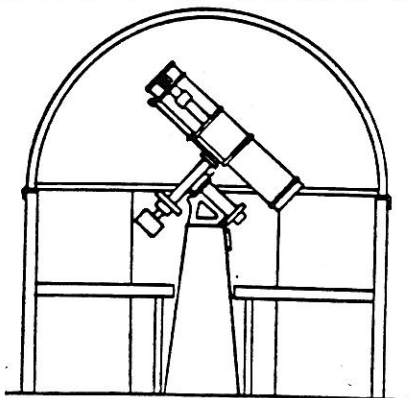


# the Spectrum

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The telephone at Beaver Meadow is for emergency use only at no cost. However, for domestic calls, there is a box placed near the phone for which we ask that you pay 50¢ for the first three minutes and 10¢ per minute thereafter. Please abide by this ruling. Thank you!

#### PERMISSION TO REPRINT

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#### PUBLIC NIGHT SHOWS

We are trying to revamp our public night shows with new topics, slides, videos, music and more assistants. While we are looking for astronomical (or blank) slides, videos and tapes, we really need ideas and a group to bounce these ideas off of to make them fly. Perhaps you've always wanted to do a project with mythology that needed help in researching, generating star maps, diagramming, photographing and so on. If your interest is in galaxies or space flight or whatever, a show could be developed around that theme. I think you get the idea. Call Dan Marcus (773-5015), Bill Smith (664-0841) or any board member and say "Hey, I got this idea I'd like to pursue..."



#### BEAVER MEADOW OBSERVATORY \*457-3104\*

**Star Parties:** As usual all parties and events will be held rain or shine.

**June 12:** Jack and Jayne Mack, oops already came and went, but I know that every one who went had a great time!

**June 19:** Public Night, NEW MOON!!!

**June 26:** Irene and Rowland Rupp, invite you to their cottage #316 at Lime Lake starting at 1pm. This is a bring a dish to pass picnic. The Rups will provide the drinks, and the hot dogs. As usual Rowland will be happy to take on all comers in horse shoes, so bring your lucky set. There will also be volley ball, swimming, and the romantic early evening boat ride around Lime Lake. Their phone there is 353-4636.

**July 3:** Public Night

**JULY 10:** AT THE BEAVER MEADOW OBSERVATORY BEGINNING AT 6:00 PM, WE WILL BE BRINGING OUT THE OLD GRILL, NEW 'HOT-DOGS' AND BURGERS, HAVING AN OLD FASHIONED, "BRING A DISH TO PASS PICNIC." IT IS TIME TO CHECK OUT THE 'COMPUTER' & '20" SCOPE'; MOON RISES AT 12:30 A.M. ENJOY A NIGHT OF FRIENDSHIP, FEAST AND OBSERVING.

**July 17, and 18:** Beaver Meadow Nature Festival- from 10am to 5pm each day, plus the usual public night!! As they say at work **HELP ME**

**SOMEBODY!!?** I will be needing the usual help with the computers and scopes especially if it is clear. I need a couple of high resolution printers to print skyglobe star charts with. Check in with me as we will probably organize a bring a dish to pass picnic from 5pm to 7pm on Saturday night!

## A TAP ON THE SHOULDER

Hobbies are supposed to be fun, relaxing and invigorating. Looking deeper, any hobby needs a foundation of knowledge to grow from; new information to stimulate learning; equipment to play the game; motivation in the form of encouragement and good feelings; and a positive attitude. I think when one or more of these is lacking then that hobby is abandoned. While it is certainly possible to do it solo, our club can help fortify these needs.

Club resources in reference books, speakers, and equipment address many of the need items. Foremost, however, is the exchange amongst members. Cultivating skills, sharing ideas, getting encouragement, support and help, gaining confidence; and sharing successes are not easily done solo. The learning/confidence/enjoyment curve climbs higher and faster in a cordial and understanding club atmosphere.

What does it take to increase your satisfaction and enrich your hobby? Often just a "tap on the shoulder" of another member who has similar interests or who can hook you up with others. This summer take advantage of the public nights (members are public too) and star parties to expand your astronomical horizons and get more out of this hobby. Break the ice; give a short talk; call up a member who has that piece of gear you'd like to try; exchange a book; volunteer for or start your own committee; or show your neighbor a constellation. A hobby that's fun, relaxing and invigorating is just a "tap" away. Have a great summer!

Bill Smith

## ELECTION RESULTS

The new board members at large for the years 1993 and 1994 beginning in September are: Tom Nigrelli, Rowland Rupp and Joel Stuckey.

## A NEW FULL-SIZED SUBARU

Japan will soon have the largest single-mirror optical telescope in the world. It's the 8.3 meter Subaru, the Japan National Telescope, contracted by Mitsubishi Electric Corporation. It is expected to be operational at Mauna Kea Observatory in Hawaii by the year 2000. Our twin Gemini telescopes, planned for Cerro Pachon, Chile and Mauna Kea, come in just a bit smaller at 8.1 meters.

While the Japanese may be the new leader in large-scale telescope construction, we can take solace in knowing that not only will the telescope be located on U.S. soil, but also that the mirror blank will be cast by Corning, Inc. in Corning, N.Y. and, just announced, Contraves of Pittsburgh, Pa. will polish the mirror. Actually, the f/1.8 mirror is cast as a meniscus, like a contact lens, to save weight. Even with a thickness in the order of only eight inches the mirror will weigh 24 tons. Contraves expects to deliver the finished mirror to Mauna Kea in August 1997 after polishing it at their underground optical facility in Wampum, Pa. Apparently three years of construction and checkout will be needed before the telescope becomes operational.

