "Why should I risk doing permanent damage, so I'll leave it dirty" Syndrome). I will also show some tricks to keeping your optics clean (Tip #1: DO NOT TAKE YOUR TELESCOPE TO THE RIVERSIDE TELESCOPE MAKERS CONFERENCE!).

See you at 7pm on February 5th---one half hour before the start of the regular meeting.

I HAVE MANAGED TO LOSE THE SIGN UP SHEET FOR THE TELESCOPE USERS SESSIONS. PLEASE CALL ME IF YOU WERE ON THE LIST PASSED AROUND AT THE DECEMBER MEETING.

Announcement: There has been interest in arranging Telescope Users Sessions for those wanting to learn how their telescope works and how to take care of them. I will have a sign-up sheet at this meeting for those interested. These sessions will be held at a convenient location in Tucson (someone's home most likely), and tailored to some amount to fit your schedule. Two or three people will attend each session to keep the groups small. Topics will be: telescope care and cleaning, optical alignment, equatorial alignment on Polaris, accessories in action, etc.

Teresa 579-0185 (before 10pm)

Sky and Telescopes Available

Because some Execs are tripping over boxes of Sky & Scopes donated to the club, we will give you one more chance to fill in your personal collection. At the next general meeting on 5 February, there should be several boxes of S&Ts mostly from the '70s and '80s to choose from. Don't expect them to be in order, but check what you are missing and help yourself. Those left over will be handed out to children at school star parties to stimulate their interest in astronomy.

SURVEY COMING SOON TO A PHONE NEAR YOU!

What is an observing site like where the sky is really dark?

Imagine looking up to see so many stars that the easy and familiar outline of the constellations is lost in the jumble! Imagine the Andromeda Galaxy, the double Cluster, the Orion Nebula, the Beehive cluster, M35, M36, M37, and more than seven Pleiades stars all clearly visible to your naked eye! Imagine hour upon hour, night after night of darkness for astrophotography and CCD imaging! That's what "dark-sky" means!

As many of you already know, the Executive has been searching for a long-term or "permanent", developable dark-sky site on the TAAA's behalf for several years. The goal has been to find land as free from city sky glow and incident light incursion as possible, at 60-90 minutes driving time from Tucson (UofA campus), and putting Tucson's glow to the north of the site. We currently have limited permission to use four primitive sites: the Empire Ranch near Sonoita; some BLM land near Arrivaca Junction; the Buenos Aires Reserve north of Sasabe; and Astronomy Vista near Amado. Although these sites are free, we have no assurance at all of their ongoing availability, nor can we develop or improve them in any way to suit our needs and desires.

In addition to the joy of group observing at a dark-sky site, a major reason to have our own land is to make site amenities available, like power, campsites, toilets, storage buildings, viewing pads, and even observatories. The TAAA now has finished 22", 16", and 10" Newtonians, a 14" Maksutov-Cassegrain, 4" and 6" refractors being donated, and a partially completed 30" mirror and plans for the tube assembly. These instruments could be permanently mounted in our own observatories on our own land, and they would be shared by the membership for years to come.

The funds for this project are about $13,000, and several alternatives have now become available to us. It's time to reassess our drive and resources to make this dream a reality. Someone from the Executive will telephone each of you before the next General Meeting and ask these questions:

1. Should the TAAA seek to obtain land for a permanent observing/observatory site (30-60 miles from Tucson), or continue with the sites mentioned above?
2. How often would you use such a site? (weekly/monthly/quarterly/yearly)
3. Developing an observing site will require a large amount of money. What do you feel is the best way to obtain funds?
    a. Approach foundations for grant money (generally cannot be used to buy land).
    b. Approach businesses and interested individuals for tax-deductible contributions.
    c. Donations from TAAA members.
    d. Loans from TAAA members.
    e. Sell landshares.
    f. Other ideas.
4. The executive has developed a number of ways to raise money within the TAAA, both to raise capital as well as to cover regularly occurring expenses of the site (property taxes, utility costs, site maintenance). Please indicate if you could participate in any of these:
    a. Valley National Bank will set up an automatic withdrawal from your account at whatever bank (need not be VNB) you use, in the amount and frequency you order. This arrangement could be canceled at any time. Because almost everyone could afford a few dollars monthly, it's a painless way to donate without having to write a check. As an example, if the entire membership donated $10/month, we would raise nearly $20,000 in a year.
    b. Individual members may grant larger sums to, in effect, become part owners of the land. As the TAAA was able to raise additional money, these grants would be repaid, and ownership of the land would be turned over to the TAAA.
5. Should those using the site have to pay a special membership rate to help pay for the maintenance and care of the site?
6. What improvements would you want the TAAA to provide at a site we owned?
7. How would you like the TAAA to better serve your needs?

