

# THE FOCAL POINT

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The Newsletter of the Atlanta Astronomy Club

August 1991

## CLUB CALENDAR

**Next Meeting:** Our next meeting is at 8:00 p.m., Friday, August 16, 1991 at Fernbank Science Center in Classroom 1.

**Program:** Several of our club members were fortunate enough to travel to the ends of the earth to witness the recent total solar eclipse. They will describe their experiences with words and pictures.

## HOW TO SEE AN ECLIPSE (AND HOW NOT TO!)

by Bill Snell

When I hear the word "eclipse" I always think of total solar eclipses, not lunar or partial solar eclipses. These other types are spectacular in their own right and I always look forward to them. However, watching the moon's shadow race toward you at more than a thousand miles per hour and then seeing the solar corona and prominences are unforgettable experiences. The sunlight disappears so fast in the final moments before totality and the whole scene is so unsettling that it is easy to see how the ancients could have thought that some giant creature was devouring the sun. I have never seen a photograph or read an account that comes close to describing what I saw in Manitoba in 1979 or in Baja.

I am glad that so many club members went to the eclipse path this year. This eclipse had a long totality, excellent weather prospects and it wasn't very far away. At least

four members went to Hawaii, at least six to Baja and at least four to the Mexican mainland. Unfortunately, Hawaii was clouded out, but Baja was mostly clear. At least one group on the mainland saw the eclipse, despite dire predictions of clouds, thanks to the expertise of the tour guide.

Though I was in Baja, I came very close to missing totality. Our group had enough information to choose a good observing site but ignored most of it. Our run-in with clouds, only minutes before totality, was more the result of poor judgment on everyone's part than on bad luck. We moved away from the worst of the clouds but, believe me, it was close!

We had set up at a small airstrip at Santiago, a mountain village near the center line. Most of the nearby mountains had small cumulus clouds building above them, but the sky overhead was very clear when we arrived and remained clear until the eclipse began. Gradually at first and then very rapidly small clouds (probably caused by the eclipse itself!) began to form and encroach on our site. They completely obscured the sun twenty minutes before totality. We took off in search of clear(er) skies, but the clouds always seemed to form just ahead of us. With only moments to spare, we stopped, jumped out of the van and watched the eclipse through thin clouds.

Totality had begun by the time I regained my balance and looked up. The clouds obscured the outer corona but we had a fine view of the structure of the very ragged middle and inner corona. Two big,

bright naked-eye prominences looked awesome in binoculars and a small telescope. The landscape had a strange blue color under the coronal light and was about as bright as it would be in deep twilight. We didn't have a very good horizon, but I could see an orange glow about halfway around. Thick clouds moved in during the last minute or so of totality so we missed third contact, but then third contact is a bummer anyway! As you might have already guessed, the clouds disappeared a few minutes later! The last minute dash and lack of time to set up our equipment detracted from the event but we did see some interesting things.

Could we have avoided this situation? Yes, because it wasn't due to simple bad luck. We ignored common sense rules when we chose our site.

First rule: Choose a site primarily on the probability of clear skies. Baja has a reputation for clear skies and this is why I had chosen it in the first place. Yet Baja does have some mountains that are notoriously cloudy and we just got too close to them. *Sky & Telescope* had even warned its readers twice to stay away from the mountains and an article in *Astronomy* gave a similar warning.

Second, do not be concerned with gaining a few extra seconds of totality by going to the center line, just get reasonably close. San Jose del Cabo had a totality only thirty seconds shorter than maximum but vastly better weather prospects.

Third, move promptly if conditions deteriorate. We should have

headed back to the coast when the clouds first appeared. In San Jose we would have been in a good position to relocate. In the mountains we literally had nowhere to run.

Fourth, if you are with a small group (rather than a tour) and did not bring a meteorologist along, let *everyone* else in the group know if you have any doubts about the weather. Start a discussion, present your case, suggest a course of action and then vote on it. I had read the warnings, seen some ominous looking clouds and concluded that we were headed for trouble yet did little about it. I can only blame myself for what happened.

I don't want to complain too much; after all, I did see the eclipse. During the hasty retreat from the clouds, when none of us knew if we would see the eclipse or not, I wasn't thinking of the trouble and expense of the trip but instead of the disappointment of missing such a rare event. A good eclipse is worth the trouble and if you are careful you have an excellent chance of success. So I will try to see another eclipse and I hope every club member will seriously consider the idea too.

