R E G U L U S

THE NEWSLETTER OF THE

ROYAL ASTRONOMICAL SOCIETY OF CANADA - KINGSTON CENTRE

DECEMBER 1981 : JANUARY 1982

PREPARING FOR 1982

With our banquet and Annual Meeting behind us and the current series of meetings going very well, the Kingston Centre is looking forward with considerable anticipation to 1982. We have every reason to be optimistic because both the increased numbers and the dedicated enthusiasm of our members over the past year promise to continue in the coming year. Of particular delight to our centre is the number who have joined us in other places such as Tucson which now boasts its own burgeoning branch (Only alliterations can describe its recent growth!).

The Annual Banquet held at Aunt Lucy's Restaurant on November 27th was a very enjoyable occasion, one on which we were able to have Dr. Douglas join us. It is such events that make our organization more than just a group of people who meet twice a month. Perhaps we will be able to have such an event more often than just annually because such occasions certainly help our centre.

The Executive elected at our Annual Meeting to serve our centre during 1982 is as follows:

Honorary President :	Dr. A. V. Douglas
President :	Angelika Hackett
Vice President :	David Levy
Secretary :	Gerald Schieven
Treasurer :	John Hansen
National Council Rep :	Leo Enright
Librarian :	David Stokes
Newsletter Editor :	Leo Enright

The talks given at our recent meetings have been well received and there has been no problem in adhering to the schedule instituted in October. The speakers, Gerald, Leo, and Angelika, have all found their audiences very receptive and interested in the subjects of their presentations.

If we were to look back further over the past year, we could also be quite satisfied with what has happened and encouraged for the future. Our being represented at the General Assembly in Victoria by four members and our successful involvement in Astronomy Day and a Star Night in May were important accomplishments that stand out above a great many minor successes.

1981 was wonderful and 1982 promises to be better than ever for the Kingston Centre.

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FOR YOUR COMPENDIUM OF ESOTERIC FACTS

Many of us are aware of the fact that the region near the centre of our galaxy contains vast regions of hydrogen and other elements with intervening regions of dust-clouds, but did you know that the Galactic Centre contains enormous quantities of alcohol?! Among the elements detected in 1970 was methyl alcohol, and in 1975 research reported in the Astrophysical Journal stated that a "truly astronomical source of ethyl alcohol" had been located in the star cloud Sagittarius B2. There is was! The real thing!

Calculations showed that if purged of all impurities and condensed, it would yield approximately 10^{28} fifths at 200 proof"!! That is a quantity which vastly exceeds the entire mass of the planet Earth. And it is at 200 proof!

(Note: Therein lies a possible plot for a science fiction novel. Need I tell you the details? The great intergalactic space monsters of the future, to slake their enormous thirst, bring to Sag. B2 their gigantic distilling devices and .....)

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A PAPER ON THE TIME OF EARLIEST SUNSET BY TERRY HICKS

Editor's Note:

Many of us are familiar with the fact that neither latest sunrise nor earliest sunset of the year occurs at a time that corresponds to the winter solstice, nor do the times of earliest sunrise and latest sunset correspond with the date of the June solstice. It is the former events that we may have noticed recently, and to the close observer such events are quite noticeable.

Terry Hicks, who has been an enthusiastic attendant at our meetings recently and who has been an expert on such events as sunrise and sunset, has written the following paper which I am pleased to publish for your interest and enjoyment. It appears on the next two pages.

The earliest time of sunset

Every year the earliest sunset occurs nearly two weeks before the winter solstice and the latest sunrise nearly two weeks after. Using the times of visible sunset for Kingston 44°14'.ON 76°30'.0W on December 14th and 15th, 1981. as an example, this article will attempt to explain the reason for this occurrence. Note: allowing 16' for semi-diameter and 34' for horizontal refraction the sun's upper limb will appear on a visible sea horizon i.e., sunset, when its true zenith distance is 90°50'.0 For those interested, the actual mathematical calculations appear at the end of this article.