Local News of Interest

For those of you who enjoyed the coverage of the Peekskill meteorite in the February, 1993 Sky and Telescope (page 26), and would enjoy getting up close and personal to some star stuff, we've got just the ticket. The meteorite and the crunched car will be making an appearance at the Gem and Mineral show from February 5th to 13th at the Executive Inn, room 153. Go check it out!

Upcoming Events

Derald Nye, our Astronomical League representative, informs us that the **Astronomical League Convention** will be held **July 29-31, 1993 in Madison, Wisconsin**. ALCON '93 is hosted by the Madison Astronomical Society, and will feature keynote speaker Roberta Humphries and workshops lead by planetary expert Don Parker and CCD proponent Richard Berry, with a host of other talk, workshops, and local tours of astronomical interest. Make your plans now, we will include a registration form in next month's newsletter.

The 3rd Annual **Grand Canyon Star Party** is scheduled for the **12th-19th of June, 1993**. Housing and final arrangements are being finalized. Look to this spot in the next newsletter for the official announcement for this year's event.

Desert Skies Classified

Wanted - your slides or photos of open star clusters to show at March's beginner's lecture. Call Rob at 745-0710.

Wanted: Brackets to hold 6X30 finder; FOR SALE: Small diagonal for Newtonian telescope; 20th wave, 7/8" minor axis, custom made; OR WILL TRADE FOR 1 1/4" diameter eyepiece with 16-18mm focal length. Call Gilbert Friedman at 571-1662

For Sale: Extensive collection of Sky & Telescope; complete from 1960 to 1988 except for five issues. Also most of '89, '90, and '91 plus several issues from the '50s. A total of 379 issues for $150. Call Ron Price at 577-1056.

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Executive Meeting, 14 Jan. 1993

Held at Flandrau Conference Room

The meeting was convened at 7:35, attending was Derald Nye, Duane Niehaus, Teresa Lappin, Eduardo Vega, John Zajac, Mike Terrenzoni, and Dean Ketelsen. There was a Wildcat basketball game limiting attendance.

1. Land Issues - Discussed new site 8 mi. west of Arivaca Junction. Located it on a topographic map, elevation is 3400 feet. Talked about purchase issues, including having the owner donate part of the purchase price for a tax deduction. Another trip to the site was contemplated. The major sticking point on this site is the selling price is much more than we have.

2. Fundraising Effort - Status of current fundraising effort was discussed. To date we have had two donations totalling $400. Brad Becker found that Valley National Bank will do automatic withdrawal from members accounts with a filled out form. If small deposits are made on a regular basis, a sizeable sum could be produced - the Lottery principle. A mailing to the Friends of Flandrau was contemplated. We were going to talk to Tim Hunter to remind us how we raised the $8000 with the previous effort.

3. Treasurer's Report - The Liability insurance bill was paid - $190 for a maximum of $2 million coverage. The Land Fund/Savings Account has $13,800, total funds are $18,080.

4. Upcoming events - Final status of events for Smithsonian on 23 Jan, Copper Creek School on 28 Jan, Sabino Canyon on 30 Jan, and Camp Cooper on 18 Feb were discussed. Astronomy Day is 24 April, 1993.

5. Chief Observer - Mike Terrenzoni has expressed interest in easing into some of the routines of the Chief Observer position.

6. Flandrau Request - Ellen Fultz called Dean with the interest in having the Club take her Father's mirror making and telescope equipment before mid-March, as she is putting the house up for sale. Dean wrote a letter to the Planetarium to have them expedite a decision to give us space for a mirror making class. He also called Pima College to see if there was any interest in setting up a shop should Flandrau decide against us.

7. Newsletter Committee - discussed the chance to make major format changes in the newsletter format and content. Having the newsletter contain more info depends on submissions from clubmembers. We will put one out and judge reaction.

8. Other Business - Discussed the possibility of sponsoring a bus trip or renting a hotel in Bisbee to watch the annular solar eclipse in May, '94. The purpose would be a fundraiser for TAAA.

Since several exec members are storing several boxes of Sky & Telescopes in their living rooms, we will announce bringing them into the next meeting. Those left over will be handed out at star parties.

We will try to get Frank Lopez at the next Exec Meeting to discuss the disposition of the 22"scope donated to the TAAA by Marvin Vann.

"Starspots"

All Aboard the Meteor Train!

