SJAA EPHEMERIS

Volume 3 Number 11 Official Publication of the San Jose Astronomical Association NOVEMBER, 1991

From Your New Editor -

Our goal will be to serve you the members of SJAA. We can do this the best we are capable of doing. We will bring you the news and happenings as fast as we hear them. To do this we will need your help - all of you. One way is to comment constructively. We are open to suggestions for improvement. John did a superb job giving us a newsletter we looked forward to each month and I would venture we referred to it many times each month. Not only should John get a pat on the back but many thanks from each of us when we see him. You did a great job John and all by yourself with little help from others except authors. Thanks a bunch John. May your skies be the best seeing there is and your new pursuits successful. Stop by often and say hello.

Next, this is your news letter; write for it. Our motto is "you write it we'll print it". Hopefully the finished product will look like you wanted it to. Please remember that some times space may require some editing - I reserve the right. We will, however, try with diligence, to keep the essence of what you intended. There are a few things to remember however: Try to keep your article to whole pages, don't be too wordy, eliminate the *ALSO and HOWEVER(S)* [note above]. Condense and be concise, but get the point across. Book reviews are good and so are articles on how you made a part for your scope to make your viewing better. Jack Zeiders has given me a task to print directions - map - to our observing sites. We'll work on this. Thanks again John for your 85 issue gift. ---------- ED.

Thank You Wolfgang

Let us give Wolfgang Hanisch a rousing hand of applause for his service to SJAA. As many of youknow Wolf was our Beginning Astronomy instructor and leader at Grant Ranch with those who wish to practice what Wolfgang taught [did I say that?]. Wolf also served well on the Board of Directors. Many thanks Wolf for all you have done for the Association.

November 2: Star Party at Fremont Peak state park.

November 9: Star party at Grant Ranch with Halls Valley Group.

November 15: (Friday) Public star party at Branham Ln Park.

November 16: General Meeting at Los Gatos Red Cross. Board of Directors meets at 6:30 pm preceeding the program

November 23: Indor Star Party at Los Gatos Red Cross.

November 28 Thanksgiving with Turkey and stuffing

November 30: Star party at Henry Coe State Park

December 9: Star party at Grant Ranch with Halls Valley Group

December 13: (Friday) Public star party at Branham Lane Park

December 14: General Meeting at Los Gatos Red Cross. Board of Directors meets at 6:30 pm preceeding the program

December 25 Open up Astronomy gifts early in morning

Bob Fingerhut Bites the Astronomical Dust

Faster than a speeding bullet. Its a new found comet. Nope! Its Bob Fingerhut! Bob finally did it. He and Linda tied the knot on Saturday, October 5, in Sunnyvale. Several notable amateur astronomers were there to wittness the fact along with many of his friends. Bob's observing will never be the same again. There will be no more lonely, cold nights. The SJAA congratulates Bob and Linda and wishes them both happieness.

------ED

Light Polution Survery

The November issue of Sky & Telescope contains a Pleadies observation chart within an article prepared by the International Dark-Sky Association. The article begins on page 547 of the issue. This is part of their annual nation-wide survery and results will be published in S & T. Participating as a club, we could easily survery our own familiar locations to quantify our observations to date. I plan on bringing this up during our next Board meeting, preceeding the General Meeting

---------Del Johnson

[Del did bring this subject up at the board meeting. I think he got the go ahead to follow up and lead the task. He now needs your support. Give him a call at: (408) 448-0293]

--- ED

Happy Thanksgiving

The Astronomical Distance Scale

The problem of determining distances to astronomical objects is extremely fundamental in the field of astronomy, nearly as fundamental as astrometry (the positional determination). It should not be surprising then that it is an area of astronomy filled with controversy and even bad feelings. Before I go into the detail with the many methods used to build the distance scale, a little bit of global perspective on the subject must be included.