Both the Subaru and Gemini telescopes have raised concern about the choice of Corning as the source of the glass blanks. The loser in the contract award was Steward Observatory Mirror Laboratory of the University of Arizona where, under the direction of Roger Angel, spin-cast borosilicate mirrors as large as 6.5 meters have been made. In 1991 U of A enlarged their spin oven to accommodate mirrors up to 8.4 meters, obviously in hope of winning contracts for these huge mirrors. The National Science Foundation reviewed the choice early this year, and its panel unanimously concluded that Corning's ultra-low-expansion meniscus glass was not expected to perform as well as Angel's proposed mirror. The selection was largely based on price, the U of A mirror cost about 40% more than Corning's.

continued on page 4

July 24: Bill Smith and Carol Lorenc invite you to their home (petting zoo) at 184 Creek Rd, Jamestown (at Busti, follow the BAA star signs). Party starts promptly <sup>(just kidding)</sup> at 3pm. Dinner is a bring a dish to pass, Bill and Carol will supply the dogs, and drinks. Feel free to bring your sleeping bag and crash for the night!! Kids are welcome and have plenty to do chasing the 8 cats, 1 dog, 3 horses, 1 goat, 1 donkey, on their 20 acre farm. Bill has a 10" scope, and really dark skies.

July 31, August 1: Buffalo Museum of Science, telescope clinic, and computer demonstration from noon to 5pm. As usual I'LL NEED HELP!!! Don't know a thing about computers, or want to learn more on how to fix a scope? Then come give us a hand. The Star Trek Exhibit will be in full swing, and we may need people for crowd control!! The Solar Observatory will be open if clear, great opportunity to check out the H alpha filter.

August 7: Public Night

August 14: Mark Reville and the Martian Family invite you to the Martian's home on Traffic Road in Otto. They have exceptionally dark skies, so bring a scope and enjoy some fine viewing. Mark's phone 627-4213, the Martian's phone 257-9616. Follow the BAA signs starting on Connoisarauley Rd. Directions to get there from Buffalo: take the 219 Expressway South to the end in Springville. Turn left off of 219 expressway on to 219. Continue on 219 South (right hand turn) until you cross a big bridge which takes you into Cattaraugus County. After the bridge, count 3 right hand turns. The 3rd will be Connoisarauley Rd. Turn RIGHT on this road. Go to the first stop sign, and turn right (East Otto Rd.). To the next stop sign, turn right (Hammond Hill Rd.). Go slow because you will have to turn Left on Uttley RD. After passing the farm stay left on the Y in the road. Then turn right onto Traffic Rd. The house is the 2nd on the right. You will see Big Lamps lining their property!

August 21: Public Night

August 28: Bill Smith is planning a trip to the Roberson Museum and Science Center in Binghamton, as well as the Kopernik Observatory. Bill has offered the use of his van for this outing, so please call him for more information and to make reservations for this trip. Phone 664-0841.

The New Addition: Construction on the new addition will have begun by the time you read this. We hope to have the major work completed by July 17! In the mean time I will need all the help I can get for public nights so we can keep visitors away from the construction site, especially when it is dark. There will be a paint up fix up day sometime before Aug 29. This date will be determined by construction. If it does get moved up it will be on a Sunday in August!!! Happy seeing, and may this summer be better than last!!!

We will be getting a new finder for the 20" If any one has any suggestions, see me.