There will be six more eclipses this century. Two will occur in South America and/or the South Atlantic. Two more will occur in Asia including one in Siberia that belongs to the same saros as the 1979 North American eclipse. If you liked Winnipeg in February you're going to love Siberia in March! Another eclipse will occur in Colombia and the Leeward Islands and the final eclipse of this century crosses Europe and Southwest Asia. Most of these eclipses will not be as easy as the "Big One" of 1991, but I hope you will give one a try.

### MIRACLE IN MARVELOUS MEXICO

by Karen Winstead

I asked Mike [*That's me!* - Ed.] if I could report to the club about our experience in Mexico on the 1991 Total Eclipse Expedition since it was my first time viewing this phenomenon. He told me to "Go for it." We left Atlanta early on July 9 and met the rest of our group in Dallas. Most of them were from Jacksonville, FL and several were Mike's buddies from his Astro-Gator days during his high school years. My first impressions of our group were questionable when I saw all sorts of cameras, tripods, video and telescope equipment loaded

onto our bus in Mexico City. I thought that Mike was taking a lot of equipment! All we had was one camera, one video camera and two tripods.

Our first full day in Mexico City was spent touring as a group. We met that evening in our hotel to consider the weather and to make a final decision on the best viewing location. A high pressure cell was supposed to keep the clouds from getting too dense in our locale, so we were hopeful for clear skies. After our group pow-wow, all that was decided was that we needed to make a few phone calls to some weather experts for current details the next morning, and that we would make the final decision then.

About 8:30 a.m. on the 11th, our group assembled with **all** the miscellaneous pieces of equipment in the hotel lobby. I'm sure we were a sight coming out of the elevators with various sizes of tripods, camera bags and boxes. A couple from California who had come to see the eclipse happened to see one of our members loading some equipment on the elevator. They asked to join our expedition, and we gladly agreed (for a few thousand pesos). We got all the equipment loaded on the tour bus which would take us to our destination... one hopefully with clear skies!

After a brief conference using our latest weather data, we made the decision to head southeast. Now numbering 20 complete with Joachim, the driver, and Juan, our trusty guide, we headed off toward the town of Puebla. Our drive was pleasant, but everyone was concentrating on the fluffy clouds which hovered in the distance along the horizon. As we crossed the mountains leaving Mexico City, we felt confident that we were leaving the city smog behind, and that we would have clear skies for viewing the eclipse.

As we drove through Puebla (a city of about 3 million people) the clouds seemed to be less toward the southeast, so we continued in that direction toward the town of Atlixco. When the clouds began to thicken, our group members began to feel *very* nervous, so we pulled off the road for a sky check and conference. There was only supposed to be a 20% chance of clear skies near Mexico City during the eclipse. We were hoping for a miracle! Climbing a nearby hill, we scanned the skies for signs of breaks in the small wispy clouds. There were many, but there were more clouds along the mountains in the distance, and we were not sure that we should continue heading in our current direction. Our guide conferred with a farmer who happened to be working in his fields next to the road. He stated that the clouds usually stayed away until later in the afternoon and that there had been no rain in the last few days. This lack of rain meant that when the temperatures cooled during totality, existing clouds would tend to disperse.

We decided to turn back toward Puebla down a different road. We found a good, level spot with enough room to set up all our equipment along a narrow two-lane highway. We were located on a plateau with views of the horizon in all directions. In the distance we could see Mount Popocatepetl, a snow-capped volcano. The clouds seemed to be clinging to all the surrounding mountains.

During the partial phases we gained some local inhabitants who stopped along the road to view the eclipse. We were all equipped with special mylar film glasses for viewing. Many Mexican people had viewers which had instructions stating they should not be used for more than 10 seconds of viewing at a time... and before continuing the eyes should have a 50 second rest. Of course, there was a great deal of excitement building and our "guests" enjoyed viewing the sun through the cameras and telescopes which we had set up on the site. The clouds were still small and puffy overhead and only occasionally covered the sun as it went through the partial phase.

