SJAA EPHEMERIS

The Celestial Tourist Speaks

The Telescope

Jay Reynolds Freeman

It's always interesting watching the pieces of a project come together. I have been building this small truss-tube unit steadily since late January.

I wanted to explore the deep sky too far south for central California sites. So I decided to build an airline-transportable telescope of respectable size, and do some voyaging.

The telescope needed to be optimized for deep-sky work — I wasn't going south to see planets. Lots of aperture and good light baffling were important, but obstruction size and tube currents were less so.

I planned to transport the telescope on scheduled airline flights. I could put a larger telescope in checked baggage, than in carry-on luggage, even with enough padding to protect it from baggage handlers.

A web article suggested a problem with things with no handles for carrying, or too oddly shaped to stack well, or too flimsy. Web-surfing led to Atlas Case, at http://www.atlascase.com, who stock several lines of tough air transport shipping containers with padding. I ended up buying one.

Most transportable telescopes are stored in pieces at home, driven to an observing site, and assembled there for use. My operations would be more elaborate: As baggage, my telescope would be in more pieces, and smaller ones, than the average instrument in the garage. The plan was to unpack it in a motel room, assemble it there at least partly, then drive it to the site.

Over the years, I have played with such designs, via pencil sketches and dimension and weight estimates. I know of two approaches to a compact portable telescope, distinguished by whether the transportation case is part of the instrument, or not. I decided on a separate case, because I was not sure I could construct an assembly stout enough to protect the contents, and light enough for part of a telescope.

My design became final when sketches convinced me I could construct a truss-tube Dobson so that except for truss poles, the parts would pack into a cube about four inches (10 cm) larger than the clear aperture. One technical risk remained:

Shrinking the Truss Poles

Truss poles are the wrong shape for baggage. Those for a 10-inch f/5 are about 40 inches (100 cm) long, so a case for them that fits baggage size limits will have no room for much else — and I do travel with more than a telescope: I need charts and eyepieces, and maybe even extra socks. I needed a way to cut the truss poles in half, and reassemble them in a motel room with a stiff, light, vibration-free joint.

I played with designs for wooden clamps, like those Kriege and Berry (1997) describe for attaching truss poles to the box. I came up with several, but they were too heavy for half-way up the poles of a small telescope. Using telescoping tubing as poles seemed asking for trouble from vibration and slop. I thought of using a piece of oversize tubing as a joint, with O-rings between it and the poles, and

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SJAA Activities Calendar

Jim Van Nuland

July

1 Fremont Peak star party. Sunset 8:30 p.m., No moon.
7 Buzz Aldrin speaks, Morrison Planetarium, Golden Gate Park
7 Houge Park star party. Sunset 8:31 p.m., 46% moon sets 0:58 a.m.
8 Observational Astronomy class, Houge Park, 8 p.m.
15 General Meeting: Dr. James Kaufman on the Moon Illusion
21 Houge Park star party. Sunset 8:24 p.m., 73% moon rise 23:37 p.m.
21-22 SJAA public star parties at Yosemite National Park.
29 Annual Fremont Peak Star-B-Que and star party. Sunset 8:16 p.m., 1% moon rises 5:33 a.m.

August

4 Houge Park star party. Sunset 8:12 p.m., 31% moon sets 11:29 p.m.
4-5 Astronomy Magazine "Sky Show," Davis, CA (see inside)
12 Observational Astronomy class, Houge Park, 8 p.m.
19 General Meeting: Speaker TBA
25 Houge Park star partyl Sunset 7:46 p.m., 15% moon rises 3:14 a.m.
26 Fremont Peak star party. Sunset 7:42 p.m., 7% moon rises 4:22 a.m.

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that might have worked, but while I was testing it, I came up with a better way, using an old telescope-maker's friend — beeswax!

I found that a section of hollow, square aluminum extrusion could rigidly join two lengths of truss pole, if I used beeswax to take up slop and damp vibration. I cut a short length of extrusion, inserted a piece of truss-pole stock part way into it, and epoxyed it in place, making a socket into which another piece of truss pole would fit. Beeswax made the slip fit into a stiff joint that was entirely satisfactory for the telescope.

It is not necessary to fill the space between pole and extrusion with beeswax. What I do is dip each "male" end of the cut pole into melted beeswax before I travel, to get a thin, uniform coat of beeswax on the portion that goes into the extrusion. A little will do, and once there is some there, you don't necessarily need to keep adding more every time you assemble the poles. I do this part of assembly and dissembly in a motel room. Beeswax softens enough under a hot water faucet to make the task easy.

I carry a little plastic bottle of spare beeswax, that I can melt entirely by putting it in a glass filled with boiling water from my portable coffee heater. That way I can add more beeswax if necessary.

I didn't think a whole lot of this idea when I thought it up — I was just glad to have a scheme that would make my project possible. Yet nearly all the amateur astronomers and amateur telescope makers who have seen the finished instrument have thought the "beeswax trick" to be a considerable technical innovation in the construction of Dobson telescopes. So in case they are right, I have been describing it at length, in case others should find it useful.

With that trick in mind, I went ahead with my project. I had built several telescopes before, including Newtonians to 12.5-inch (32 cm) aperture, but none as complicated mechanically as a truss-tube Dobson, so I was looking forward to a challenge.

Materials and Fastenings

I have some experience working in wood, so I used it extensively. I got a moderately good grade of half-inch plywood from a lumber yard, and for the small quantities of thinner plywood I needed, a hobby shop had plenty of variety in good-quality stock. Local hardware stores provided small pieces of "project" wood — poplar or oak, finished on four sides, in handy sizes. I used 5/8-inch hardwood dowels for truss poles. I had to pick through a whole bin of dowels to find enough straight ones.