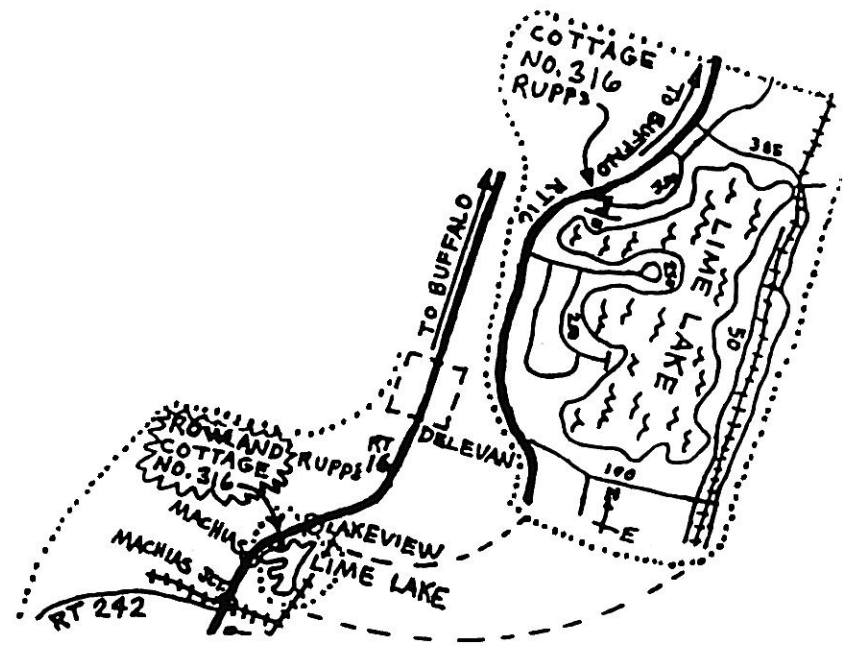
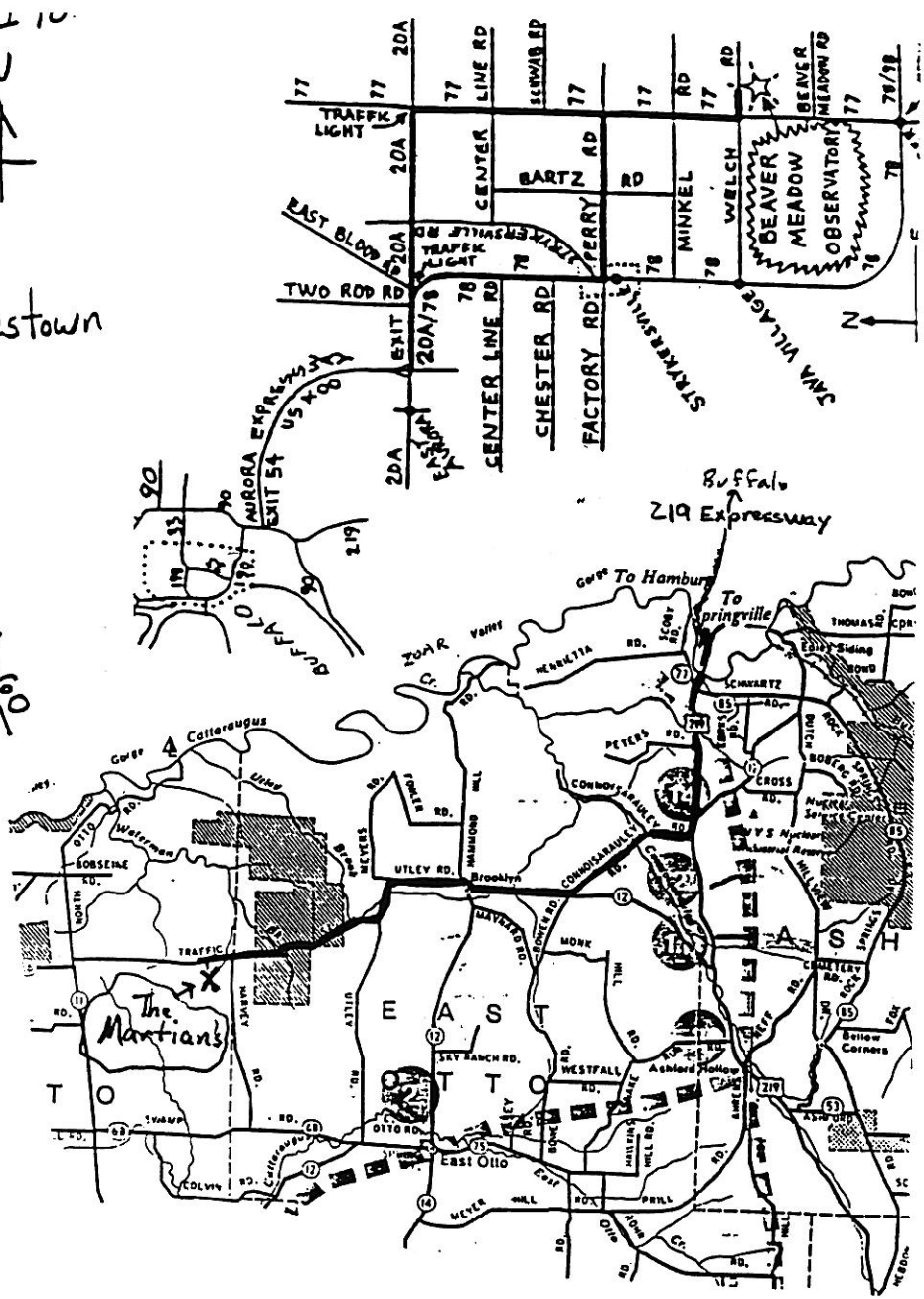
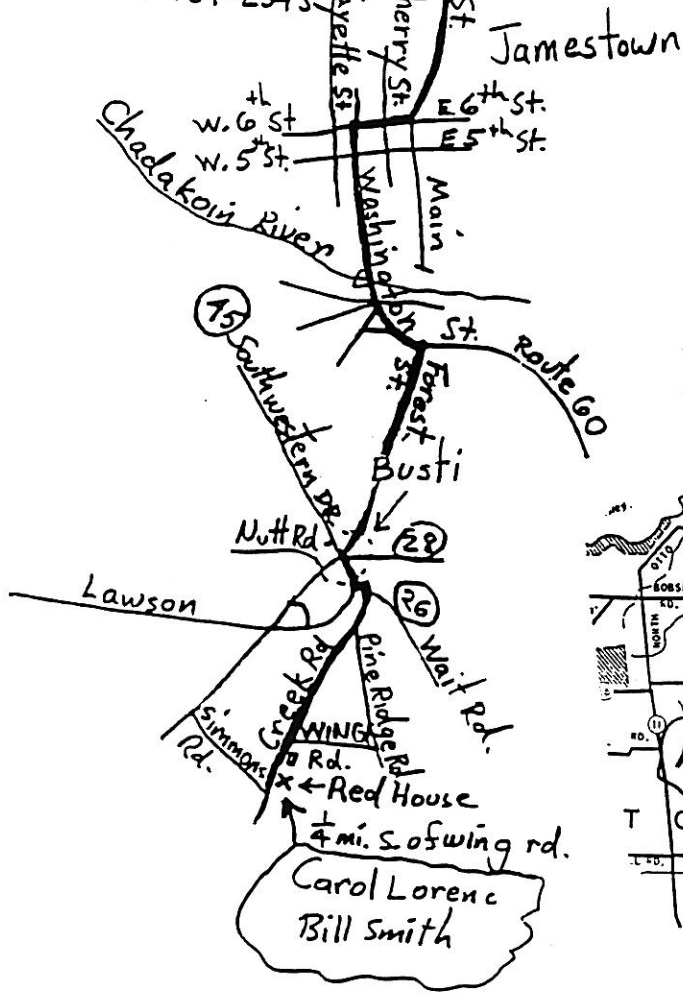
MAPS ON PAGE 3

"SPECTRUM" DEADLINE

The **deadline** for the SEPTEMBER-OCTOBER issue of the "SPECTRUM" is **no later than AUGUST 16th** which is a Monday. Articles are needed as well as any other event under the subject of ASTRONOMY.