First, the distance within the solar system are known practically within meters — witness the success of the Voyager flybys. Accurate Solar System distances are required to obtain distances to near by stars, those within 50 to 100 parsecs (1 parsecs = 3.26 light years). Once many of these are identified over a wide variety of spectral classes, they are used to compare with similar stars farther afield. Eventually, distances to galactic (open) clusters are obtained - in particular the nearest open one, Hyades. The distance to Hyades is a cornerstone (one of many) of the distance scale. At this point one must begin taking the effects of interstellar/intergalactic absorption into account, something that will plague all further observations. As you can imagine, this is a lot of painstaking work and not easily automated.

Once the distance to Hyades is known, distances to other clusters can be determined. Eventually, one locates RR Lyrae and Cepheid variables, very bright stars that are easy to identify due to their variability and have known luminosities. RR Lyrae stars get us out to the galaxy's globular cluster system, and Cepheids then get us to all of the galaxies within the Local Group (Milky Way, M31, and their satellite Galaxies - about 20 in total).

Cepheids can not be seen in more distant galaxies, so even brighter objects are needed. Thus red and blue super giants, as well as giant H-II regions (the Orion nebula is an H-II region) come into play. In addition, one uses the globular cluster systems themselves. We are now at the distances of the M81 and M101 galaxy groups. In particular, the Sc I galaxy, M101, is another pivotal object, as these type of galaxies are easily identified for extreme distances.

At this point, one must begin to use the brightest objects in the universe as our 'standard candles', as they are called - namely super novae and individual galaxies. This gets us out to galaxy clusters and super clusters, specifically the Virgo super cluster, the nearest one. Virgo is another one of the fundamental distance objects, like M101 and the Hyades.

Now, we reach the final stage, that of the cosmological redshift. It is only at these immense distances that the redshift due to the expansion of the universe is greater than the Doppler redshift due to the peculiar motions of galaxies within their clusters and super clusters. (As a corollary, even though the universe is expanding our galaxy is not.)

So, what controversies exist in the distance scale? The first one is a rather minor one, I might add - has to do with the distance to the center of the galaxy. Optical astronomers determine a distance of about 7 kiloparsecs, radio astronomers 10. A 30% difference is quite large, but not unheard of in astronomy - a science where an answer within a factor of two is considered correct! The officially accepted distance to the galactic center is currently 8.5 kiloparsecs.

The second controversy is a more serious one, with a fair bit of bad blood on both sides. This has to do with the determination of the Hubble constant, a measure of how quickly the universe is expanding. Many astronomers who carefully work out their observations with out regard for the final result, obtain a value of about Ho = 85 ± 15 km/s/Mpc (weird units, I know!). Allan Sandage, an expert in the field with over 30 years experience, always gets 50 - regardless of the data he analyzes. The implications? Well globular clusters have a determined age of 12 to 17 billion years. A value of Ho = 50, Sandage's value, means the universe is 20 billion years old, which works out OK. On the other hand, Ho = 85 means the universe is 12 billion years old - and how can a 17 billion year old cluster exist in a 12 billion year old universe?? There is no resolution of this issue, but a lot of research is going on, which is good in itself.

And now, a short summary of the different methods used to bootstrap the distance scale. The various methods given below overlap each other to some extent, and many cover the same range of distances. This is important, as independent checks using each method are required to minimize the uncertainty of the measurements. Taken individually, errors of 50% would not be unusual.

1) Radar - This measures the scale of the Solar System, by measuring the orbit of Venus accurate to within a few centimeters. A bit of geometry gives the size of Earths orbit, which is needed for subsequent steps.

2) Trigonometric Parallax - Using Earths orbit as a baseline, the positions of stars are accurately measured 6 months apart. The angle through which the stars appear to move compared to distant objects is twice the parallax angle. Measured in arcseconds, one over parallax gives the distance in parsecs. (1 parsec = 3.26 light years) Distances can be obtained up to about 100 parsecs, which includes about 500,000 stars, assuming that each star has an average separation of 1 parsec. The ESA satellite, Hipparcos, is doing this type of measurement (of 180,000 objects) to an even greater accuracy.