Kepler's first two laws of planetary motion are:(1) the path of a planet around the sun is an ellipse, the sun being situated at one of the foci (2) the rate at which the line joining the planet to the sun sweeps out areas, is constant.

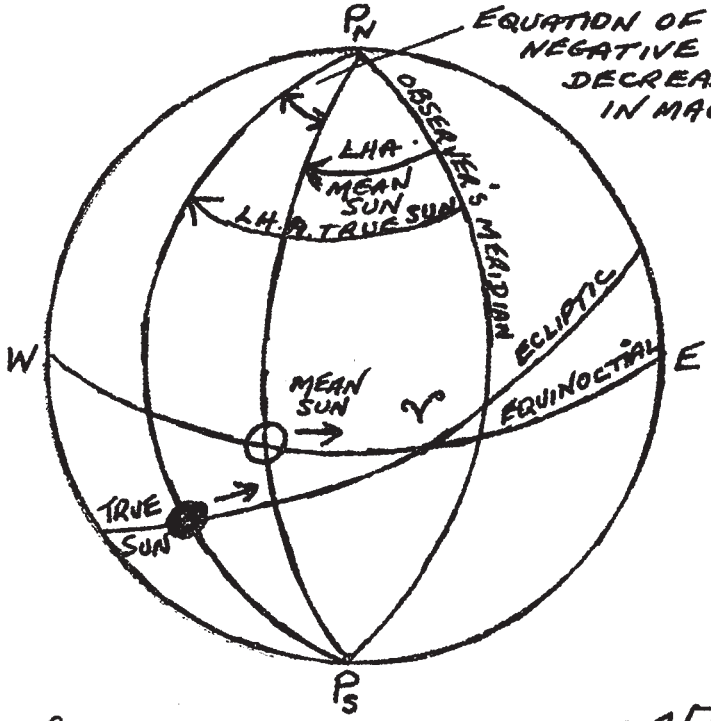
These laws dictate that the motion of a planet in its orbit about the sun will be most rapid at perihelion (early in January for the earth), its closest approach to the sun, and its slowest at aphelion, its farthest point from the sun. Thus to an observer on earth the sun appears to move in the ecliptic (apparent path of the sun in the celestial sphere) at a varying rate. The local hour angle of the true sun (LHATS) does not, therefore, increase at a uniform rate and it does not give a practical unit of time measurement, a measurement which must be uniform.

To overcome this difficulty, a Mean Sun is introduced, this being an imaginary body which is assumed to move in the celestial equator at a uniform speed around the earth and to complete one revolution in the time taken by the True Sun to complete one revolution in the ecliptic.

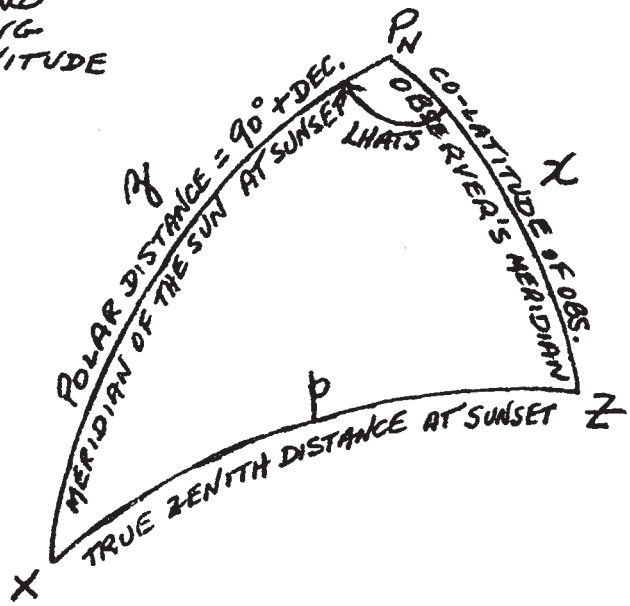
Although this assumption of an imaginary Mean Sun makes the ordinary clock possible, the same assumption also gives rise to a problem. In the case of sunset, for example, we are observing the True Sun and measuring time by the Mean Sun. It is necessary, therefore, to be able to connect mean solar time with apparent (true) solar time. The connection is known as the Equation of Time, defined as the excess of mean time over apparent time (Ref. Admiralty Manual of Navigation Vol.III (1954)). At times during the year the Mean Sun will be "ahead" of the True Sun and at other times the opposite situation holds. (Please see the following diagram.) The greatest value of the Equation of Time is just over 16m22s. On only four occasions during the year do the Mean Sun and True Sun lie on the same celestial meridian with the resulting Equation of Time having a value of zero. These dates are about the 15th April, 14th June, 1st September and 24th December.