On any clear, dark night you will perhaps see a half a dozen or so meteors per hour. On a night when a major meteor shower is in progress, you might see dozens each hour. As a meteor streaks across the sky, the visible path it takes is called the **meteor trail** , and is short-lived. Once in a while, however, a meteor will leave behind a glowing column along a portion of its path that continues to glow after the meteor itself has disappeared, and this is called a **meteor train**.

Most meteor trains vanish quickly, but in rare cases they may remain visible for up to an hour or more. Trains lasting for more than ten minutes are exceedingly rare, and the average observer will see only one or two of this duration in his or her lifetime. If you are a good observer, and regularly observe under dark skies, for every 400 meteors you observe you should see one leaving a train lasting ten seconds or more. If you're not such a good observer or are observing under moderately light polluted skies, you should see one meteor train lasting ten seconds or more for every 1000 meteors you observe. Likewise, you should see a meteor train lasting five minutes or more in every 5000 meteors you observe; a meteor train lasting ten minutes or more happens only about once in every 125,000 meteors seen. Keep in mind that these durations are for trains which start out visible to the unaided eye but then are followed later with binoculars or a telescope.

Extraordinarily bright meteors are much more likely to leave a visible meteor train than are fainter meteors. A Perseid meteor as bright as Venus (mag -4) will normally leave a train that persists for 5 seconds. One study showed that of those meteors yielding trains that last longer than one minute, 96% are brighter than visual magnitude -2. Meteors which lead to visible trains typically have a mass that is only 0.1 to 1.0 gram (.004 - .04 ounces).

There are really two types of meteor trains. Those at high altitude are self-luminous and visible only at night. Those at lower altitudes shine by reflected light and are visible in the daytime or during twilight. A daytime fireball often leaves a long smoke train that can be best observed in twilight while the sun is still shining upon it. These lower altitude trains are made up of material which has ablated off of the meteoroid. As we shall see, entirely different physical processes are responsible for the high-altitude nighttime trains. In this article we concentrate on the more common high-altitude trains.

When a meteor enters the part of the atmosphere where it becomes visible, it ionizes air molecules and forms a short-lived luminous column a meter or so across. This is what we see when we see a meteor , not the meteoroid itself. Ionization occurs when one or more electrons are given so much energy that they leave their parent atoms. Recombination occurs when the ionized gas cools after the meteor's passage and the electrons return to those (or other) atoms, and light is emitted. A meteor train, on the other hand, contains atoms with electrons in excited states (higher energy levels but still bound to the atom), but no ions (positive or negative charged particles). A meteor train starts as a hollow cylinder and rapidly expands up to a diameter of 1 kilometer or so. What happens after that is a result of the unique conditions at the altitude at which meteor trains form.

It has long been known that meteor trains are visible along only a fraction of a meteor's visible course. In fact, meteor trains are most likely to form at an altitude of 80 - 90 km (50-60 mi), whereas meteor trails are usually seen when the meteoroid is at a height of 65 - 130 km (40 - 81 mi). Daytime smokey trains are much lower, typically at altitudes between 27 and 45 km (17 - 28 me). Interestingly, a meteor train acts as a vertical line probe of the upper atmosphere. After a train forms, winds rapidly distort and displace the train. Wind speeds average 68 m/s (152 mph) in this region. At these altitudes (80 - 90 km) where the air is very thin, the wind blows horizontally most of the time. There are very few updrafts or down drafts. But there are drastic changes in horizontal windspeed and direction over just a kilometer or so in height, causing wind shear in adjacent regions. What starts out as a straight line meteor train quickly gets distorted by these high altitude winds.

Meteor trains are usually white, but if they are bright enough a green, yellow, or red color can often be discerned. The Leonids often leave greenish trains, and the Perseids yellowish ones. The lower altitude smokey trains appear smokey or grayish in color in daylight, and often appear reddish in twilight due to reflected sunlight.

Train spectroscopy suggests that most of the radiation produced by a meteor train is redward of 5000A (greenish-blue) in emission lines produced by excited states of neutral (not ionized) atoms and molecules. Lines of sodium,

magnesium, iron, and calcium have been identified in meteor trains. Train formation and longevity is a complex interaction that even today is not completely understood! A meteor train wouldn't form at all if the meteoroid was totally inert or non-reactive with the atmosphere through which it passes. Meteor trains last longer than intuition says they should! But we must remember that the atmosphere is very cold and rarified at the altitudes where meteor trains form.