3) Secular and Statistical Parallax - As above, but instead of using Earth's orbit as a baseline, it uses the movement of the sun through the galaxy. Observations are taken at intervals of many years. This requires that one know the peculiar motion of the Sun with respect to the Local Standard of Rest. Since the definition of LSR is statistical, this method must also be applied to an

ensemble of stars, usually taken to be in an open cluster - where it is assumed that all stars within the cluster are at the same distance.

4) Moving Cluster Method - This is applied to nearby clusters only, such as Hyades, Ursa Major, and Scorpio-Centaurus, as their proper motion must be measurable. Over a period of time, the proper motion of the stars within the cluster, if extrapolated forward, seems to converge to a point. A little geometry that depends on the convergence point is what will give the distance to the cluster.

5) Zero Age Main Sequence (ZAMS) Fitting - Given a known distance to a cluster, an H-R diagram can be constructed. This is then compared to the H-R diagram of other clusters, and the two graphs over laid each other until the two main sequences coincide. The shift in the observed magnitudes will then give the distance ratio between the two clusters.

6) RR Lyrae Stars - RR Lyrae stars are stars on the helium main sequence. It is assumed that they all have the *same* intrinsic brightness, confirmed independently, and since they are bright they are also seen in globular clusters. Which leads to ...

7) Cepheid Variables - Cepheids are helium main sequence stars in the so-called instability strip. While in this strip, they pulsate markedly, with the period of pulsation very strongly correlated with their color and their intrinsic brightness. Thus, one has a PLC (period - luminosity - color) equation for these objects. One must separate population I and population II Cepheids, since their differing metallicities give about a 1.5 magnitude difference in their brightnesses, but this can be done. Cepheids can be seen in all galaxies in the Local Group, a small cluster of galaxies of which M31 and the Milky Way are dominant members.

8) Super Giants - To get further, one uses the brightest red and blue super giants within a galaxy, on the assumption that the brightest (or 5th brightest, actually) will be the same brightness in all galaxies.

9) Novae - Same as above, with the assumption that the brightness of novae on a certain portion of their light curve is a universal constant.

10) H-II Regions - The velocity dispersions of giant H-II regions seems to be correlated with the absolute brightness of the parent galaxy and is used to obtain a relationship between the two. Also, the physical diameter of the largest of the giant H-II regions within a galaxy is assumed to be the same every where.

11) Globular Clusters - As in 8) above, the brightest globular clusters around a galaxy is assumed to be the same everywhere. This isn't actually a very good criterion, but for a long time it is the best that could be done. Now with the advent of better CCD's and telescopes, one can actually obtain a brightness distribution of globular clusters around nearby galaxies. The shape of the distribution is gaussian (kind of a bell shaped distribution curve) - it is now assumed that the peak of the distribution is a constant everywhere. This is a far better assumption than just using individual clusters which depend strongly on a very tiny statistical sample (less than 5), while the shape of the entire globular cluster system (greater than 100 members) depends on the physics of cloud fragmentation/star formation which is the same everywhere as far as we can tell.

12) Super Novae - Super Novae are as bright as their parent galaxies, and thus can be seen for immense distances. The shape of the light curve determines what type of super novae is seen and this can be used to determine what the absolute brightness at the peak had to have been.

13) Galaxies - At large distances, galaxies themselves must be used as the standard candles. Sc I galaxies (very open spirals) are easily identifiable, are found by themselves or within galaxy clusters, and have the nearby representative of M101 to calibrate the scale. Although, how accurate a calibration of one can be, I really can't say!

14) Cosmological Redshift - For objects like distant clusters and super clusters, quasars, etc., it is their redshift that is used to determine distances. The simple expression is the size of the wave length divided by the unshifted wave length is proportional to the distance.

This was a quick list of some, not all, of the methods being used to determine distances within the universe. Not all of the details are listed here, either, but just enough to give some idea of what is being used and some of the difficulty involved. With some of the assumptions above, I sometimes wonder how we can know anything about astronomical distances. Never the less, work is ongoing, and will likely produce more and more accurate results.