Just as the shadow was beginning to cover the sun, a large hole in the clouds settled in overhead. Anticipation built rapidly as the expedition's members began to realize that this eclipse was definitely going to be a go. As totality approached, the landscape began to take on an eerie darkness and colors were muted by the dimming light. The skies on every horizon began to appear as if it were sunset all around us. The shadow moved over the mountains and the sun was swallowed by the moon. We saw a brilliant diamond ring, and the corona was visible even before the ring disappeared. It was an absolutely incredible experience!

Totality lasted for just over six and a half minutes. One of the most amazing things to me was that many cars and trucks just turned on their lights and continued up the road as though the sun always disappeared in the middle of the day! Mike had recorded a cassette tape the night before which reminded him of the things he should do as well as things to look for during totality. I manned (personned?) the video camera while Mike took pictures. All around us were cheers, gasps of amazement in English and Spanish as the solar disk and moon did their magic. We saw Venus and Jupiter as well as Sirius and parts of Orion. It was glorious!

As totality ended, the sun treated us to another brilliant diamond ring. We all applauded the show, watched the partially eclipsed disk for a while and began loading up our equipment. The trip back to Mexico City was somewhat subdued. I imagine every-

one, even those who had seen numerous eclipses, was feeling as awed as I was after having just seen my first one. If you have never experienced a total eclipse, you must make every effort to do so. After all, what better excuse to travel to different parts of the world! I was told that each eclipse is different, and the experienced watchers told me that they had never seen a more brilliant corona. Needless to say, we all did celebrate afterwards at a restaurant with an appropriate drink—what else, a Corona beer!

## MY FIRST TOTAL SOLAR ECLIPSE

by Rebecca Kern

I never really was into astronomy, but after seeing the 1991 total solar eclipse, I'm hooked (at least on eclipses)! I went to Mexico with my Papa (Mike Kazmierczak *(that's me again—Ed.)*) and Mama (Karen Winstead). The eclipse was really neat. I just can't explain exactly why I thought it was neat—it just was! I really, really enjoyed it!

We traveled near a town called Puebla and had good, clear skies for the total phase. I saw a circular sunset just before the totality began. As the event began and ended we saw two diamond ring effects. Unfortunately we didn't see any Bailey's Beads. While the sun was covered, it got really dark just like it was going to be night.

I really want to see the next total solar eclipse in 1992. I know the eclipse is in South America and that it will be expensive, but I still hope my Papa will take me!

## A DAY IN THE SUN

by Dave Riddle

Something happened to me during that hot Mexican day. Just what happened is difficult to explain. I just know I won't soon forget it. But I will try to tell the story to you, my patient readers.

A concern about the weather led me to rise before the sun that particular morning and stroll across the deck of the ship, the *M.S. Jubilee*. Weighing close to 50,000 tons, this snow white vessel easily slid through the oily black sea. To starboard the sleeping city of Mazatlan and the western Sierra Madre mountains lay and to port stretched the Pacific Ocean. Even before I had an unobstructed view of the sky, I realized the sun hid behind a leaden panorama of cumulus clouds, some towering to immense heights, their

bases dark and heavy with rain. A waterspout [*Neat! — Ed.*] danced on the horizon, ascending and descending between columns of rain from the ragged sky.

The ship turned west. Maybe we would find the sun farther out to sea. The cloud darkened sky began to lift and retreat aft as we steamed away from land. A thin strip of blue sky touching the horizon gave promise of a tropical sun if we could outrun the overcast weather blowing out to sea from the mainland.

The sun peeked from behind the clouds and a rainbow arched over us as we again turned and headed for a patch of clear sky. The sun broke free from the clouds but a strange darkness lingered. To the west an ominous dark band began to rise and steal the light from a clearing sky. This rising apparition seemed as threatening as the storms of early morning.

At the zenith, the sun, attended by a dazzling display of iridescent clouds and a 22 degree halo, began to grow feeble. Then it shrank to become nothing more than a brilliant noon star, a dying point of light, as the shadowed sky embraced it. Day and night magically reversed themselves, the sun gone black and the sky bright with glowing planets, a pearl-like corona and sunset colors burning near the horizon.

I shouted at the appearance of this sight and the spectacle ended. A bit of the sun exploded into view. The shadowy apparition fell eastward as light and color returned to earth. Time itself seemed to have become confused at this awesome turnabout of illumination. The whole experience ended in an impossibly short time span, but some of the fleeting moments of totality lasted an eternity.