Note For a  
more Detailed  
map Call  
Bill Smith  
1-484-2343

To exit 59, RT 10  
at Fredonia





Some of the controversy may stem from the fact that Angel has developed large scale spin-casting and a polishing operation as well. Not bad for a university shop! One point made in favor of U of A was that all the technology they developed might be lost in losing this competition. Is there some obligation to sustain a complex technology for its own sake? Maybe in this case there is because U of A's main problem is not technical, it is that being a university they cannot sustain the financial loss if something goes wrong; the cost would have to be borne, at least in part, by the procuring agency.

Since Corning cannot polish the mirror themselves they will ship it to Wampum, by barge no less, in mid-1994. Contraves will design and fabricate a polishing machine and test equipment and prepare the underground facility where the polishing will take place. Let's hope they have a better knack for testing than was demonstrated by another American company when they checked the Hubble mirror. (See "Hubble Trouble", SPECTRUM, September-October 1991.) One doubts the Japanese will be so careless in monitoring their suppliers so as to allow that to happen.

So even if the largest single-element telescope won't be ours, at least the mirror will be made here. In fact, almost locally if you consider that both companies are our neighbors. Besides we'll still have the largest telescope for a while - the Keck 10 meter at Mauna Kea. It doesn't qualify as the largest single-mirror telescope because it's a segmented array made up of 36 hexagonal mirrors that somehow will be computer driven to align properly to produce a coherent image. Not to worry about this state-of-the-art technology however, we've tried this technique before with the six-segment Multiple Mirror Telescope. Oh, by the way, the 6.5 meter mirror cast by U of A mentioned earlier was made to replace the segmented MMT mirror to get better performance.

Rowland A. Rupp

#### TREASURER'S CORNER for J.D. 2,449,150:

Gen. Fund  
\$931  
BMO Fund  
\$434  
Scope Fund  
\$2647



Checking  
\$2691  
Savings  
\$1321

We are now using the new checks which you may have seen advertised in the astronomy magazines. These have four rotating astronomical scenes printed as background. Their cost is actually a little less than those bought through the bank.

The ones I wrote last month have cleared alright. The bank teller tells me that the main requirement for a check is that the account number be printed in the machine readable form with magnetic ink between the two dots and two lines on the bottom of the check. In fact there are apparently software programs with which you can make your own checks. The paper is slightly glossier than regular checks. I feel I need to write a little more legibly over the background. My only tangible criticism is that the perforations are incomplete and I have to cut the individual checks free.

Steve Kramer

#### Southern Observing

After a winter of cloudy skies (and other commitments on virtually every clear night) I was able to do some observing while visiting my mother in Tampa.

On a previous trip I met a member of the St. Petersburg astronomy organization, who graciously showed me the location of their observing site in Spring Lake, Florida.

Armed with my 8" Coulter and telrad, I drove to the orange orchard where the site is located. The night rewarded me with fairly good transparency and superb seeing conditions. It is amazing what good skies can do for your observing skills.

I was able to locate and carefully observe 28 Messier objects and was treated to spectacular views of Jupiter, all done in a three hour period. This was a welcome change for someone who has difficulty finding any objects in his light polluted, wooded suburban backyard. Next step: An Adirondack location three miles from the nearest electricity. More on that in the fall.

Joe Cavaluzzi

#### BOOK REVIEW

I've just bought a copy of John Sanford's OBSERVING THE CONSTELLATIONS. and I think it's a very useful and colorful observing guide for beginning and moderately advanced amateurs. It dispenses with a lot of the simplified astronomy often found in books like this. Instead, Sanford includes three or four pages of explanation about how to use the book and some fundamentals concerning binocular and telescopic observing. An astronomy textbook will almost certainly be needed by anyone wanting to know the physics behind the objects highlighted here.

The rest of the guide is devoted to observing each of the 88 constellations. But don't be misled by the title: there is much more depth than just identifying them. Each constellation is shown in a color photograph with a limiting magnitude around sixth, or a little higher, and a map of about the same scale and orientation where a variety of special objects are noted. This map is placed in context with surrounding constellations to aid in identification. The photograph is good because it shows just how tough it can be to pick out a star pattern when confronted by the real thing. What I especially liked in this guide is the list of interesting double stars, variable stars and deep sky objects for each constellation. Some guides include these objects only in the narrative, which means you have to search for them. For Andromeda, ten stars and eight deep sky objects are listed.

I have some minor complaints. The constellation names printed on the two maps showing the stars of the northern and southern hemispheres are hard to read. Also, the explanation of how to compensate for observing at different times is confusing because it unnecessarily refers to GMT and asks the user to rotate these maps by 15 degrees per hour although there are no degree marks on them.

I think it would be helpful to show connecting lines between the stars of adjacent constellations in the detailed maps. Finally, there is a conspicuously bright object in the photograph of Pisces that has no counterpart in the sketched map next to it. The object lies right on the ecliptic and is obviously a planet, but the author should have mentioned that in the text. I can imagine some newcomer to astronomy being bewildered by not being able to find the brightest object in the constellation.

Nonetheless, this is a good observing guide, and I recommend it for beginners. It was copyrighted in 1989 and published by Simon & Schuster. It is available at local bookstores for \$19.