I have had occasion to use good cements, so I made permanent assemblies with glue alone — no fasteners. I selected Weldwood phenolic/formaldehyde wood glue for large areas with no end grains, and used contact cement to wrap Ebony Star around the side bearings. Contact cement works best when you follow the directions: Let it dry smooth and hard before joining the pieces. Don't ask me how I know.

After a few experiments and some visits to hardware stores, I picked threaded inserts and T-nuts for

Jay Freeman shows the mirror box of his 10-inch travel telescope during its construction at the March SJAA meeting.

joining pieces that come apart for transportation. I was able to put all of them in places where they would not pull out when the machine screws that went through them were torqued down.

I used stainless fittings and fasteners whenever I could find them. Marine hardware stores offered a particularly large assortment, and also supplied the rubber grommets used to attach bungee cords to the shroud.

Construction — A Few Details

I won't bore you with conventional details of a truss-tube Dobson — Kriege and Berry is a wonderful source for those — but there are a few places where I did things differently, and it may be noteworthy that the construction is very light. Let's take it top-down.

The telescope does not have a sky-end "cage" as such — the focuser attaches between two truss poles, four inches below an octagonal wooden "ring" at the upper end of the truss. I built the octagon by gluing four strips of 3/16-inch plywood, 1.5 inches wide, into a square whose width was a bit less than the inside dimension of the mirror box. This piece looked like a square cake pan with the bottom cut out. Then I glued braces of 3/4 by 1.5 inch oak, with ends mitered to 45 degrees, inside the corners of the square, with dimensions such that the inside of the glued assembly was a regular octagon. Finally, I cut off the corners, outside the braces, creating an octagonal structure whose wall thickness alternated between 3/16 and 3/4 inch. This part nests inside the box for transport, but when I rotate it 45 degrees from the nested position, the 3/4 oak sides provide a surface for attaching the upper ends of the truss poles.

I made two sets of poles, one cut for the beeswax trick and one not. If the beeswax joints had worked poorly, I would have made a case for the long poles and traveled with them as excess baggage. The cut poles fit into a small suitcase or duffle with plenty of room left.

I was very careful to make the truss poles interchangeable — I worked hard to make sure that the spacing between attach points at the opposite ends of the pole was the same for each one. When I cut the poles for the beeswax trick, I was also careful to make the cuts at the same distance from the attach points, for each pole; thus any upper pole piece can be used with any lower pole piece.

The focuser is mounted on a thin piece of plywood that presses against two truss poles from within. The focus tube protrudes between the poles. Wooden strips glued to the edges of the plywood help located it precisely. A piece of thin brass with a hole for the focus tube fits outside, and machine screws with spacers go through plywood and brass alike, to hold all in place. The focuser thus extends minimally out from the tube. The focuser is far enough down from the octagon ring that there is no need for an additional light baffle that extends skyward from the ring.

We thought about trimming the shroud with black lace ...

A friend did me a huge favor by doing nearly all of the fabrication of a beautiful shroud from black rip-stop nylon. She has worked professionally creating women's lingerie — we thought about trimming the shroud with black lace, but decided not to. She modestly demanded that I not show the shroud to anyone with fashion or costuming experience, but telescope owners ogle it no end — even without lace. It has an edged hole for the focus tube. The bottom bungees go all the way around the mirror box — the rod-ends on the truss poles are a bit small for a bungee to get a grip on.

The mirror box is five sides of a cube. There is no detachable cell; the mirror side of the box is glued in place. It is half an inch thick; the other sides are quarter-inch. I glued long pieces of "2x2" (actual dimensions, 1 3/8 by 1 3/8 inch) inside the corners, where the quarter-inch sides join together, as braces. The truss poles attach to the outside of the box.

I didn't happen to have any half-inch plywood when I was ready to make the mirror box, but I had extra quarter-inch, so I laminated two pieces of quarter-inch together for the mirror side. It was rainy that day, so I could not use the usual trick of weighting the glued assembly by jacking up my car and setting it down with one wheel on the plywood. I glued it indoors, with 90 pounds of GEM counterweights and 75 pounds of unused, bagged cat litter as weights. I had about 10 pounds of used cat litter standing by just in case, but I am not convinced I could have kept the cat away from it long enough for the glue to set.

The mirror sits on three nylon collimation bolts inserted through the bottom via T-nuts. I also installed extra T-nuts at the right place for 9-point support pivots, in case I need them. After the mirror is in place, I attach two wood assemblies inside the box to keep it there. Each assembly has two nylon furniture glides, to define the mirror's position laterally: It sits touching two glides; the others don't let it slide more than a quarter inch if I should tip the tube backward. The assemblies also have cork-tipped fingers that protrude a little way in front of the edges of the mirror, so it can't fall out if the tube gets upside down. The cork clears the mirror by a quarter or half an inch, depending on how far in I turn the nylon bolts. Each assembly is a piece of oak, 2.5 by 6 inches, with one face against the inside of the box and the 6-inch length running crosswise; it has two wooden wedges glued on, at the right place and angle to hold the furniture glides, and two wooden fingers glued on, carrying the cork pads.