An essential fact in understanding the meteor train phenomenon is realizing that the meteoroid acts as a catalyst, triggering a recombination process that can occur in only a restricted section of the Earth's atmosphere, usually between the heights of 80 and 90 km (50 - 56 mi). In a recent study, the near-infrared emission of a train lasting 32 minutes was observed. The ablating meteor apparently supplied sodium (Ns) which interacted with atmospheric ozone (O_3) The sodium acted as a catalyst to form excited oxygen molecules (O_2), which then underwent "forbidden"transactions back to the ground state, resulting in the observed infrared emission. Forbidden transitions are called this because they cannot occur at surface atmospheric pressure where atoms and molecules in excited states collisionally de-excite before they have a chance to radiationally de-excite. This explains at least some of a meteor train's infrared emission. Perhaps the visible emission is produced in a similar fashion. At any rate, the train seems to contain particles with stored energy that is released slowly as the particles interact with the atmosphere. More observations are needed! The fact that long-lasting meteor trains are rare combined with the fact that very few scientists are studying meteors anymore indicates to this writer that a thorough understanding of meteor train chemistry may be a long time in coming.

Now for observational tips. Meteor trains are often difficult to observe because of their faintness, so be sure to have a pair of binoculars or telescope on hand should a train appear. Optics will allow you to study a train for much longer and in much greater detail than you would be able to with the unaided eye. It would be interesting to know whether or not any telescopic meteors (visible only in a telescope) leave trains. Occasionally, a bright meteor can leave a train that is visible even in bright moonlight. Be careful not to mistake a jet contrail for a meteor train! This is one problem early meteor train observers didn't have to contend with (light pollution is another).

As stated earlier, extremely bright meteors are most likely to leave visible trains. Also, the higher the velocity of a meteor as it enters the Earth's atmosphere, the more likely it is to leave a visible train. The percentage of meteors leaving visible trains (many of which last only a fraction of a second or so) is given, approximately, as:

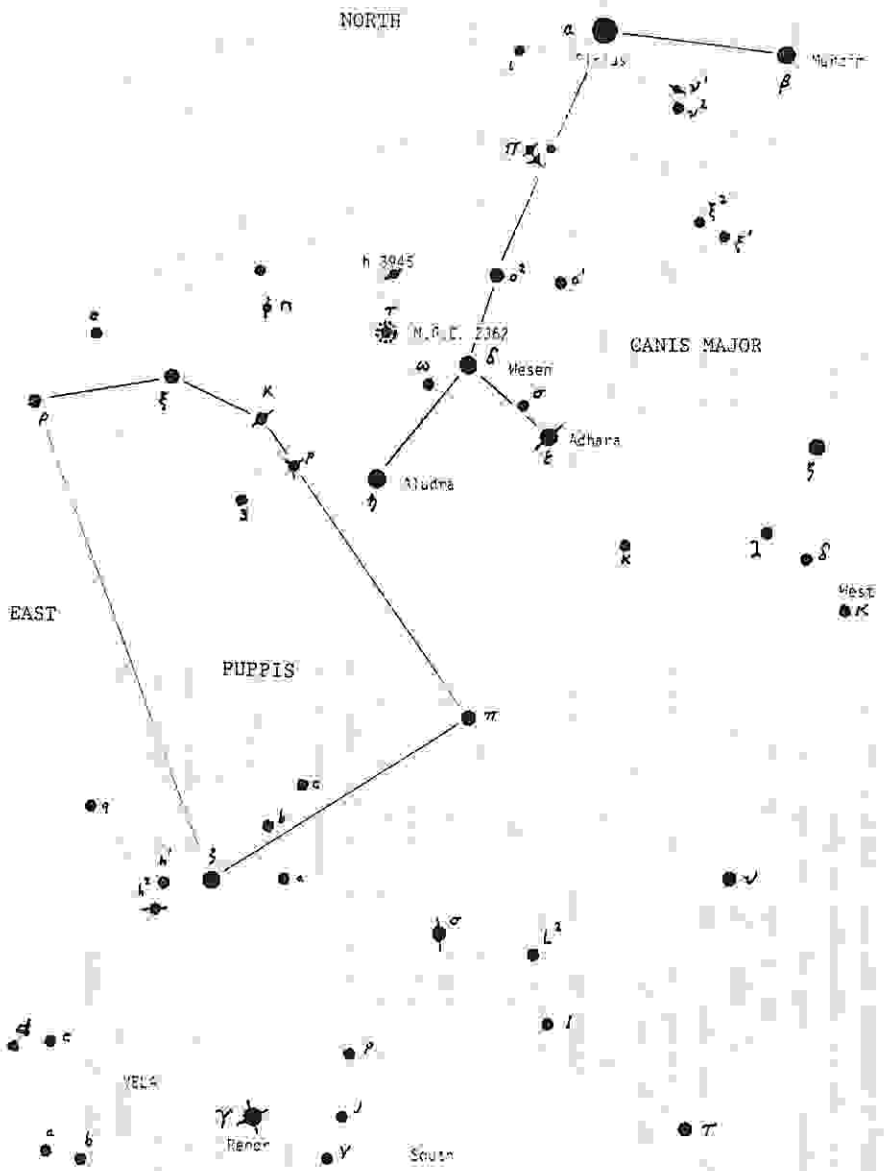
% trains = 1.5X(vel) - 45

-where vel is the meteor's geocentric velocity in km/s. According to this equation, meteors with speeds below 30 km/s are not expected to leave trains. Here is a list of meteor showers and the percentage of each leaving trains:

Meteor Shower	Velocity	Trains
Leonids	71 km/s	62%
Orionids	66 km/s	54%
Eta Aquarids	65 km/s	53%
Perseids	60 km/s	45%
Lyrids	48 km/s	27%
Quadrantids	41 km/s	17%
Delta Aquarids	41 km/s	17%
Geminids	35 km/s	8%
Ursids	34 km/s	6%
Taurids	28 km/s	0%
Capricornids	23 km/s	0%

Keep in mind that while long-lasting trains are quite rare, those lasting a fraction of a second or so are much more common.

We will have a rare opportunity to advance our understanding of the meteor train phenomenon during the Leonid meteor storm in 1998 or 1999. In a typical year, the Leonids produce only 10 - 20 meteors per hour. But, about once every 33 years, a meteor storm occurs where rates in the thousands per minute can be observed for a brief period of time. Prospects are good for both years, provided the weather isn't cloudy. The estimated peak in 1998 will be 5pm MST on Tuesday, November 17; if this is the actual time of the peak (by no means certain!) then Europe will get a better view than those of us here in North America. That night, the skies will be dark from 6:29 pm - 5:10 am when the waning crescent moon rises above the eastern horizon. The estimated peak in 1999 will be 11pm MST on Wednesday/Thursday, November 17/18, at which time the Leonid radiant will be just below the horizon, but rising fast - good for those of us in North America. The first quarter moon will set at 1:03am and the skies will be dark until astronomical twilight begins at 5:30am. Make your plans now! **- Courtesy David Oesper, Ames Area Amateur Astronomers (AAAA)**



Low in the southern skies on these cold February nights spans the Milky Way from Monoceros thru Canis Major to Argo Navis just above the southern horizon. this area of the sky is noted for its many galactic clusters and nebulae, but also many fine double and multiple star systems dot this region, why not try some of these listed below.

NU-One Canis Majoris: magnitudes 5.7-7.9 separation 17"5 P.A. 262° colors yellow and blue, a nice pair in small telescopes at 50x.

17 Canis Majoris: magnitudes A 5.8 B 9.3 C 9.0 D 9.5 separations A-B 44"4 A-C 50"5 A-D 129"9 P.A.s A-B 147° A-C 184° A-D 186° colors white, orange, blue, blue, pretty quadruple at 70x.

Pi Canis Majoris: magnitudes 4.7-9.7 separation 11"6 P.A. 18° colors yellow and blue, use 100x with 4" to 6" telescopes.

Herschel 3945: magnitudes 4.8-6.8 separation 26"6 P.A. 55° colors deep oranne and blue in a refractor, yellow oranne and pale blue in a reflector, a twin of "Albireo" beautiful color contrast, use 30x with any small telescope or try tripod mounted binoculars.

Tau Canis Majoris: magnitudes A 4.4 B 10.5 C 11.2 D 8.8 separations A-B 8"2 A-C 14"5 A-D 85"0 P.A.s A-B 90° A-C 79° A-D 74° colors white, blue, white, white, Tau is within NGC-2362 a fine stellar field use 100x in 6" and larger telescopes.

Epsilon Canis Majoris "Adhara": magnitudes 1.6-7.4 separation 7"4 P.A. 161° colors white and blue, difficult, use high powers 150x to 200x in 6" and larger telescopes to separate the companion from the brighter star, like a miniature "Rigel"

n Puppis: magnitudes 5.8-5.9 separation 9"6 P.A. 114° colors both cream, note the similarity to Kappa Puppis, use 50x in a small telescope.

Kappa Puppis: magnitudes 4.5-4.6 separation 9"8 P.A. 318° colors whites, a very pretty pair in a small telescope at 50x.

p Puppis: magnitudes A 4.6 B 9.3 C 10.0 separations A-B 38"4 A-C 42"1 P.A.s A-B 156° A-C 130° colors white, blue, blue, use 100x in 3" to 6" telescopes.