The accompanying calculations show that, at sunset, on the 14th and 15th December the local hour angle of the True Sun is respectively 66°40'.0 and 66°36'1. This difference of 3'9 of arc, equivalent to approximately 16 seconds of time (1 minute of arc equals 4 seconds of time) is entirely due to the changed declination of the sun in the interval between two sunsets. If no other factors entered the picture, sunset on the 15th December would be 16s earlier than on the 14th. However, at sunset on the 14th and 15th December the equation of time is respectively negative 5m7s and negative 4m38s (approx). This indicates that time as determined by the Mean Sun has gained 29s on apparent solar time during the interval. Thus the net change in the mean time of sunset is 13s, the later time being on the 15th December. This is in agreement with the calculations for GMT sunset which follow. (Time arguments in the Nautical Almanac are GMT). The cumulative effect of these day by day events results in sunset occurring at the time of the solstice about 3 minutes later than its earliest time. It is of interest to note that in the calculations following, the Equation of Time is automatically taken into account when the Greenwich Hour Angle of the True Sun at sunset is converted to GMT when using the almanac.

Declination figures were obtained using the approximate time of sunset, GMT 2128, as the argument for both days. No reportable differences in results would accrue for a "second approximation" using a more precise time. A small degree of uncertainty exists in the last figure of some quantities. This is principally caused by the rounding off policies followed by the compilers of the Nautical Almanac.



NOTE: $\text{haversine}\,\theta = \frac{1-\cos\theta}{2}$



$$\text{hav LHAtS} = \sec z \sec x \sqrt{\text{hav}[p+(z\sim x)]\,\text{hav}[p-(z\sim x)]}$$

	SUNSET 14 DEC.	SUNSET 15 DEC.
DECLINATION	S 23°14.'7	S 23°17.'8
p	90°50.'0	90°50.'0
x	45°46.'0	45°46.'0
y	113°14.'7	113°17.'8
z ~ x	67°28.'7	67°31.'8
p + (z ~ x)	158°18.'7	158°21.'8
p − (z ~ x)	23°21.'3	23°18.'2

14 DEC.: $\text{hav LHAtS} = \sec 113°14.'7 \sec 45°46.'0 \sqrt{\text{hav}\,158°18.'7\,\text{hav}\,23°21.'3}$

15 DEC: $\text{hav LHAtS} = \sec 113°17.'8 \sec 45°46.'0 \sqrt{\text{hav}\,158°21.'8\,\text{hav}\,23°18.'2}$

SUNSET 14 DECEMBER	
LHAtS	66°40.'0
Long. W	76°30.'0
GHAtS.	143°10.'0
GMT	21-27-33
ZONE TIME	16-27-33 (+5)

SUNSET 15 DECEMBER	
LHAtS	66°36.'1
Long. W.	76°30.'0
GHAtS.	143°06.'1
GMT	21-27-46
ZONE TIME	16-27-46 (+5)

OBSERVING A "NEWLY-SUSPECTED VARIABLE"

By Gus Johnson

Editor's Note: Again in this issue of Regulus, the second in a row, I am pleased to report having received a very welcome letter from Mr. Gus Johnson of Swanton, Maryland. In this letter, most of which is reprinted here because of the interest it may hold for many of our members, Mr. Johnson reports observing in the famous Pleiades cluster a star which has recently been suspected of being a variable.

December 2, 1981

Dear Mr. Enright:

Best wishes for clear skies and a joyous Christmas season to you and the other members of the centre.