Hundreds of porpoises leapt from the sea to greet a returning sun. They seemed exuberant about the ending of this short nightfall.

Sunset brought to the sky a vivid orange wash of light streaked with delicate blue crepuscular rays. Climbing thunderheads building over the Sierra Madre caught the orange light and reflected it upon a green ocean. For the second time that day a shadow arose from the west as planets, loosely strung across the sky, shimmered in the ebbing twilight. Night fell and the stars descended to earth.

Maybe I do know what happened to me on that hot July day. Something stirred a slumbering half-remembered emotion, an emotion of awe, a remembrance of being a child seeing the sky for the first time.

## DECISIONS, DECISIONS, DECISIONS

by Ralph Buice

Now that the July 11, 1991 solar eclipse has taken place, it's time to plan the next eclipse expedition to far off lands. Fortunately for us, eclipse calculations can be done far in advance of the actual event. *The Canon of Solar Eclipses* by Meeus, Grosjean and Vanderleen lists all solar eclipses taking place between the years 1898 and 2510, so it's easy to pick and choose a favorite. Indeed, calculations show that as many as seven eclipses can occur during a year; at the very least, there are two solar and two lunar eclipses; and at the most, there are five solar and two lunar eclipses (or vice versa).

It is certainly tempting to think that there might be many more than seven eclipses during any particular year. Since the Earth's shadow is opposite the Sun, the Moon can cross it only at the time of full Moon. In the same way, the Moon's shadow cannot touch the Earth unless the Moon is between the Sun and the Earth at new Moon. So why isn't there a lunar eclipse at each full Moon, and a solar eclipse at each new Moon? The answer lies in the small five degree tilt of the lunar orbit with respect to the plane of the Earth's orbit. At times, this tilt is sufficient to cause the Moon's shadow to go above or below the Earth at new Moon, and the Moon itself to pass above or below the Earth's shadow at full Moon. The net effect is to reduce the number of eclipses during the year. Incidentally, since the term "eclipse" really refers to an object moving into the shadow of another, a total solar eclipse is more properly called an occultation (Beow!).

Therein lies part of the problem. Since a lunar eclipse is a real eclipse, the phenomenon is visible anywhere the Moon is above the horizon. But during a solar "eclipse" the shadow of the Moon on the Earth's surface is always less than 270 kilometers wide. Whether or not an observer can see totality depends upon the observer's location with respect to this narrow shadow, and since the shadow moves at least 34 km/sec., the maximum duration of a solar eclipse is only about seven and a half minutes. Thus it is pretty unlikely that an total solar eclipse can be seen very often from Atlanta.

Every eighteen years and eleven days eclipses recur with a periodicity known as **saros**, which makes it possible to predict eclipses long in advance. Because the Moon's perigee and node positions regain approximately the same phase with each saros, eclipses belonging to the same saros have similar

characteristics. Also, because eclipses occur more frequently than once every 18 years and 11 days, several saros cycles are in progress at any given time.

In 1966, the *Canon of Solar Eclipses* was published, the result of a massive computing project at the University of Ghent using what was then a state-of-the-art IBM 1620 data processing machine. The computer was equipped with a memory of 20,000 decimal positions and an IBM 1622 punched card input-output unit. The solar eclipse calculations were divided into nine separate FORTRAN programs due to the limited memory of the computer, and each succeeding program made use of the results of the preceding one. Great care was taken to keep the thousands of punched cards involved in each of the nine stages in the proper order. Considerable attention was also paid to the calculation of tangents, since when the cosine value of an angle

was close to zero, the tangent subroutine of the IBM 1620 often caused a troublesome overflow of memory capacity. Between the eighth and ninth programs, the output cards of the eclipse data were sorted on an IBM sorting machine before being sent to the final calculation program. The answers were then typed on the console typewriter of the IBM 1620 and photographed directly for the printing of the *Canon*.