Sigma Puppis: magnitudes 3.3-9.4 separation 22"4 P.A. 74° colors oranne and blue, faint companion is difficult to see low in the sky, but use 100x in 3" to 6" telescopes.

h² Puppis: magnitudes 4.4-9.1 separation 51"1 P.A. 341° colors oranne and blue, hard to see companion in 2.4" and 3" telescopes much easier in 6" telescopes at 100x.

Gamma Velorum "Regor": magnitudes A 1.9 B 4.2 C 8.2 D 9.1 separations A-B 41"2 A-C 62"3 A-D 93"5 P.A.s A-B 220° A-C 151° A-D 141° colors white, greenish white, blue, blue, beautiful quadruple star in 3" to 6" telescopes at 50x.

Jeff Brydges

CELESTIAL CALENDAR for February 1993 (all times are in MST):

M Feb. 1 3am, Moon passes 2.3° S of Pleiades.
T Feb. 2 4:42pm, Moon at descending node (longitude 80.1°).
W Feb. 3 M53 discovered by Bode, 1775.
T Feb. 4 3am, Moon passes 5.7° S of Mars.
F Feb. 5 7:30pm, **TAAA General Membership Meeting**, Steward Obs. 1st floor auditorium.
S Feb. 6 alpha Aurigid meteor shower, ZHR 12.
4:55pm, **FULL MOON.**
S Feb. 7 3pm, Moon at perigee, distance 56.1 earth-radii.
M Feb. 8 theta Centaurid meteor shower, ZHR ?
T Feb. 9 10am, Saturn at conjunction with Sun, passes into morning sky.
W Feb. 10 3pm, Moon passes 6.5° S of Jupiter.
T Feb. 11 7:30pm, **TAAA Executive Meeting**, Flandrau Science Center conference room.
F Feb. 12 Over 800lbs. of meteorites rain down upon Iowa near Homestead and the Amanas, 1875
S Feb. 13 7:57am, **LAST QUARTER MOON.**
TAAA Star Party, Arivaca site, see map elsewhere.
S Feb. 14 10am, Moon passes 3.7° N of Antares.
M Feb. 15 4:40am, Moon at ascending node (longitude 259.1°).
T Feb. 16 Miranda, satellite of Uranus, discovered by G.P. Kuiper, 1948.
W Feb. 17 7:30pm, **30" Telescope Design, Land and Fundraising Meeting** at Duane Niehaus', see map elsewhere.
T Feb. 18 **Star Party at Camp Cooper**, see map for time.
Pluto discovered by Clyde Tombaugh, 1930.
F Feb. 19 "Mir" space station is launched, 1986.
S Feb. 20 8am, Mercury at perihelion, .3075 a.u. from Sol.
S Feb. 21 2am, **Mercury at greatest elongation east**, 18.1° from Sol (best just after sunset).
6:05am, **NEW MOON.**
M Feb. 22 11am, Moon at apogee, distance 63.8 earth-radii.
T Feb. 23 Supernova 1987A in the Large Magellanic Cloud bursts into view, 1987. Brightest supernova in 383 years.
W Feb. 24 9pm, Moon passes 0.5° S of Venus.
T Feb. 25 9am, Venus at brightest, -4.6m.
F Feb. 26 delta Leonid meteor shower, ZHR <5.
S Feb. 27 2am, Mercury stationary in RA; begins retrograde (westward) motion.
S Feb. 28 11am, Moon passes 2.6° S of Pleiades.

Andrew J. Meyer

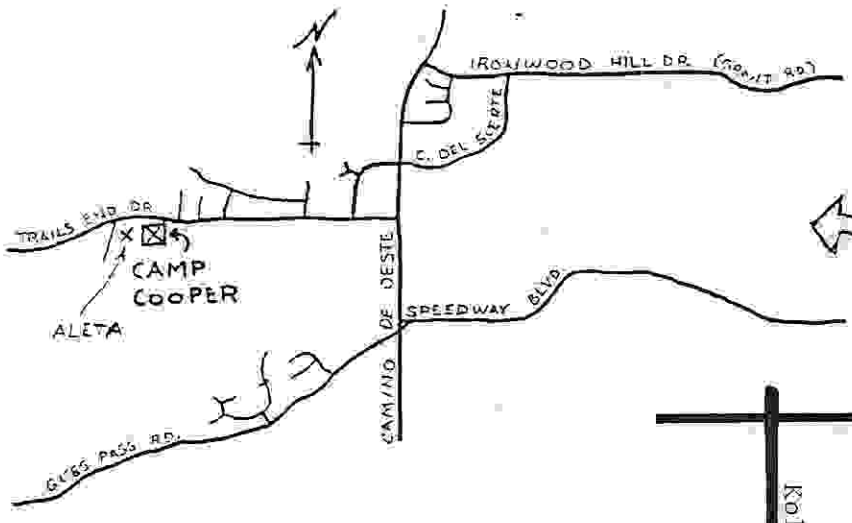
DARK SKIES for February 1993 (in MST):