---- Arnold G. Gill
Astrophysician in training

Dr. Gerald Sussman, Group 70 Member Speaks to SJAA

Saturday, 7 Sept., San Jose Astronomical Association Held a picnic at Fremont Peak State Park near the 30" Observatory. The event was attended by a group of 30 amateur astronomers including Professor Sussman of MIT, who was kind enough to give a talk on the latest results of a special research project he has been doing for the last five years. The talk described a project to design, build and use special purpose computers to solve N-body problem numerically. Previous results were able to predict motions of planets out to some 1 million years.

Professor Sussman and his associates at MIT have been able to extend these results first to 220 million years, and recently out to a whopping 845 years. With these results they have been able to confirm old conjectures and make some striking new ones.

some striking new ones.

A mechanism for the emptying of the Kirkwood gaps that was first proposed by associate Jack Wilson has been confirmed. It seems that objects in these gaps may make occasional large changes in their orbital eccentricity under the influence of Jupiter. Once in a highly eccentric orbit, they are often further disturbed by Mars, never to return to their former orbit.

Resonances in the orbital elements of the outer planets have also been found. Pluto, while in a 3:2 lock with Neptune on short time scales, shows resonances in that lock with periods of 3.8 million tears, 35 million years, 120 million years and perhaps more.

Likening these resonances to an unstable pendulum, Professor Sussman pointed out that their existence on many scales of time together with other more complex results from these simulations suggest that the solar system is unstable over long periods of time. The scale of these instabilities is extraordinary. Professor Sussman illustrated it by saying that a one centemeter error in an estimate of the position of Pluto could lead to a one A.U. error in the predicted position of the Earth one billion years from now.

When the audience expressed concern about the implications of this result, Dr. Sussman quipped, "Don't worry about it. The Earth will be OK. But, just don't buy land on Pluto.

After the talk Dr. Sussman joined the rest at the 30". When someone pointed out that they could see more but for an upper level haze in the air that night, Dr. Sussman laughed and said that he had never seen such a clear sky in Boston.

..... **Dan Zuras**

November Celestial Calendar

Lunar Phases	Date	Rise	Tran	Set
NM 03:11hr	06-11	0707	1217	1723
FQ 06:02hr	14-11	1228	1809	2345
FM 16:56hr	21-11	1648	2345	0643
LQ 07:21hr	28-11	2350	0603	1213
Nearer Planets				
Mercury	07-11	0813	1308	1759
1.06 A.U.	17-11	0836	1322	1804
Mag - 0.2	27-11	0817	1311	1800
Venus	07-11	0240	0846	1450
0.79 A.U.	17-11	0250	0849	1445
Mag - 4.3	27-11	0304	0854	1442
Mars	07-11	0630	1154	1715
2.53 A.U.	17-11	0624	1143	1658
Mag + 1.5	27-11	0618	1132	1642
Jupiter	07-11	0111	0734	1355
5.58 A.U.	17-11	0038	0700	1320
Mag - 2.0	27-11	0005	0625	1244
Saturn	07-11	1145	1659	2209
10.3 A.U.	17-11	1108	1622	2130
Mag + 0.6	27-11	1031	1545	2054
SOL Star Type G2V	Mag - 26.72			
1455 - 1612	07-11	0628	1152	1713
1536 - 1848	17-11	0636	1153	1706
1616 - 2100	27-11	0642	1154	1702
Astronomical Twilight				
JD 2,448,567.5	07-11	0502	-	1838
577.5	17-11	0509	-	1832
587.5	27-11	0514	-	1829

Sidereal Time

Transit Right	07-11	0000	PST = 0256
Ascention at	17-11	0000	PST = 0336
Local Midnight	27-11	0000	PST = 0415