The side bearings are semi-circles of 5/8-inch plywood, with "piece-of-pie" sectors for bracing across the clearance cuts for the truss poles. They detach from the mirror box for transportation. The threaded inserts that hold them in place are embedded in either the "2x2" corner braces, or in extra pieces of half-inch oak that I glued to the inside of the box, just to carry the inserts. I put washers between the threaded inserts and the box

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The Telescope

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sides as I was gluing everything together: Thus the inserts are kept from pulling out through the thin plywood. I could not find any 10-32 T-nuts; they would have worked better than threaded inserts and washers.

Rocker and ground board are conventional, of half-inch stock, with Ebony Star and DuPont Teflon for bearing surfaces. There was a thread on sci.astro.amateur when I was building the rocker, about how difficult it is to cut Ebony Star. Don't believe everything you read on sci.astro.amateur: I scored it with a hobbyist knife and then cut it with scissors, all just fine.

I had some 1/16-inch sheet Teflon for bearings: I made convex surfaces wherever I needed Teflon, bent strips of the slippery plastic over them, and fastened the ends with wide-head screws whose heads were thin enough to clear the bearing surface, given the convexity. The curved surfaces were the top edges of the rocker, for side bearings, and convex blocks of wood epoxyed to the ground board, for the bottom bearing. Several telescope makers have seemed delighted by such a quick and easy way to attach Teflon. I have made bearings of thicker Teflon with countersunk screws, but this way was simpler, because Teflon tends to deform when you torque down the countersunk heads, and that can be a pain to deal with. It was also more compact, and used less material.

Tools and Jigs

My only power tool for this project was an electric drill. (My seamstress friend used a sewing machine.) Several special tools and jigs helped. I bought a thin saw with fine teeth set to cut on the "pull" stroke. I also used a drawknife — a very old tool for shaping wood — and a good set of wood chisels. I kept chisels and drawknife razor sharp, and took great care that they cut only wood, not flesh.

I had a simple drill stand so I could use my electric drill as a drill press — that was extremely useful. Also useful was a good hand miter-box saw assembly — a fancy metal unit, with clamps and guides, adjustable to many angles, with a high-quality backsaw.

I had a variety of store-bought clamps for gluing. The project would not have succeeded without them. I built several special jigs. Useful ones included some simple wooden "V"s, to support a 90-degree angle edge down, so I could weigh down a glued joint while the glue dried, and a strip of metal with holes pre-drilled at the design separation of the fastener holes in opposite ends of my truss poles.

Packing for Portability

Except for the truss poles, the telescope packs into roughly a 14-inch (36 cm) cube for transport. With side bearings removed, the box nests into the rocker, and the octagon fits into the top of the box. I found a Rubbermaid refrigerator container about 11 inches (33 cm) diameter and 4 inches (10 cm) deep, just right to hold the primary with plenty of padding. It also fits into the box, under the octagon. There is lots more room in the box for small parts, accessories, and tools, or for clothing and non-telescope stuff, either as padding or to distribute weight more evenly among pieces of luggage. The ground board and side bearings fit around the rocker, to make up the rest of the cube.

Don't forget duct tape, so if the universe breaks down, you can fix it too.

Even though all the parts mentioned do indeed fit into the cube, I actually packed for traveling by putting as many small, heavy parts as possible into my other piece of luggage, and filling gaps in the telescope case with clothing and other light items. All the fasteners used for motel-room assembly traveled this way. Without doing so, the case would have been very heavy and awkward to handle.

The container I bought from Atlas Cases has an interior that is approximately an 18-inch (46 cm) cube. It came with two inches of foam lining, which I trimmed with a bread knife for a snug fit. It has handles and latches; I drilled holes for a long, bicycle-lock style padlock, which seems enough to deter casual pilferage. Anyone who steals the entire case can take it somewhere private and open it with power tools, so a fancier lock won't help. But the case is stout enough that I can dance on it.

I added threaded inserts to the case bottom, for simple rubber feet, sized to sit on Celestron vibration-damping support pads. Thus I can sit the telescope atop the case when I am working near the horizon, to raise the eyepiece from a rather awkward 40 cm to nearly a meter. That's steady enough for deep-sky work at 106x — the magnification I found myself using most often — and surprisingly so, since the case flexes easily. The explanation seems to be that the light finger pressure required to steer a well-balanced Dobson isn't enought to distort the case noticeably.

The vibration damping-pads worked well. I noticed no jiggles when I was observing. Wind-induced vibration is sometimes a problem with telescopes, but when sitting on its case, the 10-inch showed no wind-induced vibration at the eyepiece, even at wind speeds sufficiently high that I had to keep a hand on the telescope to keep it from turning like a weather vane.

Spare Parts and Supplies

When I am putting something together away from home base, I can count on finding a crack in the earth that goes clear to the antipodes, because I am certain to drop into it some fastener the whole project depends on. So my rule about spare small parts is, take 50 percent extra, but never less than two. If the gadget needs one 1/4-20 by two-inch Allen head machine screw, I take that one, plus two spares. If it needs six, I take nine. And so on.

I bring enough tools to get by if I lose one. A "Leatherman" or similar pocket gizmo is a handy backup, but do put it in checked baggage to keep airline security happy. I take stuff like

epoxy and grease, for repairs and maintenance. I have a spare truss pole. And don't forget duct tape, so if the universe breaks down, you can fix it, too.

Shake-Down

I lucked out. The 10-inch Dobson came up smoothly. Everything fit together. The pieces all fit in the case. The focal point was where I intended. The balance was a little tail-heavy with the solid truss poles, but the extra weight of the joints for the cut poles put it dead on. I worked hard to get the telescope ready weeks before traveling, so there would be time for modifications, but none were required.