Choices for total solar eclipses until the year 2001 are as follows:

<u>Date</u>	<u>Length</u>	<u>Visibility</u>
June 30, 1992	5' 20"	South Atlantic
November 3, 1994	4' 23"	Central South America, South Atlantic
October 24, 1995	2' 10"	Iran through North India, Thailand, Vietnam, SW Pacific
March 9, 1997	2' 50"	Mongolia, Siberia
February 26, 1998	4' 08"	East Pacific, North Columbia, Leeward Islands, Atlantic
August 11, 1999	2' 23"	North Atlantic through South England, North France, South Germany, Turkey, Iran, India
June 21, 2001	4' 56"	South Atlantic, South Africa

Which one to choose? Why, the eclipse on June 30, 1992, of course, and after that, November 3, 1994, and after that.....

## GRAZING OCCULTATION HIGHLIGHTS FOR LATE 1991

It is time, once again, for the semi-annual report on upcoming grazing occultations for the latter half of the year. After beating the computer severely about the knees, he relented and mailed me said predictions. The grazes in the upcoming months aren't great, but aren't too bad either. Cloudy weather foiled all but one attempt early in the year. If you don't know what a graze is, read the next section, otherwise skip a bit.

**The Focal Point** is published monthly by the Atlanta Astronomy Club, Inc. The AAC is a non-profit organization dedicated to the advancement of amateur astronomy. Meetings are held on the third Friday of each month (the second Friday in December) at the Bradley Observatory on the Agnes Scott College campus. Dues are \$35 annually and include a subscription to *Sky & Telescope* magazine and use of the observatory in Villa Rica.

**Submissions:** Article submissions are welcome and encouraged. Please deliver to the editor for consideration. Electronic submissions are accepted at [mike%beow.uucp@gatech.edu](mailto:mike%beow.uucp@gatech.edu). The submission deadline for the next issue is *September 5*.

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A grazing occultation is a special case of a total occultation. For any given star, a total occultation has two distinct events, a disappearance and a reappearance. If the time difference between these events is very small, then the star would disappear and reappear at the northern (or southern) edge of the moon. Since the moon isn't a smooth sphere, its mountains and valleys cause many disappearances and reappearances over several minutes of time.

The factors which affect the observability of a graze are the star's magnitude, the percentage of moon which is illuminated, the moon's altitude (if low), the sun's altitude and the cusp angle. The cusp angle is the distance in degrees on the moon's perimeter between the event and the terminator. Obviously, events on the bright (sunlit) limb are much more difficult to observe. These events have a negative cusp angle.

Listed below are grazes for the latter half of 1991. MG is the mid-graze time in Eastern Time.

DATE	MG	MAG	MN	SN	CA	%SN	DIST
AUG 31	1:43	4.6	34		7N	66-	135
SEP 13	21:18	7.5	14		12S	32+	48
SEP 16	23:03	7.4	20		17S	61+	24
NOV 3	5:09	7.0	12		13S	10-	35
NOV 11	20:37	7.1	12		17S	27+	53
DEC 10	19:32	8.2	21		15S	19+	10
DEC 12	19:58	7.5	37		14S	36+	44
DEC 29	4:45	8.2	28		13S	36-	30
DEC 30	4:54	7.9	19		12S	26-	46

I am planning to observe most of these grazes (weather permitting, of course). If you have any questions about grazes or equipment needed or are just plain interested in observing one of these wonderful astronomical events, give me a call at 760-8502.

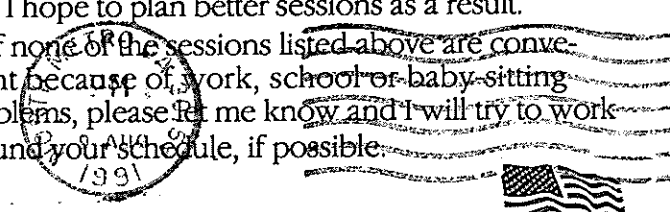
**OBSERVING SESSIONS AT  
VILLA RICA  
SEPTEMBER - DECEMBER 1991**

Future observing sessions have been scheduled for the following dates:

- Saturday, September 7th
- Saturday, October 5th
- Friday, November 1st
- Saturday, December 7th

I strongly recommend that you call me at least one week prior to any observing session to let me know you are going to attend. You can still come to the observatory if you do not call but I will not be able to inform you of changes due to weather. Also, I will have some idea how many people to expect and I hope to plan better sessions as a result.

If none of the sessions listed above are convenient because of work, school or baby-sitting problems, please let me know and I will try to work around your schedule, if possible.



**THE FOCAL POINT**

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