Darkest Saturday Night Nov 09

Sunset	1711
Twilight End	1836
Moon Set	1930

TIMES & DATES ARE PACIFIC STANDARD

by Richard Stanton

Design Help Is needed

SJAA has been working with Grant Ranch Co. Park administration to build an Observatory. SJAA is begining the design of the basic dome which will be used at Grant Ranch. Mr. Ethan Clifton, designer of the Keck dome and member of SJAA, has contributed his talent and is looking for drafters and writers. A "User Wish List" has to be prepared to identify design features. The dome is to be designed as a site-dependent unit, allowing it to be used with various equipment at any site. The SJAA will be the design owner. Contact Del Johnson at:

408-448-0239

ASTRO ADS

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NO LATER THAN THE 15TH OF EACH MONTH! Your Astro Ad will run approximately 3-months.

TELE VUE Eyepieces for sale. 26mm, 17mm, 10.5mm Plossl, $50 each. 7.4mm Plossl (has a few nicks in the barrel), $45. Celestron 26mm Plossl, $40. Pier and legs for Meade DS-16 equatorial mount, $100. Bill Cooke, 408-295-6560 10/91

CELESTRON 14 complete with fork, drive base, drive corrector, 2-inch diagonal, counter weights. With heavy steel pedestal, three legs, plus wedge. Excellent condition with excellent optics. $7800 takes it! (no eyepieces). You pick up! Contact: John Gleason 415-7928248 10/91

CELESTRON 8 w/Starbright coatings, 1.25" visual back, 1.25" mirror star diagonal, 26mm Plossl eyepiece, 7mm Ortho eyepiece, Orion T-adapter for Minolta Camera, piggyback camera mount, 8X50 Polaris finger scope, foot locker style case, and tripod and wedge. Five years old and well maintained, $900 or best offer. Tripod requires minor repair work. Paul Meyer, 408-370-3887 or 408-456-6253. 9/91

ASTRO PHYSICS Star 12ED refractor complete. Pictured in July '91 pg. 93 of Astronomy. With pulse drives instead of skysensor. In addition, included is 8X50 finder with quick release bracket, Motofocus and tube case. All mint condition. Unbelievably great performer! Only 6 months old. will sell only at purchase price. (slightly above $3,300) Now you don't have to wait 6-12 months to get it from the factory. Three Orthoscopic eyepieces by Aus Jena, 25mm, 16mm,

10mm. Call after 7 PM. Edward Hillyer 209-931-0846. 9/91

ULTRA FINDER A unique 5" f/5 refractor, Jeagers cemented Achromat in a cell, aluminum tube, mounted for 1/4-20 bolts, rack and pinion 2" focuser, dew cap, lens cover, 2" dia. 55mm Plossl (12X) and huge surplus 2" dia. eyepiece (7X @ 2-1/2° field). Has 2-3/4 times the light gathering power of Celestron,Lumicon or Orion 3" Super Finders. Solar Eclipses, the Moon, open clusters and nebulae are spectacular through this optic. Best offer over $550. (Steve is flexible, but since there are $650 worth of parts in here, he doesn't want to take a bath) Steve Greenberg 209-239-2154 (home) or 415-423-4899 (work). 11/91

COATED TRIPLET OBJECTIVE LENS f5.6, 40"fl, designed by Dr. James Baker of Harvard Observatory. Dimensioned plans for cell (optional pair of focal length reducer lenses included if you wish an effective back focal length of about 14"). Dr. Baker considered this to be one of his two best color-corrected designs manufactured. Photographic quality and will easily cover a 9" by 9" plate. A few minor scratches on the front element that do not interfere with optical quality. Two minor edge chips (covered by spacer ring) on the rear focal reducer lenses. Best offer around $600. Steve Greenberg 209-239-2154 (home) or 415-423-4899 (work). 11/91

Wanted: Used Celestron Firstscope 80 or comparable refractor for novice viewer to observe the valley with mild interest in the stars. Howard 408-996-2704 after 7PM.

Comet comments

Three new comets, two very unusual, have been discovered lately. Periodic Comet Hartley remains brighter than expected, continued position given below.