Yet I learned a lot from the use I had of the telescope, before my first trip. Some of it was relearning the habits of Newtonians: I have made thousands of observations with them, but it has been a long time since I used one extensively. Some of it was familiarization with this particular telescope. And some things were useful new ideas, suggested by experience — the bit about putting feet and vibration dampers under the case, to use as a stand for working near the horizon, was one such.

Anyhow, after five nights' experience and over a hundred objects logged, I was ready for my first trip south — to Hawaii.

Reference: Kriege, David, and Richard Berry, 1997. *The Dobsonian Telescope: A Practical Manual for Building Large Aperture Telescopes*, Willmann-Bell.

[Ed. note: The unabridged 14 part series of Jay's articles can be found on The Astronomy Connection Observing Report archives web page: http://www.observers.org/reports/reports.htm. Either scan the May and June report sections, or use the nifty search command, and pull them all up together. Then sit down for a nice read!]

Last Man on the Moon

Craig D. Wandke

On May 30, Apollo 17's Capt. Eugene Cernan, the last man on the moon, spoke to a group of enthusiastic and appreciative students at the Naval Postgraduate School in Monterey. I found out about his appearance quite by accident, through a fellow worker who had been to the school earlier in the day.

Not being able to pass up the chance to hear yet another astronaut in person, I came home, grabbed my lunar globe and camera, and rushed over to the school. It was quite by chance that he was speaking on the very day that I myself was giving an evening talk on the moon to the Friends of the Monterey Institute for Research in Astronomy, and I had my lunar samples with me which had been sent by NASA. I decided that I would take the samples with me and hope that they would give me an "entry" to seeing him if I encountered any hesitancy on the part of school officials!

I stood with my heart pounding in my chest with excitement ...

I spoke with one of the Public Affairs officers at the school and identified myself as a member of several astronomy clubs and public lecturer on the moon, and was thrilled to be told I could speak to Capt. Cernan at a particular room downstairs where he would be meeting briefly with several museum officials. I was pleasantly surprised at how accommodating the officers were to my request to meet Cernan!

I headed downstairs to the museum, and, moments later Cernan came in, surrounded by four Navy officers in uniform. Cernan is a man of obvious presence, with a charming and captivating smile. He spoke with the four officers about business matters as I stood off to one side, in total awe to be near the last man to have walked on the moon. I nervously held my moon globe in a plastic bag, a globe that held the autographs of Buzz Aldrin; the three Apollo 12 astronauts — Pete Conrad, Al Bean, and Richard Gordon; and Alan Shepard.

I stood with my heart pounding in my chest with excitement at the potential of speaking to him, and yet prepared for the disappointment of having an officer tell me that Capt. Cernan might be running behind schedule and needed to go over the auditorium where hundreds were waiting for him. As he finished talking and was starting to leave the room, I approached him and asked if he would sign my globe, which he most graciously did with a wonderful smile and large, sweeping stroke of the pen just north of Mare Crisium! I asked if I may have my picture taken with him, and he stood next to me while one of the officers took our picture. I briefly showed him the moon rocks which I had brought with me, and we chatted for a couple of seconds about the various samples in the Lucite disk.

Moments later, he excused himself as he and the group of officers left for his afternoon speaking engagement in the auditorium, and I walked — or rather, floated! — across campus to hear his speech.

Cernan had an absolutely delightful presence, while speaking for about 45 minutes to a rapt group of students; he was a particularly engaging speaker, since he himself had graduated from the Naval Postgraduate School in 1963. His speech, replete with wonderful anecdotes and reflections on his moon trips, was full of "if-I-could-do-it, you-can-do-it" enthusiasm, and it was interrupted several times by appreciative, raucous applause from the students.

I was one of the few "civilians" in the auditorium and was very thankful that I had been allowed to be present

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Visit with Gene Cernan

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for his speech. Cernan is an eloquent, reflective, and sensitive speaker, and I listened with zeal, mesmerized to be in his presence and so very thankful he had given me the couple of moments to sign my moon globe.

I must confess to a certain amount of age-related wistfulness as he spoke, using terms like "before most of you were born," as he described many anecdotes of his 1972 flight — well known to those of us who were witnesses to his flight on Apollo 17 or who are consummate space enthusiasts. His wonderful stories drew repeated gasps, laughter, and applause from the audience who appeared to be hearing them mostly for the first time. In one example, Cernan spoke of how he repaired the fender of his lunar rover with duct tape and a lunar map, and the crowd howled with laughter. When he reminded us that his last words on the moon were neither sublime nor inspirational, but rather, "Let's get this mother outta here!" the charmed audience once again roared.

His speech was clearly inspirational, as he periodically referred to "sitting in these very seats where you are sitting, nearly forty years ago." He urged the exploration of space and our return to the moon, and talked of the role of engineers in making the machines that will take us to the stars. At one point he said, "Aim for the moon ... if you miss, you'll land on a star!"

Cernan also reflected on the grandeur and majesty of the moon missions, and reminded us that he flew twice to the moon, once on Apollo 10 and again on Apollo 17. In a clear spiritual reference, he talked of "sitting on the front porch of God's house," and spoke of his little area of the Taurus-Littrow Valley, his landing site, as "my little Camelot." He said that his lunar mission had in a true sense been a "spiritual voyage," where he could cover the earth with one of his hands. He noted that, even today, it is hard for him to realize he actually went to the moon.