Little really clear observing weather without moon was to be enjoyed in November, but some fairly clear nights for visual observing at least did occur so that I finished the month with over fifty variable star estimates. I and a few others are monitoring a suspected new variable star, and in a well-watched area, like unto that bright eclipser found a few years back in the trapezium of the Orion Nebula. This one is in the Pleiades. The brightest Pleiad (Alcyone) has a little triangle of nearby, the closest star of which is the star in question. Burnham's CELESTIAL HANDBOOK calls it triangle of 9th mag. stars, but if the dimmest is 9th, then the next is 7½-8 and the brightest between 6 and 7. Two old photos of mine show it at 6.0 but the husband of the director of the AAVSO made a photo showing it dimmer than usual. My visual estimates during last month were mostly 6.0 but 6.7 and 6.4 occurred. If it is a variable two possible types come to mind: eclipsers or an R Coronae Borealis type. Assuming it to be a Pleiad, its color and normal brightness tend to preclude its being a R CrB, so maybe it is an eclipser or one of the small-range irregulars with which I am less familiar. My short 2.4-in. refractor is especially suitable for viewing this variable and the whole cluster with its 2 3/4° field at 25x.

The AAVSO accepts observations from careful observers soon if not AAVSO members, so not only Warren Morrison could be in the vanguard of observers* how observations are made and how the time is recorded. The assigned designation number looks wrong to me, and I have brought this to the attention of the director. The discoverer seems to be an observer from Tennessee, and a friend of George Kelley, with whom I have corresponded for years and visited on my occasional trips to Memphis to see relatives. George told me of the suspected star. I, too, have some suspected stars, but with variables of small range, the observer can sometimes wonder if it is rather his eyes that are playing tricks on him and not the star acting up. Red stars can cause mis-judgements of brightness due to the Purkinje Effect and where possible, out-of-focus images make estimating better. The left eye may not give the same estimate as the right eye! One must be careful. Even with the same eye two equally bright stars one above the other can look unequal; so side-by-side estimating, where possible, leads to greater accuracy. Possible inaccuracies notwithstanding, a variable star observer knows that he or she may be the only person in the world watching a given star that night, and they do sometimes "misbehave." Naturally dim stars are most in need of observing; yet sometimes a notice comes out for observations of variables that can be readily observed with binoculars or even the unaided eye, as in the case of Mira a year or so back.

Clear Skies,
Gus.

* of this star. He could show any interested observers

Once again Mr. Johnson's careful observing is an inspiration to many of us and we wish him the very best of luck in all of his observing.

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REPORTS AND OTHER ITEMS

1. Great numbers of observing events have had to be cancelled over the past several months because of the continuing cloudy weather. Depressing, isn't it? Venus has been spotted occasionally, and the Pleiades, and the great and enormous winter constellations, too, have been spotted as they swing into prominence in the southern sky. However, these have been rare and precious glimpses for the skies have yielded generally views of clouds upon clouds!

2. There are some special things to observe over the next month:
   (1) Try to observe some of the Ursid Meteor Shower members for they are usually fairly bright. This shower reaches peak on December 22nd which is close enough to new Moon so that it should not create a serious problem until near morning. The radiant is near the star Kochab.

   (2) The Moon and Venus should form a spectacular pair in the south-western sky on December 28th just as they did on November 30th. This is well worth photographing.

   (3) The Quadrantid Meteor Shower peaks on January 3rd. If the observer waits until after moonset, he may see some bright and fairly fast meteorm.

   (4) Although the eclipse season is upon us in January, there is nothing exciting to be seen by local viewers. The lunar eclipse on the 9th is for the Eastern Hemisphere and the solar eclipse of the 25th is for the far Southern Hemisphere.

   (5) A project for those with good horizons and good weather (!) may be to see how late in January you are able to view Venus before it slips across to the other side of the sun -- on the 21st of the month, and to see how soon you are able to see it in the eastern morning sky after that date. A great deal will depend on the weather, of course.

CLEAR SKIES!

GOOD OBSERVING!

HAVE A HAPPY HOLIDAY!

Leo Enright