Rowland A. Rupp

### SPY and TELL

Bill Halbert was the winner of the second prize in the Bel Canto Foundation Opera Competition. This award, a \$2000 scholarship, to be used toward the Bel Canto Opera Seminar held from June 27 through August 7 at Northwestern University, directed by the renowned bass-baritone, Giorgio Tozzi.

Darwin Christy prepared a dinner on April 30, for the Past Masters of the Tonawanda Masonic Lodge 247. The menu: Lettuce salad, beef-barley soup, chicken fingers stir-fried with cheese/cream sauce, hash brown potatoes, yellow and green beans, beets, and strawberry short cake.

Darwin sent a copy of his observations of the Great Conjunction of Jupiter and Saturn in '80-'81 to Dr. David Meisel of the Department of Physics and Astronomy at SUNY Geneseo, who uses the information in his astronomy classes. Sometime in the near future, Darwin is going to give a talk on astronomy to the Tonawanda Masonic Lodge.

On May 29th, Rowland Rupp and Dave Fliss presented a program on the planets to the young ladies at Seven Hills Camp.

The Biggies are bubbling over with happy news. Son, Kevin, graduated from Carnegie-Melon University on May 16, and is now a Second Lieutenant in the U.S. Marine Corps, and will be stationed at Quantico, Virginia. On May 29, Kevin and Nicole Dussault, also a student at Carnegie-Melon, were married in St. Johnsbury, Vermont. They are living off base at Quantico and are looking forward to a very happy life together. Our congratulations and best wishes.

Christopher Biggie has changed his major at Carnegie-Melon from engineering to industrial management. He also wants to do something in music. He plays trumpet, French horn, and is now interested in percussion. He hopes in the future to do some work in musical composition.

On June 13, Rowland Rupp sponsored a Horseshoe Tournament at Outwater Park in Lockport.

Steve Kramer's neice, 13 year old Maria, will be arriving from Italy to visit the Kramers for the month of July. Her father works for the Allitalia Airlines. While here, she will enjoy enrollment in the Park School Summer Camp, and also the Disney Channel.

Terry Radder is getting equipment ready to build an outdoor garden railroad which will eventually circle the house. He has to come up with 500 feet of track. Each car will be about 2 feet long, and Terry hopes to be finished with this exciting project next summer.

Edith L. Geiger

### BAA ANNALS

5 YEARS AGO - Summer meetings are star parties. In 1988 star parties were scheduled for the Catipovics' cottage on Grand Island and the Rupps' cottage at Lime Lake. Others were hosted by Marylou Bebak, the Rogers, the Biggies, the Morrisises and the Macks.

Bob Mayer received the 1988 College of Fellows award posthumously for his many contributions in providing technical and mechanical expertise to observers. The SPECTRUM contained observation reports by Carl Milazzo, David Czuba and Dina Adimey. Marilou Bebak restricted her observations to astronomical subjects in paintings at the Museum of Modern Art in New York City. According to Spy and Tell, Carl Milazzo was recognized as a dedicated amateur astronomer in a Buffalo News article by Terence Dickinson.

10 YEARS AGO - Star parties in 1983 were held by the Catipovics, the Rupps, Steve Desmond, Patricia Loebel, Tristan DiLapo, Claudia Belinski, John Yerger and Marilou Bebak. Articles by Fred Price on a "miniature straight wall" he first saw when observing the moon in April 1982 and by Ken Kimble on look-back time appeared in the SPECTRUM. Carl Milazzo and Michael Idem contributed detailed observation reports.

15 YEARS AGO - In 1978 we had star parties at the Desserts', at the Miesses', and at Mrs. Black's Camp Sprucelands near Java Center. We also had a family picnic at Chestnut Ridge Park.

Edith Geiger wrote a profile on Ed Lindberg, and Larry Carlino reported on the Cave 12 1/2-inch Newtonian telescope. An anonymous report of observations of Jupiter in 1977 and 1978 also appeared in the SPECTRUM. Sounds like the work of either Larry or Fred Price.

25 YEARS AGO - I couldn't find any SPECTRUMs for July or August 1968, maybe none were published during the summer. The June SPECTRUM announced that star parties would be held at Walter Semerau's solar observatory at Camp Sprucelands and at Newstead Observatory.

35 YEARS AGO - This SPECTRUM may have been the first ever published. The BAA BULLETIN was its predecessor. Paul Redding was the editor of this new, single sheet newsletter. Summer star party hosts were Ed Lindberg, Carl Kalweit and Bob Kirchgessner. A picnic was scheduled for Ellicott Creek Park. The Operation Moonwatch program was then in full swing, and a filming of the group's activities at the Clarence Station was planned.

Rowland A. Rupp

### A BINOCULAR TOUR OF THE VIRGO CLUSTER

East of Leo, stretching from Corvus north to Coma Berenices lies the 2500 member Virgo galaxy cluster. In western Virgo lies the richest part, the "Realm of the Galaxies". Roughly 40 million light years away, the light we see left the galaxies about the time of the end of the dinosaurs.

A look on Sky Atlas 2000 shows bunches of NGC's sprinkled around 14 Messier galaxies. Can any of these galaxies be seen in binoculars? You bet! Larger binoculars help a lot but the biggest factor is a dark sky. A good dark sky allows small instruments to see objects that are invisible in larger ones under brighter skies. Only when a galaxy's disk is brighter than the surrounding sky can it be seen. The fact that we can see anything at all of objects beyond our galaxy with binoculars is rewarding in itself.