M/T	Feb.	1/2	3:20am - 5:56am
T/W	Feb.	2/3	4:17am - 5:56am
W/T	Feb.	3/4	5:10am - 5:55am
T/F	Feb.	4/5	none
F/S	Feb.	5/6	none
S/S	Feb.	6/7	none
S/M	Feb.	7/8	none
M/T	Feb.	8/9	7:23pm - 8:30pm
T/W	Feb.	9/10	7:24pm - 9:38pm
W/T	Feb.	10/11	7:24pm - 10:46pm
T/F	Feb.	11/12	7:25pm - 11:52pm
F/S	Feb.	12/13	7:26pm - 12:57am
S/S	Feb.	13/14	7:27pm - 1:57am
S/M	Feb.	14/15	7:27pm - 2:54am
M/T	Feb.	15/16	7:28pm - 3:44am
T/W	Feb.	16/17	7:29pm - 4:29am
W/T	Feb.	17/18	7:30pm - 5:09am
T/F	Feb.	18/19	7:31pm - 5:44am
F/S	Feb.	19/20	7:31pm - 5:44am
S/S	Feb.	20/21	7:32pm - 5:43am
S/M	Feb.	21/22	7:33pm - 5:42am
M/T	Feb.	22/23	7:35pm - 5:41am
T/W	Feb.	23/24	8:28pm - 5:40am
W/T	Feb.	24/25	9:22pm - 5:39am
T/F	Feb.	25/26	10:17pm - 5:38am
F/S	Feb.	26/27	11:13pm - 5:37am
S/S	Feb.	27/28	12:10am - 5:36am

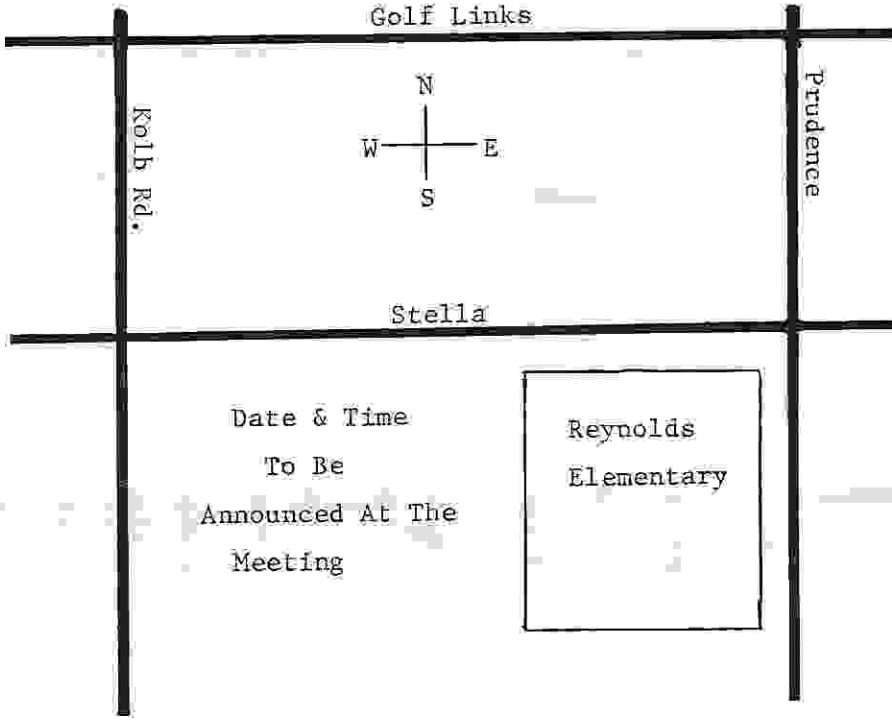
Times listed are for Tucson, Arizona when:
(1) Moon is below the horizon
(2) Sun is >18° below the horizon (astronomical twilight)