As he finished his speech, he showed several slides of his mission, stepping away from the podium and becoming clearly more relaxed, as the students asked questions. After the question-and-answer period he was presented a plaque with the school emblem, and he then moved to the foyer of the auditorium, where perhaps seventy of us were waiting for him to autograph his book, "Last Man on the Moon."

I again stood anxiously in line, but smug with my already-signed lunar globe. As it was my turn to have my book signed, he said, "Ah, you're the man with the moon rocks!" and he took a couple of minutes to examine the sample, commenting on the ones that might have come from his mission.

As I left the table, I was once again thrilled to have been in the presence of another man who had actually walked on the moon. It was, however, a particular pleasure for me to meet Cernan, who ultimately is, as he himself said, "a common man who happened to do uncommon things." I was touched by his humor, his lack of pretense, his graciousness in giving each of us a couple of seconds, his charm, and for sharing with us his reflections on life and his trips to the cosmos.

Buzz Aldrin in S F

"Dr. Rendezvous" himself, Edwin "Buzz" Aldrin, is making the rounds on a book signing tour. He will appear in San Francisco at the Morrison Planetarium at the California Academy of Sciences in Golden Gate Park on Friday, July 7, at 7:30 p.m. Dr. Aldrin will be talking about the future of civilian space travel and signing copies of his new novel, "The Return," co-authored with science-fiction writer John Barnes.

Advance tickets are available at no charge by sending a self-addressed stamped envelope to: Morrison Planetarium, California Academy of Sciences, Golden Gate Park, San Francisco, CA 94118.

Mooning

Through An Astronaut's Eye

Craig Wandke & David North

This month's column is a tad different; we got a Moonocentric submission from that tireless and devoted observer Craig Wandke.

He has given several inspiring talks to the club, and pursues the Moon with a doggedness second only (perhaps) to Harold Hill.

Often the question comes up — what do you look for on the Moon? And how? Craig thought the Apollo guidelines seemed to be the best answer around ... so with no further blather:

Apollo 8 Critical Item Checklist by Craig D. Wandke.

When Apollo 8 orbited the moon in December of 1968, it was the first time human eyes gazed down upon the surface of this alien world from so close.

Apollo 8 showcased the very latest technology by the United States, and the mission, flown by highly-trained pilots, had clear and specific directives for lunar observation.

Astronauts Borman, Lovell (later to fly on the ill-fated Apollo 13), and Anders had received training in how to observe and record the lunar scene under their spacecraft, and it interesting to note their guidelines.

Because many of the observational criteria they were required to follow may be used by all of us through our amateur telescopes (obviously with a far less detailed perspective!) it might be fun – on your next lunar observing session – to gaze on the moon as if you were an Apollo 8 astronaut ... and let's assume the last item will not concern you!

If it does, however, notify all of us in the club immediately ... as well as CNN!

Impact Craters

Is it large? Does it have rays? A bright halo? Sharp rimmed? Low-rimmed or high? Is the rim radial or concentric, and can you see flow patterns?

Is the crater circular, asymmetric, polygonal? Is there a terrace?

Look at the walls. Can you see textures, patterns, layers, flows, or channels?

Benches are flat areas below the rim but above the floor. Are there any? Note the rim relation, channels and possible eruptive features.

On the floor: again, can you see textures or flow patterns? Pay special attention to colors and any fracture patterns.

Central Peak: Color, layers and layer orientation can all be important.

If the crater is filled in, note the shape and orientation of the fill: concentric, domed, polygonal, knobby or some combination.

Look also for relief, patterns, color, and especially the filling level (does it make it all the way to the rim?)

Seemingly Uncratered Surfaces

What about the surfaces where there aren't any craters? Note the characteristics: Relief, color, patterns, fractures.

Look for High Relief Structures. Are they knobby, domed, hummocky, or cratered?

Do you see any ridges? Are they parallel, or some other arrangement? Inspect ridges closely. Can you identify superimposed flows? Are they on mare or terra? Do they seem rounded, flat-topped, wrinkly or branching?

In these same areas you might find eruptive features and fine crater fields with a careful look.

Of course, there are also Low Relief Structures. Try to identify their source — can you see an obvious starting point? Is the area smooth, dark, light or very light?

General relief features such as domes, ridges, rimless craters and halo craters, rilles or fractures may also be visible.

Rilles

Speaking of rilles, you should observe the tails for evidence of alluvial deposits. Observe the heads for any source of erosion agents.

It's particularly important to determine interruptions in continuity (this can be helpful for dating purposes).

Note the shape. Is it sinuous, linear, angular, arcuate, or some combination?

The Terminator

Generally, close attention should be paid to the terminator (where light meets shadow).

Identify flow fronts on low relief surfaces. Note glows or obscurations. Look closely for subtle relief: flows, patterns, or roughness.

UFO's

Note size, shape, color, reflectivity. Mission threatening or passive?

(Craig welcomes comments from observers on all matters relating to the moon. Email craterman@earthlink.net)

The Shallow Sky

Observe The Very Inner And Very Outer Solar System

Akkana Peck

The big gas giants, Jupiter and Saturn, are emerging into the morning sky; only a few degrees apart, they make a nice sight for the early morning riser. In the last week of July, Mercury, shrinking in apparent size as it grows from crescent to half phase, joins them, with the moon moving from near Saturn on the 26th to a very slim crescent just above Mercury on the 29th.