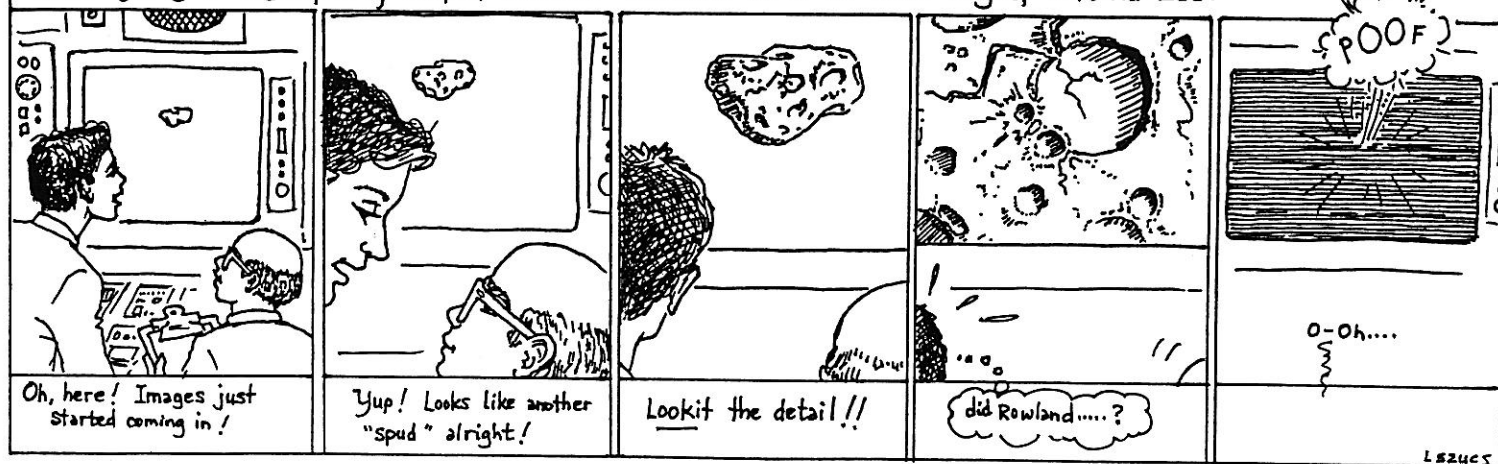
A sky atlas is essential. For binoculars I often use Bright Star Atlas 2000 as all the plotted objects can probably be seen in a 4" scope. Sky Atlas 2000 shows fainter stars, which are helpful. For any atlas, knowing how large a circle of sky you can see with your binocular (or scope and eyepiece) makes heavenly navigation, well... heavenly!

Galaxies are not the easiest things to see in binoculars and if you are not accustomed to the appearance of faint extended objects, you'll be disappointed. Important are well dark-adapted eyes, use of averted vision (gazing off-center while viewing straight ahead), looking for 1 to 2 minutes at a time to adapt your eyes to the light level and view, and firmly mounted (tripoded) binoculars. Sometimes a little jiggle will help to separate small galaxy-to-sky contrast differences. Also helpful is to find objects by knowing only roughly where they are, then check a star map after you think you found something. Estimate its location relative to field stars to check for a "definite catch".

### THE TOUR

I used both 8x40's and 16x80 binos. 10x50's are the practical minimum I'd suggest for galaxy hunting. Bluntly, not much can be seen in 8x40's or smaller; many galaxies appear to be fuzzy dots to "stellar points", which are identified by their position on a star chart. There is a difference in the look of a point between a galaxy point and a star. The easiest (although not really easy!) to see in small binos is M64, 9°

After giving us a glimpse of Gaspra, GALILEO continues on to its next target, Asteroid Ida:



northeast of the Realm's center. In increasing difficulty are M49, M87, M84, M86 and M85. These show tiny disks. All the rest of the Messiers I've identified as dots on Sky Atlas 2000. I used the 8x40's as an experiment; slow and painstaking work when you're used to larger instruments so ... on to viewing with the 16x80's! Note that the Leo Messiers: M65 and M66 are easier to see and find. Try them if the others cannot be seen.

The large 16x80 binos show diversified disks for all the Messiers and a few NGC's. You can spot them in groups in the wide 3.5° binocular field! M85 and M100 are a wide pair; M's 100, 98 and 99 form a triangle; M's 90, 89 and 58 form a north-south line with M87 centered westward; M87 forms a tight isosceles triangle with M's 86 and 84; and a NW to SE line is formed by M's 58, 59 and 60. Thus one group leads to the next. The more difficult Messiers are M's 58, 59, 89 and 100. NGC's seen were 4216 south of M99; and the tough 4526 and tougher 4535 a degree east of M49. Much easier is 4565 some 8° north of M85.

As you get used to objects' binocular appearance, field familiarity and map use, you'll find you can make old friends of these once reluctant objects. In fact that night I *leisurely* visited the 18 Messier galaxies from M64 south to M104 and the 5 Leo Messiers, noting differences in size, shape and brightness in 45 minutes with the 16x80's.

Bill Smith

#### ASTRONOMICAL HAPPENINGS

JULY 1993

- 3 - FULL (BUCK) MOON
- 4 - EARTH at aphelion (152,091 Mm)  
Conjunction - NEPTUNE & MOON  
Conjunction - URANUS & MOON
- 6 - SAGITTARID meteors
- 7 - Conjunction - SATURN & MOON
- 10 - MOON at Apogee (404,412 km)
- 11 - LAST QUARTER MOON
- 12 - URANUS at opposition  
NEPTUNE at opposition
- 14 - MERCURY at inferior conjunction  
ALPHA CYGNID meteors  
PHOENICID meteors
- 15 - Conjunction - VENUS & MOON  
Conjunction - VENUS & ALDEBARAN
- 16 - OMICRON DRACONID meteors
- 17 - VESTA stationary
- 19 - NEW MOON
- 22 - MOON at perigee (365,146 km)  
Conjunction - MARS & MOON
- 23 - CAPRICORNID meteors
- 24 - Conjunction - JUPITER & MOON
- 25 - MERCURY stationary  
FIRST QUARTER MOON
- 27 - ALPHA-BETA PERSEID meteoros
- 28 - S. DELTA AQUARID meteoros
- 30 - ALPHA CAPRICORNID meteoros  
PISCIS AUSTRALID meteoros