Comet McNaught-Russell (1991v): Robert McNaught and Kenneth Russell photographed this object in early August at magnitude seventeen. This comet will be closest the sun next April at 3.3 AU but should not get much brighter.

Comet McNaught-Russell (1991w): The same team picked up this object on Sept. 3 at eighteenth magnitude. The orbit suggests a near record perihelion of 7.1 AU. It will not get much brighter.

Periodic comet Spacewatch (1991x): T. Geherls of Kitt Peak, using the 36-inch Spacewatch telescope, discovered a twenty-first magnitude comet on Sept. 8. The orbit is of only 5.32 years. It was closest the sun (1.58 AU) last December.

EPHEMERIDES

DATE (UT)	RA (1950)	DEC	RA (2000)	DEC	ELONG	SKY	MAG
			PERIODIC COMET HARTLEY 2 (1991t)				
10-26	09h45.2m	+06°00'	09h48.2m	+05°47'	65°	M	10.4
10-31	09h56.6m	+04°23'	09h59.2m	+04°08'	67°	M	10.6
11-05	10h06.6m	+02°49'	10h09.2m	+02°35'	69°	M	10.8
11-10	10h15.8m	+01°21'	10h18.4m	+01°06'	71°	M	10.9
11-15	10h24.1m	-00°02'	10h26.7m	-00°17'	74°	M	11.1
11-20	10h31.5m	-01°20'	10h34.1m	-01°35'	77°	M	11.3
11-25	10h38.1m	-02°33'	10h40.6m	-02°48'	80°	M	11.4
11-30	10h43.7m	-03°40'	10h46.2m	-03°56'	83°	M	11.6
12-05	10h48.4m	-04°42'	10h50.9m	-04°58'	87°	M	11.7
			PERIODIC COMET WIRTANEN (1991s)				
10-26	10h45.9m	+13°30'	10h48.6m	+13°13'	54°	M	10.9
10-31	11h02.3m	+12°36'	11h05.0m	+12°19'	55°	M	11.0
11-05	11h17.9m	+11°42'	11h20.6m	+11°25'	56°	M	11.2
11-10	11h32.7m	+10°49'	11h35.4m	+10°33'	57°	M	11.4
11-15	11h46.8m	+09°59'	11h49.4m	+09°42'	59°	M	11.6
11-20	12h00.2m	+09°10'	12h02.7m	+08°54'	61°	M	11.8
11-25	12h12.8m	+08°25'	12h15.3m	+08°08'	62°	M	12.0
11-30	12h24.7m	+07°43'	12h27.3m	+07°27'	65°	M	12.1
			PERIODIC COMET FAYE (1991n)				
10-26	01h46.4m	+06°10'	01h49.0m	+06°25'	174°	E	10.0
10-31	01h47.2m	+04°58'	01h49.8m	+05°13'	169°	E	10.0
11-05	01h48.3m	+03°51'	01h50.9m	+04°06'	164°	E	10.0
11-10	01h49.8m	+02°52'	01h52.4m	+03°07'	159°	E	10.0
11-15	01h51.8m	+02°02'	01h54.4m	+02°17'	154°	E	10.1
11-20	01h54.4m	+01°23'	01h56.9m	+01°38'	149°	E	10.1
11-25	01h57.6m	+00°56'	02h00.2m	+01°10'	145°	E	10.2
11-30	02h01.5m	+00°39'	02h04.0m	+00°54'	141°	E	10.3
12-05	02h06.0m	+00°34'	02h08.6m	+00°48'	137°	E	10.4

Don Machholz (916) 346-8963

EPHEMERIS is published monthly by the San Jose Astronomical Association - 3509 Calico Ave., San Jose California 95124. Members are encouraged to submit articles for publication. These should be typed and submitted **no later than the 12th of the previous month.** All submissions should be sent to the editor, Bob Madden, 1616 Inglis Lane, San Jose, California 95118

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