For the more traditional nighttime astronomer, this month is a good time to get acquainted with the outer solar system. Uranus, Neptune, and Pluto are all well placed for observing in the warm summer nights. Uranus and Neptune are both in Capricornus and easily accessible to binoculars (or, in dark skies, to the naked eye in the case of magnitude 5.7 Uranus — can you spot it? Try it and let me know). Both will show small blue or green disks in most telescopes. Neptune reaches opposition on the 27th, Uranus on August 11th.

Pluto is more of a challenge. Several of us tracked it down at a Fremont Peak star party last month, using the 30", a 17.5", and a 12.5". I recommend the finder chart in the RASC Observers Handbook (which many of you have already bought at our club meetings): start at 20 Oph (a fairly easy naked-eye star from the Peak), then use binoculars to find the two almost-as-bright stars to the right and a little south of 20; since Pluto passes just north of one of the more northern of the two bright stars, it should be relatively easy to get near the field. Expect the planet to be about as bright as the faintest stars plotted on the RASC chart.

Though the inner solar system planets Venus and Mars aren't visible this month, you can get a glimpse of the brightest asteroid: 4 Vesta, in Sagittarius, brightens to magnitude 5.4 for opposition on July 16. On the 27th, Vesta should be easy to find, just 5' north of 52 Sagittarii.

Finally, this is a bonus month for eclipses: three of them! Unfortunately, we aren't very well positioned for any of them. The partial solar eclipse on the 1st will require a trip to the southern end of South America. On July 16, early risers can watch the very beginnings of what will be a very nice lunar eclipse from the middle and eastern Pacific.

On July 30th, we can catch a bit of a solar eclipse, right at sunset. From the bay area, we'll see less than 15% of the sun eclipsed. Locations farther north will see more of the sun eclipsed, up to 50% in northern Canada. As always, use a solar filter when you look at the sun, especially when using binoculars or a telescope: 10% of the sun doesn't remove any of the danger. This is a also a good chance for photographers to try for eclipsed-setting-sun photos ... be creative, and bring your results to the SJAA slide & equipment night in September to show us what you got!

Backyard Observatory on the Cheap

Denny Woolaghan

The observatory was constructed from a Rubbermaid 5.5'x5.5'x6.5' storage shed which was purchased from Orchard Supply Hardware on sale for just under $400.00. I wanted to place this Observatory on a 9x12 concrete pad that had been previously poured, and added rubber wheels (10) to allow the Observatory mobility on the pad for off-season & long term storage. This unit could be placed on gravel, a deck or possibly even straight on the yard. The shed is very strong.

Prior to the roof assembly I purchased some additional 2x4's and attached these to the roof perimeter with 4"x3/8" bolts, washers and nuts. I placed the 2x4's approximately 1/2" above the existing roof line, allowing the roof to slide off. I then attached supports to the rear of the shed using 2x4's and one 12" shelf bracket on each side. Across the top of both the roof perimeter and to the detached roof supports I attached 1x4's to finish off the appearance and to provide extra support, especially for the detached roof structure.

I then needed to raise the floor to a perfect height to match the horizon (and my house rooftop on one side). Twelve 99-cent concrete blocks from Home Depot and a sheet of 3/4" plywood gave me just the right height.

Three views of Denny Woolaghan's inexpensive backyard observatory. On the lower left is detail of his observatory roof customization.

Perseus ... more than meteors

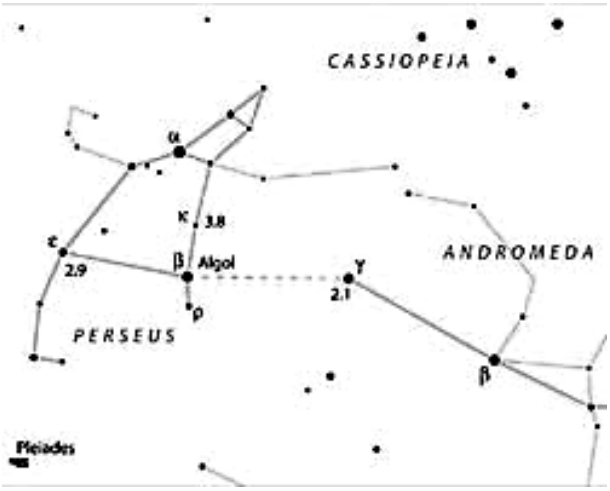
Jane Houston Jones

The constellation Perseus has more to offer than a meteor shower in July and August. But this is a meteor column, so I'll set the scene for the fabulous celestial summertime fireworks display first. The Perseids are the most famous of all meteor showers. Most non-astronomers who have seen a meteor have probably seen a Perseid! Makes a lot of sense, though —it's usually warm in July and August, when the general public is likely to accidentally look up and glimpse a falling star!

Computations of the orbit of the Perseids between 1864 and 1866 by Giovanni Virginio Schiaparelli (1835-1910) revealed a very strong resemblance to periodic comet Swift-Tuttle (1862 III). This was the first time a meteor shower had been positively identified with a comet and it seems safe to speculate that the high Perseid rates of 1861-1863 were directly due to the appearance of Swift-Tuttle, which has a period of about 120 years. Multiple returns of the comet would be responsible for the distribution of the meteors throughout the orbit, but meteors should be denser in the region closest to the comet, so that meteor activity should increase when the comet is near perihelion.

The Perseids are active from July 17th thru August 24th. The traditional peak, in reality, the second peak of three, is Saturday, August 12th at 04h UT. It is interesting that there are several peaks. A ZHR of 100 was observed in 1999 and Perseid Y2K ZHR is expected to remain at about that level. Unfortunately there is a bright waxing moon on peak night, or we'd have a darn fine site here in the western US. The tertiary peak will occur at 19H UT on the 12th. But you'll have to take a fast flight to Central Russia or Asia to see it! We'll talk more about this next shower next month. Perseids are fast, bright and leave persistent trains. Their radiant rises from low to the North-east to high in the east as the night wanes.