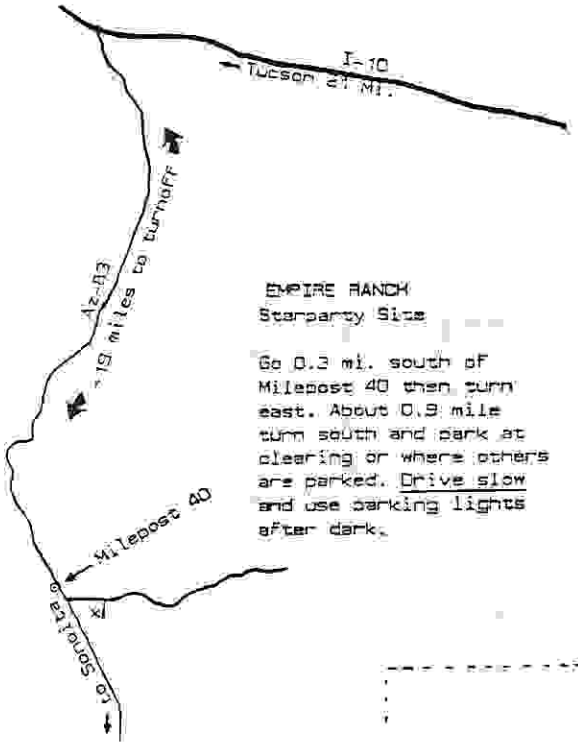
Andrew J. Meyer

Maps of Interest this Month



MAP FOR T.U.S.D CAMP COOPER

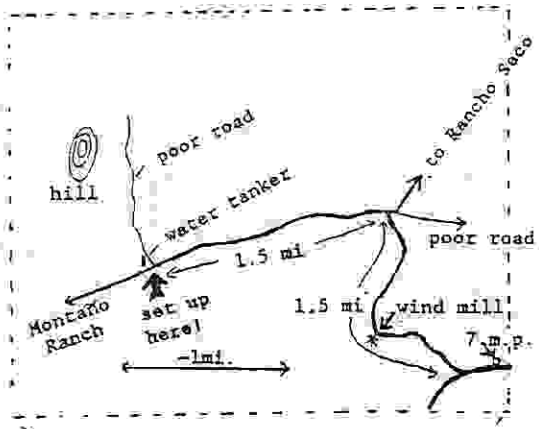


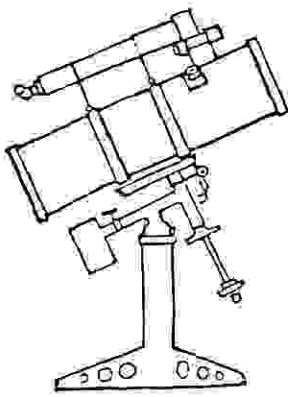


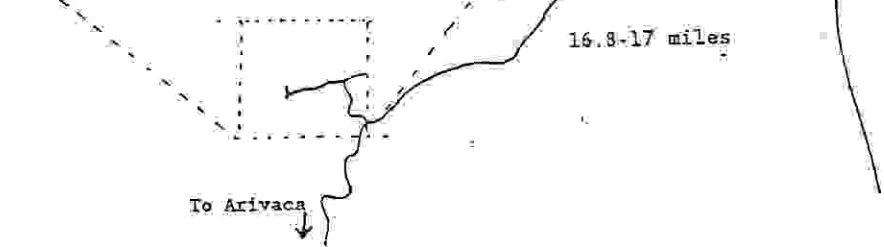
EMPIRE RANCH
Starparty Site

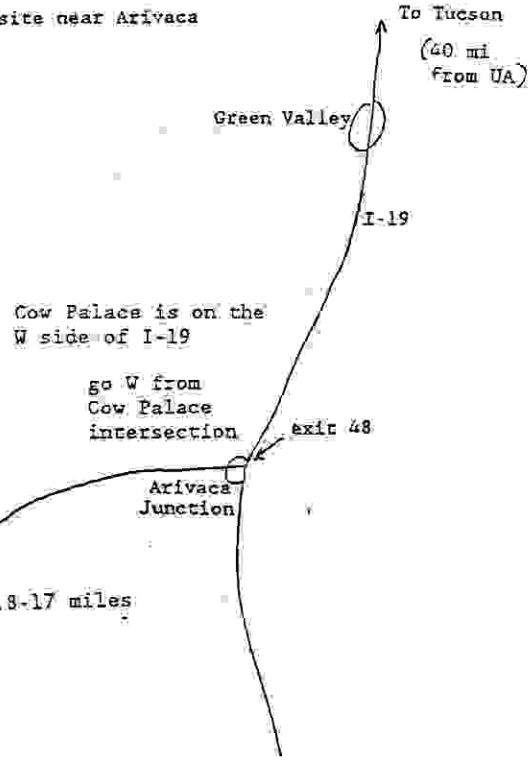
Go 0.3 mi. south of Milepost 40 then turn east. About 0.9 mile turn south and park at clearing or where others are parked. Drive slow and use parking lights after dark.

Directions to Montaño Ranch site near Arivaca









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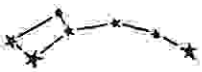

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