- 31 - Conjunction - NEPTUNE & MOON  
Conjunction - URANUS & MOON

AUGUST 1993

- 2 - FULL (GREEN CORN) MOON
- 3 - MERCURY at greatest elongation (19° west)  
Conjunction - SATURN & MOON
- 6 - PLUTO stationary  
MOON at apogee (405,257 km)
- 10 - LAST QUARTER MOON
- 12 - N. DELTA AQUARID meteors  
PERSEID METEORS \*\*\*\*\*  
UPSILON PEGASID meteoros discovered in 1975
- 14 - Conjunction - VENUS & MOON
- 17 - NEW MOON
- 19 - MOON at perigee (360,388 km)  
SATURN at opposition
- 20 - Conjunction - MARS & MOON  
Conjunction - SATURN & MOON  
KAPPA CYGNID fireballs \*\*\*
- 22 - Conjunction - VENUS & POLLUX  
OMICRON DRACONID meteoros
- 24 - FIRST QUARTER MOON
- 25 - PALLAS at opposition
- 26 - ZETA DRACONID meteors
- 27 - Conjunction - NEPTUNE & MOON  
Conjunction - URANUS & MOON
- 29 - MERCURY at superior conjunction
- 31 - Conjunction - SATURN & MOON  
FULL (STURGEON) MOON - Also this is called a  
BLUE MOON, being the second Full Moon of the Month.

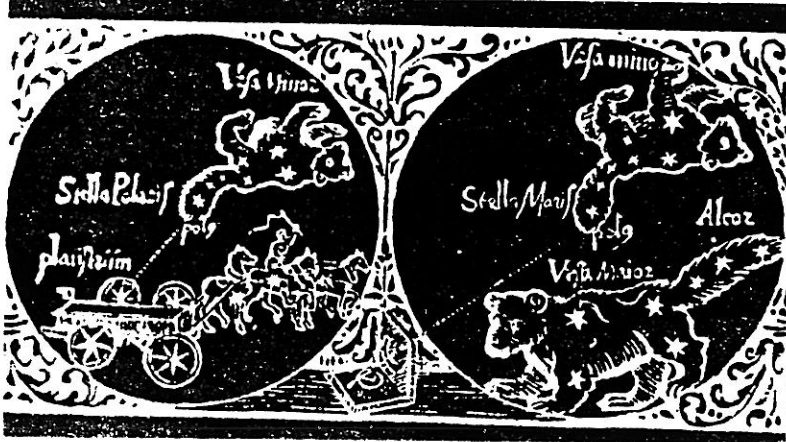
#### METEOR SHOWERS

On July 29th the DELTA AQUARID meteors will appear in the skies from radiant, Right Ascension 22 hours, 36 minutes and Declination 0° for the Northern and -17° for the Southern showers. Their duration is from July 21st through August 5th. They appear as a yellowish, long, slow streak of about 3rd magnitude. During the peek hours, 10 to 20 should be observed, although in some years there have been as many as 30 to 50 hourly. These meteors can be considered as one of the annual spectacles seen even with a Full Moon, which will be appearing at the same time.

On August 26th another shower will appear from radiant, Right Ascension 17 hours, 28 minutes, and Declination +63°, known as the ZETA DRACONIDS. These insignificant meteors last for 11 days around the date mentioned. They are long, slow, white meteors of 2nd magnitude. Only 5 to 10 can be counted hourly. It is a variable shower and perhaps cannot be seen every year. They are sometimes referred to as being sporadic meteors. Information on these meteors would be appreciated by the American Meteor Society.



In the constellation Ursa Major, we find an ancient constellation, Charles' Wain or Karl's Wagon. As Rycharde Eden wrote, "all the sterres cauled Plastrum or Charles Wayne, are hydde under the Northe pole to the canibals." The Swedes and Norse people refered to it thus: "The God Thor was the highest of them; He sat naked as a child, Seven stars in his hand and Charles' Wain." Even the royal poet King James had a say in the matter, "Heir shyne the charleswain, there the Harp gives light, And heir the Seamans Starres, and there Twinnis bright." These old and still universally popular title, **CHARLES'S WAIN** demands more than mere mention.



### MIRA

MIRA, A RED GIANT star nearly 200 light-years away, has a reputation for weirdness dating back centuries. Following an irregular cycle of about 330 days, it sometimes flares up to shine brighter than the North Star, then disappears from sight entirely. Now astronomers say that Mira is even more bizarre than previously thought; it is apparently oblong, a star flattened like a partly deflated beach ball.

"We found it to be noncircular by ten percent," says Shrinivas Kulkarni of Caltech. He adds that the picture "seems reasonably convincing," but he would like to see whether Mira changes shape over its cycle. "Our plan now is to follow it through its phases."

If confirmed, the discovery could shed light on the death of stars like our Sun, which, 5 billion years from now, as its nuclear fuel nears exhaustion, will expand into a bloated red giant itself. Many red giants are stars of variable brightness, a phenomenon thought to be caused by the star's expanding and contracting in a pulse-like rhythm. Since a star's gravity is crushingly strong, theorists have assumed that a pulsing star, although it might change its size, would retain the most compact shape possible - that is, a perfect sphere. But Mira's odd shape suggests that a red giant's death throes are not so simple.