Another fascinating object is located in Perseus, and it's another object that has a peak of brighness. It's Algol! Beta Perseii is the most famous of the eclipsing variables. At magnitude 2.15, Algol is a white spectral type B8 V main sequence star



100 light years distant. It is a binary, too, of course! At primary eclipse, 79% of the bright star is hidden by the larger companion. It dims significantly from 2.15 to 3.4 every 2.9 days. This eclipse takes place over a very short time frame - less than four hours. The dates (times in UT) to watch for this mimima of are available in Sky and Telescope. They are also printed in the RASC Observers Handbook 2000.

I hope you give Perseus and Algol and the Perseid meteor shower a look-see this summer and fall. Perseus rises from the North at sunset, and will be overhead in December. But a meteor observer, up at 2 or 3 am on a summer night, will find our hero Perseus high in the summer sky.

Sky & Telescope Subscriptions

Mark Taylor, SJAA Treasurer

Q: How do I subscribe to Sky & Telescope Magazine along with my SJAA membership?

A: When you renew your SJAA membership, use the membership form found on the back of any copy of the SJAA Ephemeris. Attach your check payable to the San Jose Astronomical Association for $45 ($15 for membership, $30 for one year of Sky & Telescope). Multiple year subscriptions are not available. Mail the completed form to the official SJAA address on the back of this Ephemeris. Forms are also available online at http://www.sjaa.net/member.html.

Yosemite Star Party

Jim Van Nuland

There is room for more participants in the SJAA Yosemite star party on July 22-23. The 70% moon is badly placed, rising about 11 pm, but Yosemite is beautiful in any case. If you'd like to participate, contact Jim Van Nuland by phone or e-mail at <jvn@sjpc.org> with the number of people and a snail mail address.

You may read some practical notes on Jim's web site www.sjpc.org/jvn and page down to "Yosemite". This also has the Sun and Moon rise and set times.

To those already signed up: Jim will be mailing the gate passes in late June or early July. If you will be traveling and need the papers sooner, contact him.

For Sale

For Sale Sky Designs 20" f4 Dobsonian. The mirrors have been recently aluminized. Comes with Orion Sky Wizard II, Tuthill 70mm finder, and ladder. $3000.00 or best offer. Paul Mancuso, paulm@catc.com

"Sky Show" Event Scheduled for Davis

Patricia Kurtz, Astronomy magazine

I represent Astronomy Magazine in its Outreach and Education arena. To this end, we are implementing a new kind of star party; one that we hope will excite and inspire the general public, as well as expert amateurs. We are proud to invite you to participate in Astronomy Magazine's Davis "Sky Show" on August 4th and 5th.

The event will be held in Davis, California, at the Veteran's Conference Center and will begin with a keynote speaker the evening of August 4th. The next day's activities may begin with a pancake breakfast followed by the opening of the exhibit area at 10:00 a.m. Our speaker series should begin shortly thereafter and will feature notables like Alex Filippenko, Ray Jay, and Seth Shostak. We will also host a special panel of astronomy personages such as Bonnie Gordon, David Eicher, Lynette Cook, and Sally Stephens. Daytime activities will include exhibits, children and family activities, vendors, photo and book signings, and solar viewing. We will set up a website that will update speakers and events as we progress. As you can tell, we are planning a full day of astronomy!

As for the night — The star party rules the night. At least it rules Saturday night! The largest area of the star party will be completely geared to the general public unfamiliar with astronomy and stargazing. There will be basic "observing stations" — one for constellations, one for lunar and planetary, and one for deep sky observing. Each station will introduce the types of telescopes in use, and some observing etiquette. The visitors will be given handouts at each station to take home with them:

Constellation Station — A quick tour of the sky and constellations. We'll introduce the summer triangle and the Milky Way along with the use of binoculars for stargazing.

Lunar/Planetary Station — We get a brief opportunity to view Venus after sunset followed by great views of a waxing Moon and will discuss their phasing. The outer gas giants will be available later in the evening. We will also talk about observing this Fall's planets Mars, Jupiter and Saturn.

Deep Sky Station - A talk (still brief, here) will discuss the difference between nebulae (i.e., reflection, dark, planetary, supernova remnants), star clusters (globs and open), and galaxies. The telescopes at this station will be separated into these three categories. The tricks to observing some objects will also be discussed.

We are looking for volunteers and telescopes to work these stations. Do you have members you consider experts or proficient in these areas that would be interested in leading a station? If you or your club would like to help run one of these stations please let us know. This will really give your members a chance to showcase what they love. And, we'd like to group most of the telescopes within these stations so that people will be able to choose what they see and learn while they're at it. Perhaps your members will have a preference as to which station they'd like to participate in.

There should be plenty of room for "hundreds" of telescopes. Please help us get the word out and make this Northern California's largest star party ever. Additionally, it will be very helpful to have an approximate count of folks with telescopes so that we can arrange special parking, if needed.

You might be asking, "Why Davis?" Recently, Davis passed one of the strongest light pollution ordinances in California. Help us show their community that light pollution does matter and that we support them with their efforts to fight it.

Please respond by email anytime, or telephone myself at (303) 948-5825, or Kris Koenig at (530) 879-0207. Email pkurtz@globaltelescope.com

Celestial Calendar
July 2000

Richard Stanton

Lunar Phases:		Date	Rise	Trans	Set
NM	12:20 PDT	01	04:46	12:14	19:42
FQ	05:53 PDT	08	12:35	18:36	00:00
FM	08:55 PDT	16	19:47	00:51	05:04
LQ	04:02 PDT	24	00:12	06:10	12:50

Nearer Planets:				R. A.	Dec.
Mercury, 0.66 A.U., Mag. 1.9					
07	06:00	13:02	20:03	06:59.5	+17:58
17	05:03	12:08	19:13	06:43.8	+18:45
27	04:38	11:50	19:03	07:03.5	+20:31
Venus, 1.69 A.U., Mag. -4.0					
07	06:24	13:44	21:05	07:38.2	+22:34
17	06:45	13:57	21:08	08:30.1	+20:17
27	07:08	14:07	21:06	09:20.2	+17:03
Mars, 2.62 A.U., Mag. 1.6					
07	05:41	13:05	20:29	07:00.4	+23:37
17	05:33	12:54	20:15	07:28.8	+22:51
27	05:26	12:43	19:59	07:56.6	+21:46
Jupiter, 5.56 A.U., Mag., -2.2					
07	02:54	10:02	17:10	03:57.9	+19:37
17	02:21	09:31	16:41	04:06.0	+20:00
27	01:48	08:59	16:10	04:13.5	+20:19
Saturn, 9.65 A.U., Mag. 0.8					
07	02:45	09:46	16:47	03:42.1	+17:35
17	02:09	09:11	16:12	03:46.0	+17:46
27	01:33	08:35	15:37	03:49.4	+17:56

SOL Star Type G2V Intelligent Life in System ?

Hours of Darkness						
05:33	07	05:51	13:13	20:34	07:07.1	+22:33
05:51	17	05:58	13:14	20:30	07:47.7	+21:08
06:15	27	06:06	13:14	20:22	08:27.5	+19:08

Astronomical Twilight:

Begin		End
JD 2,451,732	07	03:59 22:26
742	17	04:09 22:18
752	27	04:21 22:06

Sidereal Time:
Transit Right Ascension at Local Midnight

07	00:00 = 17:54
17	00:00 = 18:33
27	00:00 = 19:13

Darkest Saturday Night: 29-Jul-2000

Sunset	20:20
Twilight End	22:03
Moon Rise	04:23
Dawn Begin	04:24
Hours Dark	06:20

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Publication Statement

SJAA Ephemeris, newsletter of the San Jose Astronomical Association, is published monthly, 12 times a year, January through December.

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San Jose, CA 95159-8243

SJAA Loaner Scope Status

All scopes are available to any SJAA member; contact Mike Koop by email (loaner@sjaa.net) or by phone at work (408) 473-6315 or home (408) 446-0310 (Leave Message).

Available Scopes

These are scopes that are available for immediate loan, stored at other SJAA members homes. If you are interested in borrowing one of these scopes, please contact Mike Koop for a scope pick up at any of the listed SJAA events.

# Scope	Description	Stored by
7	12.5" Dobson	Jeff Crilly
19	6" Newt/P Mount	Dean Sala
24	60mm Refractor	Michael D. Turner
29	C8, Astrophotography	Doug Hendricks
30	7" f/9 Newt/Pipe Mount	Mike Koop
31	8" f/8 Dobson	Lee Barford

Scope Loans

These are scopes that have been recently loaned out. If you are interested in borrowing one of these scopes, you will be placed on the waiting list till the scope becomes available after the due date.

# Scope	Description	Borrower	Due Date
1	4.5" Newt/ P Mount	Tim Roberts	9/9/00
3	4" Quantum S/C	Hsin I Huang	9/5/00
6	8" Celestron S/C	Al Kestler	6/24/00
8	14" Dobson	Gary Strawn	6/29/00
10	Star Spectroscope	David Kingsley	7/20/00
15	8" Dobson	Mike Rupe	7/28/00
16	Solar Scope	Steven Nelson	8/20/00
23	6" Newt/P Mount	Raghu Srinivasan	8/12/00
28	13" Dobson	Paul Lawrence	8/26/00
32	6" f/7 Dobson	Gordon A. McClellan	8/12/00

Extended Scope Loans

These are scopes that have had their loan period extended. If you are interested in borrowing one of these scopes, we will contact the current borrower and try to work out a reasonable transfer time for both parties.

# Scope	Description	Borrower	Due Date
2	6" f/9 Dob	John Paul De Silva	?
9	C-11 Compustar	Paul Barton	Indefinite
18	8" Newt/ P Mount	Paul Barton	Storage
21	10" Dobson	Ralph Seguin	Repair
26	11" Dobson	John Templeton	7/14/00
27	13" Dobson	Steve Sergeant	8/12/00

Waiting List

16	Solar Scope	Gary Mitchell
31	8" f/8 Dobson	Bob Morgan

Submit

Members are encouraged to submit articles for publication in the SJAA Ephemeris. Send articles to the editors via e-mail to ephemeris@sjaa.net.

To subscribe to or unsubscribe from the SJAA Mailing List send email to
sjaa-request@sjaa.net
with a blank subject line followed by a single text line that says "subscribe" or "unsubscribe"

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New __ Renewal __
Membership - $15
Junior (younger than 18 years old) - $6
Sky and Telescope - add $30 to membership
(Sky & Tel will not accept multiyear subscriptions)

Make checks payable to "SJAA"

Bring this form to any SJAA Meeting
or send (along with your check) to

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