Astronomer John Baldwin, who headed the Mira observations at Cambridge University in England, speculates that Mira's shape may be caused by a surface wind blowing away part of the stellar atmosphere. Or, he says, "Variable stars may not pulsate spherically - they may wobble like jelly."

The astonishing portrait of Mira is a major success for a clever new technique that's giving astronomers their first detailed optical images of distant stars. The technique, called aperture synthesis, exploits the wavelike nature of electromagnetic radiation and the fact that waves can be made to interfere with one another. In this case, light from a star is collected by pairs of widely spaced mirrors. Because the light from one side of the star travels a different distance to each mirror than does light from the other side of the star the waves arriving at one mirror can end up out of step with those arriving at another. Bring the waves from the mirrors

together, and you have interference 'fringes' - modified peaks and troughs in the combined signal caused by the peaks and troughs in the individual signals working with or against one another.

Each pair of mirrors contributes its own fringes to the overall mix, giving more information on how the light varies from one side of the star to the other. A computer then converts the interference fringes into a detailed picture of the star itself. How detailed a picture you get depends on the number and separation of the mirrors - the more and the farther apart the better.

Radio astronomers have been using this approach for decades to image distant radio sources like quasars. Although simple in principle, it is tricky in practice. The signals from all the detectors must be combined precisely to get a clear picture. That means knowing the spacing between detectors very accurately. With the short wavelengths of visible light - far shorter than radio waves - accuracies near a thousandth of an inch are needed to get the fringes.



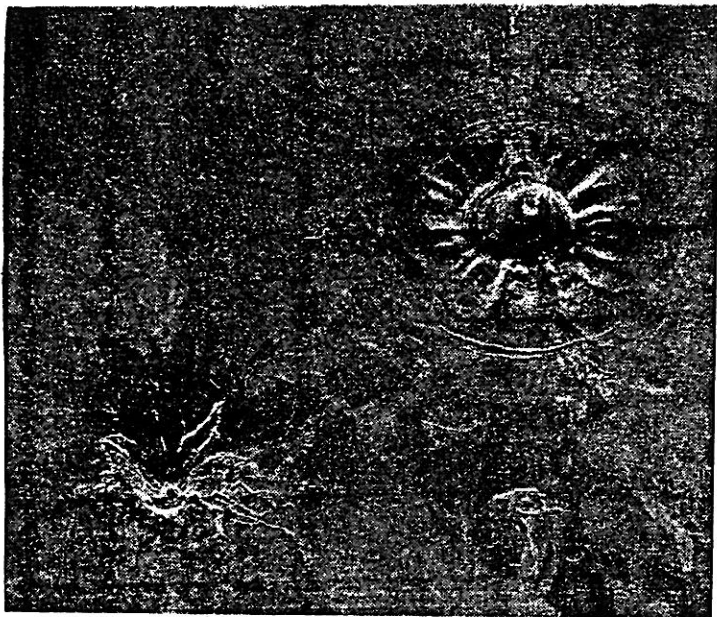
Does it wobble like Jell-O? Is it blowing off gas around its middle? Astronomers are grappling with the discovery of a noncircular star.

The teams behind the Mira work are now solving the technical problems using modified conventional telescopes. They put a mask with a pattern of precisely spaced holes at the telescope's prime focus; the holes mimic the effect of separate mirrors. The total amount of light finally collected is cut, of course, but that is more than compensated for by the greater information gathered through the interference effects.

This past year Baldwin's group obtained the first detailed images of a distant star, Betelgeuse in Orion, using aperture synthesis on the 165-inch William Herschel telescope in the Canary Islands. Meanwhile Kulkarni's team masked the 200-inch Palomar telescope to obtain images of two companion stars with a resolution 30 times better than could be achieved using the telescope in the conventional way. Both groups then trained their telescopes on Mira, with stunning results.

The next step, building a set of independent mirrors spaced up to 100 yards apart - it is well under way at Cambridge. After the surprises sprung by the early work, what this much more powerful instrument will discover is anyone's guess.

The foregoing article was written by Robert Matthews, and was published in the July 1991 issue of DISCOVER magazine.



### The VOLCANOES of VENUS

Two Volcanic domes on Venus are clearly visible in this mosaic image made by the Magellan space craft and released by the Jet Propulsion Laboratory. The larger dome at upper right is about 30 miles across with a crater nearly 13 miles. The smaller dome, lower left, is about 20 miles across with a 3 mile crater.



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BUFFALO ASTRONOMICAL ASSOCIATION, Inc.

Darwin Christy, editor  
216 Kohler St.  
Tonawanda, NY 14150

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### BOOK BRIEF

If you like to read good Sci-Fi books now and then, especially ones grounded in real science, check out Robert L. Forward's 'Rocheworld (and its sequel of sorts, Return to Rocheworld). Written by a physicist, there are lots of new angles on space travel technology, plus quite an imaginative look at a possible planetary system around Barnard's Star - featuring a double planet with all its orbital ramifications and a really unique life form. I like science fiction you can sink your teeth into, with a good dose of fun thrown in, and these hit the mark (**roaring \* hot \* vermillion** was the scream!). I enjoyed Rocheworld so much that I ventured to get another of this author's books, called Dragon's Egg, depicting life on the surface of a neutron star passing nearby in the constellation Draco. It was a bit ponderous to read (all that gravity, y'know), but life histories of generations of rapidly evolving "Slugs" aside, Mr. Forward proves himself to be a master of building plausible realities out of what-if scenarios.

Luann Szucs



PLEASE !!! Articles are needed for the next few issues of "The SPECTRUM". Any small are large appreciated.